

**CONCEPTUALIZATION AND OPERATIONALIZATION OF DELAY:
DEVELOPMENT AND VALIDATION OF
THE MULTIFACETED MEASURE OF ACADEMIC PROCRASTINATION AND THE
DELAY QUESTIONNAIRE**

by

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Abstract

Current procrastination measures fail to capture the multidimensional nature of procrastination behaviour and the multifaceted nature of procrastination problems, calling into question their use in evaluating procrastination in intervention research and clinical settings. Current measures also fail to differentiate procrastination from other forms of delay. These shortcomings have limited our theoretical understanding of delay in general and procrastination in particular. To address these problems, two sets of measures, the Multifaceted Measure of Academic Procrastination (MMAP) and the Delay Questionnaire (DQ), were developed in two parallel lines of multistage studies ($N > 4000$). In each line of research, a comprehensive approach to measurement development was followed to: (1) create items based on an initial theoretical model, (2) extensively evaluate the content of the definitions and items based on quantitative and qualitative data, (3) explore the factor structures and evaluate item functioning in order to reduce the number of items, and (4) confirm and refine the structure found in the exploratory analyses. The final structure of the MMAP consisted of four facets or separate scales: the Procrastination Behaviour Scale, the Negative Emotions Scale, the Perceived Negative Consequences Scale, and the Procrastination Duration Scale, which can be used separately or together. The final DQ consisted of six prototypes of delay: Irrational Delay/Anxious Procrastination, Hedonistic Delay/Hedonistic Procrastination, Inevitable Delay, Purposeful Delay, Arousal Delay, and Delay due to Emotional Problems. The extensive reliability analyses supported the reliability of the scales and subscales. Finally, after refining, establishing, and testing the new measures' factor structures, the data from multiple surveys were gathered to provide evidence for the construct validity arguments for the new measures. Taken together, the findings support the validity of using various total scores including the severity of procrastination problems, duration of

procrastination, procrastination behaviours measured by the MMAP, and prototypes and types of delay measured by the DQ. The validity studies also provided information regarding the prevalence of each form of delay and severe procrastination problems in student populations. The relations between procrastination and major personality factors, self-system variables as well as academic and health outcomes are discussed and compared with previous research findings.

Dedication

Dedicated to the ones who imparted to me the passion of life-long learning, the value of education, and the confidence to pursue my dreams and ideas despite the magnitude of obstacles and challenges in my way; the ones whose unconditional love and support became a never-ending source of energy to move forward in difficult days and fuelled my passion to invest in my work as deepest as I could; to those who patiently tolerated my shortcoming and struggles in different steps of the way, and kept their faith and supported me in various ways in all these years. This dissertation is dedicated to a few people who, without their love, care, support and guidance, I would have not started and/or could not successfully accomplished this long educational journey:

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my beloved wife and daughter

my dear sister and brother, Fatemeh, and Mostafa

and the last but not the least

my dear supervisor and mentor, Dr. Timothy Pychyl

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Introduction

Every one of us knows about delay: a train is delayed, a wedding is delayed, a meeting is delayed. In other words, delay is an unavoidable part of our lives. Some of these delays can be seen as quite wise, such as the delay of a marriage that one is not ready for, or the delay of a meeting at which one might get fired. Some delay can be seen as inevitable, such as the delay of one task (a meeting) in order to accomplish a more important or urgent task (bringing your child to a hospital). In contrast to these adaptive forms of delay, delay can also be maladaptive or problematic, such as needless delay in submitting an income tax form or irrational delay in preparing for an important exam, or a delay in getting help to quit substance abuse. People who regularly delay starting or completing important tasks despite their initial intention to act on the task, a form of delay commonly known as procrastination, very often suffer from anxiety, depression, dysfunctional impulsiveness, and poor mental health (Ferrari & Patel, 2004, Klingsieck, 2013; Rothblum, Solomon, & Murakami, 1986; Sirois & Pychyl, 2013, Stead, Shanahan, & Neufeld, 2010). Moreover, research has shown that re-occurring problematic delays are often accompanied by various negative emotions (Flett, Blankstein, & Martin, 1995; Pychyl, Lee, Thibodeau, & Blunt, 2000; Solomon & Rothblum, 1984) and lack of happiness (Pychyl et al., 2000), as well as causing poor academic performance (van Eerde, 2003), higher stress (Sirois, 2007), and health problems (Sirois, 2007; Sirois, Melia-Gordon, & Pychyl, 2003; Tice & Baumeister, 1997).

In addition to its alarming negative outcomes, procrastination is a frequent, common, and widespread self-destructive behaviour. Approximately 75 percent of university students report procrastinatory behaviour and around 20 percent of adults suffer from a chronic procrastination problem (Harriott, & Ferrari, 1996). Considering this evidence, it is not surprising that

problematic or maladaptive delay of an intended task—procrastination—has been the main focus of research in the last three decades (Burka & Yuen, 1983; Ferrari, Johnson, & McCown, 1995; Schouwenburg, Lay, Pychyl, & Ferrari, 2004).

A large number of research projects have been conducted so far to understand both procrastinating behaviour and chronic procrastination in academic and everyday life settings. The association of this problematic behaviour or trait with a large number of personality, cognitive, motivational and contextual factors has been examined in two major meta-analytic reviews (Steel, 2007; van Eerde, 2003). Despite such a great effort, the field of procrastination research has suffered from a lack of a clear and well-developed conceptualization, assessment and operationalization (i.e., measurement) of the construct. Unfortunately, the efforts to refine procrastination measurement has not been synchronised with increased interest in studying the relation of procrastination with various psychological processes during the last two decades. Most of the empirical efforts in the conceptualization and operationalization of procrastination occurred before 1995. However, these efforts have been limited in terms of definition, elements, and underlying theory compared to what has been considered in more recent reviews (Steel, 2007; van Eerde, 2003).

Most importantly for the present series of studies was that almost all of the existing procrastination measures have failed to address the important differences between procrastinating and other forms of delay such as rational and adaptive delay (e.g., Lay, 1986; McCown & Johnson, 2001; Aitken, 1982). In addition, existing definitions and measurements very often misguidedly have equated procrastination problems with a deficit in time management skills or a lack of discipline (Steel, 2007). Finally, there has been no consensus among researchers as to which elements constitute procrastination. For example, some exclude

emotional elements (e.g., Lay, 1986; Schouwenburg, 1995), whereas others find them important to include (e.g., Solomon & Rothblum, 1984).

Researchers have already noted the need for convergence in definitions of procrastination and for the development of a new measure (Klingsieck, 2013; Steel, 2007; van Eerde, 2003). In my dissertation research, I aimed to integrate current definitions and propose a new conceptualization of procrastination based on existing knowledge about the nature of procrastinatory behaviours and problems as well as its underlying theories. My theoretical synthesis provides the conceptual and theoretical foundation for developing and validating a new measure of procrastination, the empirical part of my dissertation work.

In my dissertation, I first review historical changes in the meaning and connotation of procrastination, then I review the psychological definition and explanation of procrastination as a trait and a problem; an extensive review and theoretical discussion of each important element¹ of procrastination follows. Based on this empirical, theoretical and conceptual evidence, I then provide an integrative conceptualization of the construct, and argue that measuring and differentiating various forms of delay may not only help us to understand procrastination but also open a new area of research. I then use this new conceptual framework to evaluate existing measures of procrastination. After the literature review, I present the approach I took to developing and validating a new measure of procrastination in academic settings, the

¹ Any conceptual and operational definitions of a construct can be analyzed and compared based on their aspects, components, content domains, features or attributes. I use the term “element” to discuss such conceptual and operational units. Given the complexity and controversy in the field related to the definition of procrastination behaviour and problems, it was practically more useful and methodologically more thorough to evaluate, discuss, and finally identify the necessary and important elements as opposed to evaluate and discuss the whole definition of constructs in the theoretical stage. After identifying the necessary elements of procrastination behaviour as well as practically and clinically important elements of procrastination problems, definitions of the constructs are provided.

Multifaceted Measure of Academic Procrastination (MMAP), and a measure that differentiates various forms of delay, the Delay Questionnaire (DQ).

Chapters 1 through 4 present the literature review, as well as the conceptual and theoretical discussion of delay and procrastination. In Chapter 5, I present the rationale, outline, and hypotheses of the empirical part of the dissertation. In Chapter 6, I present the item-creation procedure for the MMAP and DQ. The empirical parts of measurement development consist of nine studies, which are presented in chapters 7 through 13. In Chapters 7 and 8, I present the five content validity studies for the MMAP and the DQ. These include cognitive interviewing of students, evaluating content validity using an expert sample, and the evaluation of the measures by a relatively large sample of university students in second-year and above. In Chapters 9 and 10, I present the results of the first administration of the resulting measure in a large and representative sample of students. In these chapters, I describe my use of exploratory factor analysis, univariate and multivariate Item Response Theory, and Differential Item Functioning to explore the factor structure, evaluate item functioning, refine the measures, reduce the number of items, and evaluate reliability at the item and test level. In Chapters 11 and 12, I describe confirmatory factor analyses of the MMAP and DQ to evaluate the structure of these measures further, using data from two large, independent samples. In Chapter 13, I examine the relation between the MMAP and DQ subscales as well as the relation between the new measures and a large number of constructs and measures in various domains, including personality psychology, health psychology, and self-psychology. These analyses were used to discuss and evaluate validity of the measures. Finally, in Chapter 14, I review the findings in light of previous research as well as highlight the combination of classical and new methodologies used in the process of measurement development in this study. The strengths and limitations of the research

are also highlighted in this chapter. Finally, I discuss the implications of these new measures for both research and applied uses in counselling.

CHAPTER 1: HISTORY OF PROCRASTINATION

Etymologically, the term procrastinate has a Latin origin, *prōcrāstinātus*, comprised of a prefix “pro”, meaning “in favour of, forth or forward”, “cras” meaning tomorrow, and a suffix “tinus” in place of a structure for forming adjectives. The literal meaning of procrastinate therefore is “to put off until tomorrow.”

Many dictionaries have differentiated procrastination from delay and considered it as a type of delay or postponement with negative connotations. For example, the *American Heritage Dictionary of the English Language* (Procrastinate, 2014a) defines “to procrastinate” the following way: “to put off doing something, especially out of habitual carelessness or laziness”, or “to postpone or delay needlessly.” The definition of the term according to the *Webster Dictionary* is “to put off intentionally the doing of something that should be done” (Procrastinate, 2014b). Taken together, as is common in other dictionaries consulted, the lay person’s understanding of the word entails a needless delay of something that should be done, and this delay has the negative moral connotation of being careless or lazy.

The concept and the word procrastination has a long history of being used both with positive and negative connotations, however the primary meaning and usage of the word has a negative sense according to both Western (For a historical review see Ferrari et al., 1995; Steel, 2007) and Eastern references. Similarly, in this research I focused on the negative meaning of procrastination.

In Eastern mythology, the negative connotation of procrastination can be traced back to an ancient era and to the words of Zartosht (Zarathushtra, 1000-6000 BC), an ancient Iranian poet and prophet of Zoroastrianism. According to Avesta, the sacred book of Zoroastrianism, Zartosht considered procrastination (*būshyāsta*, based on ancient Persian language) as one of the

demons, the manifestations of evil spirits (Williams, 1990). The major part of the original *Avesta* had been lost during the Greek invasion as Achaemenid's (559–330 BCE) imperial library in Persepolis had burned down. However, *Vendidad*, one of the re-assembled collections of the sacred texts within the greater compendium of the Avesta, described procrastination as a feminine demon:

“Lo! here is *būshyāsta* [the demon of procrastination] , the long-handed, coming upon you, who lulls to sleep again the whole living world, as soon as it has awoken: 'Sleep!' [She says,] 'O poor man! the time is not yet come.’” (Zand-Avesta Part 1, *Vendidad*, Fargard 18; translation of Darmesteter 1898; cited in Paterson, 1995 and Müller 2001) Based on Pahlavi texts, the demon of procrastination creates laziness and is “most indolent and oblivious” demon (*aǰgahāntar ud framōšēntar*, Pahlavi Texts, ed. Jamasp-Asana, p. 90.1, cited in Williams 1990).

In the book of “One Hundred Gates to Paradise,” procrastination is considered to be a serious enough demon to be given one gate or section. As the quote reads:

You must not put off the good work of today until tomorrow, for God declared thus to Zartosht: "Putting off the duties of this day until the following, brings with it cause of regret. . . . Know that Gokhastah [Ahriman, adversary of God] has expressly appointed two demons, named Tardiness and Procrastination, for putting off the performance of good works to a remote and future period.” (part 14, 91st gate, Shea & Troyer, 1843; cited in Peterson, 1998)

Vandidad as part of Avesta focused not only on the identification but also on the treatment of demons. From this point of view, procrastinating is a treatable problem. More specifically, in order to overcome “the demonic personality of *Būšyāsta*” (William 1990), herald

of Sraosha, the divinity of *obedience* and *voice of conscience*, asks people to temper their temptation of putting things off by reciting “*Ashem¹ yad vahistem*”, which means truth or eternal law is the best of all good, and rise from slumber to perform their duties. It also asks to pay attention to the way Bûshyâsta persuades people -“the time is not yet come” - and the way she creates a deceptive calmness that does not allow people to start or to awake. Based on Avesta, one may define the procrastinator as a person who does not wake up and start his or her work early in the morning, or a person who puts an important task off for the future, and, therefore, needs to listen to the voice of conscience, obedience and observance to stop this behaviour. This ancient explanation of the relation among procrastination, conscience, obedience and observance is very similar to the current scientific explanation, which suggests a strong negative association between procrastination and conscientiousness as well as a theoretical link between procrastination and rebellion (Blatt & Quinlan, 1967; Lay, 2004; Solomon & Rothblum, 1984; Steel, 2007; van Eerde, 2004)

The negative meaning of procrastination can be found outside of ancient Iranian texts as well. For example, an ancient Hindu text, the *Bhagavad Gita* (500 BC) refers to people who are “undisciplined, vulgar, stubborn, wicked, malicious, lazy, depressed, and procrastinating”, calling them “taamasika agents” (Steel, 2007, p. 67). Based on this text, Taamasika people are looked down upon as low creatures that do not even deserve a mortal rebirth and are sent directly to hell (Steel, 2007). Although both Zoroastrian and Hindu philosophies considered procrastination as an extreme negative characteristic, there is an interesting differentiation to be noted between them in terms of the way the term procrastination is defined. According to Zoroaster, procrastination is a demonic personality of a spirit, which can temporarily influence a person, but whom can be fought with and from whom one can be liberated. On the other hand,

Bhagavad Gita defines procrastination as an evil personality characteristic of the procrastinator and there is no hope for cure or transformation. Using the contemporary language of personality psychology, the Zoroastrian conceptualization can be regarded as a state phenomenon, whereas the Hindu conceptualization refers to it as an unchangeable trait characteristic.

In ancient Greece, Hesiod (around 700 or 800 BC), a poet, and Thucydides (460-395 BC), an ancient historian, were the first Greek writers who mentioned the term procrastination (see Steel, 2007). Reviewing other historical documents, I have found that a popular and long-lasting school of Hellenistic philosophy, founded by Zeno of Citium (circa 335-263 BC), hotly debated “will power” as the most admirable characteristic in contrast to procrastination as a negative attribute. Several written documents of Stoic philosophers have been destroyed, with the exception of that of Epictetus, a late follower of this school of thought. Epictetus (50-130 AD) defined and used repeatedly the word procrastination with extremely negative connotation. He wrote:

The first and worst evil is that there arises a habit of neglect; and then a habit of postponing effort, and constantly procrastinating as to one's successes and good behavior and orderly thought and action. Now, if procrastination as to anything is advantageous [*sic*], it must be still more advantageous to omit it altogether; but if it be not advantageous, why do you not take pains all the time? (Epictetus, 50-130 AD, See Higginson, 1890)

Procrastination in Epictetus' view is an evil habit one needs to be rid of completely. It is interesting that Epictetus described procrastination as a breakdown in “will” and later he recommended that “things controllable by will are to be pursued always; and the rest as may be permitted” (Epictetus, 50-130 AD, see Higginson, 1890). It is also interesting that many

contemporary theoretical and causal explanations of the construct is reminiscent of Epictus' explanation of procrastination as habitual postponing behaviours related to a breakdown in will. In fact, "will" in psychology is conceptualized as self-control, volition, or voluntary self-regulation, and a lack of will is very often considered as the main underlying cause of procrastination (Baumeister, Heatherton, & Tice, 1994; Tice & Baumeister, 1997; Senécal, Koestner, & Vallerand, 1995; Wolters, 2003; Blunt & Pychyl, 2005; Schouwenburg & Groenewoud, 2001; Dewitte & Lens, 2000; Dewitte & Schouwenburg, 2002).

There are several speculations about the historical trends in the prevalence of and connotations ascribed to procrastination. Tracing the history of the emergence and usage of the word procrastination, Milgram (1992, as cited in Steel, 2007 and Ferrari et al., 1995) linked the negative connotation of procrastination to the industrialisation era in Western society. This theoretical speculation has been well accepted by many researchers in the field (e.g., Ferrari et al., 1995; DeSimone, 1993). For example, DeSimone (1993) emphasized that "many preindustrialized societies do not have words comparable to our notion of procrastination" (Ferrari et al., 1995, p. 4). Along the same line Ferrari et al. (1995) suggested that although the similar words with less negative connotations have existed throughout history, procrastination is "purely a modern phenomenon." Most recently, Steel (2007) presented a different opinion to soften Milgram's and Ferrari and his colleagues' more biased perspective. He provided several historical references from ancient Greece and India suggesting that "procrastination has been reasonably constant over the ages: It is and has been a prevalent problem" (Steel, 2007, p. 66).

Both historical viewpoints of the good and the bad of needless delay are only partially valid. There are undeniably greater demands put on individuals in the modern era where technological progress necessitates increased time management, punctuality and timely action.

Therefore, it may be reasonable to speculate that modernisation and industrialization have contributed to the increased usage of the word procrastination and its negative connotation in developed countries. However, according to the above-mentioned historical evidence from Persian, Greek, and Hindu texts, it seems to be naive to think that the usage of the word or concept is limited to the industrialized or modern era. Furthermore, the claim that the prevalence and the negative connotation of procrastination is consistent over time seems to be contradictory based on historical evidence (e.g., Frreari et al., 1995; Williams, 1990).

Re-examining this historical and culturally diverse evidence suggests that the degree of negativity attributed to the word procrastination and its prevalence have fluctuated over time and across cultures. Based on the Greek writings, the negative sense of procrastination seems to have changed from a form of delay with negative or bad consequences (Hesiod, 700 or 800 BC,) to a hateful act (Cicero, 44 BC, as cited in Steel, 2007), and finally to a sinful or evil dilatory behaviour with extremely negative outcomes (Epictus, 50-130 AD). As well, according to the ongoing and extensive project of Encyclopaedia Iranica at Colombia University, the negative connotation of *būshyāsta* (demon of procrastination) has changed since the glorious era of Zorastarism and Persian civilisation:

Asmussen has shown how, in the Pahlavi books [Middle Persian; AD 224-641], the demonic personality of *Būšāsp* [procrastination] diminishes as the word becomes a common noun “sleep, lethargy, dream.” However, though it is true that in several texts *būšāsp* is “de-demonized” in this way and passes into Persian and Judeo-Persian as a synonym of *kāb* “sleep, dream,” nevertheless in Zoroastrian texts on piety and observance the evil connotation of such crepuscular wastefulness remains and is

emphasized by Būšāsp's identification with the delusions and pollutions of dreams.

(Vol.4, Word: BŪŠĀSP , Williams, 1990)

My initial search shows that contemporary Persians have failed to find a specific term that is equivalent to Bushaysta yet different from laziness, delay or postponement, since the Arab invasion (AD 639) and the destruction of the last glorious Persian Empire. However, the concept of procrastination in contemporary Iranian culture still exists in the form of a proverb, and it has been completely de-demonised. Procrastination is now conceptualized as a bad behaviour which is not recommended to perform as reflected in frequently-used Persian proverb of “Kare Emrooz Ra Beh Farda Nandaaz” meaning “don't postpone what you have to do today until tomorrow.”

The evidence for the change in the meaning of procrastination is not limited to the era of ancient civilisations. For example, Ferrari and his colleague (1995) suggest that the connotation of procrastination has changed from “wisely chosen restraint” in 1548 to a concept with negative moral meaning after the mid-18th century industrial revolution. Based on my research, the definition of procrastination has changed considerably even over a short period of time from a meaning with a slightly negative connotation - “to put off from day to day; to delay” in 1828 (Procrastinate, 1828) and “to put off till tomorrow, or from day to day” in 1913 (Procrastinate, 1913, p.1142) - to a term with rather negative meaning - “to put off intentionally and habitually” or “to put off intentionally the doing of something that should be done” (Procrastinate, 2014b).

Given the historical evidence on the changing meaning of the word, it is important to identify the underlying factors of change in the connotation of procrastinating behaviours over time and across cultures historically and conceptually. Looking at the historical evidence mentioned so far, it seems that the reduction of the “devilment” linked to procrastination is accompanied by the reduction in advancement and glory of Persian and Greek empires as well as

change in the dominant religions or ideologies of the era. Similarly, Milgram's and Ferrari and his colleagues' exclusive historical analyses of procrastination imply that the enhancement in negative connotation of the phenomenon re-emerged with the burst of newly developed civilisations in Europe and America. It may be rational to conclude that procrastination as a negative behaviour or characteristic is an inevitable phenomenon within any developing civilisation throughout history. That is, negative connotations of procrastination are expected to rise rapidly in developing countries (e.g., Korea), reach their peak and stabilize in developed countries (e.g., Canada) and may decline with the fall of great civilisation. In other words, it is the spirit of development rather than a specific type of progress (e.g., technological advancement) that drives the change in the negative connotation associated with procrastination. The stronger the push towards development, the greater the demand on individuals to perform in a timely manner and therefore there is less tolerance for delay or postponement in getting tasks done.

We can reach the same conclusion about the underlying factors of historical change in the negative meaning of the concept by identifying and exploring the opposite of procrastination phenomenon on the macro or societal level. I believe that procrastination and its antonym can be defined at micro (i.e., personal, or internal) and macro (societal or external) levels. It can be argued that the concept of "punctuality" may be regarded as one of the antonyms of procrastination at the macro or societal level, if the concepts of "will" or "self-control" are viewed as opposites of the procrastination on the micro or personal level (Steel, 2007). Given this assumption, change in the meaning and importance of punctuality should be in accordance with change in the meaning and importance of procrastination at societal level. From a conceptual point of view, procrastination has a strong and negative link with performing tasks

“on time” and achieving the assigned or imposed goals, as well as the expectation of self and others to accomplish tasks in a timely fashion. Consequently, it is rational to speculate that fluctuation in the importance of being on time (i.e., punctuality) in societies changes with the rise and decline of civilisations’ glory thorough history. If this is true, there should be also some historical evidence demonstrating the relation between punctuality and progress in societies.

Adas (1990) in his book, *Machines as the Measure of Men*, described the observations and perceptions of modern westerners who traveled to Africa, India, China and Japan when these countries did not reach or start their movement towards modernisation. According to Adas, the westerners continuously reported a different perception of time in comparison to individuals who lived in non-western societies: “While Westerners were concerned with schedules, clocks, and watches, non-Westerners seemed to Westerners to act as if they lacked a sense of punctuality, which gravely disrupted their schedules” (cited in Hashimoto, 2008, p. 124). Comprehensive and interdisciplinary studies of the history of punctuality and the “birth of tardiness” (i.e., Chikoku no Tanjo) in Japan demonstrate that the punishment of the delay or idealisation of the punctuality in key social institutions, such as schools and factories, at the end of Edo period and the beginning of the 20th century resulted in a later rapid development of Japan’s glorious economy and culture at the end of the 20th century (Hashimoto & Kuriyama 2001; Kuriyama & Hashimoto 2002; cited in Hashimoto, 2008).

Conclusion of Historical Analysis

In summary, several themes and implications are important to note in relation to the definition of procrastination. First, procrastination is a universal and cross-cultural phenomenon; it is not specific to a certain era or time. Second, the connotations associated with, definition and possibly prevalence of the phenomenon have fluctuated throughout the history of human

development and across cultures. Third, the first usage of the word as a negative attribute can be traced back to ancient societies when the first social commitments, religious or philosophical ideologies were birthed. Fourth, the description of problematic delay, procrastination, is influenced by both societal and personal factors. There is a lot of evidence suggesting that the negative connotation and therefore definition and prevalence of procrastination are affected by the dominant spirit of development in a society and the strictness of the ideologies or social rules related to accomplishing tasks or duties. Fifth, factors such as the perception of time, the necessity of punctuality, the accuracy of measuring time, the degree of hedonism, and the strictness of the rules at societal and ideological levels are important elements for defining procrastination in a certain era and culture. From this point of view, procrastination might be defined at least at three inter-related levels: individual (i.e., a person who postpones a task; personal), socio-cultural (i.e., norms), and psychological (i.e., clinical experts and/or researchers), and these different definitions are themselves necessarily inter-related. Consequently, it can be assumed that societal and individual definitions might affect the moral consequences and interpretations of an expert definition and measure of procrastination. The historical analysis of procrastination definitions implies the necessity of the rejection of any procrastination measure that use term “procrastination” to ask participants directly to report how often they procrastinate or how problematic their procrastination is, since the interpretation of the term is not only different across individuals, but also varies over time and across cultures. Finally, the historical analysis imply the importance of considering the effect of time and place on defining elements of procrastination

In the next chapter, I review contemporary definitions of procrastination. In doing this, I show how different psychologists use their theoretical orientations to conceptualize and/or

operationalize procrastination and go further than lay definitions and interpretations of the construct. This analysis involves addressing issues such as the relative “pros and cons” of each theoretical orientation and their proposed defining elements. Finally, I address how my research sought to clarify further the definition and measure of procrastination as a psychological construct.

CHAPTER 2: PROCRASTINATION IN CONTEMPORARY PSYCHOLOGY

Experts' Definition of Procrastination

Like many psychological phenomena, procrastination has been studied in psychology by researchers from different perspectives including: personality, intrapsychic/psychodynamic, cognitive, behavioural and clinical. One of the predictable consequences of the diverse theoretical and methodological orientations among researchers who aim to study the same phenomenon is the diversity in the conceptual definitions of the phenomenon. Another discrepancy may arise between conceptual and operational definitions of a term, in this case procrastination, as a psychological construct. For example, the important definitional element of having an *intention to perform a task* may not be operationalized correctly if measures do not differentiate intended from unintended tasks. The degree to which items of a self-report measure represent the conceptualization of procrastination and the degree to which the test as a whole samples the content domain of the phenomenon are directly related to the both classic (e.g., Mostert, 2007; Sireci, 2007) and a more recent definitions of validity (e.g., Zumbo, 2006) . In the following sections, I examine different conceptualizations of procrastination, discuss each in terms of defining elements (aspects) of the phenomenon, and provide a summary of important sets of defining elements by redefining the construct. This theoretical and empirical literature review was necessary as it provides a base to evaluate the existing measures and to validate the new measures developed in my dissertation research.

Procrastination Definition from Counselling Perspective

Clinical and psychodynamic psychologists, as well as the writers of self-help books, were the first to study and write about the psychological construct of procrastination (Lakein, 1989; Douglass, 1978; Porat, 1980, as cited in Aitken, 1982; Ellis & Knaus, 1977; Ziesat, Rosental, &

White, 1978; Silver, 1974). One commonality across these writers is that they rejected the historical and lay notion that procrastination is a type of laziness (Ellis & Knaus, 1977; Silver, 1974; see Aitken, 1982). The major work of these researchers focuses on the causes and treatment of procrastination as a psychological problem. Consequently, in their attempt to define the construct, motivating factors or internal processes (e.g., stress, guilt, and passive aggression) were highlighted as the integral elements of procrastination. For example, McIntyre (1964) suggested that procrastination, daydreaming and dawdling are passive ways of expressing a child's (underachiever) negative emotions and conflicts (i.e., unconscious hostility and anxiety) towards authoritarian and submissive parents (MacIntyre, 1964). Similarly, Spoke (1971) considered procrastination to be an unconscious and passive expression of anger towards an authoritarian parent.

Among these early clinically-oriented researchers, Silver (1974) provided one of the first extensive conceptual analyses to define procrastination. From his point of view, procrastination is a form of behaviour that mostly occurs in deadline situations and results from moderate "stress on the sequencing and coordination of behaviour over time" (Silver, 1974; p. 49). He identifies two types of procrastinatory behaviours: delay starting a necessary task and perseveration. He defines perseveration as "inertially continuing one segment of a task instead of switching to another thereby disrupting successful task completion" (Silver, 1974, p. 49).

Stress is a central concept in Silver's (1974) definition of procrastination. He suggests that procrastination mostly occurs in deadline situations, such as writing a term paper and exams in academic settings. Each task involves decisions and completions of several stages in a particular sequencing. For example, after the topic is determined, writing a term paper requires finding relevant materials, reading, and possibly taking notes, organizing an outline, and writing

a rough draft (Silver, 1974). He argues that each stage needs to be scheduled in relation to the other stages, the final deadline, and other activities within the person's life. Consequently, procrastination may occur in each of these interrelated stages or activities as a person may experience stress in switching within such sequences.

Stress related to a task or a particular stage of the task in Silver's (1974) description of procrastination is similar to the concept of task aversiveness discussed as the main causal factor of procrastination by other researchers (e.g., Solomon & Rothblum, 1984). That is, aversiveness is a perceptual attribute related to the irrational anticipation of the outcome of an activity rather than an inherent feature of the activity. Although he considers a procrastinated task as aversive, Silver (1974) assumes procrastination is a delay in a task that "would ordinarily be enjoyable or neutral for the individual" (p. 49). What differentiates procrastinating and non-procrastinating individuals is the fact that procrastinators reduce the probability that they will reach a goal at an optimal level because they delay the task due to experiencing stress. In other words, procrastination does not usually lead to failure in the completion of an intended task, but it reduces performance and is accompanied by stress.

Another central concept in Silver's conceptualization of procrastination is the cognitive structure required for performing a task. The more a task needs structuring, the more an individual might procrastinate on it. Silver (1974) argues that since the first part of a task (e.g., writing a term paper) needs much more cognitive structuring (e.g., outline) and more decision-making (e.g., alternative outlines and starting points), a procrastinating individual has difficulty in initiating a task. Procrastinating individuals repeatedly put off the stressful situation of initiating a task in favour of doing alternative activities that, under normal circumstances, might be boring (e.g., reading news, checking e-mail, etc.). Although they are aware of the long-term

results of their behaviours, they repeatedly avoid the short term stress of initiating the task. Silver (1974) suggests that the procrastinator does not make a decision to postpone starting a task for the whole day. He or she is continuously making a decision to postpone for a short period of time, say 10 minutes or 1 hour, which might not be an irrational delay since 10 minutes should not have a huge impact on the outcome. The problem arises, however, from the fact that the procrastinator's illusory rationalization continues after 10 minutes, which produces a long term delay accompanied by negative emotions and might potentially reduce the quality of work.

Another early and even foundational key work on the conceptualization of procrastination is that done by Ellis, the founder of Rational Emotive Behaviour therapy. In one of the first and famous self-help books on the topic, *Overcoming Procrastination*, Ellis and Knaus (1977) emphasize that low self-image, a high degree of perfectionism, low frustration tolerance, and high anxiety may result in procrastination. Based on clinical observations, they outlined the following stages in the process of procrastination (Ellis & Knaus, 1977, cited in Aitken, 1982, p.11):

1. The individual wishes or agrees to do something.
2. He makes a definite decision to do it.
3. He needlessly delays doing it.
4. He observes the disadvantages of delay.
5. He continues to postpone action.
6. He berates himself for procrastinating.
7. He continues to procrastinate.
8. He barely finishes the project on time by making a last minute rush to complete it; or he finishes it late; or he never finishes it.

9. He feels uncomfortable about his lateness and berates himself.
10. He decides not to procrastinate again.
11. Soon afterward, especially if he has a complicated, difficult, or time-consuming task to complete, he procrastinates again.

Based on this point of view, procrastination should be defined as a needless and irrational delay of an intended task which is accompanied by psychological discomfort and negative emotions, particularly guilt and self-berating.

Both Silver (1974) and Ellis and Knaus (1977) did not operationalize procrastination or create a measurement based on their clinical observations. However, their comprehensive conceptual discussions about procrastination influenced the empirical development of the construct by identifying almost all of the major elements of procrastination such as delay, intention, importance, needlessness, irrationality, psychological discomfort, emotional and cognitive aspects, automaticity, and habituality.

Experimental and personality researchers who have proposed conceptual definitions of procrastination and/or developed an operational definition of the construct have not added to the above list of elements (e.g., Aitken, 1982; Lay, 1986; McCown & Johnson, 1989; Tuckman, 1991). Indeed, their definitions differ from each other only in the sense that each chose a different subset of the above items. For example, Aitken (1982), who developed one of the first measures of academic procrastination, highlights the habituality element and defines the construct as “habitual delay which continues until a deadline elicits a spurt of activity” (p.14). Solomon and Rothblum (1984), who developed a widely used measure of academic procrastination, highlighted elements such as delay, needlessness and psychological discomfort

and defined procrastination as “the act of needlessly delaying tasks to the point of experiencing subjective discomfort” (p. 503).

These researchers’ limitations in selecting elements and their potentially limited conceptualizations of procrastination may be justified by the more reductionist nature of personality and experimental research in comparison to conceptualizations derived from clinical observations. However, these limitations have resulted in a lack of consensus in the field and more importantly have led to inaccuracy in comparing the results of different studies. It is obvious that a “needless delay with subjective discomfort” (Solomon & Rothblum, 1984) and “a simple habitual delay” (Aitken, 1982) might have some overlap, but an interpretation of scores that might operationalize these definitions are different conceptually and clinically. The difference in conceptual definitions does not only present itself in Aitken’s (1982) and Solomon and Rothblum’s (1984) work. In fact, almost all of the researchers who have developed a measure for procrastination used different sets of elements to define the construct.

In addition to different elements selected to define procrastination, different researchers chose to refer to procrastination differently. Some consider it a behaviour, others an outcome variable and yet others a trait. For example, it has been noted that Solomon and Rothblum’s operationalization of the construct measures academic procrastination behaviour, while Aitken’s (1982) operationalization measures academic trait procrastination (e.g., Ferrari et al., 1995). The determination of whether a test measures a construct as a behaviour, a trait, or a psychological problem influences the selection of necessary elements. A complete review of elements and issues related to the types of the construct (trait vs. behaviour) is provided in the following sections, followed by an extensive review of existing definitions and operationalizations presented in the measurement section.

Defining Elements of Procrastination

There are several elements necessary to conceptualize procrastination and differentiate it from other similar constructs or behaviours. Some of these elements, such as delay and intention-action gap, are merely descriptive and conceptually driven, while others, such as irrationality, and negative emotion are theoretically driven. In the section relevant to the theoretical elements making up the construct definition for procrastination, I begin with an extensive discussion of the major theories underlying the elements, and then I present an evaluation of the elements. In addition to the descriptive and theoretical elements that differentiate procrastination from other constructs, I also discuss how type of task influences the scope and context of the operationalization of the construct in various measures.

Defining element 1: Delay.

The concept of delay has been the central theme for defining and measuring procrastination. Many concepts, terms and phrases can capture the notion of delay including postponement, putting off, waiting, starting late, not starting right away, completing/finishing late, being late, and so on. Delay and its synonyms are used to describe the construct of procrastination in all of the existing definitions of procrastination (e.g., Aitken, 1982; Klingsieck, 2013; Solomon & Rothblum, 1984; Steel, 2007; Tuckman, 1991). However, both dictionary and psychological definitions of procrastination at the conceptual level emphasize that procrastination is a specific type of delay rather than delay in general. Procrastinating on a task is considered to be problematic, but delaying an act can be positive, preferable or not problematic. For example, some people may postpone an act to receive more information, some may delay tasks intentionally to motivate themselves to finish the tasks effectively just before the deadline, and others may put off a task to attend to a more urgent or important matter. These intentional

delay should not be considered as procrastination according to a majority of the researchers in the field (e.g., Schouwenburg et al., 2004; Steel 2007) but rather as a wise and/or positive delay.

Even though there is conceptual consensus suggesting that procrastination is different from other types of delay, the majority of measurements fail to reflect this difference (see the measurement section for details). A measure that does not differentiate procrastination from a wise or habitual positive delay, for example, can lead to overestimation of procrastination in the population under study and result in samples consisting of participants with different forms of delay. Furthermore, it is obvious that psychological profiles obtained from such a heterogeneous sample cannot be valid and used for differentiating between high and low procrastinating individuals. The problematic nature of procrastination is the key concept differentiating procrastination from other forms of delay. Researchers use different cognitive and/or emotional elements to determine the problematic attribute of procrastination (Solomon & Rothblum, 1984; Aitken, 1982; Steel, 2007; Tuckman, 1991). These include the discrepancy between intention and action, emotional or psychological discomfort, irrationality, and negative performance.

Defining element 2: Intention-action gap.

The intention to perform a task, or more specifically a gap between the intention and action on that task, is one of the essential elements in differentiating procrastination from other forms of delay. For example, a person who does not pay his or her bills on time cannot be called a procrastinator if he or she did not intend to pay the bills by the due date. Similarly, a person who intends to postpone reading an assignment until the last day of Reading Week and who completes the task at the last minute does not show any problematic delay. There is a strong agreement among researchers, at least on the conceptual level, that the definition of procrastination is delay of an intended task (Ellis & Knaus, 1977; Lay, 1995; Ferrari et al., 1995;

Blunt & Pychyl, 1998; Sirois & Pychyl, 2013; Steel, 2007). Procrastination as a problematic delay is meaningful only if there is an intention to act, as well as a discrepancy between what is intended to be done and what actually has been done in terms of starting or completing a task (Blunt & Pychyl, 1998; Steel, 2007). As Blunt and Pychyl (1998, p. 837) highlighted:

This discrepancy between the individual's intention to act and the performance of the intended action is not limited to situational forms of procrastination such as academic procrastination. Trait procrastinators, certainly a distinct group from academic procrastinators (e.g. Ferrari et al., 1995a) also experience this gap between behaviour and intentions [*sic*] which lies at the heart of the definition of procrastination (e.g. Lay, 1995).

It seems that both procrastinators and non-procrastinators have almost the same level of initial intention to perform tasks (e.g., Lay, 1995), but the groups are different as procrastinators tend to not act according their initial intention. Lay (2004) suggests when the number of intended tasks increases, procrastinators tend to engage in other activities rather than on one of the intended tasks. In such a situation, individuals may feel overwhelmed, making intended tasks more aversive or less voluntary in comparison to unintended peripheral activities. Lay argues that frequent engagement in peripheral activities when faced with aversive tasks differentiates trait procrastinators from non-procrastinators. Procrastinators “may be more likely to act on such a preference. In contrast, non-procrastinators will more often do what they intended, regardless of the task characteristics and the presence of alternative activities” (Lay, 2004, pp. 47-48).

What can be said to this point is that the intentional element sets the person's perception of his or her behaviour as the main standard for labelling a problematic delay as procrastination. In other words, accepting intention as a necessary condition for diagnosing procrastination, we should differentiate problematic delays based on external standards (e.g., parents, teachers,

school) from problematic delays according to internal standard (person reports of initial intention). For example, a student may submit an assignment on time, resulting in no external evaluation about timing or delay, but his or her last-minute preparation could be considered problematic if he or she intended to complete it early, but only did the work at the last minute, neglecting the original intention without good cause (an issue I will return to shortly). In contrast, another student may not intend to do the task even at the last minute, resulting in no labelling of problematic delay according to his or her internal standards, but still this delay could be considered problematic by his teacher or school (i.e., external standards or evaluation). Although the delay in both cases seems problematic, the question is whether or not we should consider both as cases of procrastination. The first student's behaviour has an intentional element, therefore it is legitimate to call it procrastination. The student failed to act on an intention to act. The delay involved failing to meet an intention. In terms of the second student, one can speculate that he or she is still procrastinating since the person has committed to the assignment in the course as he or she has intentionally registered for the course. Extending this line of reasoning, if some level of obligation, commitment or initial intention exists, and there is a gap between the initial intention and actual action, the person's delay might be considered procrastination. However, this does not negate the fact that the causes, correlates and treatment of the two cases differ from each other. The first person suffers from a gap between a conscious desire or decision to act and the action, while the individual in the second case suffers from not having a desire or intention to work on the task in a timely fashion in the first place. The first case's dilatory problem might come from a high level of anxiety or lack of time management, while the second person's problem might stem from lack of interest, rebellious against the

teacher, and so on. The key issue, of course, remains intentionality as a key element in the definition of procrastination.

There are two implications of the above discussion. First, to define and measure problematic delay or procrastination, it is important to consider intention in a detailed way. Concepts such as desire, liking, want, commitment, agreement, admitted personal obligation, awareness of importance, and vague or specific notions of a schedule in relation to a task can capture various aspects of intention to perform the task. Second, whether or not one considers externally evaluated problematic delay under the rubric of procrastination, it is important to differentiate it from procrastination that is defined according to a gap between subjective intention and action. This said, to be consistent with the majority of the researchers in the field, my definition of procrastination included a gap between intention and action as an important concept. The externally problematic delay was identified in this study, but it was not labelled procrastination to maintain the clarity in the remaining literature reviews. However, in the empirical parts of the study, two types of procrastination were differentiated and discussed. The first was labeled irrational delay or anxious procrastination, and the second was labelled hedonistic delay or hedonistic procrastination

Even for internally evaluated problematic delay (i.e., procrastination), having an intention to do the task is necessary but not sufficient in differentiating procrastination from other forms of delay (Steel 2007). For example, a person may intend to do a task but get pulled to attend to a crisis situation which requires an immediate response. In this case, the delay of the intended task is legitimate and cannot be called problematic delay or procrastination. Other elements such as irrationality or negative emotions, when considered together with intention, can more clearly differentiate procrastination from other forms of delay.

Defining element 3: Irrationality of delay.

Irrationality has been considered as a key element of procrastination in most if not all writing on the topic (e.g., Ferrari et. al., 1995; Steel, 2007). In general, this concept is rooted in cognitive-behavioural theories in clinical psychology (e.g., Ellis and Bernard, 1985), and in rational decision making or economic models of decision making in social psychology and behavioural economy (Vroom, 1964, as cited in Steel, & König, 2006; Ainslie, 1992). Both of these theoretical explanations of irrationality have been used in procrastination research.

In general, the cognitive-behavioural theories (e.g., Ellis & Bernard, 1985) consider irrationality as cognition or beliefs that underlie psychological problems (e.g., depression, anxiety, and procrastination). Based on Ellis' Rational Emotive Theory, beliefs, as a cognitive unit, determine the emotional and/or behavioural consequences in activated events (Ellis & Bernard, 1985). Ellis (1991, p. 144) characterized the irrational beliefs as having: 1) “dogmatic, powerful demands and commands, usually expressed as musts, shoulds, ought to's, have-to's, and got to's” 2) “highly unrealistic, overgeneralized inferences and attributions”. Procrastination as avoidant behaviour occurs in the absence of irrational conditions/demands that students believe that they should be present before starting a task. For example, student irrationally believe that: He must feel comfortable, be certain that he/she gets a good grade or be in a good mood to study or start an academic tasks (Dryden & Sabelus, 2012). According to this theory, procrastinators' irrational beliefs about the self, others and the world result in “self-downing” (negative self-talk), low frustration tolerance, and hostility, which in turn leads to putting off a task or action until a future time despite the initial decision (Balkis, & Duru, 2007; Harrington, 2005, Dryden, 2012).

Based on the mainstream procrastination literature, a person who shows a higher level of irrational beliefs may delay intended tasks more frequently in comparison with another person with a lower level of irrational beliefs (Ferrari et al., 1995). For example, Beswick, Rothblum,

and Mann (1988) found that many irrational beliefs are positively correlated with procrastination in most of the academic tasks. More recently, Bridges and Roig (1997) controlled context effects by administering questionnaires on academic procrastination and irrational beliefs with a two to three-week interval. They found that there was a significant, but small, relation between the two measures. Among the irrational beliefs, “problem avoidance” had a stronger relation with procrastination.

What should or should not be considered as irrational beliefs is an important question that needs to be clarified, since many constructs with negative connotations have debatably been categorized as irrational beliefs. Steel (2007) and Ferrari et al. (1995) indicated that many important correlates of procrastination including fear of failure, self-criticism, self-consciousness, evaluating anxiety and perfectionism are forms or immediate manifestations of irrational beliefs within the Rational Emotive Behaviour theory. I think this is a misleading explanation as many of these factors such as fear of failure and anxiety have been well-explained by theories other than Rational Emotive Behaviour theory. I discuss these theories in the next section.

Irrational beliefs may only be counted as some possible causal factors among many others. If one is to use the causal factors to conceptualize a phenomenon, it is necessary to address the theoretical limitations of including some and excluding other causal factors from the conceptualization². Furthermore, to properly define a phenomenon, it is important to differentiate

² It is interesting to note that some researchers believe that irrational beliefs can be the result of procrastinating as opposed to its causes. Schouwenburg, (1995) wrote the “the irrational thoughts can be viewed as “as an attempt by the individual to make sense of a more fundamental phenomenon involved in both academic and general procrastination” (p. 73).

the descriptive symptoms from causal factors. Depending on the type of construct measured, it might be empirically problematic to include causal factors as the key elements. For example, if procrastination is to be diagnosed as a psychological problem, its conceptualization and operationalization should be based on problematic symptoms of the phenomenon as opposed to a selective and limited set of underlying causes. Irrationality, if defined as irrational belief or irrational cognition, cannot serve as the key descriptive dimension or indicator of procrastination but as only one of its possible causes.

The second group of theories, using rationalistic models of the decision-making process (e.g., expectancy theory), have been used to explain many phenomena including procrastination (e.g., Silver & Sabini, 1981). From this point of view, people generally tend to rationally choose the action with the greatest expected values. The greatest expected value is computed by multiplying value of the expected outcomes by the probability that they will occur. However, irrationality in choosing an appropriate action may also happen, particularly when a person does not consider some of the alternative outcomes or imposes irrational values on the alternative outcomes.

Silver and Sabini (1981) were the first to use this theoretical explanation of rationality/irrationality to conceptualize the difference between procrastination and delay. They present hypothetical stories of several persons who all put off a task (writing a paper), but whose delay is not procrastination. Based on these stories, the conditions under which delaying a task is not irrational or not procrastination can be summarized as:

- 1) A person is sure that he or she can accomplish the task or knows that the likelihood of accomplishing the task is high.

- 2) A person puts things off until the last minute but reasonably believes the task will take only that last minute to accomplish.
- 3) A person delays a task and this delay causes the task to be late or of poor quality, but the choice to delay was reasonable.
- 4) A person chooses to delay a task in favour of pursuing a more pleasurable activity (this may be foolish but does not qualify as procrastination).
- 5) A person delays a task because he or she is not aware that he or she should perform it.
- 6) A person delays a task because of irrational beliefs or goal choices, which leads to a gap between intention and action. This does not constitute procrastination unless the irrational belief or goal choice occurs repeatedly every time one encounters the necessity of doing the task.
- 7) A person repeatedly delays an intended task in face of an obligation but does not have the required ability to perform the task or does not value the task in comparison to alternative tasks.

According to the above analysis of rational/irrational delay, Silver and Sabini define procrastination and its irrationality element as:

We have found, then, that putting offs are procrastination only when they are irrational, and the irrationality is caused by recognizing (or fancying) what one ought to be doing. The irrationality can be a self-serving *belief* e.g., an obligation will go away if ignored, or, a free-floating ulterior want, e.g., a transient desire to have a spotless house only near deadlines. Thus only agents capable of

recognizing what they ought to do are capable of procrastinating; it is an irrationality parasitic on rationality. (1981, p. 211)

This definition of procrastination highlights several interrelated elements of procrastination such as irrationality, automaticity and habituality of a delay or a recognisable and/or intended task. Based on this point of view, a valid measure of procrastination may need to capture all of these elements simultaneously, otherwise the scale score may not represent procrastination but rather other types of delay such as foolish delay, task avoidance, and/or rational delay.

Silver and Sabini's (1981) conceptualization of procrastination and its differentiation from other forms of delay is valuable, however the major assumptions implicit in the method they used to analyze the stories are questionable. Firstly, they assume that in order to prove that procrastination is necessarily irrational, they need only to demonstrate that "when putting off is rational it isn't procrastination" (p. 208). This assumption is fallacious since it excludes the possibility of having other alternative attributes that cannot be identified by rational versus irrational criterion. In other words a logical condition such as "If A is not equal to inverse B then A is equal to B" is sufficiently correct only if there are not other attributes such as C relevant to A. The criterion does not cover the cases where procrastination is not irrational but rather an "arrational" phenomenon.

The second assumption is that the irrationality of a procrastinating individual stems from a rational calculation of irrational and distorted values and beliefs or "rational calculation for intervals that are rationally short" (Silver & Sabini, 1981, p. 213). The model assumes that procrastinators actively need to calculate and choose among alternative actions based on pros and cons of the actions. This assumption is also limited since it excludes other theoretical

explanations of human action and behaviours. Not only procrastinators but also non-procrastinators may behave based on processes other than rational calculation. If we are to define and operationalize procrastination, it is important to include elements related to other processes too.

The expectancy model of decision making ignores the effect of time even though procrastination is conceptually related to deadlines and is empirically demonstrated to change as individuals approach a deadline (Pychyl, et al., 2000). Silver and Sabini (1981) recognised this gap and started to integrate the role of time in their usage of the rationalistic model of decision making by suggesting that procrastinators are using rational calculation while they are procrastinating by choosing short-term relief from working on anxiety-provoking tasks. However, they did not formulate and elaborate on this effect. Based on Hyperbolic Discounting or Picoeconomics theory proposed and developed by Ainslie (1992), and Ainslie and Haslam (1992), Pychyl and colleagues (2000) explained why their participants chose relatively pleasant activities as opposed to more important, potentially less pleasant academic activities. They wrote that:

From this perspective, procrastination can be construed as a choice or decision between two tasks, one immediately pleasurable or rewarding and the other having aversive properties or having rewards available only in the long term. In Ainslie's terminology, the short-term reward is specious with regard to the long-term goal, acting as a reinforcement for continued avoidance of the behaviours required for achievement of the long-term goal (p. 249).

Later, Steel (2007) integrated expectancy theory and hyperbolic discounting and proposed Temporal Motivational Theory (TMT) to explain procrastination. Based on this theory,

various individual and group behaviours including procrastination can be explained and predicted according to the following mathematical equation (Steel, 2007; Gropel & Steel, 2008):

$$\text{Utility (motivation, desire)} = \frac{\text{Expectancy} \times \text{Value}}{1 + [(\Gamma \text{ or sensitivity to delay}) \times (\text{Delay})]}$$

Utility is the desirability of a task or motivation to perform the task. According to Temporal Motivational Theory (TMT), the utility of a task has a positive relation with “expectancy,” which is defined as the perceived probability of occurrence of an outcome in the future (e.g., accomplishing the task), and “value” which is defined as the amount of satisfaction related to the outcome. On the other hand, utility has a negative or inverse relation with a change in the magnitude of delay (i.e., the nearness or time remaining to accomplish the outcome) and sensitivity to delay (equivalent to impulsiveness) of performing the task. To resolve the problem of expectancy theory in explaining task- or time- related behaviours, Steel and König (2006) included a temporal discounting effect as an important element in the denominator of the equation. More specifically, both delay and sensitivity to delay define the effect of time in the denominator of the utility equation. They argue that based on the temporal discounting (i.e., hyperbolic discounting) explanation, “the closer temporally an event becomes, the greater its influence will be” (Steel, & König, 2006, p. 898) and the greater the motivation to choose or begin action.

Steel and König (2006) and Steel (2007) consider procrastination a utility problem that can be well explained according to the components and their relations in the above equation. They argue that the major correlates of procrastination identified in Steel’s (2007) meta-analysis resemble the components and their relations in TMT, therefore these findings should be

considered as evidence in favour of the unique application of the model in explaining procrastination:

As meta-analytic review indicates (Steel, 2007), the strongest correlates with procrastination are task characteristics and individual-difference variables related to expectancy (e.g., self-efficacy, task difficulty), value (e.g., need for achievement, task aversiveness [boredom proneness]), and sensitivity to delay (e.g., impulsiveness, temporal distance [,distractibility, and lack of self-control]). A viable theory must contain variables that address *all* three of these elements at *both* an individual and situational level. Since TMT alone does this, no other theory is feasible. (Steel, & König, 2006, p. 899)

Since TMT operates as an active, calculative processes at the conscious level, Steel (2007) has to define procrastination (i.e., utility problem) by considering the delay of an intended task as not only irrational, but also a voluntary delay. Based on Steel's (2007) definition, "to procrastinate is to voluntarily delay an intended course of action despite expecting to be worse off for the delay" (p. 66). In this definition, one of the major elements of procrastination is irrationality as the person delays "despite expecting that it will not maximize utilities, that is, interests, preferences, or goals of both a material (e.g., money) and a psychological (e.g., happiness) nature" (Steel, 2007, p. 66).

Similar to other theoretical models, TMT has both pros and cons. The theory has valuably integrated picoeconomic or Hyperbolic Discounting with Expectancy Theory. Furthermore, TMT has highlighted some of the major components of many other theories including goal setting (Bandura, 1997; Gollwitzer, 1999), self-regulation (e.g., Baumeister et al., 1994; Tice & Baumeister, 1997) and need (e.g., Murray, 1938), as well as personality-based explanations for

procrastination (Steel, 2007; Steel & König, 2006; Gropel, & Steel, 2008) . As I discussed earlier, one of the advantages of this conceptualization is addressing the importance of temporal discounting (i.e., discounting of future rewards) in explaining procrastination. Having sensitivity to delay as a component, the model also tries to explain individual differences in being influenced by the discounting of future rewards. In other words, procrastinators may innately be less sensitive to delay or more susceptible to choosing specious rewards (short-term or immediate rewards) over long-term rewards (Pychyl et al., 2000).

One of the major problems of the model is the lack of supporting evidence. To provide evidence for the validity and predictive power of the model, Steel and colleagues mention only conscious, self-report measures of different correlates of procrastination (Steel, 2007; Gropel & Steel, 2008); the authors subjectively consider the main correlated constructs or the highly significant meta-analytic categories to be equivalent to the components in the model. If the unique contribution of the mathematical models, particularly TMT, is to integrate various theories and their components and consequently to define the interrelated effects of components to produce a final important predictive construct (e.g., utility), the evidence in terms of unique effects of each component is not sufficient for the validity of model. Only by measuring all the components in an experimental design and demonstrating that the final products of the model predict the target variable may one claim that one has provided the initial evidence of the feasibility of a mathematical model such as TMT.

Similar to many other mathematical models in social science, another major problem of the model is that TMT oversimplifies the psychological processes underling human behaviour. TMT is limited mainly to voluntarily conscious processes of decision making and excludes many possible parallel, interrelated and unconscious processes, particularly emotion. Although some of

the components of the model are considered to be subjective (value, expectancy) or conceptualized as predispositions (sensitivity to delay) and therefore susceptible to influence by implicit and explicit processes, the model does not differentiate the effect of these processes. For example, it can be argued that the model does not address clearly whether perceived values and expectancy or actual—and in some cases implicit—values and expectancy should be included in the equation.

My clinical interviews with procrastinating individuals show that on many occasions, if not all occasions, procrastinators inevitably and automatically escape from starting the task without any conscious and voluntary calculation of outcome and despite their desire to not do so. Rational models assume that procrastinators use rational calculation, but with irrational or inaccurate input (e.g., value, expectancy) to justify their motivation for their irrational delay. Most of the time, choosing one action (e.g., avoidance, delay) is based on the difference between utility, value and expectancy of the action and the opposite (approach, start) or alternative (e.g., delay peripheral activity) actions. Considering the repeated experience of extremely negative emotions, and the negative perception of their procrastinating behaviours (Ferrari et. al., 1995; Krause & Freund, 2014; Pychyl et al., 2000; Tice & Baumeister, 1997), it can be argued that many procrastinating individuals should reach a point where they are not able to calculate the reoccurrence of their postponement as subjectively rational. That is, if there is no doubt that procrastination is such a self-defeating problem and procrastinators are equipped innately with a rational and mental TMT equation, they ultimately should be motivated and able to choose not to engage in problematic delay. Given the fact that many procrastinators continue their self-destructive behaviour for years, we may then need to question the application of TMT equation in this population.

The above points do not aim to ignore that some procrastinators might suffer from voluntary calculation of distorted value, expectancy or sense of time as TMT implies. But determining the total variance of procrastination that TMT can explain, which is necessary for making claims about the feasibility and validity of TMT, is an empirical question. Until the model experimentally demonstrates that it is able to strongly predict procrastinating behaviour, the model should be conceptually evaluated, and alternative explanations should be considered to be as relevant as TMT. It is important to propose the possibility of other explanations in addition and in relation to TMT using conceptual and theoretical distinctions.

First, one can conceptually argue that the end product of ignoring the rational calculation of behaviour can be similar to the rational calculation with irrational inputs. In our case, an individual who continues procrastinating despite his or her values and negative past experience might simply ignore and suppress rational calculation according to the experience and his or her promise that he or she would act realistically next time. The neurobiological evidence tends to support the latter arguments. Unconscious or implicit processing of stimuli, and therefore automatic reaction to the situation, occurs before any conscious or voluntary evaluation of, or reaction to, the situation (for a review see Wegner & Wheatley, 1999; Wegner 2002; Wegner, & Bargh, 1998). Based on this evidence, we can assume that a procrastinator might not reach the point of activating his or her TMT's mental subjective rationalistic calculator, and act simply according to an automatic inhibitory self-regulation system in the face of a stressful and unpleasant task.

Second, procrastination can be explained in several possible ways if we consider the possibility that both conscious (voluntary) and unconscious (involuntary) self-regulation processes may be activated in the face of a seemingly unpleasant task or decision. It can be

argued that procrastinators may use voluntary calculations of the outcome in a rational way (e.g., using TMT process but in opposite direction), but the power of such a process to motivate someone to begin a task may not override the effect of any automatic inhibitory reaction to the task. Alternatively, procrastinators may be involuntarily or unconsciously motivated to start the task but not strongly enough to override the motivation for delaying the task stemming from a voluntary calculation of irrational and discounting inputs according to TMT. Finally, some procrastinators might suffer from both voluntary and involuntary avoidance of a given task.

All of the above explanations are conceptually as acceptable as TMT, because all result in the same phenomenon - problematic delay of a task that the person has intended or accepted initially to start and complete. However, the choice of one explanation over others should be based on appropriate empirical evidence. Elsewhere, I have elaborated on the existing empirical evidence regarding the validity of including voluntary and automatic processes as well as explaining how these processes might interact and/or work in parallel pathways (Haghbin, 2006c; Haghbin, 2008). Furthermore, the validity of considering parallel processes of self-regulation has already been discussed in some of the well-known and well-researched models of self-regulation such as Kuhl and Fuhrmann's (1998) Personality-Systems-Interactions theory and Metcalfe & Mischel's (1999) differentiation of two, "cool" self-regulation sub-processes. Even if we are a long way from determining how exactly these parallel processes interact with each other in various situations, there is no doubt about the existence of implicit processes beside the explicit ones according to research in neurobiology, self-regulation personality psychology and social psychology (e.g., Bargh, Chen, & Burrows, 1996; Brass & Haggard, 2007; Kihlstrom, 2008, Matcalfe & Mischel, 1999; Rothbart, Ellis, & Posner, 2004; Wegner 2002). This latter point suggests that the TMT explanation is limited and may ignore important determinants of

human behaviour and experience. Among these important determinants is negative emotion; indeed, many studies have already demonstrated quantitative and qualitative change in the emotional experience of procrastinatory behaviour as procrastinating individuals approach a deadline (e.g., Pychyl et. al. 2000).

In sum, TMT and other rationalistic models suffer from a lack of evidence, conceptual limitations, and the exclusion of alternative, psychologically valid processes and important components. Considering these limitations, there is insufficient evidence to totally accept the main elements proposed by these models. Irrational delay and voluntary delay are two concepts that are introduced by these models. A definition of delay as “voluntary” biases the conceptualization of procrastination towards a particular type of process. Consequently, one should not include such elements in the concept of procrastination. As discussed earlier, irrationality cannot be considered an unique element for adding to the already disused elements of procrastination and does not provide a mutually exclusive differentiation among different forms of problematic delay. Given the theoretical limitations of such a concept, it is important to include other missing theoretical elements if we are to include this theoretical or causal element in our conceptualization. In the following section, I discuss a major gap in existing theories in this respect, the emotional elements of procrastination.

Before closing this section, it should be noted that perceived or self-reported irrationality of a delay on the one hand, and irrationality as defined by TMT or other irrationality theories on the other hand, are not necessarily the same. The former can potentially be used as a phenomenological element to differentiate procrastination from other forms of delay, whereas the latter is a causal factor based on irrationality theory. One of the main objectives of this study was to develop a self-report measure of procrastination. Any self-report measure should be

regarded as a subjective measure as opposed to an objective measure of a phenomenon; that is, this type of measure fundamentally relies on the subject's perception. This is particularly true where the area being measured is a psychological process or a latent trait/behaviour such as procrastination. Therefore, it is justifiable to accept a certain amount of measurement error related to the perception of procrastination or interpretation of its defining elements.

At the beginning of this section, I argued that the interpretation of perceived irrationality (i.e., needlessness) is different from one person to another, which, in turn, may increase measurement error if we were to add it as a defining element of procrastination as suggested by Silver and Sabini (1981). However, if we accept that subjectivity is an inherent part of self-reported procrastination behaviour, including *perceived needlessness* or irrationality, as a defining component of a self-reported measure of procrastination is justified. Perceived needlessness or irrationality is a valid and necessary component for operationalizing the types of procrastination behaviours that are defined by the presence of an intention-action gap. In order to consider the discrepancy between intention and action in procrastination, the subject needs to perceive or report that delay on the intended task was needless or without a rational reason.

Defining element 4: Negative emotion

Negative emotion related to the delay of an intended task can be defined as a theoretically driven component and/or descriptive element in conceptualizing procrastination as well as an emotional outcome of the behaviour. One of the most important theoretically driven emotions involved in procrastination is fear of failure. This emotional construct has been explained by various achievement and goal theories (e.g., Elliot & Church, 1997; Atkinson & Litwin, 1960; Schmalt, 1982), Lazarus's cognitive-motivational-relational theory of emotion (Conroy, Willow, & Metzler, 2002), and personality theories (e.g., Murray, 1938; McClelland,

Atkinson, Clark, & Lowell, 1953; see Schultheiss, 2008). Fear of failure is a construct with strong emotional or affective aspects, which can be conceptualized and operationalized as both an implicit (e.g., Schultheiss & Brunstein, 2001; McClelland, Koestner, & Weinberger, 1989) and explicit (e.g., Conroy, 2001; Elliot & Church, 1997; Conroy & Elliot, 2004) motive.

Fear of failure has been self-reported by students as one of the main reasons they procrastinate (Haghbin, McCaffrey, & Pychyl, 2012). For example, Solomon and Rothblum (1984) demonstrated that 49.4% of the variance in a questionnaire designed to measure the reason behind procrastination was related to a factor labelled fear of failure. Among participants, 6.3% to 14.3% stated that fear of failure highly reflected why they procrastinate. Others have reported similar findings in terms of the factor solution and high total variance explained by a fear of failure factor (Brownlow & Reasinger, 2000; Clark & Hill, 1994; Harrington, 2005; Milgram, Marshevsky, & Sadeh, 1995; see Steel, 2007). Many researchers also reported relatively similar percentages of participants reporting fear of failure as a main reason for procrastination (Briody, 1980; Haycock, 1993 as cited in Steel, 2007; Kachgal, Hansen, & Nutter, 2001). Kachgal and colleagues (2001) found that items such as “were concerned that you wouldn’t meet your own expectation”, “worried that you would get a bad grade” were endorsed as main reasons for procrastination by more than 20% of participants.

Clinical observation and interviews with procrastinators support the importance of fear of failure in understanding procrastination (e.g., Burka & Yuen, 1983). Empirical findings of the correlation between procrastination and fear of failure are mixed (Haghbin, McCaffrey, & Pychyl, 2012). Schouwenburg (1992) studied this relation by using two different measures of fear or failure and procrastination. Fear of failure as a trait (or overall fear of failure) did not show a significant relation with procrastination in the total sample, and the relation between fear

of failure as a trait and reported fear of failure as a reason for procrastination was small.

Schouwenburg (1995) reported that “both traits were strongly related only in students with a high score on both trait procrastination and fear of failure. For all other students, this relation was close to zero” (p. 75). He concluded that “there is no doubt that some procrastinators do suffer from high levels of fear of failure...[but] fear of failure and procrastination are generally unrelated” (pp. 75-76).

Testing the relation in a sample of 200 students at Carleton University, I found a significant correlation between reported fear of failure factor and total procrastination. More specifically, the correlation was significant ($p < .05$) with reporting procrastination as problem ($r = .24$) and other negative emotions related to procrastination ($r = .36$), but not with prevalence of procrastinatory behaviours (Haghbin, 2006b). Similarly, in his meta-analysis, Steel (2007) reported a small average correlation between fear of failure and procrastination ($\bar{r} = .18$).

There are different explanations for these inconclusive findings regarding the role of fear of failure in explaining procrastination. The difference between the predictive powers of fear of failure as an overall variable, and as a main reported reason might imply that fear of failure, similar to other negative emotions, is task- and domain-specific. In fact, re-examining the data and questionnaire from my own earlier research (Haghbin, 2006b) demonstrated that the fear of failure reported by students as a reason for procrastinating on submitting a term paper was significant ($p < .05$) relation with reporting a procrastination problem in relation to the same task ($r = .30$). This relation was not significant or had a weak correlation when the task was different. This might also explain why the correlation between general measures of fear of failure and procrastination is only significant for individuals with chronic or severe procrastination problems but not among people with low levels of procrastination. In individuals with chronic or severe

procrastination problems, fear of failure has been generalised to multiple tasks while in other groups this fear is only aroused when facing specific tasks.

Furthermore, as Steel (2007) explains, “the discrepancy between correlational and frequency data likely indicates a form of counterbalancing; people may also cite fear of failure as a reason for not procrastinating” (p. 16). In other words, fear of failure may be expressed as a reason for both initiating and postponing a task. The low correlation in this case could also be explained in other ways. One possible explanation is that the relation between fear of failure and procrastination is mediated by other factors (Steel, 2007). In this regard, in a recent study (Haghbin, McCaffrey, & Pychyl, 2012), we found that the relation between these constructs is moderated by self-efficacy or need for competence. There we explained how summing correlations with opposite direction between fear of failure and procrastination in high- and low-competence groups may result in a weak to zero correlation between the constructs in the whole sample.

Second, the major problem of studying the relation between fear of failure and procrastination is that researchers have only used self-attributed measures of fear of failure. However, many researchers have demonstrated that fear of failure can be conceptualized as both an implicit and explicit construct. Indeed, the correlates and effects of implicit and explicit fear of failure are demonstrated to be different according to a large body of literature (e.g., McClelland et al., 1953; Schultheiss & Brunstein, 2001; Schultheiss, 2008).

Similar to fear of failure, anxiety as a negative emotion has been considered as another theoretically-driven or causal emotional element of procrastination (e.g., Milgram & Tenne, 2000). In addition, anxiety also can be regarded as a descriptive element or by-product of procrastination (i.e., needless intention-action gap). The differentiation between anxiety, stress,

discomfort, and many other negative emotions is very subtle. This may be the reason that factor analyses of various negative emotions associated with procrastination results in one factor (e.g., Haghbin, 2006a, 2006b).³

From a theoretical point of view, it has been argued that students may experience a fairly high level of anxiety or negative emotion as they are facing or thinking about starting a task, consequently they try to self-regulate their negative emotions with postponing the task to a later time (Baumeister et al., 1994; Tice & Baumeister, 1997; Tice, Bratslavsky & Baumeister, 2001). However, as Tice and Baumeister (1997) highlight, “despite its apologists and its short-term benefits, procrastination cannot be regarded as either adaptive or innocuous. Procrastinators end up suffering more [from negative emotion] and performing worse than other people” (p. 458).

Longitudinal (Tice & Baumeister, 1997) and experimental (Tice et al., 2001) data have supported the above explanation. From this point of view, procrastination as a problematic delay not only is instigated by negative emotion but also lead to a greater degree of psychological distress in comparison to that experienced by non-procrastinators. Using the experience-sampling method, Pychyl et al. (2000) also supported the self-regulatory role of procrastination. The authors wrote that:

When students reported that they were procrastinating, they also reported experiencing significantly higher levels of guilt and lower levels of motivation. As a consequence, students may have been engaged in more pleasant activities when they were

³ It should be noted, recent conceptualisation and operationalisation of achievement negative emotions implies the presence of two factors, activating and deactivating negative, in relation to different achievement tasks (e.g., learning, studying for exam; see Pekrun, Goetz, Titz, & Perry, 2002; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). Factor structure of negative emotions related to procrastination was still an empirical question requiring the use of a large sample and entering both sets of negative emotions in factor analysis.

procrastinating, but they were not really happy or experiencing positive affect per se because they were also feeling guilty about their task avoidance. (p. 248)

Although negative affect showed a significant and direct relation with trait procrastination, it was not significant with a moment-to-moment measure of procrastination as participants engaged in less aversive activities. Among the negative emotions, however, guilt always had a relation with both moment-to-moment and trait procrastination (Pychyl et al., 2000). Along the same line, several researchers have demonstrated that, at least for a group of procrastinators, changes in the level of neuroticism (the tendency to experience negative emotions and psychological distress such as anxiety as well as to show impulsivity) links directly (McCown, Petzel, & Rupert, 1987; Johnson & Bloom, 1995; Lay, 1997; Lay, Kovacs, & Danto, 1998; Milgram & Tenne, 2000) or indirectly (Lee, Kelly, & Edwards, 2006) with a change in participants' self-reported procrastinatory behaviour or tendency .

To provide a better picture of the role of negative emotions in the conceptualization of procrastination, it may be important to look at the results of meta-analytical studies in the field. According to van Eerde (2003), procrastination has a significant relations with trait anxiety ($\bar{r} = 0.24$), state anxiety ($\bar{r} = 0.22$) and neuroticism (0.26). In his meta-analysis, Steel (2007) did not provide the average correlation for trait and state anxiety. His conclusion about the role of negative affect is mainly based on studying the relation between procrastination with neuroticism and mood in general. He wrote:

Neuroticism is very similar to worrying, trait anxiety, or negative affect. Typically, researchers have argued that if people procrastinate on tasks because they are aversive or stressful, then those who are more susceptible to experiencing stress should procrastinate more (e.g., R. T. Brown, 1991; Burka & Yuen, 1983; Ellis & Knaus, 1977). (p. 68)

Steel (2007) found that the relation between procrastination and neuroticism depended on whether the measures of neuroticism include (e.g., NEO and EPI) or exclude (e.g., EPQ, BPP, and BFI) impulsivity and he concluded that “neuroticism’s connection to procrastination appears to be primarily due to impulsiveness, not anxiety” (Steel, 2007, p. 76). Based on the above results and others’ findings and conclusions (Johnson & Bloom, 1995; Lee, Kelly, & Edwards, 2006; Schouwenburg & Lay, 1995), Steel disagreed that neuroticism and/or negative emotion (i.e., anxiety) should be considered causal explanations or important predictors of procrastinatory behaviour.

Since Steel’s (2007) meta-analytical study is considered one of the important and recent references where procrastination studies have been summarised and organised, it is important to evaluate his findings and conclusions. I agree that the impulsivity facet of neuroticism has greater predictive power than other facets. However, I believe that excluding negative emotions from the list of important predictors of procrastination is biased towards limiting the relevant variables in the existing literature to those that align with Steel’s Temporal Motivation Theory. For example, given the strong correlation between procrastination and boredom and task aversiveness, Steel (2007) considered these variables to be representative of “value” in the TMT model as opposed to negative emotion. Such a categorisation of variables in favour of the model ignores the fact that boredom commonly represents an emotional state, and task aversiveness had a strong tie to feeling anxious and stress in facing a task (Blunt & Pychyl, 2000; Solomon & Rothblum, 1984). Furthermore, I believe that the small correlation between negative-emotion-based measures of neuroticism and procrastination does not negate the important role of negative emotions in procrastination. This conclusion is still true even if there is a small correlation

between procrastination and both trait and state conceptualizations of negative emotions. There are several reasons that may support such a strong claim.

First, all of these constructs are measuring negative emotions, but they are limited in terms of content. Many types of negative affect such as guilt (Pychyl & Little, 1998), boredom (Blunt & Pychyl, 2000; Milgram et al., 1995), and shame (Fee & Tangy, 2000; Wohl, Pychyl, & Bennet, 2010) have shown a strong association with procrastination, but are not highlighted as negative emotions in Steel (2007). Second, procrastination as a problematic delay is meaningful in reference to specific times, content areas and tasks, whereas neuroticism, trait anxiety, and state anxiety are not context specific. Conceptually, measuring a negative emotion before, during, or after delaying a task is not necessarily similar to measuring a general tendency to feel the negative emotion (e.g., anxiety-based neuroticism). It is not identical with the score for repeatedly feeling a negative emotion (e.g., trait anxiety) in general. It is even not exactly matched with the measure of temporarily feeling a negative emotion at a particular point in time (e.g., state anxiety) without specifying the task. It can be argued that although a person with high level of neuroticism or trait anxiety is more prone to feel anxious in the face of tasks, his or her score does not necessarily mean that the person feels anxiety in the face of every task. That is, it is important to differentiate theoretical explanations that highlight the role of neuroticism from explanations that imply negative emotions may instigate procrastinatory behaviour. One could not reject a theoretical model that assumes anxiety, stress or negative emotions are the underlying factors leading to not starting a task on time, unless one had measured the emotions in relation to a task and at different points in time and using an appropriate method. However, this is not an easy task considering the implicit and explicit as well as perceptual and psychobiological nature of negative emotions and the difficulties of measuring them. Moreover,

given the emotional regulatory role of procrastinating behaviour in the short term (Sirois & Pychyl, 2013), it is very difficult to detect the exact level of negative emotions during procrastination by using self-report measures of negative emotion. The level of negative emotions also fluctuates as people may use various regulatory strategies other than but accompanying procrastinating.

The above argument did not aim to prove that a particular emotion such as anxiety or guilt is the main cause of procrastination. Proving such a theoretical proposition requires further study. The main goal of the debate was to challenge a possible bias in the rejection of some theories in favour of others, as Steel (2007) did in the discussion of his meta-analytic results. In sum, similar to irrationality as defined by rationalistic models, at this point, negative emotions might also be considered as one of the possible causal elements of procrastination based on the evidence discussed.

Despite its questionable causal role, negative emotion can be considered as an important descriptive element and/or outcome of procrastination. The evidence supporting the relation between procrastination and negative emotions is not limited only to the above key studies. Procrastination accompanies, results in, or changes various negative emotions including anxiety (Ferrari et al., 1995; Lay, Edwards, Parker & Endler, 1989; Rothblum, Solomon, & Murakami, 1986; Solomon & Rothblum, 1984; Senecal, Koestner, & Vallerand, 1995; van Eerde, 2003, 2004), distress (Schouwenburg, 2004), depression (McCown et al., 1987; Saddler & Sacks, 1993; Senecal et al., 1995; van Eerde, 2004), guilt (Pychyl, 1995; Pychyl et al., 2000), negative affect (Lay, 1995; 1997; Lay & Silverman, 1996), six types of agitation (e.g. anxiety, worry), dejection, discouragement, and shame (Lay, 1995; 1997; Wohl et al., 2010), as well as negative affect (Knouse, & Frend, 2014).

Very often the strength of the relation between negative emotions and procrastination depends on whether the procrastination measure has accommodated negative emotion as an element. However, Flett and colleagues (1995) demonstrated that the relation was significant even when researchers used procrastination measures without emotional elements. The descriptive role of negative emotion can also be studied by directly asking individuals with high levels of procrastinating behaviour if they feel negative emotion in relation to their procrastination. Steel (2007) reported:

Froehlich (1987) and Haycock (1993) asked students retrospectively how they felt after procrastinating, with over 80% of the responses categorized as negative. Similarly, an online poll by the Procrastination Research Group (2005) that surveyed over 9,000 respondents indicated that 94% find that procrastination has some negative effect on their happiness, with 18% indicating that the effect is extremely negative. (p. 79)

As a pilot effort before the development of the MMAP, I re-analyzed several datasets in which students reported the frequency of procrastinating on various academic tasks and their level of emotional distress, or psychological problems related to the procrastinating behaviour. The variation in frequency of reported procrastination was strongly and positively related to variation in reported experience of emotional distress (e.g., $r = .61$, $p < .05$, $N=200$). Furthermore, in a dataset containing 200 Carleton students, I selected 83 students who reported high frequency of procrastination on academic tasks. It should be noted that the difference between individuals with high and very low levels of procrastinating behaviours was significant with respect to their degree of overall negative emotion and their psychological distress (Haghbin, 2006b). Frequency analysis revealed that students who reported high frequency of procrastinating behaviour also reported various negative emotions in relation to their procrastinating behaviour on academic

tasks. The percentage who reported moderate to extreme levels of negative emotion was as follows: 78% overall negative emotion, 87% guilt, 84% nervous, 77% angry at self, 77% dissatisfied with self, 68% disgusted with self, 66% helpless, 66.3% distress, 64% sluggish; 60% ashamed, 60% angry, 60% scared, 55% sad, 51% hopeless, 53% frightened, and 45% loathing (Haghbin, 2006b).

Some of these emotions, such as guilt, might be experienced after the person starts postponing an important intended task (Pychyl et al., 2000); others, such as sluggishness or nervousness, may be experienced before the person starts delaying the task. That is, the starting point and duration of each negative emotion is still an empirical question (Steel, 2007). However, all of the above evidence does not leave any doubt in terms of the possibility that procrastination very often, if not always, is accompanied by negative emotion, whether it is before, during or after procrastination. If this is the case, we should consider negative emotion as a descriptive element of procrastination. Even if one argues that only a group of procrastinators experience some level of negative emotion, it is rational to differentiate this group from others who do not suffer from negative emotions.

Several researchers disagree with the above conclusion (Flett, Blainstein, & Martin, 1995; Lay, 1997; Schouwenburg, 1995; Steel, 2007). For example, Lay (1997) stated that “negative affect is a variable more general than dilatory behaviour, and is not specific to trait procrastination” (p. 269). Schouwenburg (1995) suggested that procrastinating can be considered a needless delaying, but does not necessarily indicate experiencing subjective discomfort or suffering. Steel (2007) is strongly critical of a study that included negative emotion as a component of procrastination. He stated that “unfortunately, this study is less than decisive. It operationalized procrastination as delay in conjunction with negative affect” (p. 79). Similarly,

van Eerde (2003) concluded that “another limitation may be the scales used in some of the research that may have confounded procrastination with the feelings about procrastination, . . . so that the correlations of procrastination with affect may be somewhat inflated” (p.1410).

On the other hand, several researchers in the field agree with the above proposals and include a negative emotional component in their conceptualization of procrastination (e.g., Burka & Yuen, 1983; Milgram, & Tenne, 2000; Solomon & Rothblum, 1984; Klingsieck, 2013;). For example, Rothblum and colleagues (1986) found that both behavioural and emotional criteria identified procrastinators in academic settings as people who: 1) “nearly always or always put off academic tasks”, and 2) “nearly always or always experience problematic levels of anxiety associated with this procrastination” (p. 387). It should be noted that the latter group of researchers have used different labels or types of emotional constructs in their conceptualization and/or operationalization of procrastination including subjective discomfort (Burka & Yuen, 1983), psychological distress (e.g., Solomon & Rothblum, 1984), anxiety (Rothblum et al., 1986), and state of unhappiness (Ferrari et. al., 1995).

It is essential to include negative emotions in the conceptualization of procrastination problems. Procrastination, similar to other human phenomena, has an emotional component and, similar to other psychological problems, the emotional component is negative, problematic or leads to psychological distress or dissatisfaction (Burka & Yuen, 1983; Solomon & Rothblum, 1984; Steel, 2007). In other words, because there is consensus that at least a group of procrastinators experience some level of negative emotion or psychological distress (Burka & Yuen, 1983; Ferrari et al., 1995; Flett et al., 1995; Lay, 1997; Pychyl et al., 2000; Haycock, 1993; Rothblum et al., 1986; Schouwenburg; 2004; Solomon & Rothblum, 1984; Steel, 2007), it is rational to include and operationalize such an element in order to differentiate this group from

others who do not suffer from negative emotions. Even if one can agree that negative emotion is a consequence of procrastination as opposed to an aspect of it, it is still important to study forms of delay that do not result in negative emotions, because doing so will help us to better theorize procrastinatory delay.

Last, but not least, given that defining the problematic nature of a delay is the most important element differentiating procrastination from other forms of delay (e.g., Steel, 2002, 2007), it is important for the sake of validity to include emotional aspects in the content domain when operationalizing the “problem” in conceptualization of procrastination. Indeed, it is absolutely necessary to include a negative emotional element, particularly if an instrument is used to identify procrastination as a psychological problem. I believe it is legitimate to assume that the aetiology, intervention strategies and prognosis of procrastinatory behaviour may differ depending on whether or not there is negative emotion or psychological distress. Therefore, we need to accept at face value the numerous and repeated self reports of experiencing negative emotion in relation to procrastination, as such reports are a central criterion in many diagnostic assessments of other psychological problems (e.g., Social Phobia; Generalised Anxiety, Depression; Obsessive Compulsive Disorder; American Psychiatric Association, 2000). Based on the above evidence, negative emotions were considered a defining component of procrastination problems, a problem related to the irrational needless delay of intended task.

Defining Element 5: Performance.

Irrationality and negative emotions related to the gap between intention and action are not the only elements required to conceptualize and operationalize “problems” in the conceptualization of procrastination. Poor performance or negative consequences may also be considered one of the defining elements of problematic delay. As very often procrastination is

defined in reference to a particular task, the effect of procrastination on the final performance of that task has been studied frequently, particularly in academic settings. In this context, overall GPA, grade in a specific course, missing deadlines, and the time spent on a task have all been used as measures of academic performance (van Eerde, 2003). van Eerde (2003) revealed that the procrastination correlated with course grade ($\bar{r} = -0.28$), GPA ($\bar{r} = -0.28$) and missing a deadline ($\bar{r} = 0.29$).

Steel (2007) argued that “if procrastination is irrational as well as representative of low conscientiousness, this “last-ditch” effort should tend to be less successful than efforts made well before the last minute” (p. 70). Poor performance, low self-efficacy, anxiety, and procrastination may have reciprocal and circular associations with each other (Haycock, 1993). For example, low self-efficacy can result in irrationally postponing tasks, the postponement may cause failure or poor performance, and poor performance may lead to reduced self-efficacy which in turn may increase the likelihood of procrastination behaviour (Steel, 2007). This cycle of self-efficacy, irrational delay, and poor performance may underlie the consistent negative association between procrastination and academic achievement. For example, Steel’s meta-analysis revealed a weak, negative average correlation between procrastination and overall academic performance ($\bar{r} = -0.19$), including GPA ($\bar{r} = -0.16$), course grade ($\bar{r} = -0.25$), final exam grade ($\bar{r} = -0.17$), and assignment grade ($\bar{r} = -0.21$).

As van Eerde (2003) suggested, “not only task performance, but broader functioning may be affected by procrastination as well, depending on the task or context” (p.1404). Within the context of health, Sirois (2007) found that scores on three self-report measures of procrastination she investigated, without exception, were positively related to sum of actual health problems; correlations ranged from $r = .15$ to $r = .25$ in a sample of 250 participants with a mean age of

33.8 years. The correlation of a general procrastination scale (Lay, 1986) was also significant ($p < .50$) with various wellness and health behaviours such as medical ($r = -0.22$) and dental ($r = -0.30$) checkups and overall wellness behaviours ($r = -.34$). General procrastination in everyday life was also related to stress as an important predictor of illness ($r = 0.13$) as well as an overall score measuring 8 behaviours related to monitoring and performance of household safety ($r = -0.45$). Testing a mediational model, Sirois (2007) demonstrated how stress and health behaviour mediate the relation between procrastination and health problems.

Steel (2007) also referred to other contexts where procrastination shows negative effects on performance variables. He reported that:

Elliot found an even stronger negative relation ($-.42$) between procrastination and financial well being. Similarly, Mehrabian (2000) found a significant correlation of $-.26$ between career/financial success and procrastination. Notably, evaluation of success was based on peer rather than self-report. (p. 80)

The degree to which behaviour results in socioeconomic harm or to a reduction of performance in relational, personal, and occupational duties is an important criterion for the diagnosis of many psychological problems (American Psychiatric Association, 2000). More specifically and from a clinical point of view, such a criterion can define the severity of problems and therefore the necessity of intervention. In terms of procrastination, using a similar rationale to that discussed for inclusion of negative emotion, one can argue that poor performance and important negative consequences (e.g., health, personal) may work as a component to differentiate problematic delay (e.g., delay lead to different degrees of poor performance) from unproblematic delay as well as to gradate the severity of problematic delay. These differentiations not only are potentially important to reduce possible sources of measurement

error and heterogeneity of samples, but they are also necessary to identify individuals who are clinically and educationally at risk.

Although it may seem easy to justify the inclusion of poor performance or negative outcome as a component, particularly in assessing a psychological problem, measuring and conceptualizing such a dimension is very difficult. Performance and negative outcomes can be evaluated by self-reports, other-reports (peers, parents, teachers), experts (counsellors, clinicians), using interviews, or actual measures of accepted performance indices (e.g., GPA). Furthermore, the context and scope of performance measurement may vary. Poor performance related to problematic delay in an educational context may mean something different from that in health or occupational contexts. Even within the same context, for example academic, one may define poor performance according to the immediate performance related to a task (assignment grade), overall performance in the relevant context (GPA), or overall performance in general or in another context (well-being, health, relationship).

There is no “golden” solution that can be used to overcome the complexity of choosing and operationalizing an appropriate performance scale in the proposed study. Because the other elements in my study were assessed using the self-report method, self-reports of performance were also employed. Although such a method is susceptible to faked and/or biased responding (Lanyon & Goodstein, 1997; Strack, 2006), a self-report measure at least has one advantage, flexibility. Specifically, using a self-report measure of performance allows the measure to cover a wide range of contexts and therefore provide a representative sample of the content domain. For example, participants can be asked to rate their performance on specific tasks, overall performance within a context and overall performance in general. It is also flexible, as it can be easily used as a basis for creating an other-report measure. In this study, in the first stages of

measurement development, items covering negative outcomes or performance in various domains were included to quantify the negative aspects of procrastination. A set of exploratory analyses were then used to identify empirically a concise sample of important negative consequences. Since the scope and importance of the negative elements were to be determined empirically, I used a liberal criterion in choosing the domains. The domains included academic, psychological (e.g., personal dissatisfaction), and social or relational outcomes, as well as health, and well-being.

Defining element 6: Type of tasks

Type of task is not only important for defining performance, but also can serve as an element for determining the scope of procrastination. That is, it can serve as an element to differentiate various measures of procrastination according to contexts.

Task, setting, context and situation are interrelated concepts that can sometimes be used interchangeably. In this study, however, I consider the following subtle differences when using these terms. Situation is the broadest term; it can include not only the physical element or concrete limitations of an environment, but also its emotional aspects. In other words, situations can be conceptualized and operationalized as both a nominal (e.g., school, course) and a subjective construct (e.g., uncertainty, pressuring) (Mischel & Shoda, 1995). Nominal situations may have different scopes. In fact, context (e.g., academic) and task (e.g., exam) represent different levels or scopes of a nominal situation. In the present study, the terms context and setting are used interchangeably and represent a broader meaning than task. They refer to concrete facts that surround an event, or nominal situation and environments (e.g., health related; everyday-life) where specific categories of action happen. Finally, tasks (e.g., sending a bill

payment) are considered relevant categories of action within a specific context (e.g., everyday life).

Procrastination has been measured mainly in reference to academic contexts (Solomon & Rothblum, 1984; Aitken, 1982) or everyday life or general contexts (e.g., Lay, 1986). Both academic and everyday-life contexts include specific sets of tasks. Solomon and Rothblum (1984) covered six academic tasks including writing a term paper, studying for an exam, keeping up with weekly reading assignments, performing administrative tasks, attending meetings and performing academic tasks in general. Similarly, Milgram and colleagues (1995) used 17 academic tasks⁴ (e.g. writing a term paper, buying school supplies and keeping up with readings) to measure academic procrastination. It should be noted that some of these tasks can be divided into different stages or sub-tasks (Silver, 1974). For example, writing a term paper may involve finding a topic, selecting the materials, reading them, outlining and writing. Considering the detail involved in defining academic tasks, one needs to identify a legitimate but representative sample of tasks in order to develop a measure of procrastination in academic settings.

In terms of measuring everyday-life procrastination, how to define an appropriate set of tasks is even more undetermined (Steel, 2002). For example, Lay (1986) used the following tasks to operationalize general procrastination: paying bills, attending social events (e.g., concerts, sporting events), planning a party, returning phone calls, important appointments or deadlines (e.g., being on time at the airport), shopping for birthday gifts, and shopping for an important item. Although the tasks used by Lay (1986) seem to capture the everyday-life context, their

⁴ Later, Milgram and colleagues (1998) reduced the list of tasks to three major and common educational tasks, homework, examination, and writing a paper.

appropriateness (Steel, 2002) and representativeness is questionable. Everyday-life tasks may change through time and across cultures as well as in different gender and age groups. For example, tasks common in 1989 may be different from those of 2009. Checking and answering emails, installing new anti-virus software, and performing back ups are some of the new tasks that have become common in the last two decades.

Another difficulty involved in defining a set of tasks to be measured is that different people may procrastinate differently on various tasks. That is, some tasks are more aversive, boring, or anxiety provoking and therefore more susceptible to be procrastinated on (Blunt & Pychyl, 2000). Tasks can also have different values for self-esteem, well-being and/or success. There are individual differences in responding to tasks. Some people might procrastinate on certain tasks, while others may procrastinate on another set of tasks.

These variations in tasks, their values and reactions to them demonstrate the importance of determining whether procrastination is a generalized or context-specific phenomenon. If it is context-specific, what extent of specification is sufficient for generating the indicators of the construct? Should we, for example, differentiate procrastination at different stage of writing a term paper? On the other hand, if procrastination is not context-specific, which set of tasks should be used to be representative of the content domain?

The answer to the first question is related to the topic of behaviour versus trait procrastination. Apparently, only one study has tried to answer this question. Using both parent and student reports, Milgram, Mey-Tal, and Levison (1998) compared procrastination on three specific tasks in the academic domain as well as comparing procrastination in the academic domain with life routine procrastination. The correlations between general and academic procrastination were high based on both student ($r_{(52)} = .65$) and mother ($r_{(52)} = .57$) reports.

Milgram and colleagues (1998) suggest that variability patterns of procrastination are similar across tasks and therefore procrastination should not be considered a domain-specific phenomenon.

Although interesting, this study is limited as it measured only three tasks, and only two contexts in total. The tasks on which people procrastinate are not limited to academic and everyday life contexts. Organizational, health, and financial contexts are some of the major contexts that have different sets of general or common tasks. Unfortunately, there is no specific measure to cover these particular tasks and contexts.

It should be noted that both context-specific and non context-specific operationalization (i.e., trait and behavioural procrastination) are and have been legitimate and common (see Steel, 2007); choosing one over another depends on the researchers' purpose and interest. In terms of the scope and the level of specification of tasks as well as identifying the representative sample of tasks, there is no systematic study to answer these issues. In my dissertation studies, I used various levels of specification in different studies related to the development of the MMAP. The detailed explanation of this topic is presented in the method sections of these studies.

Taken together, I conclude that the elements of delay, intention-action gap, irrationality, negative emotions, performance or negative outcomes and type of tasks can be used to define procrastination. However, before defining this it is important to mention two other issues related to possible types of the construct. In the following section, I first discuss a new usage and definition of the term procrastination with positive connotations in addition to the well-accepted negative meaning of the construct. Second, I discuss differences and issues related to defining and measuring the construct as a behaviour, a trait or a psychological problem.

Type of Procrastination Construct

Positive versus Negative Procrastination

Although there is consensus about the negative connotation of the word procrastination (see Steel, 2007; Blunt & Pychyl, 2005; Schouwenburg, 2004), some researchers recently have suggested that procrastination can be positive too (Chu & Choi, 2005). Choi and Moran (2009) describe their new conceptualization as follows:

Passive procrastinators [italic added] are traditional procrastinators who postpone their tasks until the last minute because of an inability to make the decision to act in a timely manner. In contrast, *active procrastinators* [italic added] make intentional decisions to procrastinate, using their strong motivation under time pressure, and they are able to complete tasks before deadlines and achieve satisfactory outcomes. (p. 196).

The major problem of this definition is that it equates “procrastinate” and “delay.” What the authors mean by asserting that “active procrastinators make intentional decisions to procrastinate” probably should be corrected, as some individuals make intentional decisions to delay. There is no doubt that postponing a task to the last minute is not necessarily negative and that people who postpone their tasks with a valid reason should not be considered as having problematic delay or procrastination. This concept is not new. Many authors have mentioned the importance of differentiating deliberate and wise delay from procrastination as a self-defeating behaviour (Blunt & Pychyl, 2005; Ferrari et al. 1995; Steel, 2007; Schouwenburg, 2004). For example, Schouwenburg (2004) argues that:

Not all postponement, however, should be considered dilatory [procrastinating] behavior [sic]. Deferment can be purposely planned, and it can be wise to postpone doing

something. For example, in Europe, for many students at university, it would be wise to postpone preparing for an examination until the exact subject has been announced. If postponement is unplanned, however, this is dilatory behavior [*sic*]. When dilatory behavior [*sic*] becomes habitual, or chronic, delaying can be interpreted as a typical response or as a habit or trait; in that case, it is considered trait procrastination. (pp. 4-5)

Despite some questionable exceptions (e.g., Ferrari et. al, 1995, see Chapter 1), the prevailing historical usage and dictionary meaning of the term procrastination is negative. More important, based on the review of clinical and empirical definitions and elements of procrastination, there has been a consensus at least, on the intention-action element of procrastination. As Blunt and Pychyl (2005) noted, “common to most empirical definitions of procrastination is the notion that procrastination represents a discrepancy between an individual’s intention to act and the performance of the intended action” (p. 1722).

In sum, using the term procrastination, as in active procrastination, to refer to positive, wise (Schouwenburg, 2004), or sagacious (Ferrari et al., 1995) delay is misleading and may result in nothing more than an unproductive semantic debate. If there is no doubt that delay can be positive or negative, and as procrastination has been defined as a type of problematic, negative form of delay so far, it does not make sense to modify with an adverb to imply that it has a good side. In fact, Pychyl (2014, personal communication) considers the notion of “active procrastination” a prototypical example of an oxymoron. If delay as a broader term carries both positive and negative connotations, there is no need to redefine procrastination as both a positive and negative construct. Consequently, in this study, I maintained the common usage of the term “delay” to refer to both possible positive and negative postponement, and “procrastination” to refer to specific negative postponement according to empirically defined elements. In other

words, the active procrastination (i.e., intentionally delaying tasks) used in Choi and Moran's (2009) terminology will be similar to one form of positive delay, purposeful delay, in this study.

In addition to equating delay and procrastination, another problem of Choi and Moran's (2009) conceptualization is that it differentiates two types of delay using a limited set of factors. If the reasons for delay are to be used as indicators of a behavioural phenomenon, they should fully represent the domain being tested. A self-reported preference for working or not working under time pressure is not the only reason that may define a delay as positive or active. Similarly, an inability to make decisions is not the only causal factor needed to define problematic delay. Many rational and irrational reasons and underlying causal factors may lead us to consider a delay to be positive or negative. The fundamental rule of content validation highlights the necessity of providing a representative sample of elements of the content domain, as described by the domain's definition, test specification and expert opinion (e.g., Kane, 2006).

One of the major dimensions used to operationalize active procrastination is a preference for pressure, a self-reported belief that one intentionally delays tasks because one works better under pressure. Researchers repeatedly question the claim that "working better under pressure" is a valid reason for procrastinatory behaviour (e.g., Ferrari et al., 1995; Simpson & Pychyl, 2009; Tice & Baumeister, 1997; Tuckman, 2005). The problem with relying mainly on a self-reported reason, particularly the above one, is that self-reported reasons may not necessarily be the actual motive for delay. Reported reasons for behaviours with negative psychosocial connotations may also represent irrational beliefs or rationalisations of the negative behaviours.

In conclusion, despite the problem of labelling and the difficulty of operationalizing time-pressure preference, the effort to conceptualize and measure a form of adaptive delay is very valuable. In their proposed conceptualization of active procrastination, Choi and Moran (2009)

have defined and used several dimensions including satisfaction and ability to meet the deadline. These dimensions are similar to negative emotions and performance discussed in the elements section of my thesis. In the conceptualization section, I discuss the elements related to purposeful delay (active procrastination) in greater detail. I also evaluate the measure that is developed based on the above conceptualization in the measurement section.

Procrastination: Behaviour, Trait, and Psychological Problem

There are different ways to define and operationalize procrastination. Typically, procrastination has been measured as a trait or as a behaviour. From a theoretical point of view, traits are one of the important causes or predictors of trait-specific behaviours (Lay, 1997; Schouwenburg, 1995). Schouwenburg (1995) argued that:

The term procrastination applies to various phenomena. First, we can call any sample of dilatory behavior [*sic*] procrastination. Second, we can reserve the term for the habit of postponing things and imply a personality trait. Third, we can also use the term procrastination for any single manifestation of personality trait. . . .Procrastinatory behavior [*sic*] appears to be diverse; by term academic procrastination we may designate: (1) postponing the moment one is intending to begin studying; or (2) postponing the moment that actual studying is to begin; or (3) study intention-behavior [*sic*] discrepancy; or (4) doing things other than studying. (p. 82)

Schouwenburg differentiates between procrastinating during a particular period of time or on specific courses and habitual or trait procrastination. From his point of view, procrastinating in an academic setting can simply be a manifestation of a procrastination trait.

Lay (1997) elaborated further on the trait-behaviour relation. He suggested that conscientiousness as a higher order trait is the proximal source of trait procrastination and that

these higher and lower order traits are the main predictors or causes of procrastinating behaviour. Although Lay (1997) argued that a “[lack of] Conscientiousness is the proximal source of trait procrastination,” he did not suggest that trait procrastination is the source of all procrastination behaviour. He wrote:

The trait examined was procrastination, an appropriate choice, as it is primarily a summary variable, rather than a source variable (Buss and Craik, 1983; Pervin, 1994). Repeated episodes of dilatory behaviour are the defining characteristic of the trait procrastinator. (p. 268)

This distinction is also useful in looking at the relation between trait and behavioural procrastination from a measurement point of view. From such a standpoint, when a person repeats procrastinating behaviour over time and situations, an observer may call this a procrastinating habit, tendency, characteristic or trait. That is, the number of procrastinated tasks and repetition can be considered as the main factors to differentiate trait and behavioural procrastination. In general, procrastinatory behaviour is assumed to be temporary and more context-dependent, while trait procrastination is defined as relatively enduring and context-independent. Procrastinatory behaviour and trait procrastination may differ in terms of their form, tasks and durations, but their defining elements (e.g., intention) are very similar.

Unfortunately, procrastination research has not paid attention to the validity of interpretation of procrastination scores measured by questionnaires that have been designed to capture procrastination as behaviour or trait. The majority of procrastination studies use a correlational design where both trait and behaviour procrastination have been frequently interpreted as an outcome variable or a psychological problem. Although it is legitimate to study the predictors of behaviours and traits, the scores and correlates of procrastination in such studies

cannot extrapolate to operationalizing procrastination as a problem according to the well-accepted definition of validity which places emphasis on the importance of considering the specific purpose of instruments for the interpretation of their scores (Cronbach, 1971; Cronbach & Meehl, 1955; Kane, 2006).

As I discussed in the element section, the conceptualization and operationalization of procrastination as a psychological problem requires specific attention and necessitates the inclusion of elements that define the problematic nature of the behaviour or tendency (e.g., negative emotion, negative outcome, dissatisfaction, and context). This is more important if a procrastination measure is to be used in a counselling setting, program evaluation or intervention research. For example, a person can problematically delay only a few intended tasks, but be extremely unsatisfied or suffer from the needless delay. Procrastination in such a case is very likely to not be recognised as a procrastination problem according to the existing behavioural or trait conceptualization, even though in fact this person needs specific attention. For example, a person who procrastinates only on academic tasks but where this behaviour negatively affects his or her performance or other aspects of his or her life, would not be identified as having a procrastination problem according to trait measures if he or she does not procrastinate in everyday life (e.g., sending a bill payment on time).

Based on the current literature, “chronic procrastination” is a term that is used to identify clinically important procrastinators or those with a procrastination problem. Identification of such cases is often based on the participants’ score on a trait measure of procrastination (e.g., Ferrari et al., 1995; Ferrari, Diaz-Morales, O’Callaghan, Diaz, & Argumendo, 2007). According to such measures, the severity of a procrastination problem depends on the frequency of delay on everyday tasks or the average rate of needless dilatory tendency, as opposed to the emotional,

cognitive, or psychosocial quality of the problematic dilatory behaviour or tendency. It is rational to assume that a person who shows a high level of needless delay of intended everyday or academic tasks will also be more likely to have high scores on the negative emotional, cognitive and psychosocial elements. However, this assumption does not reduce the importance of defining a psychological problem according to its different aspects. Failure to cover such elements in operationalizing a measure not only reduces the validity of score interpretation and the likelihood of identifying critical cases, but also hides any effects of therapeutic intervention in program evaluation research. Effective interventions may influence different aspects of procrastination problems, not only the behavioural aspects. For example, if an intervention significantly reduces the negative cognitive aspect of a procrastination problem, but not the behavioural or emotional aspects, it should still be identified as an effective intervention. In this example, the individual is benefitting from the intervention in terms of his or her negative self talk, and this may well be the impetus for further effort and/or further changes affectively or behaviourally. A test that does not cover such aspects is not valid to be used for the above evaluative purpose (Cronbach, 1971; Cronbach & Meehl, 1955; Kane, 2006).

Duration or course of a problem is one of the important aspects of defining and measuring a psychological problem and its severity. Defining procrastination as a psychological problem highlights more accurately the course or duration of procrastination in comparison to the existing trait versus behaviour conceptualizations. The course of a problem can define not only the severity of procrastination, but also can differentiate acute and chronic forms of procrastination. In fact, Dr. Pychyl and my own observations suggest that there are at least two groups of procrastinators in terms of duration. One group of procrastinators report that their problem is short-term and is started at the beginning of high school or university, while another

group of procrastinators state that they have been always procrastinators. The differentiation between short-term and long-term procrastination has both theoretical and clinical implications. It can be argued, for example, that long- versus short-term procrastinating individuals may have different sets of coping strategies to reduce negative consequence of their problem and may have different perceptions and/or level of negative emotions related to their problem as well as its secondary consequences (e.g., health related problems). It can be speculated that long-term procrastinators may have already developed a broader set of coping strategies to deal with their tendency in comparison to procrastinators who recently started to procrastinate. Consequently, it can be argued that each of the above groups may need different types of counselling or clinical interventions and may have different treatment prognosis. Built on the above discussion, the duration of behavioural, cognitive and emotional facets of procrastination was considered a key element to quantify procrastination problems further in this study.

In sum, in my dissertation, procrastination behaviour refers to incidents of needless or hedonistic postponement of specific tasks; procrastination trait refers to a long-term (i.e., chronic) and habitual tendency to procrastinate on various tasks; and procrastination problem can be either acute (a recent and specific period of time) or chronic instance of procrastinatory behaviour on important tasks which produces psychological distress, dissatisfaction and/or poor performance. From this point of view, procrastination as behaviour, trait, and psychological problem are hierarchically interrelated concepts. A measure that is designed to capture procrastination as a psychological problem can potentially provide additional sub-scores measuring procrastinating behaviour and trait procrastination. Furthermore, it is important to operationalize the duration of procrastination in order to differentiate procrastination based on the history/progression of the problem.

CHAPTER 3: REDEFINING THE CONSTRUCT

There are many elements identified as necessary or important to conceptualizing procrastination whether considered as a behaviour or trait or in terms of the psychological problems that result from it. Some of the elements (i.e., delay, intention-action discrepancy, needlessness) are descriptive and necessary to define procrastinatory behaviour. Some of them are both descriptive and theoretically-driven dimensions (negative emotion or psychological distress) that are necessary to define a procrastination problem and may need to be used to further clarify procrastination behaviour. The outcome elements, the consequences of procrastination behaviour (i.e., poor performance, dissatisfaction) and the duration element, may define the severity of procrastination as a problem. In addition to the above elements, repetition of procrastinatory behaviour, the sheer frequency or “quantity” of procrastination as well as the importance of the contexts or tasks where the behaviour occurs are key elements to differentiate procrastination behaviour, trait procrastination and problematic procrastination from each other.

To summarize and clarify the role of elements in my new conceptual understanding of procrastination, it is important to put them together and define procrastination behaviour, trait procrastination and problem procrastination. These terms are defined as follows:

- *Procrastination behaviour* is a needless delay of a task, despite the initial intention to start or finish it.
- *Trait procrastination* is the long-term habitual tendency to delay tasks or decisions across a variety of tasks, despite the initial intention to perform them, which is very often irrational, accompanied by negative emotions, which may cause poor performance or personal dissatisfaction about the outcome.

- *Procrastination as a psychological problem* is procrastination behaviour or trait procrastination which is accompanied by negative emotions and cause poor performance or personal dissatisfaction about the outcome.

The elements in the above definitions should be considered broad labels for emotional, cognitive, and behavioural aspects of procrastination. These are interrelated issues related to the elements that require attention. Firstly, each of these elements needs to be considered as a content domain in which there are many concepts that differ in intensity and content. For example, intention can vary from an initial commitment to a firm plan (Stroud, 2010). Perceived irrationality and needlessness can be a general belief that the intended task was not delayed for a good reason or that postponing the intended task was a problem despite the individual's belief that he or she would be not be worse off from postponing the task. Negative emotion, can be expressed in the form of a specific emotion such as anxiety, guilt, and depression, or generally conceived as a state of psychological distress.

In addition to the issue of the scope of content covered by each element, some of the elements and constructs are not necessarily orthogonal and may overlap with each other. For example, irrational delay may be similar to a delay involving negative emotion and vice versa. Similarly, a delay that involves psychological distress may typically cause personal dissatisfaction.

Similar strategies and techniques were used to obtain a set of items that capture relevant elements of procrastination, as well as relevant and representative domains under each element. Based on the psychometrics literature, redundancy in the initial item pool is considered a positive and necessary strategy for developing a self-report or survey questionnaire (e.g., DeVellis, 2003). Therefore, I used a liberal strategy when creating the initial item pool in order to cover a

broad range of content domain for the elements that I discussed in the previous section. The elements and their subcategories (e.g., health, personal, and academic aspects of negative outcomes) were included regardless of the possibility of overlap. In other words, a large set of items was created to capture a range of subjective meanings (e.g., intention = planned, committed, intended, wanted, desired, thought, aware) of each element and sub-element. Refined content domains and items were obtained in several stages, including content validity studies using expert and student ratings, as well as exploratory analysis of the structure of the measures. In the empirical section of my dissertation, I detail the strategies (e.g., factor analysis, IRT) used to deal with redundancy and overlaps.

Various Forms of Delay

Applications of the identified elements of procrastination are not limited to defining and measuring the phenomenon. These elements can and should also be used to differentiate procrastination from other forms of delay. Indeed, given the clear consensus among researchers that procrastination is a form of delay, differentiating between procrastination and other forms of delay is a necessary feature of effectively conceptualizing and creating a valid measure of procrastination.

Based on the conceptual evidence presented in the element section, some of the above elements can not only be used to refine the procrastination construct, but also to help us to define other forms of delay. More precisely, a combination of elements (e.g., an intention-action gap accompanied by negative emotions or poor performance) can differentiate two major categories of task delay: problematic and adaptive. Problematic delay at the behavioural level requires having a needless gap between what a person intends or ought to do and their actual actions, and

this delay carries possible negative consequences for the individual such as reduced time to complete the required task or heightened anxiety. Conversely, a delay is not problematic if a person rationally or strategically delays a task, and the delay is not accompanied by, or does not lead to, a significant level of negative emotions or poor performance, or if the person is not concerned about it.

Problematic and adaptive delay may also be further divided into subcategories. For example, adaptive delays can be categorized as purposeful delay (e.g., voluntarily delaying a task based on one's personal preference to complete it the day before its deadline) and inevitable delay (e.g., due to a busy schedule, conflict between necessary tasks related to home and education or emergency). Problematic delay can be categorized as irrational delay of intended tasks and hedonistic delay (or negligence). One of the main differences between these two groups is in the formation and strength of their initial intention to perform the task at an optimal time or in a timely manner. In irrational delay or anxious procrastination, the person intends to begin or finish the task on time, but she or he does not act upon the intention. In hedonistic delay, the person does not have a clear intention to do the task that he or she is expected to do at a certain point in time, therefore he or she does not do it. These groups are similar, as their delays can cause poor performance and negative external evaluation. However, they are different in terms of the subjective experience of their behaviour. In the former group, procrastination may be accompanied by stronger activating negative emotions such as anxiety and guilt and personal dissatisfaction. In fact, I would argue that these individuals would clearly label their own behaviour as procrastination. In the second group, procrastination may be accompanied by a lower level of activating negative emotions, but their delay may lead to external dissatisfaction. Although these individuals may or may not identify their delay as procrastination, other people

in their lives might. Table 3-1 contains defining and descriptive components of various types of problematic and adaptive delay, along with their hypothetical causes, correlates, and examples.

It is an accepted principal in psychology that different causes may lead to the same behaviour or problem, and, vice versa, that different problems may be explained by several causes. Therefore, as mentioned above, each of the prototypes of delaying individuals may still represent various groups based on the possible factors underlying their delay. For example, as shown in Table 3-1, procrastinators may be differentiated based on whether they avoid tasks that elicit activating negative emotions (anxiety) or deactivating negative emotions (e.g. boredom) and/or seek to experience positive emotions related to other activities. Individuals engaging in hedonistic delay may not form a clear intention to start tasks due to an explicit lack of interest in academic tasks in favour of more pleasurable activities, or they may intentionally rebel against important tasks imposed by others. Inevitable delay is a necessary consequence of external and contextual factors as opposed to a self-regulation problem. However those who often engage in inevitable delay may have a conflict in educational, professional and/or personal aspects of their life, a workaholic lifestyle, a lack of time-management skills, or a temporary additional project in their routine schedule (see Table 3-1).

Table 3-1

Initial Prototypes of Delay, Defining Elements, Hypothetical Causes and Correlates, and Examples.

Problematic Delay	Elements/Features	Reasons or proximal causes	Possible Correlates	Example
Irrational Delay Anxious Procrastination (Traditional Procrastination)	<ul style="list-style-type: none"> • Initial intention • Irrational/needless • Not imposed by external forces - Involuntary ⁵(automatic and intrapsychically imposed) in severe procrastination problems - voluntary in non- severe procrastination • Negative emotion • Dissatisfaction of behaviour and outcome • Negative consequences • Often related to a particular task or context • Repeated 	<ul style="list-style-type: none"> • Lack of self-control • Low conscientiousness • Neuroticism • Perfectionism • Irrational belief • Fear of failure • Distorted time perception • Negative activating emotion (e.g., Anxiety) before starting a tasks 	<ul style="list-style-type: none"> • Neuroticism • Self-control • Trait anxiety • Conscientiousness • Negative emotions • Task aversiveness • Negative activating (Guilt, Anxiety) and deactivating (boredom) Emotions • Depression • Health problem • <i>GPA</i> • <i>Well-being</i> 	<ul style="list-style-type: none"> - One repeatedly delays preparation for an exam despite one's initial intention to start or continue; accompanied by anxiety and guilt. - One engages repeatedly and irrationally in any boring or unimportant activity instead of starting to write a paper according to one's initial intention.

⁵ The usage of terms voluntary and involuntary can be confusing. Voluntary delay may refer to a general meaning of a postponement that is not imposed by others, or a delay that is initiated by individual volition, or it may refer specifically to a deliberate delay based on a mental calculation involving prioritising between activities with different values and expectations (Steel, 2007). These definitions can become contradictory in psychological research. The general meaning of voluntary,

Problematic Delay	Elements/Features	Reasons or proximal causes	Possible Correlates	Example
Hedonistic Delay Hedonistic Procrastination	<ul style="list-style-type: none"> • Not imposed by others • Voluntary • No/weak intention • External dissatisfaction of outcome • Poor performance • Often related to a particular task or context 	<ul style="list-style-type: none"> • Lack of self-control • Low conscientiousness • Lack of interest • Hedonism • Lack of energy • Low motivation • Negative deactivating emotions before starting a tasks 	<ul style="list-style-type: none"> • <i>Conscientiousness</i> • <i>Self-regulation</i> • Impulsivity • Agreeableness • Task aversiveness • Negative deactivating emotions (e.g., boredom) • Conflict with parents • <i>GPA</i> • <i>Mental Health</i> • <i>Well-being</i> 	<p>- One postpones voluntary preparation for an exam without experiencing negative emotions (e.g., guilt, anxiety) despite the fact ones knows that the delay may cause poor performance. Instead, one prefers to engage in pleasurable activities such as partying, going out, clubbing, etc.</p>

not imposed by others, can include both a deliberate delay that proceeds from the will, or based on a mental calculation or an automatic and intrapsychically imposed delay that might or might not be rationalized by the agent of the delay. A delay that is not imposed by others is not necessarily based on person volition. The specific meanings of the delay are theoretically driven constructs. Philosophically, a delay that is caused entirely by external forces is not irrational. Therefore, it is necessary to exclude externally imposed delay from irrational delay or procrastination. Therefore, at the descriptive level the phrase “not imposed by other or external force” is a better way to describe the necessary elements discussed above. In this study, the term voluntary was used only in its specific and theoretically driven definition.

Adaptive Delay	Elements/Features	Reasons or proximal causes	Correlates	Example
Purposeful Delay	<ul style="list-style-type: none"> • Not imposed by other • Voluntary • Internal Satisfaction • No intention-action gap • No psychological distress • Often related to particular task or contexts 	<ul style="list-style-type: none"> • Time pressure preference • Sensation-seeking 	<ul style="list-style-type: none"> • Sensation-seeking • Agreeableness • Active procrastination scale • <i>Anxiety</i> • <i>Fear of failure</i> • <i>Impulsivity</i> 	<ul style="list-style-type: none"> - One intentionally delays writing a paper in order to gather more information - One deliberately delays starting preparation for an exam since one prefers to work under pressure. This involves satisfactory completion of the task.
Inevitable delay	<ul style="list-style-type: none"> • Voluntary • Inevitable(not needless) • Psychological distress • Intention-action gap • often not related to a particular context 	<ul style="list-style-type: none"> • Busy schedule due to <ul style="list-style-type: none"> - Workaholic style - Being pleaser - Conflict among personal, relational and professional tasks/demands; Role Conflict Or Lack of Time-management skill • Temporal or unexpected events 	<ul style="list-style-type: none"> • Stress • <i>Health</i> • <i>Assertiveness</i> • <i>Time-management</i> • Activating Negative emotions (e.g., Anxiety, Guilt) 	<ul style="list-style-type: none"> - One has no choice but to delay some tasks due to a busy schedule or heavy workload - One needs to delay some tasks due to emergency matters. - One often delays due to conflict in scheduling.

Note. In the correlate column: bold font = moderate to strong relation; italic font = reverse relation; The hypothetical relations are based on initial conceptualisations of the forms of delay. The direction and magnitude of relations were changed based on the final and refined conceptualisations— particularly for purposeful delay. The revised hypotheses are presented in the validation section.

In addition, problematic delay can be also differentiated according to the level of defining elements or the severity of the problem. The number or types of tasks one delays and repetition of procrastinatory behaviour may define an important variation within each group and therefore be useful for finding and testing theoretical models. Accordingly, a good measure should be flexible, measuring temporal or context-specific (i.e., behavioural) procrastination, severe, and chronic procrastination simultaneously, as well as being able to be administered in different contexts. This feature, in fact, is one of the objectives of my proposed study, which I discuss in greater detail in the next chapter.

Before closing this section I need to highlight a number of important points. First, several causal factors discussed in relation to each type of delay are based on speculation (i.e., conceptual links from previous research and theory) and need to be studied and tested empirically. Similarly, the correlates of each prototype (see Table 3-1) are hypothetical. Some of these hypothesized relations were tested in my validation studies. I discuss the findings related to these hypotheses in Chapter 13. At the time of writing this section, it appears that there is no instrument that defines, measures, and differentiates types of delay as presented in this section and, therefore, no systematic studies that evaluate the relations between the types proposed and other psychological factors. However, some of the evidence about purposeful delay presented in Table 3-1 can be found in Choi and Moran (2009). Furthermore, readers can find a summary of existing empirical evidence related to the traditional conceptualization of procrastination in the meta-analytic studies by Steel (2007) and van Eerde (2003). In terms of the correlates that have emotional elements (e.g., neuroticism), the relation with the new conceptualization of procrastination was expected to be stronger in comparison to the findings of meta-analyses. This

is because the emotional aspect (e.g., negative emotion and personal dissatisfaction) is one of the defining facets of procrastination in this study.

Second, the labels used in Table 3-1 may be debatable. For example, calling inevitable delay “adaptive” may seem inappropriate, since the category contains a heterogeneous group with several negative proximal-causal factors/self-reported reasons possible such as having a workaholic lifestyle or a lack of time management skill. The main rationale for calling inevitable delay “adaptive” is the fact that the problem is not lack of self-control and that occasional delay does not necessarily result in poorer performance. Such people may switch between and concentrate on important tasks if the tasks are urgent. Similarly, one can argue that hedonistic delay should not be labelled problematic since these individuals are not dissatisfied about their delay by definition. This may also be legitimate for some. However, my rationale for calling this group problematic is based on the speculation that the members of the group can show a lack of self-control as they usually act according to their hedonistic impulses. Furthermore, it can be argued that delaying and ignoring important tasks can result in poor educational and/or professional outcomes and negative external evaluation. Finally, it is important to differentiate between rationalisation and actual causal forces behind hedonistic procrastination. Therefore, it is important to examine whether or not those who report only hedonistic procrastination have lower levels of dissatisfaction and negative deactivating emotions. These factors are not necessary defining elements for differentiating irrational from hedonistic delay. The elements need to be studied empirically after development and validation of hedonistic procrastination behaviour. This issue is examined and discussed in Chapters 13 and 14.

Third, some of the defining elements of hedonistic and purposeful delays may be similar to *arousal procrastination* as proposed by Ferrari (1992). He believes arousal procrastinators’

dilatory behaviours are rooted in a “need to rush at the last minute” (Ferrari, 1992), or a preference for enjoyment, pleasure, novelty and sensation seeking (Ferrari & Díaz-Morales, 2007). Ferrari (1992) also defines another group of procrastinators, *avoidant procrastinators*, who “may delay in order to avoid the (perceived) unpleasantness of a task or the possibility of public and/or private task failure” (p. 108). Although there is some similarity between his definition of avoidant procrastination and my conceptualization of anxious procrastination (i.e., irrational delay), the latter is not limited to one defining element (fear of failure or task aversiveness), but is a multifaceted construct that is defined by an intention-action gap, negative emotion/irrationality and poor performance or personal dissatisfaction.

Finally, we need to differentiate between dimensions and elements of procrastination. Researchers very often use these two terms interchangeably. Learning from the attachment literature (e.g., Bartholomew & Howrowitz, 1991; Brennan, Clark, & Shaver, 1998), for example, I reserve the term “dimension” for a continuous underlying variable that differentiates all or some of the mentioned prototypes. In contrast, terms such as “element,” “aspect,” “facet”, and “component” are used to describe the defining attributes of each prototype, and therefore may not necessarily be used in all of the prototypes. The conceptualization of a construct, and consequently its operationalization, should differentiate the construct from related constructs. Similar to attachment research (e.g., Bartholomew & Howrowitz, 1991; Brennan et. al., 1998; Fraley, Waller, & Brennan, 2000), differentiation in conceptual and measurement efforts can be made either according to descriptive elements (facets) or underlying dimensions. My conceptual definition is based on the first method, which I call a descriptive or multi-faceted conceptualization. The second method, which I refer to as multi-dimensional conceptualization, should be obtained in future research, when the target phenomena have already been defined. For

example, in the attachment literature, the first efforts were made to define and measure four styles or prototypes of attachment. Later, researchers used factor analysis to empirically identify two underlying dimensions of attachment. The operationalization of procrastination in the present study was based primarily on multi-faceted conceptualization. I am also optimistic that this effort may identify and provide a preliminary evidence for a dimensional conceptualization of the construct.

So far, I have highlighted the defining elements of procrastination, defined procrastination as a multifaceted construct, and mentioned some of the features of a good measure of the construct. The purpose of this dissertation was to develop a measure capturing procrastination as a psychological problem, a behaviour, and a trait according to the multi-faceted conceptualization I discussed above. However, before taking this discussion further, I need to discuss existing measures of procrastination and how they “measure up” to the construct elements that I have justified theoretically.

CHAPTER 4: EXISTING MEASURES OF PROCRASTINATION

The two types of scientific measures of procrastination, observed and self-report, were developed rapidly in the 1980s (Ferrari et al., 1995). The observation-based and self-report measures were created to measure procrastination in either academic or general settings. The observational method typically quantifies observable delay in accomplishing a task. The task is assumed to be important, have a time frame and is subject to be delayed by some individuals (Steel, 2007). For example, researchers may give an inventory to a participant and consider the number of days taken to return a completed questionnaire as index for procrastination (e.g., Lay, 1986). In an academic setting, researchers often use the time taken to finish or submit a term paper or assignment as an index of procrastination. Other examples of observed measures of procrastination include class attendance, time taken to begin filling out an online questionnaire or a weekly assignment, as well as time taken to register in an experiment (Tice & Baumeister, 1997; Ferrari et al., 1995; Steel, 2007). Similarly, in an everyday setting, delays in significant everyday life tasks or duties, including bill payments, income tax filing, timely library book returns and redeeming gift certificates, are often considered to be observed measures of general procrastination.

The observational measure of procrastination has a fundamental issue of interpreting delay as procrastination. The use of such a measure leads a researcher to assume delays on an important task or a task with a specified timeframe equates to procrastination, because such undertakings are often met with procrastination. It is legitimate to assume that a procrastinator may delay beginning or finishing the above tasks. However, not everyone who delays these endeavours can be considered procrastinators. A person with a temporary or regularly busy schedule may postpone filing an income tax form, redeem a gift certificate or return a completed

inventory. Students who partake in online questionnaires or surveys may also deliberately delay such tasks in order to avoid procrastinating on different and more important tasks. As was discussed in the re-conceptualization of procrastination and its defining elements, at least four groups of individuals with different characteristics and reasons may be defined. Therefore, it is necessary to consider important, unobservable and often subjective elements when determining whether or not to categorize all observed delays as procrastination. From a methodological point of view, measuring internal processes (e.g., intention, negative dissatisfaction) seems very difficult, if not impossible, using observational methods.

From 1982 until the time this project was launched, 6 self-reports in academic procrastination, 4 measures of general or everyday-life procrastination, and 1 self-report of decisional procrastination had been developed. Some of these measures are considered to capture procrastination as behaviour (Solomon & Rothblum, 1984; Aitken, 1982), while others have been designed to measure trait procrastination (Lay, 1986; McCown & Johnson, 1989). Unfortunately, these measures are limited or defective in various aspects such as lack of or limited theoretical conceptualization, a discrepancy between item content and their conceptualization, problematic item wording, as well as being confounded with other constructs. For example, the measures very often confound procrastination with problems in time management self-discipline or promptness. Lack of time management may be one of the causes for delaying a task, but time management itself should not be considered as an indicator of procrastination (Steel, 2007). Promptness may be interpreted as the opposite of procrastination based on a societal point of view, but from a psychological point of view a person who is not prompt and delays making a decision or doing a job may have no intention to do so, may have rational reasons for his or her delay (Steel, 2007), or may volitionally and without feeling any

negative emotion postpone the action. Similar to observational measures, none of the self-report instruments have considered the necessary and important elements of conceptualization of procrastination and, therefore, cannot differentiate procrastination from other forms of delay.

With this summary of the types of scales developed and a brief critique of some common problems, I now turn to an evaluation of existing procrastination measures. The criteria for evaluation include the presence of important elements (e.g., intention-action gap), the ability to differentiate procrastination from other forms of delay, the discrepancy between item content and conceptual definitions, and the appropriateness of item wording. A brief description of each measure, including its psychometric properties and sample items, is presented in Tables 4-1 through 7. Each of the scales is included in Appendix A.

Academic Procrastination: Self-report Measures

Table 4-1 contains description and psychometric properties of five major measures of procrastination in academic setting including Aitken Procrastination Inventory (API), Procrastination Assessment Scale – Students (PASS), Academic Procrastination State Inventory (APSI), Procrastination Checklist Study Tasks (PCS), and the Academic Procrastination Scale (APS).

Table 4-1

Description and Psychometrics Properties of Procrastination Self-reports

Measure	N & Alpha	Definition	Subscales	Sample Items	Validity	Type of task
API Aitken (1982)	19 items 5-point Likert-type Alpha=.85 Test-retest= .71	Procrastination involves habitual delay which continues until a deadline elicits a spurt of activity (Aitken, 1982 p. 14)	None, single scale score for procrastination	“I delay starting things until the last minute” or “I keep my assignments up to date by doing my work regularly from day to day”	Significant relations with: General procrastination Perfectionism Extraversion Neuroticism Observed delay in general and personal tasks	Use words such as “jobs”; “tasks”, “works”; “return library books”, “appointments and meetings”
PASS Solomon & Rothblum (1984)	18 items 5-point Likert scale Alpha=.63 to .84 Test-retest= .65 - .74	“Procrastination – the act of needlessly delaying tasks to the point of experiencing subjective discomfort” (Solomon & Rothblum, 1984, p. 503)	Prevalence (6 items)	“to what degree do you procrastinate on this task”	Significant relations with: General procrastination ($r=.72$); TPS (.60); Observed delay in academic tasks; depression (0.44); Not significant: perceived academic control (-0.09); assignment grade (0.05); implementation intentions (-0.17)	Six specific academic areas: writing a term paper, studying for an exam, keeping up with weekly reading assignments, performing administrative tasks, attending meetings and performing academic tasks in general.
			Problem severity (6 items)	“to what degree procrastinating on this task is a problem for you”		
			Motivation (6 items)	“to what extent do you want to decrease your tendency to procrastinate on this task”		

Note. API= Aitken Procrastination Inventory ; PASS= Procrastination Assessment Scale – Students; Other Psychometrics References: API: Ferrari et al. (1995); McCown, Petzel et al. (1987); Vestervelt, 2000; PASS: Howell, Watson, Powell, & Buro (2006); Haghbin (2006a); Beswick, Rothblum , & Mann, (1988);In the validity column: bold font = moderate to strong relation ; italic font = reverse relation

Measure	N & Alpha	Definition	Subscales	Sample Items	Validity	Type of task
APSI Schouwenburg (1992, 1995)	23 items 5-point Likert Subscales Alpha respectively =.90, .85, and .79	dilatory behaviour – “putting off of that which is necessary to reach some goal” (Lay, 1986 cited in Lay & Schouwenburg, 1993).	procrastination (13 items) fear of failure (6 items) lack of motivation (4 items)	“prepared for study at some point of time but did not get any further”, “gave up studying early in order to do more pleasant things” “experience fear of failure” and “had doubts about your own ability” “felt, when studying, that you dislike the subject” and “found the subject matter boring”	Significant relations with: Procrastination: GPS ; Test Anxiety Fear of failure: GPS ; Test Anxiety Motivation: GPS ; Test Anxiety(.18)	Use word “studying”
PCS Schouwenburg (1995)	22 items 4-point of time Alpha Total=.68 Alpha subscales= .29 to .66	“Procrastination refers to postponing of tasks, such postponing is inferred from three behavioural manifestations: (1) lack of promptness, either in intention or behaviour; (2) intention-behaviour discrepancy; and (3) preference for competing activities” (Schouwenburg, 1995 p.72)	Behavioural Promptness (i.e., time of action) 11 a-items Intentional Promptness (i.e., time of intention) 11 b-item: Procrastination (i.e., discrepancy= a – b items)	“For the last term in which you attended lecture, please indicate how you did that in comparison with your intention to do so.” 1.a Present at lectures 1.b.intend to be so 2.a. Listen with concentration 2.b. Intend to do so	- Behavioural Promptness with Trait procrastination - Intentional Promptness with Trait procrastination -PCS Procrastination with Trait procrastination	Three tasks area: A)Administrative task area (e.g., registering or reading through a study guide) B)Attendance at lectures (listening with concentration or present at lectures) C) Preparation for exams (started studying, obtaining books and papers, or rehearsing the material

Note. APSI= Academic Procrastination State Inventory; PCS = Procrastination Checklist Study Tasks; Other Psychometrics References: Lay & Schouwenburg, (1993); GPS= General Procrastination Scale (Lay, 1986); In the validity column: bold font = moderate to strong relation ; italic font = reverse relation

Measure	N & Alpha	Definition	Subscales	Sample Items	Validity	Type of task
APS: Mailgram & Toubiana (1999) Mailgram et al., (1998)	21 items 4-point Likert	“putting off to the later day things that we should or think we should do earlier” (Mailgram et al., 1998, p. 304).	Academic Procrastination (21 items)	“I daydream when I have to study for a test” ; “When I have to sit down and do my homework, I put it off again and again”; “I begin preparing lengthy papers soon after they are assigned”	Significant relations with: Neuroticism <i>Extroversion</i> ; Openness to experience Conscientiousness	(1) preparing for tests (9 items)
	Alpha Total=.90		Discomfort (3 items)	“ When I postpone preparing for tests, I feel bad about it”; “When I postpone doing homework. I feel bad about it”		(2) preparing homework (6 items)
			Desire for Change (3 items)	“I am interested in changing my habits of procrastinating in writing term papers”		(3) preparing term papers (6 items)

Note. APS= Academic Procrastination Scale; Other Psychometrics References: Milgram & Tene (2000); In the validity column: bold font = moderate to strong relation ; italic font = reverse relation

Measure	N & Alpha	Definition	Subscales	Sample Items	Validity	Type of task
GPS Lay (1986)	20 items 5-point Likert Alpha= .82 test-retest r = .80	“the tendency to postpone that which is necessary to reach some goal” p.475 (Lay, 1986)	Unidimensional	“the tendency to postpone that which is necessary to reach some goal”. Items included statements like “a letter may sit for days after I write it before I mail it” or reversed statements like “I generally return phone calls promptly”.	Significant relations with: DPS ; AIP; Observed delay; Conscientiousness (competence, order, dutifulness) Achievement-striving; Self- discipline; Rebelliousness No Significant relations with: GPA	Concerts, sporting events, party, phone call, decision, arrive at the airport, pay a bill, letter, task, job, work.
AIP (McCown & Johnson (1989, 2001)	1989 version: 20 items 2001 15 items 15 distracter items 7-point Likert Alpha Total=.84 Test-retest r = .81	They have not provided a clear definition.	Unidimensional	“I am not very good at meeting deadlines” and “I am prompt and on time for most appointments”.	Observed delay (e.g., less studying time, late bill payments, delay in income tax filing); Time management; Time loss; Impulsivity; Neuroticism Depression	Pay bills; appointment; maintenance of things; things

Note. GPS= General Procrastination Scale; AIP= Adult Inventory of Procrastination; Other Psychometrics References: McCown, Johnson, & Petzel (1989); Ferrari et al. (1995); Sirois (2007); Vestervelt, (2000); DPS= Decisional Procrastination Scale; In the validity column: bold font = moderate to strong relation ; italic font = reverse relation

Measure	N & Alpha	Definition	Subscales	Sample Items	Validity	Type of task
TPS Tuckman (1991)	35 items long – 35 items short – 16 items 4-point Likert Alpha= .86 test-retest r = no	“The lack or absence of self-regulated performance has been labelled procrastination, the tendency to put off or completely avoid an activity under one’s control” (Tuckman & Sexton, 1989; cited in Tuckman, 1991 p. 474)“the tendency to waste time, delay, and intentionally put off something that should be done” (Tuckman, 1991, p.479).	One-dimensional	“I needlessly delay finishing jobs, even when they are important” or “I always finish important jobs with time to spare”	Significant relations with: <i>Self-efficacy; Self-regulation; Completing homework; Self-oriented perfectionism</i>	Task, job, work, decision, boring tasks, unpleasant job, studying, deadline, something’s too tough to tackle, important job, something
TAP Sroloff (1983, as cited in Milgram, Sroloff, & Rosenbaum, 1988) Milgram et al. (1988) Short version (Milgram et al., 1998)	TAP: 54 items Shorter version:24 items 4-point time-space Alpha Total=.91	“putting off for tomorrow what one should do today” (Milgram et al., 1988, p. 197) “the procrastination of everyday life, i.e., the extent to which people perform routine tasks of living promptly or late” (p. 198) “Procrastination may be defined in terms of difficulties in scheduling when to do the task in question, and failing to adhere to one's schedule in doing it” (p. 199)	<i>Time frame</i> (when a person does a particular task; individual and task differences in the length of time frame) <i>Scheduling</i> (the ease with which one schedules a task) and <i>adhering to scheduling</i> (whether or not a person adheres to a scheduled task)	Participants rate when they do tasks using the following responses: T1) prompt performance. . . . T3) performance without much time to spare T4) performance at the last possible minute, if at all. S1) Prompt scheduling with conscientious performance. . . . S3) putting off scheduling, but when one sets a time for doing the task, doing it on schedule, S4) putting off scheduling and rescheduling, and thereby failing to do the task until the last minute, if at all.	Significant relations with: Duress; Perceived incompetence; <i>Self-regulation; Life satisfaction; Type A hard-driving; Time urgency factors</i>	38 everyday asks (e.g., doing the dishes, paying bills, visiting relatives, and making hospital visits and dentist appointments), 10 work, and 6 academic life.

Note. TPS= Tuckman Procrastination Scale; TAP= Tel-Aviv Procrastination Inventory; Other Psychometrics References: Ferrari et al. (1995); In the validity column: bold font = moderate to strong relation ; italic font = reverse relation

Measure	N & Alpha	Definition	Subscales	Sample Items	Validity	Type of task
DPS Janis & Mann, (1977) Mann, (1982 as cited in Mann, Burnett, Radford, & Ford (1997)	5 items 5-point Likert Alpha= .81	One of the “aspects or expressions of defensive avoidance”(Mann et al., 1997, p. 3).	One-dimensional	“I put off making decisions” or “When I have to make a decision I wait a long time before starting to think about it”	Sig. relations with: Trait procrastination Observed delay Stress; <i>Self-esteem</i> , impatience; Self-handicapping ; Social anxiety; <i>Self-confidence in making decisions</i>	decision
APS Choi and Moran (2009)	16 items	“Passive procrastinators are traditional procrastinators who postpone their tasks until the last minute because of an inability to make the decision to act in a timely manner. In contrast, active procrastinators make intentional decisions to procrastinate, using their strong motivation under time pressure, and they are able to complete tasks before deadlines and achieve satisfactory outcomes”. (p. 196)	F1) Preference for pressure (4 reverse items) F2) Intentional decision (4 items) F3) Ability to meet deadlines (4 reverse items) F4) Outcome satisfaction (4 reverse items)	“I am upset and reluctant to work under upcoming deadlines” “to use my time more efficiently, I deliberately postpone some tasks” “I often fail to accomplish goals that I set for myself” “I don’t do well, if I have to rush through the task”	Sig. association of: Time structure with Tot., F1 & F4; Purposive use of time with F2 & F3; Time control with Tot. F1 & F3 ; Conscientiousness with F4; Emotional Stability with Tot., F1 Life satisfaction with Tot., F1, F2 & F4; GPA with F3; Self-reported performance with Tot., F1 & F4; Decisional Procrastination with F2 , F3, & F4;	Not specified. Task; Deadline

Note. DPS= Decisional Procrastination Scale; APS= Active Procrastination Scale; Other Psychometrics References: DPS: Sirois (2007); Ferrari et al. (1995); Vestervelt, (2000); In the validity column: bold font = moderate to strong relation ; italic font = reverse relation

Aitken Procrastination Inventory

The Aitken Procrastination Inventory (API: Aitken, 1982) is one of the first academic procrastination measures. Table 4-1 contains a description of the API and its psychometric properties. My evaluation of this measure is as follows:

1. Aitken's (1982) conceptual definition implies three elements: Procrastination is a habitual phenomenon. It is a type of delay with a specific end. Procrastination does not necessarily have an emotional or cognitive aspect. Procrastinating does not necessarily reduce performance.
2. Only a vague description on how the items were selected is provided. There is no clear description on how the initial pool of 66 items got reduced to final 19.
3. The selection of the tasks chosen for the items is not representative of the domain of tasks in academic settings (see Table 4-1).
4. The author does not provide enough evidence for convergent validity (Vestervelt, 2000).
5. There is no clear differentiation between procrastination and other forms of delay. For example, the reverse item, "I used vacant hour between classes to get started on my evening's work" does not necessarily measure a problematic dilatory behavior. Important elements such as intention-action gap, irrationality, and negative emotion are not captured by the API items.
6. The author created many reversed items that are quite problematic because they do not measure the opposite of procrastination. For example, the following items, "I keep my assignments up to date by doing my work regularly from day to day",

“I get right to work at jobs that need to be done” measure promptness as opposed to procrastination. The opposite of promptness is not necessary procrastination

Procrastination Assessment Scale – Students

The Procrastination Assessment Scale – Students (PASS: Solomon & Rothblum, 1984) is the most widely used measure of procrastination. A summary and description of PASS and its psychometrics properties can be found in Table 4-1. The result of my evaluation of item content and structure of the PASS are as follows:

1. PASS directly asks participants to rate their procrastination frequency and problem. This method creates a fundamental problem in sampling the concept as it capitalises on the understanding of the participant in terms of their dilatory behaviour. As I discussed in historical review of procrastination concept, different people may define procrastination differently. Furthermore, the lay definition of the term procrastination is different from the expert definition of the construct. The frequency of procrastination estimated by using PASS should be inflated as the measure does not differentiate procrastination from other forms of delay.
2. PASS defines the emotional element as subjective discomfort. To measure this element, the PASS asks participants “to what degree procrastinating on this task is a problem for you.” Even though the PASS is one of the few measures that captures an emotional aspect, it is limited to the single aspect of subjective discomfort. There are many negative emotions that are not captured clearly. Moreover, asking whether a behavior causes a problem does not measure clearly and directly the emotional state

related to behavior. The problem can be physical, relational or cognitive and not necessarily emotional.

3. The PASS does not differentiate procrastination from other forms of delay
4. The measure does not measure irrationality or the performance element.
5. As Milgram and colleagues (1998) noted, the PASS equated the importance of purely educational tasks (homework, test preparation, term papers) to administrative tasks and attending meetings. “One may question whether administrative matters and attending meetings are academic tasks, and whether the final item, non-specific school activities, belongs in the same scale as specific academic tasks. Given the heterogeneous character of this brief scale, it is not surprising that the split-half reliability reported by the authors is unsatisfactory (0.26).” (Milgram et al., 1998, p. 303)

Academic Procrastination State Inventory

The Academic Procrastination State Inventory (APSI: Schouwenburg, 1992, 1995) is “designed to measure changes or fluctuations in academic procrastination” (Schouwenburg, 1995, p. 85). This measure is not widely used and therefore does not have much validation evidence. The description and psychometric characteristics of APSI are presented in Table 4-1. The following points are a summary of my evaluation of the measure.

1. The APSI does not include emotional elements of procrastination.
2. As Milgram et al., (1998) mentioned, the APSI does not capture specifically procrastinatory behaviours in three major academic tasks (i.e., homework assignment, exam, and writing papers).

3. Items such as, “ Drifted off into daydreams while studying”, “Gave up when studying was not going well”, “Allow yourself to be distracted from your work”, “ Interrupted studying for a while in order to do other things”, or “ Experienced concentration problems when studying” measure interruption during studying as opposed to delay of tasks. It can be argued that even though procrastinators may be easily interrupted from studying, there is no empirical evidence suggesting that procrastinators are the only group to do so. People with attention deficit problem, for example, are more prone to be easily distracted from their ongoing activities and suffer from lack of concentration (Barkley, 1997, as cited in Ferrari, 2004). Inattention/distraction shows moderate to strong association with three measures of procrastination (Ferrari, 2000), but this finding should not be interpreted as if inattention is equal to delay. Inattention may need to be considered as either a possible cause or a correlate of delay but not as equivalent to delay or procrastination. In fact, a factor analysis of these constructs demonstrated that nine attention deficit sub-scales and three procrastination scales were clearly associated with different latent factors (Ferrari, 2000)⁶.
4. In addition to the above items, items such as “Forgot to prepare things for studying”, and “Putt off the completion of a task” do not consider the elements such as the discrepancy

⁶ Ferrari (2004) has ignored the strong correlation between procrastination and inattention. Based on his factor analysis, he concluded that “chronic behavioral [sic] and cognitive procrastination . . . really seem to be unrelated to deficits in attention as characterized by attention deficit disorders without hyperactivity (ADD)” (p. 193). I do not agree with this conclusion. The factor analysis may support that inattention and procrastination are related to two different latent variables, but this should not be interpreted as if there is no relationship between two constructs.

between action and intention as well as irrationality of postponement , therefore cannot differentiate procrastination from other forms of delay.

Procrastination Checklist Study Tasks

In addition to the above self-report, Schouwenburg (1995) developed another measure of procrastination named the Procrastination Checklist Study Tasks (PCS). A description of PCS, sample items and its psychometric characteristics can be found in Table 4-1. The result of my evaluation of item-content and structure of PCS is as follows:

1. There have been few efforts to demonstrate the instrument's validity. The PCS correlation with only a self-report of general procrastination are presented but the correlation of the instrument with major personality variables are not reported. As well, no test-retest reliability has been reported.
2. In contrast to his previous measure (i.e., APSI), Schouwenburg (1995) in the PCS has presented a thoughtful method to capture the discrepancy between doing and intending to do the tasks. However, despite his intention to measure the discrepancy accurately, the accuracy of his measurement was low, which is shown by low reliability. The PCS measure has relatively low internal consistency, Cronbach's alpha is less than .70 for all subscales and the total score.
3. The order of presenting action and intention items, the selection of task areas and tasks, as well as time-pace of the response options are problematic and may have potentially caused the low internal consistency of the instrument. For example, students are asked to determine the time of action, then asked to determine the time of intention to perform that action. This seems counterintuitive, since one always intends

to do a task, first, and then acts on his or her intention. The reverse order in asking about action and intention may also raise a possibility of answering the intention question in a socially desirable way. Furthermore, the PCS mixed trivial and important tasks under each task area. For example, such tasks as “reading a study guide” and “registering for a course” are different in importance in my opinion. Many students who never procrastinate would not engage in reading a study guide as it is not an important or required task, even though academic administration might recommend it. However, registering for a course is absolutely imperative for matriculation and can potentially separate a procrastinator from a non-procrastinator.

4. PCS scores are based on the calculation of reported time of intention and action, therefore the accuracy of reported time is very important for the precision or reliability of the measure. In other words, PCS assumes that participants remember the time of their behaviour and thought accurately. It can be argued that it is very difficult to accurately remember thought processes and action related to an important issue let alone an unimportant one after several months. Asking about when one intends to “listen with concentration”, “take notes” during the last semester or “start making extracts [*sic*]” during the last three exams seems problematic.
5. The PCS does not measure whether or not the discrepancy between intention and action are needless, irrational or accompanied with negative emotions.
6. I think the PCS with some major changes can be used as a good measure of intention-action gap in the future.

Academic Procrastination Scale

Similar to the PASS and the PCS, the Academic Procrastination Scale (APS: Milgram & Toubiana, 1999; Mailgram et al., 1998) is a task-specific measure of procrastination behaviour in educational settings. In addition to procrastination, the APS measures discomfort related to procrastination and the desire to change the procrastination habit. A description of the APS is presented in Table 4-1. My evaluation of the APS's items and content can be summarized as follows:

1. This scale is claimed to be validated (Milgram et al., 1998; Milgram & Tene, 2000), however the concurrent validity is demonstrated using new and poorly validated instruments.
2. The APS measures negative emotions with 3 items, however it does not include them in the calculation of total procrastination.
3. It seems that the APS has covered measuring delay in a relevant and concise set of academic tasks. The structure of measure is based on three important tasks, which in turn provides clarity in administrating and flexibility in usage of the measure as well as producing task-specific scores.
4. The APS has not been developed and validated in a native English language population. The language of development was Hebrew.
5. Half of the APS items scores are reversed for a total score calculation. Most of the these reverse items including "I do my homework the same day I receive the assignment" or "As soon as I know when an examination will be given, I start to prepare for it" do not capture intention- action gap or needlessness of delay and therefore do not differentiate between different forms of delay.

Taken together, my review of the various measures of academic procrastination revealed that these measures did not operationalize all of the defining elements of procrastination, consequently they have confounded procrastination with other form of delays. With the exception of PASS, the above self-reports: 1) do not define and measure procrastination as a problem; and 2) there is no consensus among them in terms of list of the important tasks in academic setting. I turn now to a brief review of the various measures of “general” procrastination, beginning with the most commonly used measure, the General Procrastination Scale (Lay, 1986).

General Procrastination: Self-report Measures

General Procrastination Scale

The most frequently cited measure of procrastination in everyday life is the General Procrastination Scale (GPS) developed by Lay (1986). This measure is very often used as a measure of trait or chronic procrastination. Lay’s definition and the description of his measure are presented in Table 4-1. In the following points, I discuss some of the problems of the GPS.

The GPS does not measure the emotional and irrational elements of procrastination.

1. Most items do not reflect the gap between intention and action, a necessary element of procrastination. For example, an item, such as “when planning a party, I make the necessary arrangement well in advance”, may capture conscientiousness in general or time management and order in particular, rather than a delay of an intended task or a gap between intention and action. By the

same token, it has been noted that “I usually make decisions as soon as possible”, captures promptness as opposed to procrastination (Steel, 2007).

2. The GPS does not differentiate positive or sagacious delay from problematic delay. For example, the item “a letter may sit for days after I write it before I mail it” does not necessarily indicate procrastinating behavior as one can do other more important tasks before mailing the letter, which would indicate a wise delay.
3. The content validity of the GPS chosen list of tasks is questionable as it does not capture all categories of important everyday activities including, exercising, laundry, cleaning the house, making appointments, or making document back up are not included.

Adult Inventory of Procrastination

The Adult Inventory of Procrastination (AIP: McCown & Johnson, 1989 cited in McCown & Johnson, 2001; McCown, Johnson, & Petzel, 1989) is another measure of trait procrastination⁷ related to everyday life. This measure has frequently been used for evaluation of procrastination treatment and intervention. Table 4-1 contains a description of the measure and a summary of psychometrics evidence associated with the measure. My evaluation of the measure is as follows:

1. Similar to Vestervelt (2000), I could not find the definition of procrastination that the authors based their measurement on.

⁷ Ferrari (1992) suggested that the AIP measures avoidant procrastination. AIP “examined procrastination motivated by fears of success or failure, avoidance of disclosure of skill inabilities, and insecurities of performance” (Ferrari, & Díaz-Morales, 2007).

2. The majority of API items do not differentiate procrastination from other forms of delay. For example, the item “I find myself frequently running out of time” describes a person who might have many things to do rather than a procrastinator.
3. In many cases, some of the items of the API reflect other than procrastination concepts. For example, items such as “I am prompt and on time for most appointments” and “I usually pay my bills on time” could measure promptness; similarly, the item “if someone were teaching a course on how to get things done on time I would want to attend” may tap into individual’s assessment of his/her time management ability.
4. The API does not clearly reflect the elements of procrastination, such as intention-behavior gap, irrationality, and negative emotions.

Tuckman Procrastination Scale

The Tuckman Procrastination Scale (TPS: Tuckman, 1991) is the most recent measure of trait procrastination developed in North America. The TPS may be used in both academic and everyday life settings. Table 4-1 describes the measure and some of its psychometric characteristics. Based on the TPS’s items and definition I evaluated it as follows:

1. Despite the focused attempt to follow a valid process of instrument construction, Tuckman’s conceptual and operational definitions appear to be somewhat problematic. First, by asserting that procrastination equates to “the tendency to waste time, delay, and intentionally put off something that should be done” or “the tendency to put off or completely avoid an activity under one’s control” Tuckman failed to include important elements, such as intention-action gap, negative emotions, or irrationality. Secondly, this conceptualization is misleading as

Tuckman believes that procrastination is an intentional action, which is not a far leap from equating procrastination with being rebellious or lazy.

2. The TPS does not differentiate procrastination from other forms of delay. For example, items such as “when I have a deadline, I wait till the last minute” or “I always finish important jobs with time to spare” can measure both positive and negative delay. A person who is not able to finish an important job ahead of time might have a lot of tasks or works slowly rather than procrastinates on them.
3. Similar to Tuckman’s conceptual definition, “I postpone starting in on things I don't like to do,” “I manage to find an excuse for not doing something,” “When something's too tough to tackle, I believe in postponing it,” measures deliberate delay rather than inevitable delay of an intended task.

Tel-Aviv Procrastination Inventory

The Tel-Aviv Procrastination Inventory (TAP: Sroloff, 1983, cited in Milgram, Sroloff, & Rosenbaum, 1988) aims to measure trait procrastination in everyday life and includes two highly correlated subscales of “schedule adherence” and “time frame performance.” Milgram and colleagues (1998) later reduced the number of items in the TAP and called the measure the Life Routine Procrastination Scale. A description of the measure and its psychometrics can be found in Table 4-1. My evaluation of the TAP is as follows:

1. After initial publication describing the TAP measure, Milgram and colleagues (1992, 1996, 1998) used 19, 20 and 24 items from the original 54 items and renamed the instrument, Procrastination Scale (Milgram, Gehrman, & Keinan, 1992), Daily Life Procrastination Scale (DLPS: Milgram & Naaman, 1996) and

Life Routine Procrastination Scale (LRPS: Milgram et al., 1998), respectively.

The Cronbach alphas were very good, .83, .82, and .84 for Procrastination Scale, DLPS, and LRPS respectively (Milgram et al., 1992, 1996, 1998). However, there is no discussion on how these items were selected and whether or not both instructional sets were used. The inconsistency of scale titles and unclear instructions create confusion around the use and validity of the instrument(s).

2. Items, such as "I put off making a routine visit to the dentist", "I put off washing the dishes as much as possible" and "I pay college tuition on time" in the 1998 version of the test do not capture whether the delay is rational or irrational.
3. The measure does not operationalize several of the defining elements of procrastination such as "needless" delay or negative emotions.
4. The TAP response options are complicated and may convey more than one idea. For example, participants are asked to rate 54 items twice on 4-point scale. In the schedule adherence instruction, participants are asked to classify themselves as falling into one of the following options on each of the 54 tasks: "S1 (Schedule 1) = prompt scheduling with conscientious performance; S2 = putting off scheduling, but when one sets a time for doing the task, doing it on schedule; S3 = prompt scheduling, but failing to perform on schedule and rescheduling a second or third time before doing the task; S4 = putting off scheduling and rescheduling, and thereby failing to do the task until the last minute, if at all" (Milgram et al., 1988, p. 203). Such response options may need to be considered as categories as opposed to as different levels of a contentious scale with equal measurement space.

In sum, these three measures of procrastination in everyday life have a number of strengths such as measuring procrastination as trait, providing validity evidence, and having good internal consistency, but each fails in significant ways in terms of capturing the full construct definition of procrastination. Specifically, a major flaw in these scales is that procrastination is confounded with delay in general or problem of time management. Similar to academic procrastination scales, these measures do not incorporate the defining components such as negative emotion, irrationality, and personal dissatisfaction or poor performance. Therefore, the usage of these self-reports as measures of chronic procrastination problem is questionable. In the following section, I review the final set of procrastination inventories which consist of two different and specific procrastination self-reports.

Specific Procrastination Self-reports

Decisional Procrastination Scale

One of the specific measures of procrastination is the Decisional Procrastination Scale (DPS). More specifically, the DPS is a subscale of The Flinders Decision Making Questionnaire (FDMQ: Mann, 1982, as cited in Mann, Burnett, Radford, & Ford, 1997) or its newest version, the Melbourne Decision Making Questionnaire (MDMQ: Mann et al., 1997). Table 4-1 contains a summary of the measure and in the following points I present an evaluation of the measure:

1. The DPS has been well-developed and validated, however it is limited to measuring delay in decision-making as opposed to delay of starting or completing tasks (Sirios, 2007).
2. If one considers decisions preceding actions, decisional procrastination can be regarded as a subcategory of the procrastination problem. Based on this assumption, a decisional procrastination scale needs to incorporate the necessary

elements of conceptualization of procrastination otherwise the scale fails to differentiate intentional or reasonable delay from procrastination. Reviewing the measure reveals that the items in the DPS do not cover the defining element of procrastination such as intention-decision/action gap. For example, items such as “I don’t make decision unless I have to” or “I put off making decision” do not clarify if a person delays making a decision despite intending to decide earlier or generally avoids making decisions. Since DPS does not differentiate various forms of delay in decision making, it should be considered as a measure of delay in making decisions in general as opposed to decisional procrastination.

3. The item “Even after I make a decision I delay acting upon it” does not capture decisional procrastination, but a delay in action.
4. DPS does not capture psychological distress related to delay in making decisions as well as irrational delay in making decisions.
5. DPS does not differentiate delay making minor (buying shoes) vs. major (choosing university) decisions (Milgram & Ten, 2000)

Active Procrastination Scale

Choi and Moran (2009) recently developed a new measure, the Active Procrastination Scale (APS), which aims to measure intentional decisions to delay a task according to an internal motivation for working under time pressure, and the ability to meet deadlines with satisfactory outcomes. Table 4-1 includes sample items, a description, and psychometric properties of the measure. I have already mentioned issues related to the definition and conceptualization of active procrastination (see page 59). In the following, I present a further evaluation of this newly developed measure.

1. The reliability of the measure are good. The developers of APS have provided convergent validity evidence for the measure. However, they failed to provide appropriate ground for content validity of their measure. Choi and Moran (2009) have ignored a large body of research in the area of procrastination. Even in their attempts to provide evidence for construct validity, none of the trait or behavioral measures of procrastination has been used. Instead, they have used a specific type of procrastination, decisional procrastination (DPS).
2. With the exception of items related to intentional decision to delay, all of the items in the remaining three factors (i.e., preference for pressure, ability to meet deadlines, and outcome satisfaction), are reversed coded items. Given the difficulties related to interpretation of reversed items (DeVellis, 2003), it is psychometrically and conceptually inappropriate to not include items that measure active procrastination directly. Considering the common knowledge among psychologists in terms of the importance of having none-reverse-coded items, it can be speculated the developers of the APS have had these type of items in their initial item pool, but have not been able to obtain their desired factors using none-reverse-coded items.
3. Considering the above discussion, items such as “It’s really a pain for me to work under upcoming deadlines”, “I’m upset and reluctant to act when I’m forced to work under pressure”, and “I’m frustrated when I have to rush to meet deadlines” are more appropriate to be considered as “dislike to not work under pressure” as opposed to “preference to work under pressure”. In other words, because even one single direct-coded item of “preference to work under pressure” has not

loaded on the “preference to work under pressure” factor, one cannot be sure that the above reversed items capture the concept with the opposite meaning.

4. Similarly, items such as “I have difficulty finishing activities once I start them”, “I’m often running late when getting things done”, and “I often start things at the last minute and find it difficult to complete them on time” are conceptually closer to the notion of “traditional” procrastination than “ability to meet deadlines.” In fact, this factor has shown a strong correlation with the only procrastination measure used in Choi and Moran’s (2009) study. Even if we ignore the “jangle fallacy” (Kelly, 1927, as cited in Block 1995) here, I believe, it is important for the authors to clarify the relation between “traditional procrastination” and the subscales of active procrastination. Given the strong conceptual and empirical link between the above items and procrastination, it seems the authors have, in fact, included traditional procrastination as one of their elements to define active procrastination.
5. Similarly, the following items, “My performance tends to suffer when I have to race against deadlines”, and “I achieve better results if I complete a task at a slower pace, well ahead of a deadline,” that are supposed to measure “outcome satisfaction,” are closer to the concept of “preference to avoid working under pressure or dissatisfaction with postponement”.
6. Some of the APS’s labels and concepts (i.e., intentional decision, outcome satisfaction) appear to be similar to the identified elements in my proposed conceptualization of procrastination (e.g., intention-action gap, negative emotion and outcome dissatisfaction). However, there are two major differences. First, the

elements used in the APS are intended to measure purposeful delay, whereas the proposed-in-this-study elements are intended to measure procrastination. Second, while relations among elements are important to conceptualize and operationalize procrastination in my research, the interconnections among the factors in the APS are not considered in its operationalization. In other words, in the APS, the elements are not measured in relation to the same task. Therefore, it is more appropriate to consider the APS factors to be separate constructs as opposed to the elements of one construct. In my proposed conceptualization, elements should be present in relation to the delay of same task to call the delay procrastination (see example in Table 3-1). In Table 3-1, a dilatory behavior needs to have a combination of elements (intention-action gap, needlessness) to be called procrastination.

Summary and Conclusions Regarding Existing Measures

In sum, none of the measures include identified important and necessary elements and therefore fail to differentiate procrastination from other forms of delay. None of the measures assess duration of procrastination and differentiate acute (i.e., short-term) and chronic (i.e., long-term) procrastination. In other words, although the construct has often been used as an outcome variable to represent a psychological problem in academic or general settings, there is no measure of procrastination as a psychological problem with the exception of the PASS. Some of the existing measures also suffer from having ambiguous or irrelevant item content and/or having an unrepresentative sample of task domains in academic or everyday-life contexts. There is no measure that can be flexibly used in multiple contexts such as everyday life, academic, and/or organizational settings. Given these numerous shortcomings, there was a definite need to

develop a new measure that would address the limitations of current instruments; such a measure was the purpose of my dissertation research which I describe in the next chapter.

CHAPTER 5: RATIONALE, OUTLINE AND HYPOTHESES

In previous chapters, I presented an integrative conceptualization of procrastination as a psychological problem based on a review of existing definitions and relevant theories. I also evaluated the available procrastination measures according to the elements of procrastination identified in my more comprehensive conceptualization and construct definition. Given the conclusions of the above reviews, and to fulfil the ultimate purpose of this study, I developed and validated a new set of measures, the Multifaceted Measure of Academic Procrastination (MMAP), by conducting several empirical research projects. The MMAP includes four context-specific measures, the Procrastination Behaviour Scale (PBS), the Perceived Negative Consequences Scale (PNCS), the Negative Emotions Scale (NES), and the Procrastination Duration Scale (PDS).

These sets of instruments aim to be task specific within academic contexts and collectively measure procrastination as a psychological problem in a student population. One of the objectives of the study was to develop a self-report measure that can capture procrastination in relation to each important educational task separately, as well as in overall academic tasks. Therefore, two versions of the MMAP were developed, the General Academic Tasks version, and the Specific Academic Tasks version. In the general version, the phrase “academic tasks” was used in the wording of the items. That is, the type of task was not specified in the wording of the items. In the task-specific version, the same items were included but instead of “academic tasks,” specific academic tasks such as writing, reading, and studying for exams were used in the wording of items.

Although the MMAP aims to measure procrastination as a psychological problem, the set of measures could potentially provide sub-scores measuring procrastination behaviour and trait

procrastination. To provide such diverse operationalization of the construct, I tested the reliability and validity of various total scores including total scores representing procrastination as a psychological problem in academic settings, one score representing trait procrastination, and finally, separate scores measuring procrastination behaviour in various tasks.

In addition to the main measures of this study, I developed an independent measure, the Delay Questionnaire (DQ), which captures different prototypes of delay. This measure was developed and initially validated based on my conceptual categorisation of delay as summarised in Table 3-1. Similar to the measure of attachment styles and prototypes developed by Bartholomew and Horowitz (1991, the Relationship Questionnaire), a vignette approach was used. The DQ was expected to provide a categorical score (i.e., types of delay) and continuous scales (i.e., prototypes of delay) related to different forms of delay such as irrational delay (anxious procrastination), hedonistic delay, purposeful delay, and inevitable delay. Contrary to the format of the measure of attachment mentioned above, I developed multiple items in continuous scales of the DQ in order to avoid the problems related to single-item measures of latent variables. The structure and types of delay measured by the DQ was not limited to those found in my literature review; a large student sample was used to identify missing content (i.e., type of delay).

The MMAP scales and the DQ were developed separately, but for both, I used a multi-stage process involving: generating items, evaluating content validity, reducing and refining initial items through internal consistency analysis and exploratory factor analysis, testing the measurement structure using confirmatory factor analysis, and evaluating convergent and discriminant validity. A detailed description of each stage is presented in subsequent chapters. Generally, I expected that measurement models that were identified and confirmed in factor

analysis to be similar or close to the structures that I reached based on theoretical and conceptual discussion in chapters 1 to 4. The scales and subscales were expected to have good to excellent reliability and internal consistency. The measures were expected to have promising convergent and divergent validity.

Some of the specific hypotheses are presented in Table 3-1; the detailed set of hypotheses for both MMAP and DQ are presented in validation chapter (Chapter 13). Below, I present the hypotheses in general for the overall procrastination problems score.

Based on the meta-analysis of Steel (2007) and van Eerde (2003, 2004), as well as Lay's (1997) theoretical explanation, it was expected that procrastination behavior would be negatively correlated with Conscientiousness. The emotional component of procrastination was also hypothesized to have a weaker correlation with conscientiousness in comparison to total procrastination. It was also expected that procrastination behaviour and problems (intensity) would demonstrate a moderate to large negative relation with self-control.

Consistent with findings reported by Steel (2007), it was expected that procrastination would show a positive and moderate relation with self-efficacy, and non-significant to weak relations with Extraversion, Openness to Experience, Agreeableness, and age.

Given the evidence discussed in the emotional elements section, and according to Pychyl and colleagues' (2000) explanation, Tice and colleagues' (2001) theory of emotional regulation and Lazarus and Folkman's (1984) Appraisal-Anxiety-Avoidance theory, the overall scale for procrastination problems (i.e., intensity of procrastination problems) was hypothesized to have a moderate effect size in relation to various constructs with strong emotional components such as fear of failure, emotional coping, test anxiety, emotional problems, and neuroticism. Similar to the above hypothesis, I expected that anxious procrastination as measured by the MMAP and the

DQ would be positively correlated with depression and fear of failure, but negatively correlated with well-being, perceived health, GPA, and academic performance. The correlation between the new measures and social desirability was expected to be weak and in a positive direction.

Finally, given the fact that all measures of procrastination capture delay with a negative connotation, it was expected to find significant large to moderate correlations between procrastination as measured by the existing self-report measures and procrastination as measured by the MMAP and the DQ. Further expectations and a more detailed discussion of the validity are presented in greater detail in Chapter 13.

CHAPTER 6: INITIAL ITEM CREATION AND DEVELOPMENT

This stage is one of the most important stages in developing a self-report measure (DeVellis, 2003). There are many essential points that need to be considered in the process of item creation based on experts' suggestions (DeVellis, 2003; Hinkin, 1998). I begin the chapter by discussing these key criteria for item creation drawing largely from the guidelines presented by DeVellis (2003).

First, it is important to construct and select items based on the measurement purpose and the definition of procrastination and delay, as discussed earlier. In particular, the composition of elements should aim to recognize the distinction between procrastination and delay.

Second, the major rule in item generation is that the items should have the construct of interest in common. In this study, the theories related to the emotional elements of procrastination were used to create the items for negative emotion. Furthermore, various terms related to elements should be used in item generation. In this regard, I included relevant items from previous measures if they reflected the necessary elements of delay in general and procrastination in particular. Problematic items adopted from previous measures were modified to reflect the necessary elements. In addition to the existing literature on procrastination, any available sources that provided information about the subjective expression of the emotional and irrational elements were used to generate items. Some of these resources included: previous qualitative data, unpublished theses, weblogs, and procrastination groups in social networks.

Third, multiple items should be created for each latent element. Redundancy was necessary at this stage. I tried to create three times as many items as the predicted final number required to measure each element. As I intended to have at least four items for each element in the final version of the MMAP, I attempted to provide approximately 12 items for each element.

In contrast to the liberal strategy regarding the number of items, the length of each item was restricted. Based on DeVellis' (2003) recommendation, items should ideally not have more than 16 words and a total of 20 syllables. This structure would be appropriate for a person with cognitive ability at the six-grade level (Fry, 1977). When using vignette approach the sentences should follow the above comprehension rule. For items that consisted of more than one sentence, such as vignette items, the length of each sentence should follow the above rule.

Fourth, there are several important points in terms of clarity of item wording. The double-barrelled items, those that convey more than one idea, should be avoided. For example, an item like "Despite my initial intention, I often postpone writing my term paper until the last minute, because I irrationally change my program to go to a party" is problematic. It includes more than one idea: the habitual postponement of writing a paper, having initial intention, hedonistic delay, as well as a specific irrational alternative act. The double- or multiple-barrelled items were only acceptable if the construct consisted of more than one conditional elements. For example, the problem can be reduced if the item is changed to "I postpone my initial plan to writing my term paper without a rational reason" to measure irrational delay, or be changed to "Despite having an approaching deadline for my term paper, I postpone writing my term paper until last minute to go to party." These issues are discussed in more detail in the following paragraphs.

The clarity of the item may also be impaired by grammar mistakes. At the item creation stage of the study, a native English speaker who had extensive research experience in psychology was asked to evaluate each item for grammar problems, particularly ambiguous pronoun references and misplaced modifiers as recommended by DeVellis (2003). That said, the test was to be administered in a multicultural setting, therefore the items needed to include commonly used words, which were appropriate for a participant with an intermediate level of

comprehension in English. The appropriateness and clarity of the items were assessed in my content validity study with a representative sample of native and intentional student.

In addition to the grammar and structure of the item wording, the format of items (question) and responses, as well as the method of administration of the items were important. For my questionnaires, the question and response format were determined during the process of item creation and according to DeVellis' (2003) recommendations. This selection was later evaluated in the content validity and cognitive interviewing studies.

My initial plan in terms of the item-response format was to use a 7-point Likert scale since it could adequately record the range of responses. Distinctive modifiers were used for all response options. The modifier such as a frequency adverb (e.g., often, always) was avoided in the wording of the items. I expected that the variations or gradations would be captured by response options, as opposed to specific adverb item statements (DeVellis, 2003).

Many constructs in this study consisted of multiple defining elements. For example, the conceptualization of procrastination problems comprised of elements such as: repeated delay, intention-action gap, needlessness, negative outcome, dissatisfaction, and negative emotion. Even for the constructs under "procrastination problems," there were multiple elements. For example, the conceptualization of procrastination behaviour consisted of elements such as needlessness, intention, and postponement, and the conceptualization of perceived negative consequences consisted of needless delay and negative outcome. Single items which comprise multiple elements may lead to the use of conditional statements, which in turn can lead to the "double barreled" or "multiple barreled" problem discussed earlier. For many constructs, conditionality are inherent parts of the conceptualization and therefore operationalization. When possible (e.g., procrastination problems) the elements were measured separately and added later

to represent the full construct. For the inherently conditional items (i.e., items that had elements that were meaningless when measured separately), the attempt was made to reduce the problem and write the items, response options, and instructions in a way that could shift the focus of answer formulation on the main element; this was the case for procrastination behaviour or perceived negative consequences.

Conditional items can potentially result in long items and, therefore, create a high cognitive load on test takers. In addition to item wording, the cognitive demand of rating an item depends on the format of response options and instructions used. The item and response format was modified to reduce the cognitive demand as much as possible and to be more in accordance with participants' cognitive ability to comprehend the created items. Different types of items and responses and format of presentation were created. In a small pilot sample of 5 participants, I evaluated their cognitive process and subjective understanding of the items using a think-aloud procedure and cognitive interviewing technique (e.g., DeMaio & Rothgeb, 1996). Based on this information, the decision about the appropriate method and format to be used was made. It should be noted, however, that despite all of the efforts to reduce complexity and the length of the items, there were several long items. I chose to keep them because they captured complex constructs such as procrastination behaviour (irrational and hedonistic delay) that consisted of several necessary elements.

It should also be noted that issues related to the use of simultaneous multiple elements in defining a construct of interest are not limited to the MMAP. The DQ prototypes conceptualization required incorporation of a set of defining elements as well. Consequently, it can be argued that using a vignette approach to incorporate all of the elements simultaneously can cause the same problem of selective processing of some elements and ignoring others while

a participant responds to a vignette. Despite the above disadvantage of a vignette approach, there were several advantages to this method in the present study. First, using diverse methods to operationalize procrastination was positive because it provided a more representative sample of the construct. Second, the method of the DQ had the advantage of being simple, convenient and time effective, as has been demonstrated by the widespread use of similar measures in the attachment literature (Bartholomew & Heatherton, 1991). Third, given the fact that the DQ and the MMAPS were validated simultaneously, comparison of the results enhanced the depth and quality of validation argument. The simultaneous administration of the measures also provided an opportunity to reduce the potential methodological problem of the DQ by eliminating vague vignettes in future research.

The MMAP's Item Creation Procedure

“Procrastination problems” consisted of four major facets: procrastination behaviour, perceived negative consequences (undesired outcome and dissatisfaction), negative emotions and duration. Given that each facet had a broad set of potential subscales (sub-content domains) and theoretically could be used alone, four separate scales/sections with independent instructions were developed to capture them. In the following sections, I first present the definition and then the process of item creation.

Definitions.

At the first stage of item development, a clear definition for each construct was developed and organised. Since each definition consisted of various defining components and

subdomain of contents (e.g., do unnecessary activities, non-urgent activities, irrational delay, and needless delay), a list of elements and their synonyms was created to facilitate item creation.

Procrastination behaviour consisted of two potential subscales, Anxious Procrastination (irrational delay) and Hedonistic Procrastination. Anxious Procrastination behaviour in an academic setting was defined as a needless delay of an assigned task, despite the initial intention to start or finish it at a particular point in time. That is, Anxious Procrastination is a form of delay on intended tasks where the delay is perceived as needless, irrational and/or unwanted. Based on this definition each item should capture two conditions in order to be considered a relevant representative of the construct. Firstly, it should reflect a needless, irrational, or unnecessary delay on an academic task (e.g., writing assignment). Secondly, it should reflect delaying despite one's initial intention, or a gap between the time that one initially intended to work on the task and the time that one actually works on the task. Some of the main words used in items wording for this construct as well as related construct included needless, unnecessary and intention. Needless means delaying without a rational reason. When it is needless delay, one generally knows that it is not a good idea to delay the intended task. For example, if one intended to study for an exam at a particular time, but instead engaged in "unnecessary activities" and then studied at the last minute, this would be needless delay.

Unnecessary activities typically are not urgent and are not part of one's initial plan. For example, one may watch TV, spend time on Facebook, or clean his or her room instead of studying for his or her exam as initially intended. "Intention" can refer to a vague thought or decision (e.g., thinking about doing an assigned task ahead of time) or it can refer to a specific and concrete plan (e.g., doing the task at a specific time on a specific day). Delay as it is used in this study means to postpone, put off, do near the deadline, etc. These descriptions were

presented to students before presenting the items related to procrastination behaviours and problems.

Hedonistic Delay is a form of delaying on assigned tasks where one volitionally (willfully, intentionally) chooses to do fun, pleasurable, and/or exciting activities instead. In this type of delay, one does not perceive the assigned tasks as important or necessary in comparison to the other activities, and does not form an initial intention, or at best forms an anemic intention (Stroud, 2010) to start or finish the assigned task on time (i.e., may form no intention or a vague or weak intention). Based on this definition, each item of Hedonistic Delay measure should represent the following conditions: 1) it should reflect a delay on academic tasks; 2) it should reflect the inclination for choosing fun, pleasurable, or exciting activities over academic tasks; 3) it should reflect lack of interest in academic tasks, or/and 4) it should reflect no clear intention or desire to do academic tasks on time or very weak (“anemic”) intention to do the tasks at a particular time.

“Negative Emotions” was a defining element of procrastination problems and defined as specific or general unpleasant feelings that arise from thinking about initiating a task, initiating action on a task, not initiating action on a task, or from delaying the task. Two conditions are necessary to rate an item as highly representative of Negative Emotions. Firstly, the item has to be related to a negative emotion. Second, the negative emotion must be related to the delay.

In this study, “undesired outcome” was a defining element of procrastination problems; it referred to the extent to which postponing intended tasks leads to psychological, social, or academic outcomes that are suboptimal or not as good as one would like. Based on the definition, the following two conditions were necessary to develop items that were highly representative of undesired outcome: 1) The item refers to a negative or poor or undesired

outcome such as Low GPA or grade, poor self-reported academic performance, or poor assignment quality; and 2) the item refers to a relatively lower level of mental or physical health or a negative effect on relationships or social activities, etc. The poor outcome/performance is primarily due to the delay of academic tasks, particularly a needless delay.

Dissatisfaction was considered a defining element of procrastination problems and referred to the extent to which one experiences a general feeling of being displeased or discontent about his or her needless delay on school related tasks and/or about the consequences of the needless delay. Both undesired outcome and dissatisfaction were considered as defining components of perceived negative consequences of procrastination behaviour particularly needless delay or anxious procrastination.

The above definitions and descriptions of the construct served as a foundation to develop item wording and item response options and later to gather and organize content validity evidence. Given these definitions and conceptual background, I now turn to a presentation of the item creation process (item wordings and response options). In the chapter that follows, I present the content validity studies that mainly examine the relation between the definitions and items I created for the measures.

Creation of Item Wording.

Different strategies were utilized to create items for various scales and subscales of the MMAP. For Irrational Delay (i.e., classical procrastination), existing measures developed prior to 2009 were reviewed. Some relatively good items were chosen. The items were then modified to include all of the necessary elements of procrastination behaviour and represent the new definition. In addition, many new items were added to cover a broad content domain under each element. A list of synonym words was created to capture delay, intention, and perceived

needlessness. For example, to capture intention, words with different levels of strength such as thought, told myself, initially intended, and planned were used. The generated items were examined by two experienced researchers to check for language errors and unclear sentence structure or awkward phrasing. For hedonistic delay, all items were original based on the defining elements of the construct explained in the previous section. Similar to irrational delay, hedonistic delay had more than one defining element, therefore and inevitably this resulted in complex and conditional items (see Appendix B for example).

Two sources were used to develop the negative emotions scale. First, the level of endorsement or mean negative emotions for a broad set of perceived negative emotions related to procrastination behaviours were obtained from my M.A. research (Haghbin, 2006). The dataset consisted of 62 positive and negative emotions. The emotions were sorted in descending order based on their means to identify those with the highest level of endorsement. Table 6-1 illustrates the perceived negative emotions (affective experience) that had mean endorsement above the overall negative emotion means ($N=196$). Second, the categorisation and the final choices of emotions were based on a well-established theoretical model for achievement-related emotions developed and proposed by Pekrun and his colleagues (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Pekrun, Goetz, Titz, & Perry, 2002) and a circumflex model that categorizes emotions based on two dimensions of valence (positive vs. negative) and activation (activating vs. deactivating) highlighted by Tellegen, Watson, and Clark (1999), Watson and Clark (1992) and Pekrun, 2006.

Table 6-1

Procrastination Negative emotions Mean and SD

Emotion	Mean	Variance	Emotion	Mean	Variance
Ei7 Guilty	3.79	1.626	Ei46 Angry	2.84	1.888
Ei4 Angry at self	3.57	1.652	Ei17 Sluggish	2.77	1.614
Ei60 Dissatisfied with self	3.52	1.943	Ei5 Disgusted	2.73	1.909
Ei15 Nervous	3.51	1.39	Ei55 Scared	2.7	1.758
Ei42 Upset	3.17	1.864	Ei61 Helpless	2.7	1.832
Ei23 Sleepy	3.09	1.823	Ei2 Sad	2.69	1.631
Ei24 Blameworthy	3.09	1.874	Ei62 Hopeless	2.59	2.059
Ei47 Ashamed	3.04	1.901	Ei32 Frightened	2.57	1.755
Ei57 Disgusted with self	2.99	2.092	Ei39 Jittery	2.56	1.499
Ei41 Irritable	2.93	1.646	Ei31 Hostile	2.25	1.46
Ei20 Distressed	2.92	1.845	Ei34 Alone	2.2	1.842

Note. The above items were under question “When I procrastinate on **academic tasks**, I typically feel,...”. N=196;

Based on the two dimensions, four categories of emotions were defined. These included negative activating emotions, negative deactivating emotions, positive activating emotions, and positive deactivating emotions. The first two categories were particularly important for this study as the measure was primarily focused on problematic aspects of procrastination. Despite this focus, the positive aspects of emotions were also included for two main reasons. Firstly, the positive emotions were important for future theoretical research. It could be argued that lack of positive emotions may be related to procrastination problems and such a link may be both theoretically and empirically different from the one between negative emotions and procrastination. Secondly, adding positive emotions could enhance the social validity and acceptability of the measure. Therefore, having both positive and negative emotions were assumed to be more natural for the assessment process and allow the test takers to express themselves more freely.

Similar to the Achievement Emotions Questionnaire formats, the emotions for three stages related to task completion and delay could be measured: 1) delay before starting the tasks

(i.e., at the time of starting), 2) while delaying the tasks and 3) delay after finishing the task. Only the second category (while delaying the tasks) was a descriptive component in the conceptualization of procrastination problems. Negative emotions are assumed to often accompany dilatory behaviour and can be felt and reported by those who needlessly delay, therefore the construct had an important descriptive value for quantifying procrastination as a problem. These types of emotions were named task-delay emotions. The two sets of emotions (before and after) did not have such a descriptive role for procrastination, and, therefore, were not necessary for reaching the main objective of the project (measuring procrastination problems). However, as discussed in detail, negative emotions prior to starting a task (i.e., task-initiation negative emotions) were particularly important as causal factors behind irrational postponement of intended tasks. Measuring negative emotions in initial stages of task engagement could potentially be used in studies that are geared towards understanding emotional processes related to procrastination. Since there was no instrument to measure a comprehensive set of task-initiation negative emotions, were developed and evaluated in the content validity study and in the structural analysis stages. The final set of emotion-related terms for both task-initiation and task-delay items are presented in Table 6-2.

Table 6-2

Initial Structure of Negative Emotions Scale

	Task Initiation Negative	Task Initiation positive	Task Delay Negative	Task Delay Positive
Activation	Anxious, Angry, Guilty, emotional distress,	Attentive, Active, Joy, Excited, Hopeful or Enthusiastic	Anxious, Angry, Guilty, emotional distress	Attentive, Active, Joy, Excited, Hopeful or Enthusiastic
Deactivation	Bored, Sluggish/sleepy hopeless	Relaxed, Content, Calm	Bored, Sluggish/sleepy, hopeless	Relaxed, Content, Calm

Given the importance of negative emotions, they were measured by separate items with eight items for task initiation and eight items for task delay. Positive emotions were combined based on the overarching activation dimension including positive activating emotions, positive deactivating emotions under task-delay emotions, and similarly two items for task-initiation positive emotions.

A broad set of items were developed to capture negative outcome and dissatisfaction. Both sets of constructs, negative outcome and dissatisfaction, were considered part of the subjective experience of procrastinating; therefore these were presented under one scale/section, perceived negative consequences and dissatisfaction. Academic, personal, social/relational and health were considered the main categories of perceived negative consequences. For each category, at least five items were developed to capture different content domains.

The aforementioned main parts, behaviour, emotion and consequences, were aimed to measure intensity/severity of procrastination problems in the here and now. To provide information regarding the onset of procrastination problems, the procrastination duration scale was developed. The scale was developed in a way to capture the background information for the three intensity aspects discussed above. That is, duration scales captured not only the onset of procrastination behaviour but also the start of negative subjective consequences of behaviour; when the behaviour started and when it became or felt problematic.

In sum, to capture procrastination behaviour and various elements of procrastination problems, four sections or separate scales were created. These included: 1) a procrastination behaviour scale to measure anxious and hedonistic procrastination, 2) a negative perceived consequence scale to measure various negative consequences of procrastination and dissatisfaction, 3) a negative emotions scale, and 4) a procrastination duration scale. The items

selected for the content validity phase included 18 items for anxious procrastination, 12 items for hedonistic procrastination, 9 items for emotions before starting the task, 9 items for emotions while delaying on a task, 23 items for negative consequences, 14 items for dissatisfaction, and 19 items for duration scale.

Response Options and Instructions.

A 7-point Likert scale was chosen as the response options for the first three scales. Several types of word labels or anchors were considered for student feedback including frequency, intensity and agreement (see Table 6-3). These options were tested in the pilot study and further retested in the cognitive interviewing study.

Table 6-3

Possible Response Options for the Procrastination Behaviours, Perceived Negative Consequence and Negative Emotions Scale

	1	2	3	4	5	6	7
AU/T U	Never true for me	almost never true for me	Sometimes true for me	true for me half the time	true for me most of the time	almost always true for me	Always true for me
AB	Strongly Disagree Strongly disagree	Moderately Disagree	Slightly Disagree	Neutral neither agree nor disagree	Slightly Agree	Moderately Agree	Strongly Agree Strongly agree
FU	Never	Almost never	Sometimes	Half of the time	Often	Very often	Always
IU	not at all	A little bit	Somewhat	Moderately	Considerably	Strongly	Very Strongly
IU	not at all			Moderately			Very Strongly/extr emely
TB	Extremely uncharacteris tic	Moderate uncharacteris tic	Slightly uncharacteris tic	Neutral	Slightly characteristic	Moderately characteristic	Extremely characteristic
TB	Very untrue of me	Somewhat untrue of me	Slightly untrue of me	Slightly true of me	Somewhat true of me	Very true of me	

To measure duration, two different sets of response options were used, one 7-point and one 6-point scale (see Table 6-4). Two different sets of word labels were developed. Both sets of

the duration response options included a “not applicable” option. The response options were tested in the pilot study and as well as in the main cognitive interviewing study.

Table 6-4.
Initial Response Options for the Procrastination Duration Scale

0	1	2	3	4	5	6	7
Not applicable	Less than a year	1 to 2 years	3 to 4 years	5 to 6 years	7 to 8 years	9 to 10 years	More than 10 years
As long as I can remember	Since elementary school	Since early high school	Since late high school	Since starting university	More recently	Not applicable	

In addition to items and response options, four separate sets of instructions were developed to be used for the questionnaire sections related to procrastination behaviour, negative emotions, negative consequences, and duration. Each of these was evaluated based on students’ qualitative feedback in a pilot study and in the cognitive interviewing study as well.

Initial Evaluation.

Before using the measures in the content validity stages, the items, possible response options and instructions, as well as the format of presenting the items were tested in a pilot study. The pilot consisted of four undergraduate students in our research group and one graduate student. A semi-structured version of the cognitive interviewing technique⁸ was used to initially evaluate how the test takers formulated their answers and which conditions required less cognitive load and resulted in faster and more accurate responding. Based on this study, I edited the frequency response options and second duration response options to be more natural for test takers and these revisions resulted in faster and easier formulation of answers for the

⁸ This cognitive interviewing techniques are discussed in the next chapter.

participants. It should be noted that a separate and systematic cognitive interviewing study was conducted in the content validity stage and these decisions were re-examined again.

The DQ's Item Creation Procedure

The process of item development for the Delay Questionnaire was similar to the one discussed for the MMAP. However there was a major difference between MMAP and the DQ. Most forms of delay in the DQ were newly proposed. The definition, based on limited body of knowledge about various forms of delay, could only be used as a starting point for creating and/or organising delay stories. Consequently not all forms of delay proposed at this stage had the same level of coherence and theoretical homogeneity in their initial definition. For example, both purposeful delay (time management, sensations seeking) and inevitable delay (busy schedule, urgent issues) consisted of heterogeneous causal factors. At the time of developing the measure, theoretical and empirical evidence that differentiated the effect of the various causes and explained how the subjective experience and negative consequences of the forms of delay were different did not exist. Given such a discrepancy in the coherence and strength of the proposed construct, the process of item development including definition and item wordings was designed to be accomplished in multiple stages and go beyond this chapter. The process of building the measurement model and items started based on theoretical and conceptual discussion as well as existing qualitative data. However, later, the initial model was not only tested but also the model was modified and enriched based on the students' actual experience of and direct feedback about the DQ.

In the first stage, a set of constructs based on various sources of information was defined, which are presented in this chapter. The definitions worked as a summary of the students' educational life at school and addressed how they deal with imposed/assigned academic tasks

with specific timelines and optimal time frames and how they postpone some or most of the tasks. These definitions or synopses of stories were obtained based on various sources including theoretical discussion regarding the interaction between various causal factors that influence task-engagement and delay, as well as previous empirical and conceptual research, particularly procrastination research, and a collection of qualitative information (real stories, clinical observation and qualitative research).

In the second stage, presented in this chapter, new stories were generated for each initially proposed form of delay. Similarly, stories from other sources were edited and organized under each proposed form. In the third stage, a large number of students evaluated the generated stories/definitions from previous stages and simultaneously generated new stories or forms of delay that had not been covered well. The students proposed the stories based on their experience and direct knowledge at school. In the fourth stage, the new forms of delay were identified through students' generated stories and feedback. Additional new stories were created based on newly emerged forms. Stages 3 and 4 are presented in the next chapter when I discuss the content validity of the DQ, because the process of item development (item wording) was prolonged to the end of content validity studies in the student population. The generated items were entered in a factor analysis to find a robust structure of the measure. The constructs were then redefined and labelled accordingly. Finally, the prevalence of the refined delay forms were rigorously examined in order to ensure the importance and significance of the forms of delay, providing further information for content relevance of the delay forms.

Definitions.

For each initial four forms of delay, a clear and detailed definition that could help item creation was developed. The definitions and descriptions of the four initial forms of delay that

were used in the initial stage of item creations and content validity study are presented below. It is important to be noted that some of the definitions and labels were changed based on the result of factor analysis as explained above (see Chapter 10).

Anxious Procrastination or irrational delay is a form of delay where individuals needlessly and repeatedly delay important tasks, despite their initial intention to start or finish the tasks. Delay of an intended task is considered needless when the individual perceives it as unnecessary, irrational or unreasonable. Irrational delay is often due to engaging in activities that individuals themselves consider unnecessary or unimportant. This form of delay is accompanied by negative emotions and causes poor performance or personal dissatisfaction with the outcome.

This definition of irrational delay in the DQ consisted of both necessary elements to measure procrastination behaviour such as needless delay and initial intention as well as the descriptive elements that often accompany procrastination behaviour and represent the emotional aspect of the construct. These elements capture negative aspects of procrastination and therefore are necessary components for procrastination problems. Therefore, it can be assumed that anxious procrastination in the DQ captures the negative aspects of phenomenon more directly and strongly than the anxious procrastination subscale in the MMAP, but less intensely than the procrastination problems total score. In the DQ, the negative and emotional aspects were not the main focus of the stories. The main focus of the stories was on the behavioural aspect of the procrastination vignette.

Hedonistic delay is a form of delaying assigned tasks where one volitionally (wilfully) chooses to do fun or exciting activities instead of the tasks. As explained previously, in this type of delay (also labelled as a form of procrastination), one does not perceive the assigned tasks as important or necessary in comparison to other activities and does not form a clear initial

intention to start or finish the assigned task on time. Hedonistic delay often leads to poor school performance, however individuals do not experience high levels of negative emotions (e.g., guilt, anxiety) or dissatisfaction about the delay and its consequences, at least not early in the school year (e.g., Tice & Baumeister, 1997).

Purposeful delay is a form of delaying tasks where one purposefully chooses to do tasks near the deadline. Individuals may delay tasks because they prefer to work under pressure, because they want to get more information, or because they think it will optimize their schedule. These individuals complete tasks on time and are neither dissatisfied with doing tasks near the deadline, nor with the consequences of their actions.

Inevitable delay is a form of delaying tasks where individuals intend to do tasks earlier but often encounter unavoidable obstacles beyond their control or unforeseeable changes that require them to delay. This form of delay is believed to affect a diverse group of people. For some individuals, their own tendency to accept too many commitments leads to them to being overscheduled and overwhelmed and having to delay on personal and/or academic tasks. Others delay because difficulties in time management leads to unavoidable scheduling overloads or conflicts. For a third group, delay is truly inevitable – they may have too many unavoidable responsibilities, disruptions or emergencies such as family commitments or issues related to chronic health problems. All three groups may be dissatisfied with their delay and its consequences, and they may feel some level of negative emotions such as anxiety or guilt.

Item Wordings and Response Options

The DQ items were stories or vignettes. The vignette items were very flexible in terms of length and content. Both necessary and unnecessary elements were included in each story. Moreover, the broad content domain related to each construct could be captured with each item.

This is why the number of items in the vignette approach did not need to be as large as the one that is recommended in a typical one-sentence-item measure. The optimal number of items was considered to be three items, but the measure can be shortened even further to have one item (e.g., Bartholomew & Heatherton, 1991).

Despite the flexibility in the length, it was still important to use clear and short sentences in stories. In this approach, the use of natural and easily comprehensible phrases was important. The stories should seem natural and include familiar situations and content since the formulation of answers was designed to be based on the degrees of identification or likeness with the scenarios as opposed to agreement, disagreement or frequency.

Different strategies and broad sources of information were used to obtain and create vignettes. Existing qualitative research, online procrastination groups, online undergraduate student groups and procrastination books were searched, and stories as well as common phrases that could refer to elements were extracted. It should be noted these stories did not have all of the elements that were discussed in the previous section, however the stories provided a good starting points to create the final stories.

Two methods were used to create the initial set of stories from definitions to story or from story to defining elements. First, for each construct, several descriptions without any additional words or common phrases were developed that purely reflected a combination of elements that were used in the conceptual definition. The descriptions were then enriched in a way that sounded more natural and contained some common phrases or activities that a test taker was more likely to identify with. In contrast to this procedure, some stories with all of the details were directly created or obtained from the above sources. These stories were then transformed to the various pure components in order to be sure that all aspects were captured and there was no

reparative content. All of the stories/descriptions were analyzed regarding their content domain and use of particular phrases. Inspection and item creation were performed in an iterative fashion in order to create new stories or edit existing stories to cover missing content.

In addition to me, two senior researchers (one Ph.D. student and a professor) participated in the process of story creation and editing. All three researchers had a broad experience working with students and in the educational setting. Based on the pool of stories, I selected 30 stories after assuring the clarity of the stories to cover a broad content domain (see Appendix C). All stories were written for both male and female names separately. The final selection consisted of stories with both names from both genders under each type of delay. The initial DQ included, 9 stories for irrational delay or anxious procrastination, 7 stories for hedonistic procrastination, 6 for purposeful delay and 8 for inevitable delay. The response options consisted of a 7-point Likert scale where 1=Not like me at all, 2=A little bit like me, 3= Somewhat like me, 4= Moderately like me, 5=Very like me, 6=Very much like me, 7=Almost 100% like me. Below are three examples of these vignettes (see Appendix C for the complete set).

Example for Irrational Delay: “Lorenzo doesn’t know why he always avoids doing his school work until it’s too late to produce his best work. He often tells himself he won’t do this again, but it seems like whenever he has school work he should be doing, he does all sorts of other things instead, like watching TV, text messaging, surfing the Internet, etc. Lorenzo is generally not happy about his habitual delay and would like to find a way to change it.”

Example for Inevitable Delay: “Adam tends to have lots of demands on his time from work, school, family and friends. For example, Adam has a lot going on this semester; he is taking a full course load, has a part-time job, is involved in extracurricular activities and also has to put some time aside for his family and friends. Adam wants to work on his school tasks ahead of the deadline, but he often has to put them off to fulfill other commitments. Adam sometimes feels emotional distress when has to postpone academic tasks and is generally not happy about his delay.”

Example for Hedonistic Delay: “Professor Johnson assigns a class term paper that is due in two weeks. Alicia makes no plans to work on it, not because she is lazy or too busy with other courses or her job, but because she is in university mainly to have fun. She puts off all of her school work, because there is always more fun to be had first. When it comes to her school work, Alicia often pulls something together at the very last minute. It is never anywhere near the quality that it could be, but Alicia isn’t bothered by this.

Appendix B and C shows the initial items for the MMAP and DQ that were selected at the end of item creation stage. These items entered in the process of content analyses to be further tested and refined. The content analyses were utilised in multiple studies and presented in the next two chapters.

CHAPTER 7: CONTENT VALIDITY OF THE MMAP

Three studies using three distinct samples were conducted to evaluate the content validity and clarity of the MMAP. Since procrastination is a prevalent phenomenon among students, it can be argued that students have first-hand knowledge and experience on the topic of procrastination and procrastination problems. Therefore, in the first stage, the content validity and clarity of the MMAP were evaluated by a relatively large number of students who registered in a second- or third-year psychology course. Since evaluating content validity requires familiarity with psychology research as well as experience with or knowledge of typical tasks in the university, upper-level students were chosen to participate in the content validity study as opposed to first-year students. After analyzing the upper-level student data and applying the findings of the study, the refined content-validity package was presented to psychology researchers and counsellors to evaluate the content validity and clarity of the measure further. Finally, I conducted a series of interviews to carefully analyze how students process the content of items, instructions and formulate their answers based on various response options. In this stage, a cognitive interview using a think-aloud technique was used. The cognitive interviewing study was conducted in parallel with the above studies. The measure was refined based on all three sources of information.

Study 1: Evaluation of content validity of the MMAP by Students

The initial item pools generated in the previous stage were assessed for content validity where the items that did not represent the construct definition well or the ones that were not clear were identified. The non-representative and unclear items were deleted or modified before entering into the next stage of measurement development. The definitions prepared in the previous stage (see Chapter 6) were used as a base to evaluate an item's content.

Method

Sample and Procedure.

Two hundred and ninety-two participants were recruited from the population of Carleton University undergraduate students who had been in school for more than one year. Students were informed of the study through the Experiment Sign-up System of the Department of Psychology (SONA) at Carleton University. Participants were given the link to the survey web page.

All participants read the consent form at the beginning of the survey and were given an option to accept or decline participation. Those who agreed to participate were guided to subsequent sections where the expert questionnaire package was presented. Those who did not choose to receive credit were asked if they would like to enter their name in a draw for five prizes (including one \$100 gift card and four procrastination self-help books). All participants received further information about the study in the debriefing form at the end of the survey. The estimated time for the completion of this study was about 60 minutes. The median and mean completion time in the actual survey was 40 and 43 minutes respectively.

In the main part of the surveys, for each construct the definition and description of construct were presented. When the definitions were thought to be difficult and the construct consisted of multiple elements with conditional relations (e.g., anxious procrastination behaviour), the constructs and elements were further explained (see Appendix B). After presenting the definition and descriptions, participants were asked to evaluate the representativeness and clarity of items, as well as the adequacy of content domains. More specifically, they were asked “Please rate how well each item represents the construct as defined above.” and “Please rate each item’s clarity.” For the first question, participants could choose

one of the following options: “1. Slightly representative,” “2. Moderately representative,” or 3. Highly representative; for the second question, the following scale was used: “1 = Low,” “2 = Moderate,” and “3 = High”. If participants chose Option 1 for the above questions in the online version, they automatically received a question at the end of the scale. This question asked them to change the wording of the item to make it more clear and representative of the construct. At the end of each scale, participants were also asked to evaluate the adequacy of the content domain specific to the construct of interest. Participants were asked to take a moment to point out any aspects of the construct that might have been omitted in the definition and/or presented items. At the end of the survey, participants answered a short demographic questionnaire and receive a debriefing form (see Appendix B).

Measures

Multidimensional Measure of Procrastination (MMAP-Expert). The expert version of the MMAP included definitions of the target constructs and the items generated based on the definitions. Participants were asked to read each definition and evaluate the clarity and representativeness of items (see Appendix B).

Demographics Questionnaire. The questionnaire included information such as gender, date of birth, field of study, registration status, and language proficiency.

Results

Participants were asked to report the number of years they had completed of post-secondary education, rate their level of English reading comprehension and writing skills in English and report their main language. Table 7-1 presents the frequencies and percentages for the main categories in the education and language variables.

Table 7-1.

Frequencies and Percentages related to English Language Skills and Year of Education

	f	%	Valid %		f	%	Valid %
<u>Year-Education</u>				<u>Comprehension</u>			
Less than year	1	0.3	0.4	Intermediate	17	5.8	6.4
1 year	85	29.1	32.2	Advanced	74	25.3	28
2 years	89	30.5	33.7	Superior	46	15.8	17.4
3 years	45	15.4	17	Native	127	43.5	48.1
4 years	30	10.3	11.4	<i>Total</i>	264	90.4	100
5 years	7	2.4	2.7	<i>Missing</i>	28	9.6	
6 years or more	7	2.4	2.7	<i>Total</i>	292	100	
<i>Total</i>	264	90.4	100	<u>Writing</u>			
<i>Missing</i>	28	9.6		<i>Medium</i>	47	16.1	17.9
<i>Total</i>	292	100		<i>High</i>	107	36.6	40.7
<u>Language</u>				<i>Very High</i>	109	37.3	41.4
English	244	83.6	99.2	<i>Total</i>	263	90.1	100
French	2	0.7	0.8	<i>Missing</i>	29	9.9	
<i>Total</i>	246	84.2	100	<i>Total</i>	292	100	
<i>Missing</i>	46	15.8					
<i>Total</i>	292	100					

Before examining representativeness and clarity, two filter questions were defined based on the above data. For representativeness, only students with two or more years of university education were selected. For clarity, those with intermediate English comprehension were eliminated. The mean representativeness and clarity were calculated for each item (see Table 7-2) in the selected sample. The items with representativeness and/or clarity less than 2 (moderately) were considered problematic. These items were deleted unless the items' content was theoretically important and the low representativeness were due to the problem in the instructions or presentation of the definitions and item. However, these items were kept to be evaluated by the expert sample. Items with a mean clarity of less than 2 was modified based on students' feedback. For any items with a low score in representativeness and clarity, participants were asked to change the items to become representative. The proposed items were listed under

each problematic item. When the goal was to modify the problematic items and keep them for the next stage of content validity, proposed items were considered as potential substations.

Almost all items demonstrated a high level of clarity. However, there were several items that did not have high level of representativeness or relevance (see Table 7-2). Anxious procrastination items, with the exception of Items 7 and 12, had acceptable representativeness and clarity. The two Items 7 and 12 were the only anxious procrastination items that had reverse wording. It could be assumed that some participants did not count such positive wording items representative of procrastination construct. The items were kept to be evaluated further in the second study.

Table 7-2

Representativeness of Items based on Upper-level Undergraduate Students Rating

Item	Mean	SD									
PBS_A3	2.45	0.71	PBS_H10	1.77	0.74	PNC_O1	2.59	0.67	PNC_D3	2.49	0.68
PBS_A1	2.44	0.68	PBS_H12	1.71	0.78	PNC_O2	2.53	0.7	PNC_D13	2.49	0.7
PBS_A13	2.44	0.68	NES_i10	2.57	0.67	PNC_O21	2.51	0.74	PNC_D8	2.49	0.73
PBS_A6	2.41	0.76	NES_i14	2.43	0.72	PNC_O3	2.51	0.69	PNC_D2	2.46	0.68
PBS_A18	2.38	0.71	NES_i23	2.42	0.76	PNC_O12	2.5	0.68	PNC_D1	2.43	0.78
PBS_A15	2.37	0.68	NES_i16	2.41	0.78	PNC_O22	2.49	0.71	PNC_D11	2.36	0.8
PBS_A14	2.37	0.74	NES_i4	2.4	0.74	PNC_O16	2.46	0.69	PNC_D6	2.35	0.74
PBS_A2	2.35	0.72	NES_i1	2.4	0.74	PNC_O5	2.46	0.7	PNC_D7	1.93	0.84
PBS_A8	2.35	0.73	NES_i15	2.35	0.78	PNC_O13	2.44	0.75	PNC_D14	1.86	0.86
PBS_A4	2.34	0.76	NES_i6	2.34	0.74	PNC_O23	2.44	0.73	PDS_i5	2.6	0.65
PBS_A9	2.34	0.72	NES_i12	2.34	0.8	PNC_O17	2.43	0.73	PDS_i15	2.55	0.69
PBS_A11	2.34	0.74	NES_i11	2.32	0.82	PNC_O20	2.41	0.76	PDS_i2	2.53	0.68
PBS_A10	2.34	0.72	NES_i7	2.32	0.83	PNC_O19	2.36	0.79	PDS_i12	2.53	0.7
PBS_A17	2.27	0.79	NES_i3	2.23	0.84	PNC_O15	2.34	0.8	PDS_i10	2.53	0.67
PBS_A5	2.25	0.73	NES_i13	2.21	0.82	PNC_O18	2.32	0.78	PDS_i4	2.51	0.69
PBS_A16	2.24	0.77	NES_i25	2.21	0.82	PNC_O10	2.29	0.82	PDS_i3	2.51	0.69
PBS_A7	1.82	0.81	NES_i21	2.19	0.85	PNC_O4	2.27	0.79	PDS_i1	2.5	0.7
PBS_A12	1.65	0.79	NES_i26	2.16	0.86	PNC_O14	2.26	0.75	PDS_i16	2.49	0.72
PBS_H9	2.37	0.77	NES_i19	2.16	0.84	PNC_O6	2.24	0.8	PDS_i13	2.49	0.67
PBS_H7	2.33	0.82	NES_i22	2.13	0.85	PNC_O11	2.22	0.76	PDS_i11	2.49	0.67

Item	Mean	SD									
PBS_H11	2.22	0.83	NES_i2	2.08	0.86	PNC_O9	2.17	0.83	PDS_i9	2.49	0.7
PBS_H2	2.18	0.87	NES_i5	2.05	0.87	PNC_O8	2.17	0.86	PDS_i6	2.48	0.7
PBS_H6	2.11	0.89	NES_i20	2.03	0.89	PNC_O7	2.14	0.75	PDS_i19	2.47	0.73
PBS_H5	1.89	0.83	NES_i24	2.01	0.85	PNC_D10	2.57	0.71	PDS_i17	2.47	0.73
PBS_H8	1.89	0.81	NES_i9	1.67	0.8	PNC_D5	2.53	0.7	PDS_i18	2.47	0.7
PBS_H3	1.86	0.8	NES_i8	1.66	0.78	PNC_D12	2.53	0.68	PDS_i14	2.44	0.74
PBS_H1	1.86	0.82	NES_i18	1.61	0.8	PNC_D9	2.52	0.66	PDS_i7	2.4	0.72
PBS_H4	1.81	0.8	NES_i17	1.59	0.76	PNC_D4	2.51	0.66	PDS_i8	2.37	0.77

For hedonistic procrastination, only 5 out of 12 items had mean representativeness above a moderate level. Given the large number of non-representative items, the items were changed based on the recommendation of students and entered in the second stage of the content validity study. Moreover, four new items were added based on student feedback regarding representativeness and adequacy of the content domain (Items 13 to 16 in Table 7-3). The majority of the changes were to clarify choice of fun activity and the lack of commitment or intention to start an academic task on time.

Table 7-3

Change in Hedonistic Items with Low Representativeness Based on Student Feedbacks

Item	Initial	Modified
PBS_H1	I am neither interested in making a plan for working on writing assignments nor interested in starting them ahead of time.	I am neither interested in making a plan for working on writing assignments nor interested in starting them ahead of time because I would rather do more enjoyable things instead.
PBS_H3	When writing assignments are assigned, I don't give any thought to when I will start working on them.	When writing assignments are assigned, I don't give any thought to when I will start working on them because I am focused on more enjoyable activities.
PBS_H4	I don't really care about starting writing assignments on time, and I try to do them at last minute.	I don't really care about starting writing assignments on time, and I intentionally do the assignments at last minute.
PBS_H5	When I receive writing assignments, I don't make even a vague plan to start them ahead of time.	When I receive writing assignments, I don't make even a vague plan to start them ahead of time and would rather do fun leisure activities instead.
PBS_H8	When I receive a major writing assignment, I don't give it any thought at all, and I do it at the last minute.	When I receive a major writing assignment, I don't bother myself to think about it and instead concentrate on pleasurable activities.

Item	Initial	Modified
PBS_H10	10. When it comes to writing assignments, I personally don't intend to work too hard or to get started on time.	When it comes to writing assignments, I wilfully don't intend to work too hard or to get started on time.
PBS_H11	I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on this type of school tasks on time.	I naturally fill my time with a lot of fun and exciting activities as opposed to planning and working on school tasks on time.
PBS_H12	I do not really care if I get a bad grade due to working on a writing assignment at the last minute	I wilfully postpone starting my assignments due to my exciting social life, and do not care if I receive bad grades for them.
PBS_H13		I choose to do writing assignments at last minute so I leave more time for fun stuff instead.
PBS_H14		I am focused on fun and enjoyable stuff and do not bother myself with writing assignment until the last minute.
PBS_H15		I intentionally choose to do fun stuff instead of doing major writing assignment ahead of deadline.
PBS_H16		Having fun is my main priority, so I am not afraid to deliberately postpone doing my assignment until the last minute.

Out of 26 NES items, only 4 items had representativeness below 2. All four of these items were related to positive emotions. Low representativeness seemed to be due to a problem in the instructions and the presented definitions. The survey only provided a definition related to negative emotions; the definition of positive emotions was missing in the definition section. The four items were kept as the problem was related to instructions and presentation of items, not the items themselves. Many students indicated problems in Items “Whenever I am about to start writing assignments, I feel angry” and “Whenever I am about to start writing assignments, I feel guilty.” The items were considered for deletion, but still kept to be check in the next stage.

Among the PNCS items, only two items (items 7 and 14) related to dissatisfaction content domain had low representativeness. The wording and meaning of the items were contrary to the constructs (reversed items). I changed the wording to be in the same direction with the construct. Item 7, “In general, my needless delay of writing assignments does not affect my satisfaction with myself” was changed to “In general, my needless delay of writing assignments negatively affects my satisfaction with myself.” Item 14, “In general, my delay of writing assignments does not affect my satisfaction with my performance at school” was changed to “In general, my delay of writing assignments does negatively affect my satisfaction with my performance at school.” Students suggested a change to item 7 under negative outcome. Item 7 was changed from “My needless delay on major writing assignments has caused me to not be able to appropriately plan for pleasurable activities” to “My needless delay on major writing assignments does not allow me to appropriately plan for pleasurable activities.” A new item, “My needless delay on major writing assignments does not allow me to fully enjoy social activities” was added to the negative outcome section based on students’ feedback.

No potentially problematic items were identified for the Procrastination Duration Scale. Students did not mention any possible missing aspects of the construct that had not been include in presented items.

Overall students provided a unique and rich information regarding the representativeness of items based on the definition that were presented for each content domain. They also provided many good suggestions when the items did not have high content relevance. Students did not mention any possible missing aspects of the construct that had not been included in presented items, supporting the adequacy of content domain as I defined it. A couple of items were suggested and used to cover some content area with larger number of items (e.g., negative effect

of procrastination on social activities). With this complete, I then turned to evaluate and refine the new measures further based on experts' feedbacks and the result of cognitive interview study.

Study 2: Evaluation of content validity of the MMAP by Experts

The classical method of evaluating content validity requires the use of participants who have research experience in the area of interest. In the second study, researchers and graduate students who had studied procrastination were asked to review the definitions of the constructs and elements, as well as the initial item pools. Based on expert evaluation, missing content was evaluated and new items were added to capture it (DeVellis, 2003; Hinkin, 1998). Table 7-4 presents the definitions that were provided to experts so that they could evaluate the adequacy of content domains and representativeness of items. In addition to definitions and item wording, experts were asked to evaluate the clarity and appropriateness of response options, instructions, and format of the questionnaire.

Method

Sample and Procedure.

Nine researchers and graduate students who were in the field of personality psychology and were familiar with the procrastination research literature agreed to evaluate the content validity and clarity of the MMAP. The purpose, application, instructions, definitions, description of important words, and generated items of the newly developed questionnaire, the Multidimensional Measure of Academic Procrastination (MMAP), were presented online to eight experts; the paper-and-pencil version of the content validity package was presented to one expert.

Table 7-4

Definitions of the Constructs in Content Analysis Study 2

Definitions	
1	<i>Anxious Procrastination Behaviour or Irrational Delay</i> in an academic setting is a needless delay of an assigned task, despite the initial intention to start or finish it at some point in time. Procrastinating is a form of delaying on intended tasks where the delay is perceived as needless, irrational and/or unwanted.
2	<i>Hedonistic Delay</i> is a form of delaying assigned tasks where one volitionally (wilfully, intentionally) chooses to do fun, pleasurable, and/or exciting activities instead. In this type of delay, one does not perceive the assigned tasks as important or necessary in comparison to the other activities and does not form a clear initial intention to start or finish the assigned task on time.
3	<i>Negative Emotions</i> here refer to specific or general unpleasant feelings that arise from even thinking about initiating a task, initiating action on a task or from delaying the task. These feelings may arise at any time, including during delaying needlessly on a task and after finishing a task that has been delayed needlessly. Since it is possible that one experiences positive emotions (e.g., happiness and/or relief at having finished the task) in the above situations, items containing positive emotions are included to increase the face validity of this section.
4	<i>Undesired Outcomes</i> refer to the extent to which postponing intended tasks leads to psychological, social, or academic outcomes that are suboptimal or not as good as one would like.
5	<i>Dissatisfaction</i> refers to the extent to which one experiences a general feeling of being displeased or discontent about his or her needless delay on school related tasks and/or about the consequences of the needless delay. Another way to think of this is that the needless delay makes us unhappy.
6	<i>Duration</i> here is a defining facet of procrastination as a problem, and it refers to the period of time during which one habitually procrastinates on academic tasks and/or experiences negative emotions, negative consequences or some level of dissatisfaction related to his/her procrastinating behaviours. The purpose of measuring this construct is to understand whether procrastination is an acute or chronic problem in the person's life.

Since similar items are used for various academic tasks, only the set of items that referred to major writing assignments was presented to the experts in order to reduce the fatigue effect. The participants were asked to evaluate the appropriateness and clarity of instructions, representativeness and clarity of items, and adequacy of content domains. More specifically, experts were asked "Please rate how well each item represents the construct as defined above"

and “Please rate each item’s clarity.” For the first question, participants could choose one of the following options: 1 (*slightly representative*), 2 (*moderately representative*), or 3 (*Highly representative*). For the second question, the following scale was used: 1 (*Low*), 2 (*Moderate*), and 3 (*High*). If participants chose option 1 for the above questions in the online version, they automatically received a question at the end of the survey that asked them to change the wording of the item to make it more clear and representative of the construct. At the end of each scale, participants were asked to evaluate the adequacy of the content domain specific to the construct of interest. Participants were asked to take a moment to point out any aspects of the construct that might have been omitted in the definition and/or presented items. At the end of the survey, participants answered a short demographic questionnaire and received a debriefing form. The average time for the completion of this study was about 52 minutes.

Measures

Multidimensional Measure of Academic Procrastination. The expert version of the MMAP included definitions of the target constructs and the items generated based on these definitions. The expert version comprised all parts of the initial version of the MMAP, including items, responses, instructions, and descriptions of the words. In addition, as discussed above, several questions were added to evaluate the relevance, representativeness and clarity of the questionnaire material as well as the definitions of the scales and subscales. Participants were asked to read each definition and evaluate the clarity and representativeness of items. A sample of the expert package is presented in Appendix B.

Demographics Questionnaire. This questionnaire includes information such as gender, date of birth, area of expertise, experience in personality psychology, procrastination and measurement research.

Results

In the first stage, one native English expert with more than 15 years of research experience in the area of procrastination evaluated the representativeness and clarity of the measure, the online survey, and the expert package. Errors were identified and resolved and confusing items were clarified based on initial feedback and face-to-face discussion. The link for the online version of the expert package was then sent to new experts. Seven experts filled out the online survey, three males and four females. Two had a PhD, two were PhD students, three had an MA and one had a BA degree in psychology. All experts reported that were very or extremely familiar with procrastination research; three of them had more than 10 years of experience in procrastination research.

The experts' mean rating of the representativeness and clarity of each item was calculated. The mean representativeness of *irrational delay* items was above 2.00 (moderately representative), ranging from 2.43 ($SD = .79$) to 2.86 ($SD = 2.86$). Sixteen out of 18 items were strongly representative based on the experts' answers. The mean clarity ranged from 2.00 ($SD = .82$) to 2.71 ($SD = .49$). Eleven items had high clarity and seven items had moderate clarity. Items with moderate clarity were adjusted, substituted, or highlighted for elimination in the next stages. The following item was reported as missing content: "I delay on major writing assignments despite the fact that I know I will feel guilty about my delay later." This item was added in the first administration of the student version. Experts reported several minor errors in item wording; these recommendations were implemented when relevant. In terms of the definition of *irrational delay*, no missing aspects of the construct were reported.

Experts rated the representativeness of all 16 *hedonistic delay* items of the MMAP above 2.5, indicating strong representativeness. The clarity of 11 items was reported as high and five

items as moderate. Items with moderate clarity were noted for elimination or adjusted based on the recommendation of the experts. One of the experts recommended adding the following items: “I choose to do writing assignments at last minute without feeling guilty about it.” This item was added to the student version. One expert indicated that definitions should clarify time by including both “on time” and “ahead of time,” similar to the usage of both phrases in the items.

The mean ratings of the representativeness and clarity of *negative-emotion* items were very high, with the exception of two items that measured feeling sleepy. Two of the experts reported low representativeness for the items. Five experts reported strong representativeness. One expert did not evaluate the items. These items were kept because they theoretically belonged to the deactivating negative emotions, and there were not many other items measuring deactivating negative emotions.

Undesired-outcome items, with exception of two items, were reported to strongly represent the construct ($M > 2.5$). Two items that measure the negative effect of procrastination on close relationships had mean ratings of moderate representativeness. The items were “When I have delayed working on major writing assignments, it has led me to not be at my best in my personal relationships,” and “My needless delay on major writing assignments has had a negative impact on my relationships with significant others (e.g., family or partner).” The item “My delay on writing assignments has negatively affected my wellness to some extent” had moderate clarity. The word “wellness” was reported to be not common/appropriate. These items were highlighted for further investigation and adjustment in the next stage.

Among the *dissatisfaction* items, only three items had moderate clarity. All items had strong representativeness. The low-clarity items included “In general, my needless delay of writing assignments negatively affects my satisfaction with myself,” “I am not satisfied with

myself for continuing to procrastinate on major writing assignments particularly when my procrastination results in sub-standard work,” and “I feel blameworthy when I delay working on major assignments without a rational reason.” These items were modified or eliminated in the next stages.

All of the *duration* items had strong representativeness. With the exception of two items, all of the items had high clarity. The two items that had moderate clarity were “Now that I think about my past, I have habitually postponed working on writing assignments at the last minute since....,” and “Delay on school related tasks (e.g., writing assignments) has been part of who I am since.....”.

Overall, the experts provided content validity evidence suggesting that the items and overall scales adequately represented the constructs as defined. The experts also suggested several reasonable changes to item wording. Experts also confirmed the suitability of the instructions and chosen response options. This study (second content validity study) and the cognitive-interview study were conducted in parallel. The recommended changes from both studies were reviewed and implemented before the first administration of the new scales. In the next section, the cognitive interview study is discussed.

Study 3: Cognitive Interviewing

Cognitive interviewing is a powerful technique that can be utilized to refine a new measure during the measurement development process and/or to evaluate a refined measure before it is administered. The technique is used to find hidden sources of error or difficulty in the process of completing a survey, including problems in understanding the instructions, items, and response options, recalling the information, and formulating the answers (Willis, 1999; Willis,

Schechter, & Whitaker, 1999; DeMaio, & Rothgeb, 1996). The technique not only helps a researcher to find hidden sources of error or confusion, but also helps to find a solution based on participant feedback.

There are two types of cognitive interview, think-aloud and verbal probing method (Willis, 1999). The think-aloud method is easier and less structured in comparison with the probing method. In the think-aloud method, the interviewer simply asks an interviewee to think aloud while reading the items and choosing a response option. Both the participant's thoughts and relevant observed behaviours are recorded and analyzed to find the sources of problems and pattern of problematic response formation. In the think-aloud technique, the researcher should allow participants to talk freely about their thoughts. The only time the interviewer interferes is when a participant pauses or looks confused while reading an item or choosing options. The interviewer then reminds the interviewee to share his or her thoughts.

In cognitive interviews using the verbal probing method, the interviewer actively asks several questions to get information about any possible problems in various answering processes including comprehension of items, retrieval of information after reading the items, and the process of choosing response options (Willis, 1999). The interviewer also tries to find out how the interviewee judges and estimates the items based on retrieved information, and whether or not he or she interprets the question based on typical response biases such as social desirability. Table 7-5 presents advantages and disadvantages of these methods as well as example questions based on Willis (1999).

Table 7-5

Cognitive Interview Techniques

	Think-Aloud	Verbal Probing
Advantages	<ul style="list-style-type: none"> • Less interviewer-imposed bias • Requires less training for interviewer • Open-ended and less structured format 	<ul style="list-style-type: none"> • Avoids distraction from the objective • Requires less practice for the interviewee
Disadvantages	<ul style="list-style-type: none"> • Requires interviewee practice • Interviewee resistance • Burden on interviewee • Tendency to go off-track • Resulting in biased response formulation 	<ul style="list-style-type: none"> • The possible effect of interfering in answering process (artificiality of the probing process) • Potential for response bias via leading questions
Examples	<ul style="list-style-type: none"> - Please read each item and try to think aloud as you are reading and answering 	<ul style="list-style-type: none"> - How did you understand it? Please repeat the question in your own words. - What came to your mind as you were trying to answer this question? - How did you choose this option among other options?
Subtypes:		<p>Type of probes:</p> <ul style="list-style-type: none"> - Scripted: All questions are predetermined and used by all interviewers - Spontaneous: no fixed set of questions; developed during interview by each interviewer - Semi-scripted: using both scripted and spontaneous probes <p>Probing Approaches:</p> <ul style="list-style-type: none"> - concurrent (asking probing questions after answering each item) - retrospective (asking probing questions after answering all questions)

In this study, a combination of think-aloud and a semi-scripted verbal probing was used. Probing questions were presented after participants had answered each item (i.e., concurrently).

Method

Sample and Procedure.

Ten participants were recruited from the population of Carleton University undergraduate students. The students were informed of the study through electronic postings on the psychology department's SONA system. Volunteer students registered in one of the available time slots for an interview. In the interview session, participants received the consent form (see Appendix B). After signing the consent form, the interviewer used a cognitive interview protocol (see Appendix C) to study the participants' thought processes while they were answering the questionnaires (i.e., MMAP). All participants received further information about the study in the debriefing form at the end of the survey.

The maximum time for completing cognitive interviewing stage was 120 minutes. Interviewees received a 2% increase in their final grade for PSYC 1001, PSYC 1002, PSYC 2001 or PSYC 2002 for participating in this study. Ten participants were interviewed to evaluate the MMAP.

General and cognitive interview. The one-on-one interview was done in two parts. The main purpose of the first part was to evaluate whether interviewees procrastinate or engage in other forms of delay, and if so, to what extent they show dilatory behaviour in dealing with important school tasks. In this part, a combination of free and semi-structured interview techniques was used to get demographic information and general information about courses, tasks and assignments in recent and previous semesters. If interviewees did not mention their studying habits and the way they were dealing with school tasks in the free interview, I asked them how they dealt with various courses and tasks, whether or not they intended to do them ahead of time, how firmly they made their intentions, whether or not they followed their plan,

and so on. Right after each interview, the participant's level of procrastination or other form of delay was determined and recorded.

The second part of each interview session employed cognitive interviewing techniques. I used both concurrent (questioning during answering) and retrospective (questioning after answering) methods for different participants. During the first stage, I asked participants to read the items and answer based on their experience. A combination of think-aloud and verbal probing methods was used. Participants were asked to think aloud to the extent possible while reading the materials and/or choosing response options. If they did not provide sufficient information, or if they showed signs of resistance, difficulty, or confusion in following the think-aloud procedure, probing questions were presented. When they identified the comprehension of an item as problematic, participants were asked to paraphrase the item. Resistant participants were encouraged to provide any thoughts about the items and in some cases were reminded that criticising the items would not hurt my feelings or the research. Both observed problems (e.g., long pauses, signs of confusion and agitation) and problems directly stated by interviewees were noted.

Results

The results in this section are presented based on the content of interviews. Those interviews that provided meaningful and unique information for the development and revision of the items are presented first. Below I summarize the results of interviews 1, 2, 3, 4, 6, and 8, which produced all of the important insights and changes. Interviews 5, 7, 9, and 10 did not result in any additional important findings.

The first interviewee was a male student, a new immigrant, who reported having a busy schedule and being an over-achiever. Generally, he answered the questions based on future

behaviour and ideal behaviours. He used phrases such as “I should ...” and “I should not....” The interview started with a general discussion about his life in school.

The participant formulated his answers based on what he should do as opposed what he typically does. He had difficulty comprehending the following items: “I don’t like to postpone major writing assignments, but I end up working on them near the deadline without any rational reason” and “I am neither interested in making a plan for working on writing assignments nor interested in starting them ahead of time.” He considered the phrase “without a rational reason” very severe and strong. Despite not reporting needless delay, this participant reported moderate to high levels of negative emotions related to needless delay. The summary of results for this interview is presented in Table 7-6.

Table 7-6

The Result of the First Cognitive Interview

Original and Paraphrased Items	Note: Reaction/Observation/Solution
I am neither interested in making a plan for working on writing assignments nor interested in starting them ahead of time	Difficult to understand
I don't like to postpone major writing assignments, but I end up working on them near the deadline without any rational reason.	Difficult to understand
"without a rational reason"	Find it strong
When I needlessly delay working on major writing assignments, I overestimate the importance of other, less urgent activities that I do instead of working on the assignments.	Long pause Difficult to answer
[Even once I have started a major writing assignment, I repeatedly take breaks to do other things that end up taking longer than I planned.], [There is a needless delay between when I want to do major writing assignments and when I actually do them.], [When major writing assignments are assigned, I tell myself that I will not start them late, but I end up delaying them without really a good reason.], [I engage in unnecessary activities instead of working on major writing assignments despite the fact that I know I will feel dissatisfied about my delay later.], [I plan to work on major writing assignments ahead of time and follow my plans.]	Mismatch between response and the evaluation of procrastination in interview (i.e., high endorsement in survey but reporting low needless delay in interview)

The second interviewee was a male, second-year student with a history of depression who revealed that he engaged in moderate levels of needless delay. This interview result was consistent with his total score on the survey. The participant seemed very intelligent and was active in the cognitive interview process; he had a good understanding of the items and instructions. The participant's pattern of responses changed from low to moderate to higher levels of needless delay. Table 7-7 shows some of the key findings in the second interview.

Formulating responses to duration items, particularly those involving the duration of negative consequences of delay was difficult, if not impossible, using the available response categories.

The interviewee reported fluctuations in the negative consequences of delay in his life. His dilatory behaviour did not bother him in high school but did bother him in elementary school and in university.

Table 7-7

The result of the Second Cognitive Interview

Original and Paraphrased Items	Note: Reaction/Observation/Solution
I would rather do fun stuff instead of getting an early start on major writing assignments.	“Everybody does this” This preference can be seen in different types of delayers .
I postpone major writing assignments despite expecting to be worse off if I delay. Paraphrased: <i>Even though I know that I will be worse off if I delay, I postpone major writing assignments.</i>	Not clear but correctly paraphrased
I do not care about major writing assignments, <i>and I do not plan to do them ahead of time</i> when there are more fun activities	Long pause Difficult to comprehend; My decision: Eliminate the italicized part
I repeatedly put off starting major writing assignments to do something else that takes just a few minutes, wasting a lot of my time before I finally start doing them.	Found confusing; similar feedback from two experts
When I needlessly delay working on major term projects, significant others (e.g., parents, partner) complain about it.	“If they know. They often do not know”
I am not satisfied with myself because of my needless delay on major term projects.	Interviewee suggested: “I am critical of myself” instead of “I am not satisfied with myself”

Original and Paraphrased Items	Note: Reaction/Observation/Solution
I blame myself for the negative consequences of postponing major term projects on my performance as a student	Confusing
Paraphrased: <i>I guilt or blame myself for postponing major assignments.</i>	
My delay on major term projects has had a problematic effect on my relationship.	“Which relationship?” My solution: Change relationship to relationships
<i>I do not like myself</i> because of the negative consequences of postponing major term projects until the last minute.	Reaction to the italicized phrase; Found it very strong to say “I don’t like myself” Solution: Change to: I am down on myself..... I am critical of myself.....
Phrase “not enjoy my life” as a consequence of irrational delay	Found it very strong; Milder version for the interviewee: “not enjoy my time”

The third interviewee was a female, fourth-year student. In her interview, she stated that she procrastinates in all aspects of her life but is not bothered by some of the negative consequences of her behaviour. She had low grades but was relatively satisfied. Based on my evaluation, she engaged in high levels of hedonistic delay and low to moderate levels of needless delay. She had no specific intention to start tasks on time or ahead of time and no negative emotions such as guilt. However, despite reporting low negative emotions, the interviewee felt very motivated to change.

She had a very good understanding of the questions and was good at formulating the answers during the cognitive interview. The participant often used a general and perceived evaluation of her behaviour when answering the questions as opposed to recalling specific behaviour for specific tasks and differentiating between them when formulating her answers. No specific problem or unique reaction to items was seen.

The fourth interview was with a second-year male international student. The interview took 30 minutes. The participant reported a high frequency of delay. The explanation of his postponement in writing and studying for an exam had all defining elements of anxious procrastination. However, he reported that he did not “care” about assigned readings. He then stated, “I don’t intend to do assigned readings since they are not necessary.” When he was answering questions related to negative consequences, he was asked how his answer about reading tasks was different from his answer about writing tasks. He reported that he did not feel there was an association between keeping up with the assigned readings and a good grade; if reading tasks were important for his grades, his answers about reading tasks would be similar to his answers about writing tasks. This can potentially create a source of error because his answers were not related to a delay but rather to him thinking that the task was not important.

The interviewee had difficulties answering questions that contained the phrase “without a rational reason.” He perceived this phrase as having a strong and very negative connotation, so much so that his responses to the items seemed to reflect his reaction to this phrase rather than his dilatory behaviour. Interestingly, he did not have the same problem with items that included “needless delay” as opposed to “without a rational reason.” This perception of the phrase was observed in other participants as well.

The sixth interviewee was a female undergraduate student, 20 years of age. Based on her general interview, she had been suffering from severe and chronic procrastination, which had negatively affected her GPA. Her responses to the MMAP questions showed a similar level of procrastination problems as in the general interview. This participant experienced high level of negative emotions and was motivated to overcome her problem.

Several problematic phrases that had come up in the previous interviews emerged during this interview as well. For example, the interviewee could not formulate a unique response representing hedonistic delay to items such as “I would rather do fun stuff instead of getting an early start on major writing assignments.” As was demonstrated before, even those individuals who do not procrastinate endorsed this item. It appeared that after reading this item, the response to other items that included “fun stuff” was biased, even when those items explicitly addressed delay. Consequently, this item needed to be modified to include actions (delay) as a result of fun, instead of measuring preference for fun activities. Furthermore, it seemed that referring to having no specific plan, having weak intentions, and/or not caring worked better for capturing hedonistic delay and differentiating it from anxious procrastination.

Sentences that use negative words (adverbs, nouns or conjunctions) could potentially be undetected and become a source of error, even in a face-to-face administration of the measure. Most interviewees, including this one, seemed to find it more difficult to formulate answers for negative items. It was important to reduce such items and/or highlight the negative adverbs or nouns in the sentences. Based on the interview results, items such as “I am neither interested in making a plan for working on writing assignments nor interested in starting them ahead of time” needed to be simplified and or eliminated.

It is noteworthy that no interviewee reported both a high level of hedonistic delay and a low level of irrational delay. Those with a high level of irrational delay, such as the sixth interviewee, also reported a high level of delay for items that were supposed to measure hedonistic delay. The item, “I don’t intend to work on writing assignments, and I do other fun things instead” was endorsed highly by those who reported a high level of irrational delay. It appeared that intensifying “no intention” for example by adding the word “plan,” could provide a formulation of response that was closer to what the item aimed to measure: “I don’t intend or plan to work on major writing assignments, and I do other fun things instead.”

The eighth interviewee was a male. The general interview showed that he had a moderate level of procrastination on some tasks. This participant did not report procrastinating on studying for exams but did report procrastinating on writing lab reports. The result of his general interview matched his response to the MMAP. The participant disagreed with a majority of the hedonistic items. He was asked to paraphrase some of the items so that it reflects his experience. The items that he paraphrased become more representative of anxious procrastination. For this participant, the hedonistic items did not reflect his behavioural pattern (anxious procrastination) These results may support the differentiation between the hedonistic and anxious procrastination items.

Interviews 5, 7, 9 and 10 did not result in any additional or important findings over and above what was found in the above described interviews. There was agreement between what was found based on the general interviews and the MMAP results. In contrast to other interviewees, interviewees 9 and 10 were asked to answer the questionnaire first before the general and cognitive interviews were conducted in order to examine if the sequence of interviewing and testing sessions affected agreement between the results of the two parts. The

results of the interview and the MMAP sessions were very similar regardless of the order, however it seemed that more unique information regarding individual items and sections was produced when the students were interviewed first. Answering the whole measure first resulted in a clearer understanding of the test and the content of items, which in turn made it difficult to recognise and later recall the problems in items or differentiate between the items.

During cognitive interviews for a selected number of items in each section of the MMAP, I presented interviewees with the multiple response sets discussed in Chapter 6 (see Tables 6-3 and 6-4) in order to evaluate which response options would facilitate the formulation of answers and lead to appropriate responses. The results were very similar to the findings of the pilot study discussed in Chapter 6. For the duration scale (PDS), using various stages of the educational journey (e.g., elementary school, early high school, late high school) as labels for the response options facilitated recalling the onset of procrastination behaviour and problems.

For the Procrastination Behaviour Scale, Perceived Negative Consequences Scale and Negative Emotions Scale, response options denoting frequency and agreement worked better than response options denoting intensity and trait-like options. Interviewees also expressed that frequency and agreement response options felt more natural and easier to use. More specifically, frequency options felt more natural for behavioural items and agreement options felt more natural for negative emotions. Both frequency and agreement response options seemed to feel natural for items about perceived negative consequence.

When thinking aloud, interviewees very often expressed agreement with items even when frequency response options were required. However, when probing questions were used to explore how they arrived at a particular answer, most interviewees used frequency language (e.g., sometimes, often, always) to explain their behaviour. Moreover, using agreement options

seemed to result in less accurate formulation of responses. Instead of quantifying the actual level of procrastination behaviour or problems in recent semesters, some interviewees rated some of the items based on what they should do or whether they agreed with the content of the items in general. It seemed such errors in understanding the questions and in the formulation of answers were more likely with agreement response options. The degree/strength of agreement chosen by at least two interviewees appeared to be less in accordance with the level of procrastination identified in their general interview or obtained when they were directed in their cognitive interview to recall their procrastination in recent semesters. The students appeared to make their overall decision regarding whether they agreed or disagreed with items in a dichotomous manner. The strength of their agreement reflected their reactions to specific phrases in the items' content rather than the frequency or intensity of the overall content of items (i.e., procrastination behaviour or its negative consequence). These problems were reduced when frequency response options were used. Overall, participants responded better to frequency response options. As a result, I decided to use 7-point frequency response options as described in the previous chapter.

Discussion

The results showed that even participants who did not procrastinate tended to endorse elements of procrastination problems such as negative emotions. Participants answered these questions based on the possible reaction or consequences that they believed they would have if they procrastinated. Three strategies can be used to reduce these issues in the MMAP: adding a “not applicable” option, showing procrastination problem items only to participants who report moderate to high procrastination or delay (adapting testing), or eliminating cases who report low dilatory behaviour. The results also showed that items referring to negative emotions and negative outcomes worked best for participants who needlessly delay tasks.

The response categories in the duration items (i.e., Elementary School, Early High School, Late High School, Starting University, and More Recently) indicate the onset of the dilatory behaviour and its consequences. The response categories assume that participants experience no fluctuation after the onset of habitual needless delay. However, at least one interviewee reported fluctuation in the subjective experiences of the dilatory behaviour. It appears that the response categories measured the duration of procrastination behaviour more accurately than the duration of its emotional consequences. To measure the duration of procrastination's consequences more accurately, cases with fluctuation should ideally be identified. However, because the main objective of the duration scale is to measure the duration of procrastination behaviour, I chose not to include items and response categories measuring fluctuations in the subjective experiences of the behaviour in a few cases in this study. For the purpose of this measure—the application of the measure in intervention studies and counselling settings—what is important is the onset of behaviour and the negative subjective experiences of the delay at the present time. The latter concepts are captured by subscales that measure negative emotions, negative consequences, and dissatisfaction.

Differentiation between needless delay and hedonistic delay seemed small for some participants, particularly as self-reported in the interviews. Even an interviewee who reported no negative emotions such as anxiety and guilt when she procrastinated, rated both types of procrastination behaviour items high and expressed a willingness to change her behaviour. It could be argued that reporting low levels of negative emotions or dissatisfaction by those individuals is a form of defense mechanism. Future research may be needed to test this speculation.

None of the interviewees showed pure hedonistic procrastination based on their interviews or their MMAP results. In several interviews, respondents who clearly had high levels of anxious procrastination answered some of the hedonistic items high, and respondents who had moderate levels of anxious procrastination rated hedonistic items very low. If the items mentioned preference for or involvement in fun activities, participants were inclined to rate them high. If the concept of “no care” or “no intention” was emphasised, the interviewees endorsed the hedonistic item very low. Retaining items with all of these defining elements was important in order to cover conceptually and to measure a broad range of the latent trait hedonistic procrastination. Moreover, the fact that some interviewees rated both hedonistic and anxious procrastination highly supports the conceptualization of delay as a prototype that assumes dilatory behaviours are not mutually exclusive types of behaviour; a person may have more than one type of dilatory behaviour.

This study showed that using unimportant tasks in procrastination items can be a source of error in measuring procrastination in a group of participants whose academic work requires different topics, tasks, and assignments. Some students may assess the consequences of dilatory behaviour related to a specific task as low, not because they do not delay but because the task is not important. There are three solutions for this: 1) when the task-specific version of the MMAP is presented, researchers should choose only the tasks that are important for the majority of participants; 2) researchers should set up the selection of important tasks before administering the main questions of the MMAP; and 3) researchers should include questions that measure the importance of the tasks, and use the answers to eliminate cases for whom a particular task is not important. All three strategies were used in different stages of this study. Specifically, these

strategies were implemented in the development of the task-general version of the MMAP (see Chapter 11 and Appendix D).

Overall, the cognitive interviews helped to identify problematic items and phrases as well as find solutions for the highlighted problems. This was particularly informative when several interviewees had similar reactions to the same items or phrases. Cognitive interviews were also used to evaluate how participants may form their answers. The ways that participants processed the items, recalled information, and chose their responses were different from what I had expected. Even when items asked for a specific mental calculation (e.g., frequency of behaviour in recent semesters), some interviewees used an overall mental summation based on recent weeks to estimate their response instead of calculating the frequency during the specified period. Most interviewees built their responses based on a general perception of themselves and/or idiosyncratic understanding of the question. Very often participants seemed to build a general perception of the test based on the first few items and used a particular formulation for the first few items and then continued using the same formulation and process to answer the other items. Despite these inaccurate or unexpected methods of response formulation, the selected responses were interestingly stable and matched with the results of the general interviews where students were asked about their study habits and how they deal with school tasks.

It can be assumed that answering the questionnaire in front of the researcher and the process of thinking aloud and cognitive interviewing was not natural to students. Consequently, it is difficult to evaluate whether or not the information regarding the process of formulation is valid. Explaining the process of arriving at answers was also affected by interviewees' metacognitive abilities and imagery capabilities. Despite this limitation, information about the formulation of answers was useful in selecting response options. Both frequency and agreement

options seemed to facilitate the process of answering questions better than other types of response options (e.g., intensity). Frequency options seemed to result in less error in understanding the questions and formulating answers, therefore these options were used in the subsequent studies.

CHAPTER 8: CONTENT VALIDITY OF THE DQ

The process of content validity evaluation for the DQ was slightly different from the process used for the MMAP⁹. For the DQ, not only did upper-year undergraduate participants evaluate the initial vignette items, but they also were encouraged to identify any missing content and generate new vignette items based on their or their friends' stories. Moreover, participants provided additional information regarding each story including the level of endorsement and the relevance of stories to student populations. These topics are discussed in the Method section.

Method

Sample and Procedure

Three hundred participants (68% female; mean age=21.5, *SD*=4.75) were recruited from the population of Carleton University graduate and/or undergraduate students who had been in university for more than one year. Students were informed of the study through announcements made on the SONA system. Participants were given the link to a web page where they could complete the survey.

All participants saw the consent form at the beginning of the survey and were given the option to accept or decline participation. Those who agreed to participate were guided to subsequent sections, where the main questionnaire package was presented. Those who did not

⁹ Similar to the MMAP evaluation, four senior researchers with a graduate degree in psychology and familiarity with procrastination research evaluated the initial DQ in a separate study. However, only the results of the content validity study that used upper-year undergraduate students are presented in detail here, for several reasons. First, the initial DQ was significantly changed after analysing the student sample and implementing the stories they generated, whereas the content validity study with researchers was conducted before student version. Second, the expert evaluation did not suggest any major changes in the initial stories; the minor changes recommended by researchers were considered when selecting the initial DQ items at the end of the content-validity studies. Finally, the number of researcher participants was low.

receive credit were asked if they liked to enter their name in a draw for four procrastination help books. All participants received further information about the study in the debriefing form at the end of the survey. The mean time for the completion of this study was about 44 minutes.

The main survey (the main questionnaire package) consisted of three parts. In the first part of the survey, students were asked to read the descriptions (stories) of different forms of delay that students often report and then answer two questions about each story. In the first question, participants were asked report the extent to which the story described them. In the second question, students were asked to evaluate how the story was relevant to a student population. Participants were encouraged to answer all questions even if they seemed similar.

In the second part of the main survey, the four initial forms of delay and their related items were presented on separate pages. On each page and for each form of delay, students were asked to rate the extent to which the content of the story represented the definition and to report how clear and understandable the wording of the stories was. For the vignettes that were rated low in representativeness and/or clarity, students were automatically presented with a question at the end of the page asking them to change the wording to make the items more clear or representative of the construct. Finally, at the bottom of each page, participants were asked to point out any aspects of the construct that was missing in the definition and/or stories.

In the third part of the main survey, after evaluating the four forms of delay, students were asked to write an example of a typical delay story related to an important academic task or in an academic setting that was not covered well by the definitions or stories in the previous section. To encourage students to generate stories, it was indicated that the story does not need to be perfect in terms of writing; participants could sketch a story based on their experience at school or the experiences of people they know. The story could include the thoughts or emotions

of the main character before, during, and after postponing the task as well as how it affects her/his performance or satisfaction. The task of identifying missing or underrepresented content and generating new stories was asked at the end of survey when the participants had read the stories at least twice and rated the same stories at least four times and from different perspectives. It seems likely that students at the end of survey had enough information to identify missing content or themes that were not covered appropriately.

Measures. The following measures and questions were included in this study. The main questionnaire, the DQ, was presented at the beginning of the survey. In addition to the DQ, there were other self-reports that were developed to measure the dimensions underlying the DQ, but these eliminated from my PhD studies.

Demographics Questionnaire. The demographics questionnaire included information such as gender, date of birth, field of study, registration status, and language proficiency.

Delay Questionnaire (DQ-Expert). The DQ-Expert is a new measure that I created as a part of my doctoral studies. The DQ-Expert captures different prototypes of delay: procrastination, hedonistic delay, purposeful delay, and inevitable delay. The expert version of the DQ included definitions of the target constructs and the items generated based on these definitions. Participants were asked to read each definition and evaluate the clarity and representativeness of the items (see Appendix c). The DQ-Expert consisted of 30 stories, nine stories for procrastination, seven stories for hedonistic delay, six stories for purposeful delay, and eight stories for inevitable delay.

Results

The results of Study 4 are organised into two major sections. In the first section, the content of the initial DQ was evaluated based on multiple criteria: social relevance,

representativeness, and clarity. Based on the results of this part and participants' feedback, problematic items were deleted or modified. In the second section, new or complementary content domains (forms of delay) that were not covered sufficiently in the initial DQ were identified, student-generated stories were refined, and new stories were developed.

Evaluation of the Initial DQ Items.

Students rated the vignette items based on their experiences at school. Table 8-1 shows the percentage of participants who endorsed each story to a moderate (i.e., "moderately like me" to "almost 100% like me") level. The magnitude of endorsement was above 10% for all items, indicating that at least 10 percent of students felt that the stories were close to the way students generally acted in school. The highest level of endorsement was related to irrational delay items and the lowest level of endorsement was related to hedonistic delay. A majority of participants indicated that the stories were relevant to students based on their experience and knowledge. The percentage of non-relevance was below 10% for a majority of the stories with the exception of HDi5, HDi6, PDi1, and PDi6. The percentage of non-relevance for HDi5, HDi6, PDi1, and PDi6 was between 13% and 19%. The main content validity indices, representativeness and clarity, were above a moderate level for all items and above 2.5 out of 3 for a majority of the stories.

Table 8-1

Content Validity Analysis of the Initial DQ items.

Delay	Endorsement				Relevance		Representativeness		Clarity	
	f	%	M	SD	F	%	M	SD	M	SD
IrDi1	119	58.9	3.92	1.77	173	86.9	2.45	0.655	2.6	0.551
IrDi2	114	57.0	4.06	1.857	166	84.3	2.71	0.563	2.76	0.487
IrDi3	91	46.0	3.54	1.911	155	80.3	2.57	0.58	2.69	0.487
IrDi4	79	40.3	3.17	1.806	125	67.6	2.31	0.638	2.53	0.559
IrDi5	64	32.8	2.93	1.654	120	65.6	2.5	0.634	2.58	0.525
IrDi6	81	41.8	3.39	1.858	146	76.4	2.63	0.572	2.68	0.5
IrDi7	73	38.0	3.14	1.828	110	59.5	2	0.753	2.56	0.573
IrDi8	61	31.6	2.99	1.865	133	70.4	2.67	0.542	2.69	0.515
IrDi9	74	38.1	3.26	1.96	135	73.8	2.58	0.619	2.68	0.51
HDi1	30	14.9	2.12	1.333	112	56.3	2.71	0.536	2.84	0.37
HDi2	38	19.0	2.25	1.438	114	58.8	2.44	0.6	2.64	0.532
HDi3	39	19.7	2.26	1.498	122	64.9	2.61	0.558	2.72	0.459
HDi4	21	10.7	1.85	1.219	89	48.6	2.65	0.584	2.79	0.43
HDi5	23	11.7	1.76	1.256	79	45.4	2.61	0.592	2.70	0.483
HDi6	11	5.7	1.54	0.945	76	42.7	2.68	0.539	2.79	0.459
HDi7	20	10.3	1.87	1.325	99	54.4	2.59	0.588	2.72	0.461
PDi1	27	13.4	1.85	1.345	78	43.1	2.69	0.55	2.83	0.39
PDi2	29	14.6	1.88	1.393	74	40.9	2.72	0.529	2.79	0.42
PDi3	40	20.3	2.30	1.49	89	49.4	2.66	0.542	2.82	0.382
PDi4	49	25.1	2.52	1.745	121	63.7	2.63	0.561	2.75	0.435
PDi5	74	37.8	3.07	1.681	118	62.4	2.2	0.718	2.64	0.511
PDi6	70	36.1	2.99	1.715	105	56.1	2.24	0.698	2.59	0.543

Delay	Endorsement				Relevance		Representativeness		Clarity	
	f	%	M	SD	F	%	M	SD	M	SD
InDi1	75	37.3	3.10	1.563	143	73.7	2.41	0.642	2.64	0.549
InDi2	100	50.5	3.66	1.823	148	77.9	2.72	0.482	2.83	0.377
InDi3	51	26.0	2.47	1.647	101	55.2	2.73	0.527	2.78	0.429
InDi4	64	32.8	2.94	1.582	127	68.6	2.51	0.609	2.75	0.456
InDi5	47	24.1	2.59	1.555	106	57.9	2.58	0.57	2.72	0.472
InDi6	72	37.1	3.08	1.68	128	69.6	2.63	0.578	2.7	0.531
InDi7	29	15.0	2.05	1.482	70	40.0	2.7	0.556	2.82	0.409
InDi8	47	24.1	2.65	1.613	121	65.8	2.49	0.61	2.69	0.494

Note. IrDi = Initial Irrational Delay Item; HDi = Initial Hedonistic Delay Item; PDi = Initial Purposeful Delay Item; InDi = Initial Inevitable Delay Item

Based on the representativeness and clarity results, retaining all items was justifiable. However, items such as HDi5, HDi6, PDi1, and PDi6 had lower scores on multiple indices and could be deleted or modified. The general strategy was to retain items in the initial stages of measurement development, particularly because the number of items under purposeful and hedonistic delay was lower than the number in other categories. Moreover, the items had high levels of representativeness and clarity based on both the student and researcher samples. Items IrD7 had the lowest representative score in comparison to other irrational delay items. Items InDi1 and InDi4 had low representativeness among inevitable delay items. Item IrD7 from the irrational delay category were deleted to reduce the number of items. Given the repetition of its content, InDi4 from the inevitable delay category was deleted. The elimination of IrDi7 and InDi4 was acceptable because there were many good items with similar content in these categories.

Students and researchers who rated item representativeness as low suggested some modifications. The modifications for HDi2, HDi4, HDi5, and HDi6 were implemented (see Table 8-2 below). The changes were accepted because of lower scores on several indices presented in Table 8-1 above. Moreover, a minor change was implemented in IrD3 and IrD8 based on researcher feedback.

Table 8-2

Modification of Initial Vignettes based on Experts Feedback

Item Code	Initial Story	Proposed Change
HD4	Eric doesn't give any thought to when he will start working on his school tasks. He admits that he often doesn't care to keep up with the weekly readings and/or assignments for his courses. Others (e.g., parents, professors) sometimes criticize Eric for delaying his school work. This doesn't really bother him, he would just rather put his time and energy into other things he's more interested in.	Eric doesn't worry about when he will start working on his school tasks. He tells his friends that he doesn't care to keep up with the weekly readings and/or assignments for his courses. Others (e.g., parents, professors) sometimes criticize Eric for delaying his school work. This doesn't bother him too much, he would just rather put his time and energy into other things he's more interested in.
HD5	Krista often doesn't have any intention of following the timelines that professors set for getting school work done. She tends to do what interests her first and do school work at the last minute, without feeling bad about it.	Krista often doesn't have any intention of creating a plan to work on school tasks ahead of time or of following the timelines that her professors recommend. She tends to do what interests her first and do school work at the last minute, without feeling bad about it.
HD2	Colin admits that he's kind of lazy when it comes to doing school work. He often doesn't have any intention or desire to start a school task on time. He enjoys having time to relax and doesn't see the point of pushing himself to get an early start on studying and assignments.	Colin says that he doesn't care about school work as much as the more enjoyable aspects of campus life. He often doesn't have any intention or desire to start school tasks on time. Colin enjoys having time to relax and doesn't see the point of pushing himself to get an early start on studying and assignments.
HD6	Professor Johnson assigns a class term paper that is due in two weeks. Alicia makes no plans to work on it, not because she is lazy or too busy with other courses or her job, but because she is in university mainly to have fun. She puts off all of her school work, because there is always more fun to be had first. When it comes to her school work, Alicia often pulls something together at the very last minute. It is never anywhere near the quality that it could be, but Alicia isn't bothered by this.	Professor Johnson assigns a class term paper that is due in two weeks. Alicia makes no plans to work on it, not because she is too busy with other courses or her job, but because she is always invited to different parties and going out with her friends. When it comes to her school work, Alicia often pulls something together at the very last minute. It may not be near the quality that it could be, but Alicia isn't bothered by this.

New Content Domain and Items.

In the final part of the content validity study, after answering all questions related to the initial 30 stories, students provided 140 stories and/or content domains that were not covered sufficiently. The stories were based on their own experiences or other students' experiences. To select new content domains and items, I began by reading the stories and recording the main and specific themes for each story. Each story was allowed to have several themes (e.g., panic attack, unmotivated, emotional instability). Next, I re-read the themes and stories and grouped similar themes into higher level themes or categories (e.g., Mental and/or Emotional Problem for depression, panic attack, grief). I expected the higher-order categories to represent the psychological or situational processes underlying the dilatory behaviour or problem explained in the stories. Several stories implied more than one major category or process. The newly extracted themes included task-aversiveness, lack of skills, no-delay, drugs/alcohol, medication side-effects, strategic delay, accidental delay, forgetfulness, grief and loss, depression, panic attack, traffic and/or bad weather, busy schedule, unmotivated, time-management, self-handicapping, being a "pleaser," perfectionist/perfectionism, and getting information. The new higher-order categories included task-aversiveness, strategic delay, temporary emotional problems, mental illness, temporary/externally-caused delay, and other specific delays.

The overall categories and their respective stories were compared with the initial forms of delay used in stage one in order to select the final set of themes and stories. Some of the major themes could be positioned under the initial forms of delay such as irrational delay or anxious procrastination. More specifically, several student-generated stories emphasized the role of task aversiveness, which could be grouped under anxious procrastination based on previous research (e.g., Solomon & Rothblum, 1984). Similarly, "no-delay" was another major theme that could be considered the opposite of anxious procrastination. However, since these themes were identified

by several students as missing or underrepresented content, it was important to include stories with a focus on task aversiveness and no-delay in addition to existing anxious procrastination stories. The main strategy was to not eliminate or merge a theme with initial categories based on the conceptual, theoretical and previous empirical evidence at this stage, but rather to empirically test the overlap and implement elimination in the next stages, the exploratory and confirmatory factor analysis. That is, newly extracted themes were combined during this stage, but newly generated themes and stories were not combined with pre-existing themes. The goal of this strategy was to give more value to students' qualitative feedback (new stories and themes) obtained in the second stage of the content-validity study.

The idea of strategic delay was repeated several times. Based on this form of delay, the person does not systematically delay or the person may intentionally and purposefully postpone some tasks in favor of other tasks to optimize his or her schedule. This type of delay was part of the initial definition of purposeful delay, however student feedback implied the need to divide purposeful delay into two separate themes: purposeful delay for the excitement of doing tasks at the last minute, and strategic delay in order to optimize one's schedule. Regardless of how we label these types of delay, it was important to include specific stories for both types. For the sake of convenience, the first type was named purposeful-arousal delay and the second type was named purposeful-strategic delay. The final decision on whether or not to separate these two subtypes was made based on the result of factor analyses.

Not all proposed stories and themes were relevant to the objective of developing the DQ. The main theoretical goal was to develop a set of enduring prototypes of delay that can be explained by psychological and contextual dimensions. That is, the goal was to find forms of delay that defined patterns of dilatory behaviours with specific psychological and emotional components that last at least for one semester. Some of the stories and themes illustrated a temporary form of delay. Accidental postponement and temporary delay were not important for this project and, therefore, were ignored. The only temporary form of delay that had a practical use for the study was delaying due to grief or loss. This problem can potentially cause acute emotional problems (e.g., depression, lack of motivation) similar to the ones related to mental illness and may last for several months. In fact, it was important to include these forms of delay for their function as potential screening variables. In order to study forms of delay with important and enduring psychological and contextual components, it was important to differentiate delay with emotional consequences from delay that is a direct manifestation of psychological problems.

Based on the above considerations and rationale, the final set of categories (i.e., higher order themes) was selected. The categories were: anxious procrastination (classical definition of procrastination, irrational delay); hedonistic delay; purposeful-strategic delay (including no-delay); purposeful-arousal delay (sensation- and excitement seeking); task-aversiveness; delay due to mental illness (DMI); and delay due to loss (DL).

Stories were read again and were organised under each category. Under each category, the stories were rated and sorted based on the coherence and clarity with which they represented a particular form of delay. In some cases, generated stories or story sketches were merged to produce a more comprehensive story. If a story had irrelevant information, the information was highlighted for deletion. It should be noted that many of the student-generated stories fell under the initial forms of delay (i.e., coded as irrational delay, hedonistic delay, or inevitable delay). From the 140 student-generated stories (full or sketch stories), 47 stories pertained to irrational delay, 10 to hedonistic delay, and 40 to inevitable delay. These stories and their specific themes were inspected to ensure that they did not have any additional content that was not covered by the initial stories. Some stories pertained to more than one form of delay. These stories were rated very low and were candidates for elimination unless they covered a unique content domain that was not covered by other stories. The final selection of new stories was based on my analysis and rating of the stories explained above and feedback from a leading procrastination researcher on the stories under new categories. The stories were checked and edited for clarity. Table 8-3 presents the final selection of new stories and their respective categories.

Table 8-3

The Final Selection of Student-Generated Stories

New Stories	Form
<p>Jessica always plans to do her assignments ahead of the deadline. However, she procrastinates on tasks or assignments that she has no interest in or finds them too vague. For example, this semester she is enrolled in a compulsory class that she has no interest in. She has postponed taking this course but now needs it to graduate. She finds the teacher and the material dull and has no motivation to complete any of the assignments. She puts off her work until right before the deadline and then rushes to complete the assignment. This course has caused her a great deal of stress and she wants it to be over as soon as possible.</p>	TA
<p>Katie intends to work on her assignment before the deadline. However she is not able to divide her time optimally among various tasks. When she has multiple tasks to complete, she often spends all of her time on the tasks that she is interested in and is unmotivated to work on the other tasks. She finds herself rushing to finish the uninteresting tasks before the deadline. As a result, she experiences a lot of stress when doing those tasks and she is not satisfied with her quality of work or her time management.</p>	TA
<p>Jo knows she has a large assignment due. She tells herself she will start ahead of time and finish the assignment with time to spare. However, every time she goes to work on the assignment, she feels unmotivated. Working on assignments is not fun and feels very isolating. The work is stressful and difficult, even tedious at times. Jo postpones writing her assignment because it is something unpleasant she rather not go through. Eventually, time runs out and she accepts that the assignment must be done. She hastily works on it and ends up causing herself extra stress and misery. She knows the assignment wouldn't have been so bad had she started sooner and vows to never work like this again, even though she knows that's not true.</p>	TA
<p>Claire always makes plans and is good at prioritizing various tasks. Even though she is very busy and has a full schedule of activities, she always manages to get things done. This semester, she has 4 midterms and a lab report due all in one week as well as her usual part-time job and other commitments. She chose some tasks to begin working on early while leaving the rest to start right before the deadline. This sometimes causes her some stress but she generally manages to follow her initial plan and complete all of her assignments on time.</p>	PD-S

New Stories	Form
<p>Paige most often will start her assignments well before the dead line because she does not do well under stress. She always leaves plans for extra time before the deadline just in case she needs to fix something in a paper, etc. However, sometimes it is hard for Paige to start her assignments right away or get them done quickly, although she gets them done on time. Paige is very busy. She attends dance class three nights a week and is a full-time student. Also, she tries to make time for her family as well. Paige sometimes feels overwhelmed with her activities, but always manages to make time for everything and gets everything done on time.</p>	PD-S
<p>James has a midterm exam and an assignment due in 2 weeks. He knows that he needs to do the work to pass the course but he has a difficult time to focusing on his work due to his mental health condition. He has suffered from this condition for some time. This has affected his performance in school and often led him to delay his work. James generally does not postpone his tasks when the symptoms of his mental illness are under control.</p>	MI
<p>Kevin was generally able to focus on his school tasks and complete his work in a timely fashion. However, at this point of his life, Kevin is feeling sad and depressed and feels he may need help to overcome his depression and other negative emotions. Due to his emotions he is having trouble staying focused on the tasks at hand for school, and finds it hard to get motivation to work on assignments. He knows that putting off his school work will hurt his grades, but he has difficulty to bring himself to get any work done.</p>	MI
<p>Marta usually plans to work on her school tasks ahead of time and is able to accomplish most of her tasks on time, according to her plan. However, recently she suffered a loss of someone very close and has a hard time concentrating on anything. She is grieving and therefore cannot focus on her school work. She knows that the delay will likely have a negative effect on her academic performance, considering she will need to catch up on a lot of stuff.</p>	DL
<p>Kevin knows that he needs to attend his classes and start working of his assignments but he prefers going out and having fun. Kevin is pretty popular and gets many invitations to parties. He stays out late with his friends having fun rather than attending his 8:30 a.m. class or starting his assignments. This lifestyle has affected his grades but this does not change his tendency to put pleasure before work.</p>	HD

Note. TA = Task Aversiveness; PD-S = Purposeful/strategic delay; MI = Delay due to mental illness; DL = Delay due to loss

Conclusion

In sum, students not only endorsed many of the initial vignettes and definitions in the DQ, but also generated stories that captured the constructs that were defined in the first stage. These findings supported the credibility of the method that used initial construct and item development to generate “relevant” or “authentic” vignettes for the student population. However, the study revealed that there was some missing or not-sufficiently-covered content in the first version of the DQ. Students provided new stories with content distinctively different from the initial forms of delay (e.g., delay due to mental illness) and content with a specific focus on a conceptual theme that theoretically overlapped with initial forms of delay (e.g., task aversiveness and no-delay overlapped conceptually with anxious procrastination). It appears that both methods of item generation were complementary and able to capture forms of delay that are theoretically and clinically justifiable given our expert knowledge of the population. However, the structure of the measure and the validity of the final products needed to be tested empirically.

The second version of the DQ had 37 items and consisted of the final stories in the first stage of the content validity studies (i.e., the initial stories after modification and elimination based on student feedback) and the selection of student-generated stories. This version was entered in the exploratory factor analysis and statistical refinement process (e.g., IRT, Reliability analysis) presented in Chapter 10.

CHAPTER 9: EXPLORATORY ANALYSIS OF THE MMAP'S STRUCTURE

The MMAP was administered to a sample of undergraduate students using an online survey (Study 6). The main purpose of this study was to explore the dimensionality of the MMAP's scales, refine the measures, reduce the number of items, check item functioning in measuring the constructs of interest, eliminate possible measurement bias, and check the reliability of items, subscales, and total scores. There were many methods and strategies to perform each of these objectives. I present a detailed description of the techniques below.

Method

Participants and Procedures.

The participants were recruited from the population of Carleton University undergraduate students. Students were informed of the study through electronic postings on the psychology department's SONA system. The initial sample consisted of 1417 participants. After cleaning data from duplicate cases, cases with overt bias, and cases with more than 25% missing values on the new measures, the total number of cases with valid responses was 994 (see data cleaning section for details).

Once registered, all participants were directed to the consent form (see Appendix D) at the beginning of the survey. At the end of the consent page, participants were given an option to accept or decline participation. Those who agreed to participate were presented with the measures one by one. Before receiving the debriefing form, participants were asked if they were interested in receiving a course credit or entering a draw with the opportunity to win a \$100 gift card from Amazon.ca or Amazon.com or one of four procrastination self-help books (i.e., The

Procrastinator's Digest: A Concise Guide to Solving the Procrastination Puzzle). The actual average and median time for completing this stage was about 54 and 44 minutes respectively.

To reduce the fatigue effect, at the beginning and in the middle of the survey, participants were encouraged to take as many breaks as they need during the testing session. In the middle of the survey, participants received a message that reminded them of the possibility of taking short breaks or saving their incomplete survey and return to the survey after a longer break. Since the main purpose of these studies was to explore the structure of the new scales, all of the new scales were presented at the beginning of the survey. At least two reminder emails was used to encourage participants who had registered for the study but who had not started or completed the survey. The data collection took the entire semester to assure the representativeness of sample across the term (non-procrastinators and procrastinators).

Measures

Demographics Questionnaire. The questionnaire included information such as gender, date of birth, ethnicity, country of origin, first language, field of study, year of study, and GPA.

Multidimensional Measure of Academic Procrastination (MMA-P-General). This was the new set of measures that I created for my doctoral dissertation research. It captures procrastination behaviour and components of problematic procrastination in relation to academic tasks. In the general version, the phrase "academic tasks" is used in the wording of the items. That is, the type of task is not specified in the wording of the items. The MMA-P consists of four main scales, including the Procrastination Behaviour Scale (PBS; 35 items), the Perceived Negative Consequences Scale (PNCS; 40 items), the Negative Emotions Scale (NES; 18 items), and the Procrastination Duration Scale (PDS; 19 items). In addition to the items of the main four sections, two peripheral sets of questions (Task Priming and Task Reflection) can be used before

and after the administration of the MMAP main scale(s). The peripheral questions are used to provide task-specific scores.

Social Desirability. The Marlowe-Crowne Social Desirability Scale (MCSD; Crowne & Marlowe, 1960) is used to measure the degree to which participants tend to give socially desirable responses. The MCSD consists of 33 items in true-false response format. The items are presented in Appendix G. In addition to the overall MCSD score, I calculated two subscales measuring the sum of positively keyed items (MC-Pos) and negatively keyed items (MC-Neg) based on the recommendation of Strahan (2007). This may control problems associated with item keying direction in the MCSD and provide a different pattern of correlations between social desirability and the procrastination measures employed (see Appendix B).

Big Five Personality Traits. Neuroticism, Conscientiousness, Extraversion, Agreeableness and Openness was measured by the Big Five Personality Inventory (BFI; John & Srivastava, 1999; John, Donahue & Kentle, 1991, as cited in John, Naumann, & Soto, 2008). The BFI consists of 44 items and employs a 5-point Likert scale scored from 1 (“disagree strongly”) to 5 (“agree strongly”). Items can be found in Appendix G. The BFI has demonstrated an adequate level of internal consistency as well as convergent and divergent validity (John, Naumann, & Soto, 2008).

Activities Questionnaires. This short questionnaire measures whether or not participants read an instruction that is presented before a list of regular activities such as watching movies or cooking (Ariely, 2010). It uses a multiple-choice format.

Survey Reader Questionnaire (SRQ). This was a set of items that I created for my doctoral dissertation research. It consists of 17 single-choice items that measure whether the

participants read the items throughout the survey. These items direct participants to choose a particular answer, skip answering a question, or ask them about the frequency of or general attitude towards particular activities. Only a subset of the SRQ items was used in my research. The items were spread throughout the online survey package.

Analyses

Exploring Strategies for Factor Analyses. One important stage of measurement development is exploring the structure of measures and refining them accordingly. The MMAP has some specific features and format that affected the factor analysis method chosen. The MMAP is a task-specific measure, repeating similar items under three major academic tasks (i.e., Writing Projects, Reading Assignments, Exam Preparation). Conducting exploratory factor analysis on the items related to all three tasks simultaneously seems to be the first choice. However this strategy is not methodologically plausible, as this approach may lead the effect of type of task to overshadow the extraction of the theoretically defined latent traits. More specifically, EFA in essence searches blindly for shared variance between items that can be assumed to be due to an unobserved latent trait (factor). If we include items from three different academic tasks in the EFA procedure, each of the three types of task could potentially be identified as a latent factor that explains shared variance (similarity). Similarly, performing EFA on three tasks separately may complicate the analysis. Even if we expect that the overall structures found through EFA on three tasks would be the same, small differences in pairwise correlations may lead to having different sets of items under the extracted factors, making final decisions regarding item selection problematic. To resolve this problem, a version of the MMAP for overall academic tasks was developed for use in the EFA. The task-specific version was used

for the confirmatory stage of data collection, when testing the structure in three confirmatory models was possible.

Another feature of the MMAP and DQ was related to the format of response options. Both MMAP and DQ consist of polytomous items where a 7-point ordered categorical Likert scale was used. The standard and widely used strategy in both exploratory and confirmatory factor analysis is to use Pearson product-correlation or covariance. In this method, items with Likert response options are treated as continuous variables as opposed to ordered categorical variables. In fact, popular statistical software packages such as SPSS use this method to perform factor analysis (Flora, LaBrish, & Chalmers, 2012). The application of this method for Likert responses has been criticized recently by a number of researchers (Flora et al., 2012; Reise, Moore, & Haviland, 2010; Wirth & Edwards, 2007) as it can potentially violate distributional assumptions and result in biased estimations (Wirth & Edwards, 2007) and produce spurious factors (Bock, Gibbons, & Muraki, 1988).

There are three strategies and methods to factor analyze a multidimensional measure with polytomous items. The first strategy is to use a polychoric correlation matrix as data input to find latent factors that explain pairwise correlations. This strategy leads to a more stable result when the sample size is large and there are not many items with positive skew (Flora et al., 2012). However, the calculation of a polychoric correlations may become unstable and impossible depending on the magnitude of the pairwise associations and when there are large numbers of items. Another strategy, used mainly in CFA on polytomous data, is to use limited information factor analysis that uses some adjustment in the estimation process. These adjustments include methods such as weighted least squares (WLS) or robust WLS (Flora & Curran, 2004; Muthen, 1984; Muthen & Muthen, 2015). This method may resolve the problem

of model fit but may result in underestimation of factor loadings and overestimation of number of factors, particularly in the case of small Likert scales (Bock et al., 1988).

All of the above strategies are considered limited-information factor analysis since they only use correlations or covariance among items and ignore all other information in the raw dataset such as item characteristics. The more complex strategy is to use a full-information factor analysis, which initially was developed for analyzing items with dichotomous responses (Bock & Aitkin, 1981; Bock et al., 1988) and later was extended for use with polytomous item responses (Muraki & Carlson, 1995).

As it appears from its name, the full-information method uses all information in the dataset to explore or evaluate the factor structure and provide more detailed information on the psychometric function of the items and on the measure as a whole. Full-information factor analysis in essence should be considered as synonymous with, or as one of the techniques under, Multidimensional Item Response Theory (MIRT) where the interactions of items and multiple person characteristics are considered in developing and testing a measurement model. The difference between full-information factor analysis and MIRT on graded response data is often related to how a researcher presents the result of analysis. The results of the same analysis can be presented using the language of either factor analysis (factor loading, commonalities, eigenvalues) or Item Response Theory (item characteristics and fit, information curves). The MIRT or full-information factor analysis is a non-linear extensions of factor analysis method that uses a complex procedure to estimate model parameters and therefore requires large sample sizes.

Another consideration is the presence of multivariate outliers and particularly influential outliers. After assuring that outliers are not related to researcher or participant error, one needs to

deal with this issue in factor analysis. The standard practice is to eliminate influential outliers before conducting any method of factor analysis. Many researchers and methodologists criticize the practice of eliminating cases when the magnitude of items falls within the normal range (e.g., Bollen & Arminger, 1991; Pek & MacCallum, 2011; Yuan & Zhong, 2008). This is common when the analysis is at the item level. Flora and colleagues (2012) argue that eliminating cases with influential outliers may negatively affect the accuracy of parameters and model fit estimations and enhance the occurrence of spurious factors. They recommend the use of a robust procedure, such as case-robust methods (Yuan & Bentler, 1998) or minimum covariance determinant (MCD; Pison, Rousseeuw, Filzmoser, & Croux, 2003) estimator that reduce the effect of outliers.

It can be argued that there is no perfect statistical method to factor analyze data or that there is always some level of departure from assumptions. This is an inherent part of factor analysis or any other analysis that try to model reality. By definition, models are efforts to provide an acceptable representation of reality not equate perfectly with reality. Flora and colleagues (2012) explain this issue and provide a recommendation based on the latest developments in this methodological field. They write:

“...researchers should strive to find models that have an approximate fit to data such that the inevitable assumption violations are trivial, but the models can still provide useful results that help answer important substantive research questions (see MacCallum, 2003, and Rodgers, 2010, for discussions of this principle). We recommend extensive use of *sensitivity analyses* and *cross-validation* to aid in this endeavor. For example, researchers should compare results obtained from the same data using different estimation procedures, such as comparing traditional ULS or ML estimation with robust

procedures with continuous variables or comparing full-information factor analysis results with limited-information results with item-level variables. . . . Because different modeling procedures place different demands on data, comparing results obtained with different methods and samples can help researchers gain a fuller, richer understanding of the usefulness of their statistical models given the natural complexity of real data.

In line with the above recommendation and based on the features of the data in this study, I used two limited-information factor analysis strategies as well as full-information factor analysis. More specifically, I used ULS and ML factor analysis on polychoric correlations of the dataset after eliminating cases with influential multivariate outliers. In addition, I used a two-stage robust method developed by Pison and colleagues (2003) on the whole dataset without eliminating outlier cases. In the latter method, a minimum covariance determinant matrix was calculated and then principal factor analysis was used to explore the factor structure. Parallel to the above procedure, MIRT, or full-information factor-analysis for graded response models, was used.

The results and final products of both limited- and full-information methods were compared. Where there were no major differences between the limited- and full-information methods, I present and discuss the results of the full-information method. Where there was a noticeable difference between the methods, I present the result of the limited-information method.

Assessing Dimensionality. One of the most critical decisions in exploratory factor analysis of a new measure is to determine the number of factors (Preacher, Zhang, Kim & Mels, 2013). As many methodologists have mentioned, this decision is subjective as there is no unique or perfect method to determine the “true” number of factors (Bentler & Mooijaart, 1989; Cattell,

1966; Cudeck, 1991; Cudeck & Henly, 1991; MacCallum, 2003; MacCallum & Tucker, 1991; Meehl, 1990; see Preacher et al., 2013 for review). Preacher and colleagues review this problem in factor analysis and argue that instead of searching for the correct number of factors, researchers may need to search for the “optimal” number of factors. The optimal number of factors depends on the specific factor analysis goal of the research. Relatively similar to the differentiation between basic and practical research, two major goals for factor analysis are to find a model with “the highest verisimilitude, or proximity to the objective truth” (Meehl, 1990; Popper, 1959, as cited in Preacher et al., 2013, p. 31), and to find a factor solution with the highest level of generalizability (i.e., cross-validation) where prediction, selection or replicability is important.

Preacher and colleagues (2013) use different model-assessment indices that are adjusted for complexity to choose the optimal factor model for each of the above goals. The root mean square error of approximation (RMSEA; Browne & Cudeck, 1992; Steiger & Lind, 1980) is recommended to find the optimal factor number when the goal is verisimilitude. In particular, the lower boundary of the 90% confidence interval of the RMSEA is recommended because this lower boundary is less affected by a small sample size. When the goal is generalizability, Akaike’s Information Criterion (AIC; Akaike, 1973) or its similar criterion, the Bayesian Information Criterion (BIC, Schwarz, 1978), are recommended. Both verisimilitude and generalizability goals are important in many measurement development projects, including the present study; therefore, looking at both criteria is recommended.

It should be noted that RMSEA, similar to a chi-square test, is sensitive to sample size. Moreover, research shows that both chi-square and RMSEA indices support misspecified models that use unreliable measures over the models that use reliable measures (Miles & Shevlin, 2007).

When using model fit indices, it is important to be aware of the limitations and to use other statistical strategies as well as considering interpretability and background theory in order to choose an appropriate model.

There are many widely used or recommended methods to determine the most appropriate number of factors that are not based on model-assessment indices. These include the Kaiser Criterion (eigenvalue greater than 1), scree plot, parallel analysis, Minimum Average Partial¹⁰ (MAP; Velicer, 1976), and the Very Simple Structure (VSS) criterion. Among these methods, the Kaiser Criterion (eigenvalue greater than 1) proposed by Kaiser (1960) for principal component analysis has been the default criterion in SPSS to determine the number of factors for decades. However, the use of Kaiser Criterion has been criticized repeatedly particularly for factor analysis (e.g., Fabrigar, Wegener, MacCallum, & Strahan, 1999; Kline, 2013). This criterion overestimates the number of factors and can lead to the correct number less than 9% of the time based on simulation studies (Ruscio & Roche, 2012). Consequently this criterion was not used in my study.

Parallel Analysis was proposed by Horn (1965) and has been recommended by many methodologists and researchers (e.g., Fabrigar et al., 1999; Henson & Roberts, 2006; Ruscio & Roche, 2012). Parallel Analysis determines the number of factors by comparing the eigenvalues of real and random data. The method has been widely used in the last decades. However it may not show the optimal number of factor when the sample size is very large (Warne & Larsen, 2014). With very large sample sizes, similar to this study, the eigenvalues related to the random

¹⁰ Minimum Average Partial uses average partial correlations to determine number of factors after sequential removal of the effects of the initially-extracted factors.

data matrix tend to become very small (Revelle, 2014), therefore the method identifies more factors (Warne & Larsen, 2014).

Scree plots have been frequently used to determine the optimal number of factors since they were first introduced by Cattell in 1966. In scree plots, the variances or eigenvalues (Y-axis) of all possible factors are graphically presented in order from largest to smallest along the X axis. The decision about the optimal number of factors is then determined based on where the curve drops drastically and forms an elbow (i.e., break; hinge). Determining where the curve forms the elbow is often subjective and can change from one researcher to another, particularly when the factor structure is complex. Despite the subjectivity related to this method, simulation studies demonstrate that approximately 42% of the time the number of factors suggested by this method is correct (Courtney, 2013). The method works particularly well when factorability is high (Courtney, 2013).

The Optimal Coordinate method has been developed by Raiche, Roipel, and Blais (2006) to overcome the subjective limitations of the scree method by using the gradients and preceding coordinates associated with eigenvalues in order to determine the elbow. Both the Optimal Coordinate method and parallel analysis have outperformed the eigenvalue-greater-than-one rule (Ruscio & Roche, 2012). Based on simulation studies, the optimal-coordinate and parallel-analysis methods determine the correct number of factors at a rate of 74% and 76% respectively.

With the VSS criterion (Revelle & Rocklin, 1979), arriving at a simple structure and using the highest factor loadings are considered key in determining number of factors (Revelle, 2014; Courtney, 2013). VSS works well if the factor structure is not complex (Revelle, 2014). There is not enough evidence that compares the VSS criterion with other methods (Courtney, 2013). In the MAP method (Velicer, 1976) the number of factors are determined from the

matrices of partial correlations and use of principal component analysis. There are simulation studies that support the use of the MAP technique alongside other methods (Courtney, 2013; Ruscio & Roche, 2012).

In sum, there is no single strategy to determine the correct number of factors. The strength of methods very often depends on factorability, number of items, and sample size. Methodologists recommend a combination of methods, including parallel analysis, use of model-assessment indices, scree plot, MAP, and VSS as well as interpretability (e.g., Revelle, 2013). Making decisions based on the convergence among the findings of various methods may reduce the subjectivity of the factor-model selection. The interpretability and meaningfulness of the factor structure and the composition of the factors need to be considered in choosing between competing models, particularly when convergence among findings is not possible. I used various statistical indices and examined interpretability of the factor structure in order to determine the number of factors in my studies.

Search for Alternative Models: Hierarchical and Bifactor Model. Similar to other fields of research in the study of personality, providing a total score for the multidimensional (MMAP) scale in this study was considered a desired practical feature. This required empirical investigation and support. When results indicate a unidimensional model, researchers can easily justify the calculation and usage of a single total score for the whole test. However, the usage of a total score when items of the test load uniquely under different factors is questionable.

The validity and reliability of a total score has been a controversial topic in factor analysis. The majority of exploratory factor analysis efforts have been focused on orthogonal and/or oblique factor structures where the specific factors are the main causal components that determine variance in indicators/items. A solidified oblique factor structure may indicate

interrelation of the factors and therefore imply that all separate factors could be considered as a general construct. However, having a solidified simple and correlated multidimensional factor structure is not sufficient evidence for the validity of calculating a total score.

Two alternatives to a correlated factor structure can be considered and evaluated to provide support for the validity and reliability of a total score. These include hierarchical and bifactor structure (Reise et al., 2010). In the hierarchical model, one higher order factor (second-order) is considered over and above the factors with a narrower definition (first-order factors). Based on this model, the higher ordered factor causes the lower factors. The bifactor model, also known as the general-specific model, consists of one general factor and several “specific factors” or “domains.” Both general and specific factors are at the same level and affect indicators/items. The specific factors measure various domains of general factors.

The optimal evaluation of the total-score hypothesis requires using CFA on data collected from a separate sample. However, in addition to CFA, the hypothesis can also be investigated by using exploratory strategies. In the first stage, a single exploratory factor model can be compared with multiple factor models when investigating the optimal number of factors. If the multidimensional model consists of interpretable factors that are correlated with each other and has a better fit than a unidimensional model, the correlated multidimensional models are refined and then alternative models, exploratory bifactor and hierarchical models, are tested in the last stage. In the Hierarchical (HEFA) and Bifactor (BEFA) Exploratory analyses, items are allowed to load on general or second-order factors and any first-order or specific (domains) factors.

It should be noted that there are no differences in magnitude of model fit among the three alternative models, correlated multidimensional, HEFA and BEFA when the models are just identified (e.g., 2-factor model with equality constraint or 3-factor model). The final choice

should be made based on theoretical considerations, the magnitude of loadings on general and specific factors, as well as the magnitude of Omega statistics.

Hierarchical models have been more commonly used in personality psychology in comparison to bifactor models. Researchers have highlighted several advantages of bifactor models over hierarchical models (Reise, Bonifay, & Haviland, 2013) particularly when they are specified and tested within a confirmatory analysis framework (Chen, West, & Sousa, 2006). Chen and colleagues (2006) argued that BEFA provides better interpretation of the association of general and specific factors with external variables and leads to a more parsimonious model. Therefore, if the predictive validity of both general and specific factors is important, they recommend the usage of bifactor instead of hierarchical models. In CFA, a bifactor model can be specified in such a way that a hierarchical model can be nested within it, allowing model comparison (Yung, Thissen, & McLeod, 1999; Reise et al., 2013). In a bifactor model, group comparisons of both general and specific factors is possible, whereas in the hierarchical mode, only the higher order factor can be compared. Despite the advantages, the use of a bifactor model needs to be justifiable theoretically.

From a theoretical point of view, the use of a bifactor model is recommended when one assumes that communality of the items is explained by a general factor; there are unique portions of variance in sets of items that are related to specific domains, and these variances are important in understanding the phenomenon. In bifactor models, domain factors are at the same level as the general factor. When dimensions are highly correlated and one can assume the correlations among specific factors are due to a higher-order factor, the usage of a hierarchical model is recommended (Chen et al., 2006).

In the present study, both models are presented and evaluated in exploratory and confirmatory stages. That is, even when a hierarchical structure seemed more justifiable, testing a bifactor model is beneficial from a practical point of view. Since both correlated and hierarchical models can be nested within a bifactor model (Reise et al., 2013), testing a bifactor model is theoretically justifiable for evaluating total and specific scores.

It should be noted that I used a canonical BEFA where the specific factors did not covary with each other or with the general factor. More specifically, I used Schmid-Leiman orthogonalization to rotate the factor structure so that it would be matched with a canonical bifactor structure.

Evaluation of Total Score. One of the important analyses related to HEFA and BEFA is the calculation of Omega statistics. Omega, as a model-based reliability coefficient, provides a more appropriate estimate of general factor reliability over Cronbach's coefficient Alpha (Revelle, 2014; Zinbarg, Yovel, Revelle, & McDonald, 2006). This is because Omega considers inequality in factor loadings. In the present study, Psych Package in R (Revelle, 2013) was used to evaluate the HEFA and BEFA, and to obtain Omega Statistics (ω).

Two omega estimates, ω_h , and ω_t , are provided. The Omega estimates in Psych are based on the formulation of Omega recommended by McDonald (1999) as the estimation of general factor (ω_h) and total test (ω_t) reliability. It should be noted that the magnitude of Omega estimates is meaningful and reliable if the factor loadings on general or second-order factors are not small and the inclusion of the general factor is theoretically meaningful (Revelle, 2014). Small factor loadings (e.g., .45) under a general factor may indicate the rejection of our hypothesis regarding the presence of a general factor.

Calculation of omega is more appropriate for a measurement model that has more than two factors. However, the Psych package provides the statistics for a 2-factor model by adding some constraints to the model (see Revelle, 2014). In this study, the ω_h for models with more than two factors was reported.

The omega statistic provides not only information for testing the accuracy or reliability of the scales but also the internal structure of scale, an important aspect of construct validity (Zinbarg et al., 2006). Reise and colleagues (2013) argue that even when multidimensionality is evident, the researcher needs to use a bifactor model to calculate omega in order to evaluate the justifiability of a total score and the meaningfulness of a specific score. They recommended calculating ω_h to evaluate to “what extent the total score is interpretable as a measure of a single common construct” (p. 136), and using ω_s to investigate to “what degree subscales provide reliable measures of constructs independently of the general construct” (p.136). In line with this recommendation, I calculated and discussed ω_s in addition to ω_t and ω_h .

The magnitude of the same omega statistics can have very subtle differences when using different factor estimation methods. In this study, I used a Maximum likelihood factor solution when calculating Omega indices. The mean percentage of common variance of all items related to the general factor is one of the statistics that can be used to evaluate the quality of the alternative factor solutions, HEFA and BEFA. This statistic was reported.

Finally, as the HEFA and BEFA are alternatives to correlated factor structure models, testing HEFA and BEFA as well as calculating omega statistics is done after item-reduction processes, on the final set of items for each section of the questionnaire.

Item Response Theory (IRT). IRT is often very useful in measurement construction in order to achieve desired statistical specifications at both the item and test level. Furthermore, it

can be very useful to compare different versions of a test. In IRT, both reliability and error are conditional on the level of a latent trait. Measurement error and precision can be different for different levels of a latent trait. This provides a more detailed picture of reliability and can also be useful in creating a reliable measure for the desired level of a latent trait. This is particularly important in personality research (Embreston & Reise, 2000). In the present study, when the number of items under a subscale was sufficient, I used IRT to evaluate reliability along the latent trait.

In addition to using IRT to evaluate reliability, I also used it in the process of refinement. The data obtained from an administration of MMAP and DQ are polytomous. There are several IRT models for polytomous data including Samejima's two parameter polytomous Graded Response Model (GRM, Samejima 1969), Modified Graded Response Model (Muraki, 1990, Generalized Rating Scale Model), Rating Scale Model (Andrich, 1978), Rasch Partial Credit Model (Masters; 1982) and Generalized Partial Credit Model (Muraki, 1992). Among them, the GRM works best with ordered polytomous responses such as Likert scale items, therefore it is chosen for this study (Embreston & Reise, 2000, T. J. Kline, 2005)..

In this study, many statistics, functions, and curves were produced through evaluation of the subscales within a GRM model. Some of this information is reported, depending on the goal of using IRT. IRT is considered as a model-based test development approach. It includes model fit indices and parameter estimates. Fit statistics for the appropriateness of the model for the entire inputted measure (subscale) as well as fit indices for each item within the model are an inherent part of using IRT. Since the fit indices are very sensitive to becoming inflated with a large sample size, I report them in this study but did not use them rigorously for item reduction.

GRM, similar to other IRT models, is based on a fundamental mathematical function named Item response function. Item response functions are the building block for other functions, statistics, and curves produced including item information functions. These functions explain the relation between the probability of choosing each response option for an item and the levels of latent trait. That is, the IRT mathematical model explains the relation between a person characteristic (latent trait, Theta) and characteristics of items that are designed to measure the person characteristic.

Two main item parameters are used in GRM and therefore reported in this study: a set of threshold (difficulty, severity) parameters as well as one statistic to represent the discrimination power of each item. It should be noted that threshold/difficulty parameters and Theta use a standardized scale, which helps with interpretation of the content of items during test development (Embreston & Reise, 2000). The discrimination parameter is similar to factor loading in classic test theory and determines the strength of the relation between an item and the latent trait. Items with higher discrimination provide more detailed information about the person's latent trait.

The discrimination parameters are used to produce each item information curve and therefore tests information curves. Test and item-information functions or curves are the most important IRT result in order to develop and refine a test. A larger discrimination parameter corresponds with taller and narrower item-information curves (IICs) and therefore higher accuracy in measuring the latent trait but in a narrow range. A lower discrimination parameter corresponds with shorter and wider IICs and therefore low accuracy but in a broad range of the latent trait. In this study, the general strategy for using IICs was to categorize them based on their height and width and then choose a set of items with diverse item-information curves. Items with

very low height, however, were not selected. This process is explained in more detail in the Results section.

In this study, test-information curves were used to evaluate the reliability of each subscale or scale with more than five items at different levels of the corresponding latent trait. Moreover, item-information curves were used extensively when the number of items underlying a factor was more than the desired number. In many cases, the desired number of items was five. In addition, category-response curves were used to evaluate the items and item-response functioning along the latent trait when the number of items under a subscale exceeded the desired number.

It should be noted that before using a unidimensional IRT model, I tested the assumption of local independence using CFA and the assumption of unidimensionality using EFA. A detailed description of the assumptions and the strategies I used to resolve violations of these assumptions is provided in the Results section.

Differential Item Functioning (DIF). In Differential Item Functioning, I evaluated whether or not the performance of items for gender-group members with similar trait levels (i.e., matching criterion) was different. There are several parametric methods to investigate Differential Item Functioning, including using Logistic Regression and an IRT framework. Within the IRT framework, one may look at the equality of item parameters across groups (e.g., Lord, 1980; Raju, Fortmann-Johnson, Kim, Morris, Nering, & Oshima, 2009) or use an IRT model to estimate the matching criterion (Choi, Gibbons, & Grane, 2011). The matching criterion for the traditional logistic regression method is a sum score. In this study, a combination of Logistic Regression and IRT latent trait estimation was used to evaluate the DIF. Regardless of the statistical method used in investigating DIF, it is important to determine whether or not the

difference in item functioning is uniform or nonuniform. In uniform DIF, the item with a problematic DIF has a consistent bias in favor of one group regardless of the level of the latent trait. For example, an item measuring the latent trait procrastination has a consistent bias in favour of the female group regardless of their level of procrastination.

In contrast, with a nonuniform DIF, the magnitude or direction of bias changes between subgroups depending on the level of latent trait. If only the magnitude of the bias changes, the nonuniform DIF is considered ordinal. However, if the direction of bias is changed at different levels of the latent trait, the DIF is considered as a “crossing” or “interaction” nonuniform DIF. In the latter case, the item may be biased in a positive direction for people with a high level of the latent trait and biased in a negative direction for people with a low level of the latent trait and vice versa.

Different thresholds or criteria can be used to determine DIF including use of a significance test or an effect-size measure. The likelihood-ratio significance test is often used to compare various types of DIF.

Results

MMAP Dataset Preparation and Assumption

Normality. I checked univariate normality before running any analysis on the data. A skewness and kurtosis z-test as well as the Kolmogorov-Smirnov test did not support the univariate normality of the items. Given the large sample size in this study, and given the sensitivity of the standard error of skewness and kurtosis as well as Kolmogorov-Smirnov test to large sample sizes, I used graphical methods of evaluating univariate normality including histograms and Q-Q normality plots (Tabachnik & Fidell, 2007).

Table 9-1

Items with Normality Problem

Code	Item	R	z-skew	z-kurt
NE12	Whenever I am about to start working on academic tasks, I feel angry.	4	12.30	2.37
NE32	After I finish an academic task that I have needlessly delayed for a while, I feel angry.	4	13.89	2.80
H9	When I receive an academic task, I don't give it any thought at all, and I do it at the last minute	4	11.87	2.74
H17	When academic tasks are assigned, I don't give any thought to when I will start working on them.	4	11.70	1.52
H26	When it comes to academic tasks, I don't intend to work too hard or to get started on time.	4	12.32	1.44
H31	I don't really care about starting academic tasks on time, and I intentionally do the assignments at the last minute.	4	15.60	5.51
H7	I choose to do fun activities instead of getting an early start on academic tasks and I do NOT feel bad about it.	5	13.26	3.02
H22	Having fun is my main priority, so I am not afraid to deliberately postpone doing academic tasks until the last minute.	5	14.17	5.58
H33	I do not care about academic tasks, and I do not plan to do them ahead of time since I have more exciting activities to do.	5	18.12	9.46
H34	I choose to work on academic tasks at the last minute without feeling guilty about it.	5	16.79	6.98
H6	I do not really care if I get a bad grade due to working on an academic task at the last minute.	6	18.96	12.02

A visual rating scheme was created to quantify non-normality according to the probability plots. Items were rated from 1 (normal distribution) to 6 (severe departure from normality) by two raters. The average rate was used to evaluate the normality of each item. The results supported the normality assumption of most items. However, 11 items showed signs of severe non-normality (see Table 9-1). These items had a low level of variability and were positively skewed, indicating low social validity (i.e., credibility) of the items' contents. Therefore, these items were eliminated from further analysis.

Linearity and homoscedasticity. Linearity and homoscedasticity were checked by looking at pairwise scatter plots. However, because inspection of all pairwise scatter plots was not practical, I looked at random pairwise scatter plots as well as examining scatter plots between variable items with strong positive or negative skewness. None of the pairwise scatter plots examined had any clear departure from the linearity assumption. To test linearity for the bivariate scatters that were not clear, both quadric and cubic curves were fitted and compared with a linear fit. No noticeable contribution above the linear model was found when quadric and cubic curves were used. Figure 9-1 illustrates a sample of bivariate scatter plots among items with positive skew.

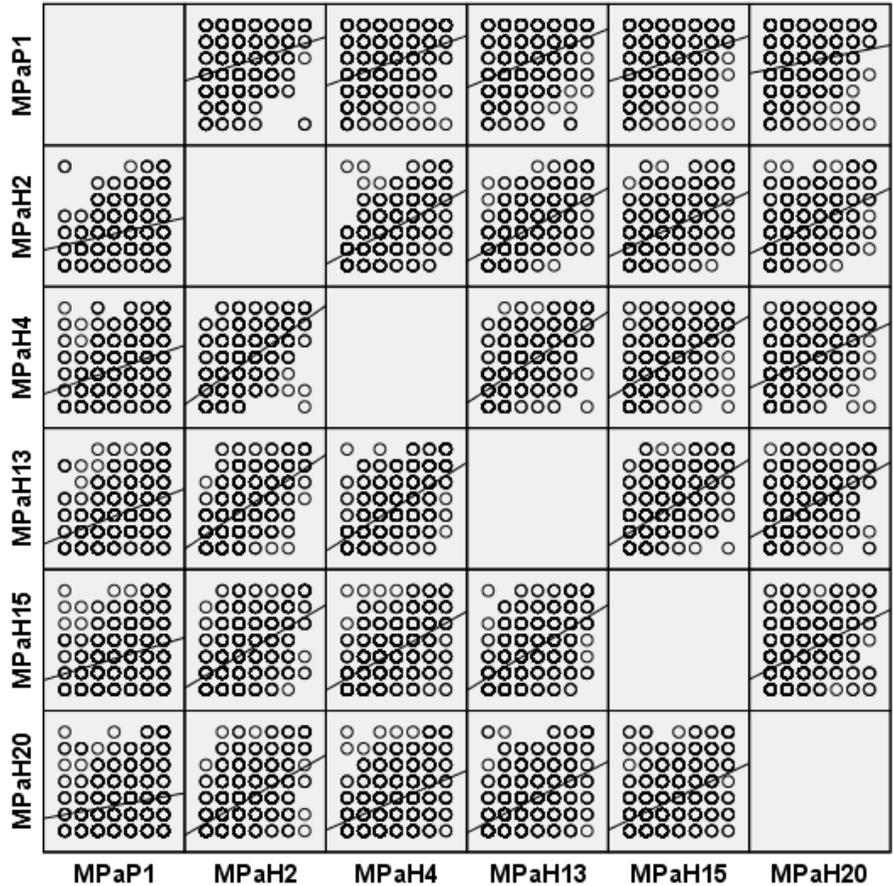


Figure 9-1. Bivariate Scatter plots among items with positive skew distribution.

Multivariate Outliers. Mahalanobis distance was used to identify cases with multivariate outliers for each multivariate analysis including EFA on behavioural items and EFA on procrastination problem items. For procrastination behaviour, 66 cases had a significant Mahalanobis distance scores ($p < .001$), an indication of having multivariate outliers. Cook's Distance (CD) scores were calculated for the sets of items to determine whether the cases with multivariate outliers were influential (Stevens, 2002). Several critical values or cut-offs are suggested for determining influential cases according to Cook's D (e.g., values close to 1 or more; $CD > 4 / [n - k - 1] = .004$; or $4/n = .003$; Stevens, 2002; Tabachnik & Fidell, 2007; Gordon, 2012). Using Cook's distance greater than .004 as the criterion, only 32 cases were identified as

influential cases with significant multivariate outliers. This finding suggested that some of the cases with multivariate outliers were influential in the dataset and may need to be eliminated in subsequent analysis. The final sample size after eliminating multivariate outliers became 962. Similar inspection was used for the EFA of procrastination problems as a whole and for each subscale. Only 29 and 46 cases were influential outliers in procrastination problem items as a whole and duration items respectively. Since items describing negative outcomes, dissatisfaction, or negative emotions assume some level of procrastination behaviour, the influential outliers were also inspected in each procrastination problem scale after eliminating the cases with very low levels of procrastination behaviour. Only 7 and 10 cases were influential outliers for perceived negative consequence and negative emotion, respectively. The limited-information EFA polychoric method as well as MIRT analysis were performed in both original dataset and reduced dataset. The results of both analyses were very similar.

Multicollinearity and Singularity. The factor analysis produced results without any warning or error, indicating that matrix R was not non-positive definite and matrix inversion was possible. This finding supported the absence of singularity (Tabachnik & Fidell, 2007) and multicollinearity (Flora et al., 2012). Moreover, there was no correlation above .90 between items and the tolerance (1 – squared multiple correlation) for all items were above 0.1. In fact, more than 95% of the items have a tolerance above 0.2. The conditional index (square root of largest eigenvalue to smallest eigenvalue) was 11.7 and 24.0 for EFA on procrastination behaviour and procrastination problem items, respectively. These values are lower than the criterion for problematic collinearity (Belsley, Kuh, & Welsch, 1980). The above findings indicate the absence of multicollinearity problems.

Factorability of matrix R. Several criteria were used to evaluate factorability of the items. All strongly supported factorability. Bartlett's Test of Sphericity was significant ($p=0.000$) for all factor analyses. The off-diagonal relations of the anti-image matrix had small magnitudes. Moreover, there were many correlations between pairs of items that were above .30 and significant. Finally, the Kaiser-Meyer Olkin measure of sampling adequacy was above .90 for all exploratory factor analyses (above the recommended value of 0.6). All of these findings support the factorability of datasets.

Social desirability at item level. The majority of the items had significant correlations with total social desirability as well as the sum of the positive and negative items in social desirability. However, the strength of relation for all significant correlations was small based on Cohen's (1988) guidelines, ranging from .06 to .18. The same results emerged when the relations between total scores of items and social desirability scales were investigated. Furthermore, the relation of procrastination items with social desirability is noticeably less than the relation of social desirability with big five items. The correlation between social desirability and some of the personality items reached as high as 0.35 ($N=994$). Given these findings, I decided not to change or eliminate the items based on their associations with social desirability.

Exploratory Factor Analysis on Procrastination Behaviour.

Various methods of Exploratory Factor Analysis were used to study the structure of procrastination behaviour. These included both limited- and full-information methods. In the first stage, the number of factors was investigated.

Dimensionality of Procrastination Behaviour. Several methods were used to determine the number of factors. Figure 9-2 presents the scree plots and numeric criterion to determine the

number of factors using scree plots based on limited-information estimates. Examination of the scree plot supported the presence of two factors.

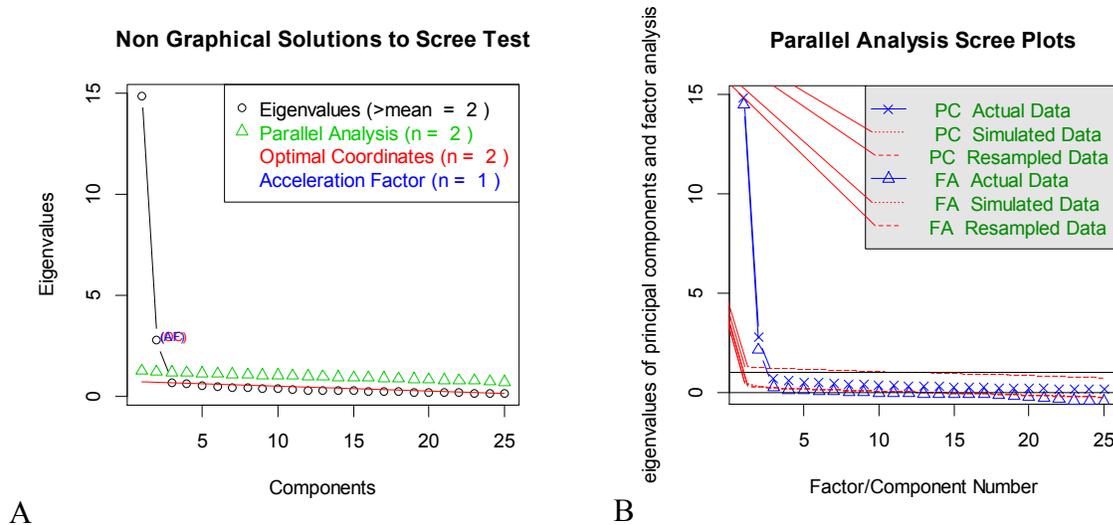


Figure 9-2. Graphical presentation of number of factors underlying procrastination behaviour

Minimum Average Partial (MAP, Velicer, 1976) and Ordinal Coordinates criterion supported the presence of two factors. VSS complexity 2 achieved a maximum of 0.83 with two factors. Parallel Analysis suggested two factors based on the eigenvalues of the principal component analysis and three factors based on the values of the Maximum Likelihood factor analysis. However, the Bayesian Information Criterion (BIC) reached its minimum with a five-factor solution (BIC=-724.61).

One-factor to seven-factor solutions were explored using full-information factor analysis. The sequential differences between the fit indices of the one-factor model up to the seven-factor model were significant, supporting a six-factor solution. However, all the items that even loaded under the third factor did not have high loading, indicating the sufficiency of a two-factor solution. Furthermore, the two-factor solution (RMSEA=.07) was the first factor solution that

reached an acceptable level of RMSEA, indicating acceptable fit. Given all of the above findings and the interpretability of the two-factor solution, the two-factor solution was chosen.

Factor Structure and Loadings As the first scale in this study, all three types of factor analyses discussed in the Methods section were performed and reported. The results of the limited-information polychoric method is presented first for a two-factor solution. In the next stage, the MCD method and full-information method were applied and presented.

Cases with multivariate outliers related to procrastination-behaviour and procrastination-problem items were identified ($p < .01$) in the whole dataset. I deleted influential outliers and then used the reduced dataset to calculate polychoric correlations. Psych package (Revelle, 2013) in R (ver. 3.0.2) was used to calculate the polychoric correlation matrix for behaviour and problem items. Table 9-2 presents the factor loadings and communalities of a two-factor solution on procrastination-behaviour items.

Communality values for the majority of the items were high. The results showed that 71% of the variance was accounted for by two factors. The pattern of factor loadings after an Oblimin rotation seemed to be a simple factor solution. With the exception of H13, all items were loaded on one factor, replicating the initial and conceptual structure of the measure. The loadings for all items were above .50. The correlation between factors was .60.

Table 9-2

Factor Loadings and Commonalities Based on Limited-Information 2-Factor Model of Procrastination Behaviour using Maximum Likelihood Estimation and Oblimin Rotation

Item No	Variable	Factor 1	Factor 2	h2
P27	When I receive academic tasks, I plan to work on them ahead of time, but I needlessly delay starting them.	0.96		0.82
P10	I plan to work on academic tasks ahead of time, but when the time comes, I needlessly postpone the tasks.	0.95		0.82
P23	I plan to work on academic tasks ahead of time, but when the time comes I postpone the tasks.	0.94		0.80
P1	I initially intend to not put off academic tasks, but I continuously find myself doing so.	0.91		0.69
P3	When academic tasks are assigned, I tell myself that I will not start them late, but I end up delaying them without a good reason.	0.91		0.77
P35	I don't like to postpone academic tasks, but I find myself working on them near the deadline without a good reason.	0.90		0.74
P14	I intend to work on academic tasks well before the deadline, but instead of working on them I often engage in other activities without a good reason.	0.87		0.78
P25	Despite my intention to start and finish academic tasks on time, I engage in other unnecessary activities instead.	0.86		0.81
P5	There is a needless delay between when I want to do academic tasks and when I actually do them.	0.84		0.74
P12	I keep putting off academic tasks until later without any rational reason.	0.84		0.82
P21	I needlessly delay working on academic tasks despite the fact that I know I will not be happy about doing so later.	0.83		0.78
P11	Instead of working on academic tasks according to my intention, I involve myself in some activities that are not urgent.	0.83		0.78
P18	I delay on academic tasks despite the fact that I know I will feel guilty about my delay later.	0.81		0.72
P32	I engage in unnecessary activities instead of working on academic tasks despite the fact that I know I will feel dissatisfied with the result of my delay later.	0.78		0.73
P16	Just before I am about to begin an intended academic task, I tend to avoid it by doing something else.	0.75		0.70

Item No	Variable	Factor 1	Factor 2	h2
P8	I postpone academic tasks despite expecting to be worse off if I delay.	0.74		0.66
P29	I engage in some unnecessary activities instead of working on academic tasks based on my initial plan.	0.69		0.65
H28	I choose to do academic tasks at the last minute so I leave more time for fun stuff instead.		0.87	0.70
H24	I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on school tasks on time.		0.84	0.69
H30	I plan and do fun activities (e.g., partying, going out, sports) as opposed to plan and work on academic tasks ahead of time.		0.80	0.66
H15	I am not interested in starting academic tasks ahead of time because I would rather do more enjoyable things instead.		0.76	0.62
H2	I don't intend or plan to work on academic tasks, and I do other fun things instead.		0.73	0.53
H20	When I receive academic tasks, I don't make even a vague plan to start them ahead of time.		0.71	0.48
H13	I am focused on fun and enjoyable activities and do not bother myself with academic tasks until the last minute.	0.25	0.70	0.76
H4	I intentionally choose to do fun stuff instead of doing academic tasks ahead of their deadline.		0.623	0.57

Note. Factor loadings less than .20 are suppressed; Factor 1: Irrational Delay Factor 2; Hedonistic Delay; h2 = communalities

In addition to the polychoric correlation method, the two-stage robust method in combination with ULS extraction as well as full-information factor analysis was used. The results were similar using all three methods (see Tables 9-2 and 9-3). There was no cross loading for item H13 for MCD with ULS extraction. This method seemed to produce a cleaner factor solution than the polychoric method.

Based on the full-information factor analysis, the two factors account for 73% of the variance in the dataset with all procrastination behaviour items included. Similarly, the MCD factor analysis showed that the factors accounted for approximately 71% of the variance. Given the contents of the items with high loadings on each factor, the first factor was named Irrational

Delay (ID) and the second factor was named Hedonistic Delay. Under each factor, the number of items with acceptable and good loadings exceeded what was planned. Therefore, unidimensional item response theory was used for each extracted factor to select the desirable set of items.

Table 9-3

Factor Loadings and Communalities Based on MCD Method with ULS Extraction and Full-Information 2-Factor Model with Oblimin Rotation for Procrastination Behaviour

Item	MCD Method (N=994)			Full-Information (N=963)		
	Factor 1	Factor 2	h2	Factor 1	Factor 2	h2
P1	0.87		0.67	0.92		0.73
P3	0.89		0.76	0.93		0.80
P5	0.83		0.72	0.86		0.77
P8	0.72		0.69	0.77		0.71
P10	0.96		0.82	0.97		0.86
P11	0.84		0.76	0.85		0.81
P12	0.88		0.83	0.87		0.86
P14	0.83		0.77	0.90		0.83
P16	0.77		0.70	0.78		0.75
P18	0.85		0.75	0.85		0.77
P21	0.87		0.79	0.87		0.83
P23	0.94		0.82	0.96		0.85
P25	0.87		0.82	0.89		0.85
P27	0.97		0.82	0.98		0.86
P29	0.72		0.69	0.77		0.73
P32	0.84		0.77	0.83		0.78
P35	0.90		0.74	0.92		0.80
H2		0.74	0.51		-0.77	0.58
H4		0.61	0.54		-0.66	0.62
H13		0.71	0.71	0.27	-0.70	0.79
H15		0.75	0.59		-0.80	0.67
H20		0.66	0.42		-0.74	0.51
H24		0.81	0.67		-0.88	0.74
H28		0.87	0.66		-0.90	0.74
H30		0.75	0.60		-0.83	0.71
SS						
Loading	15.25	2.39			13.28	5.09

Note. Factor 1: Irrational Delay Factor 2; Hedonistic Delay;

Unidimensional IRT on Irrational Delay Items.

The sample without influential multivariate outliers was used to test a Graded Response Model (GRM, Samejima 1969), an IRT model for polytomous items. The same sample was used

to test the assumptions. Previous factor analysis showed that irrational delay items loaded on one factor, supporting the assumption of unidimensionality. Another specific assumption for unidimensional IRT is local independence. According to this assumption, the pairwise associations among items should be equal to zero (not significant) at any specific magnitude of the latent trait. This assumption is very similar to the assumption of uncorrelated error terms in multiple regression. When error terms of items are correlated, it means that the relation between items is not completely explained by the latent trait and there might be other factors that affect the items and therefore they become locally dependent. This feature can be used to identify the problem of local dependence through modeling a unidimensional CFA model and looking at correlations among error terms for items whose Modification indices for error-term covariance are high. In this study, a modification index above 20 was considered high and used to define correlations in the CFA model. Modeling the correlations between errors in Irrational Delay items showed that only the association between error terms of items 1 & 3 ($r=.38$), 11 & 12 ($r=.26$), 18 & 21 ($r=.30$) was higher than .20, a criterion for local dependence (Embretson & Reise, 2000; Erhart et al, 2010; Reeve et al., 2007)¹¹.

Presence of local dependence often results in inaccuracy of parameter estimates and overestimation of test information. Depending on the reason underlying local dependence (e.g., location of item, fatigue or long measure, item wording, multidimensionality, excessive similarity), one may use different strategies to deal with pairs of items with local dependence (Embretson & Reise, 2000; de Ayala, 2008). Among the 17 Irrational Delay items, the major

¹¹ A significant standardized residual can be considered as another criterion for local dependence. This criterion was not chosen, since large sample size can affect tests of significance.

reason for the violation of local independence in items 18 and 21 was excessive similarity in their content domains. Items 18 and 21 were the only items that explicitly referred to delay despite awareness about emotional consequences of delay. Items 1 and 3 and items 11 and 12 had less similarity in terms of their content but their shared variance may be related to the proximity of the items to each other. One item in each pair was nominated for elimination.

Factor loading of the items in CFA (a similar concept to item discrimination power in IRT) was used as a criterion to eliminate one item in pair 18 and 21. The item with a lower factor loading, item 18, was eliminated. To resolve the local dependence related to items 11 and 12 as well as items 1 and 3, items 11 and 1 were eliminated since there were other items with similar content in the remaining set of items and both items had lower factor loadings. The remaining set of items included 14 items which were used in unidimensional IRT analysis where a GRM model was used.

The chi-square test for the graded response model for the 14-item version of the Irrational Delay scale was significant, indicating the model did not fit the data. Given the sensitivity of chi-square test to sample size, the decision about the applicability of the IRT model should not be made based on this statistic.

Table 9-4 presents the parameter estimates for Irrational Delay items, their standard errors as well as the fit index for each item. Chi-square indices of fit for 6 items were not significant at the .01 level, indicating acceptable item fit. Within each response category, the spread of thresholds (i.e., b, severity or difficulty parameters) seemed relatively moderate, implying a moderate level of similarity among items in measuring the latent trait. Within each item, the range of between categories thresholds along the latent trait for a majority of the items was reasonably broad and in the correct order, implying that a reasonable range of the latent trait

Irrational Delay could be measured by most items. Item discrimination statistics (i.e., a or slope parameters) of items ranged from 1.5 to 2.2, indicating that the items can adequately differentiate various levels of procrastination. The slope parameters were particularly higher for items P25, P27, P10, P23, P12, P21, and P14. This finding suggests that these items have higher discriminatory power and provide more information about different levels of the latent trait. To understand the discriminatory power of the items within a GRM model it is also important to study and compare Item Information Curves (Embretson & Reise, 2000).

Table 9-4

Item Parameter Estimates and Item Fit Statistics for Irrational Delay Items

Item	a	b1	b2	b3	b4	b5	b6	χ^2	p
P3	1.89(0.10)	-2.29(0.08)	-1.33(0.04)	-0.49(0.03)	0.00(0.03)	0.61(0.03)	1.39(0.04)	98.74	0.115
P5	1.77(0.09)	-2.33(0.09)	-1.36(0.04)	-0.46(0.03)	0.10(0.03)	0.79(0.03)	1.64(0.05)	69.60	0.853
P8	1.49(0.08)	-1.91(0.06)	-0.83(0.04)	0.02(0.03)	0.57(0.03)	1.36(0.04)	2.23(0.08)	145.44	0.000
P10	2.21(0.12)	-2.16(0.07)	-1.14(0.03)	-0.26(0.03)	0.18(0.02)	0.79(0.03)	1.63(0.05)	86.94	0.362
P12	2.20(0.12)	-1.88(0.06)	-0.96(0.03)	-0.18(0.03)	0.27(0.02)	0.87(0.03)	1.80(0.06)	90.15	0.277
P14	2.03(0.11)	-2.08(0.07)	-0.94(0.03)	-0.20(0.03)	0.22(0.02)	0.84(0.03)	1.78(0.06)	141.97	0.000
P16	1.62(0.09)	-2.10(0.07)	-0.99(0.04)	-0.06(0.03)	0.45(0.03)	1.10(0.04)	2.05(0.07)	120.33	0.005
P21	2.04(0.11)	-1.73(0.05)	-0.87(0.03)	-0.13(0.03)	0.29(0.02)	0.90(0.03)	1.74(0.05)	158.94	0.000
P23	2.21(0.12)	-1.96(0.06)	-1.09(0.03)	-0.22(0.03)	0.23(0.02)	0.83(0.03)	1.69(0.05)	117.99	0.007
P25	2.23(0.12)	-1.83(0.05)	-0.95(0.03)	-0.16(0.02)	0.31(0.02)	0.94(0.03)	1.81(0.06)	100.90	0.088
P27	2.23(0.12)	-1.79(0.05)	-1.01(0.03)	-0.23(0.02)	0.21(0.02)	0.77(0.03)	1.65(0.05)	89.29	0.299
P29	1.55(0.08)	-1.94(0.06)	-1.00(0.04)	-0.11(0.03)	0.40(0.03)	1.16(0.04)	2.17(0.08)	147.59	0.000
P32	1.81(0.10)	-1.55(0.05)	-0.69(0.03)	0.01(0.03)	0.42(0.03)	1.04(0.03)	1.86(0.06)	150.08	0.000
P35	1.85(0.10)	-1.72(0.05)	-0.94(0.03)	-0.30(0.03)	0.16(0.02)	0.68(0.03)	1.56(0.05)	119.19	0.006

Note. The standard errors for each item parameter estimate are presented in parenthesis; b= thresholds, severity or difficulty parameters; a = discrimination statistics.

Category Response Curves. The Category Response Curves (CRCs) for Irrational Delay items 7-point response categories were generated. The steepness of the curves seems acceptable, supporting the discrimination properties of the items. It appeared that the response categories were distributed across different levels of latent trait (theta axis) very well as expected. Most items covered the areas below and above the mean symmetrically as expected. “Never,” “almost never” and “sometimes” covered the area below the mean of the latent trait, while “often,” “very

often,” and “*always*” covered mainly the area above the mean in a majority of the items (see Figure 9-3).

Figure 9-4 compares the position of the middle point along the latent trait axis. Most midpoints have maximum probability around the latent trait equal to zero, the mean of the latent trait. However, it should be noted that the height of middle response categories in most items was lower than the adjacent response categories and in some cases the midpoint was even covered (e.g., items P1, P8, P32) by adjacent response categories (see figure 9-3). This may indicate that the middle category was not providing much information over and above the adjacent categories for the average theta level. For these items, the likelihood of choosing adjacent response categories (3 and 5) is more than the *probability of choosing the middle response category for individuals with the average latent trait. These results suggested that the 7-point response set may not produce more information than would a 6-point response set.* In future research, it would be informative to test the response-category functions of the items with a 6-point Likert scale or with a 7-point set that has a different midpoint anchor.

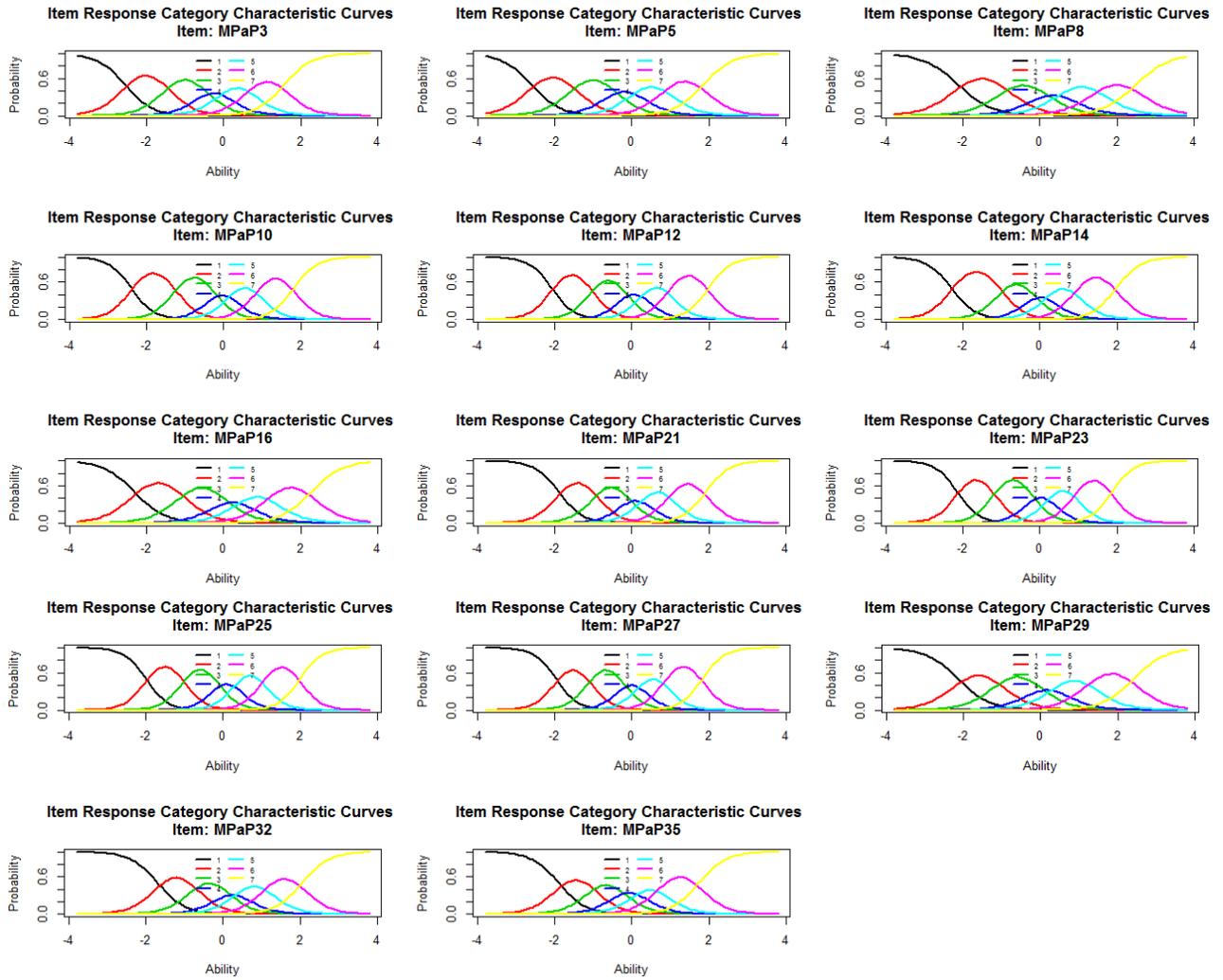


Figure 9-3. Category response curves of the Irrational Delay items.

Item Response Category Characteristic Curves - Category: 4

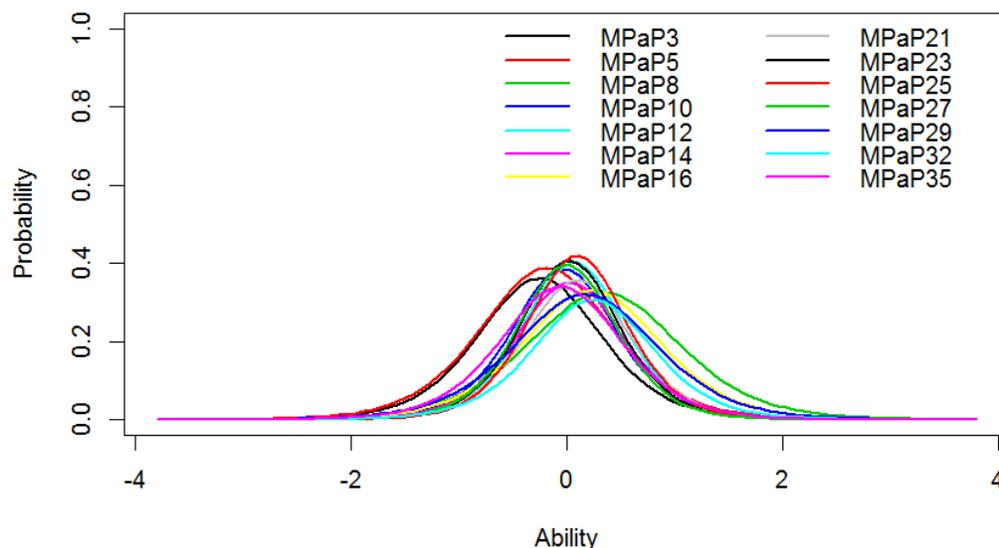


Figure 9-4. Comparison of middle categories in Irrational Delay items

Information Curves. Figure 9-5 presents the Test Information Curve for the 14-item version of the Irrational Delay scale. The reliability of the set of ID items within a particular range of the latent trait was obtained¹². The reliability of the scale was above .75 for the latent trait at a level ranging from 3.10 SD below the mean to 3.05 SD above the mean. From 2.5 SD below the mean to 2.5 SD above the mean, the reliability was above .90.

¹² The following formula was used to calculate reliability: Reliability at θ_i = information at θ_i / information at $\theta_i + 1$.

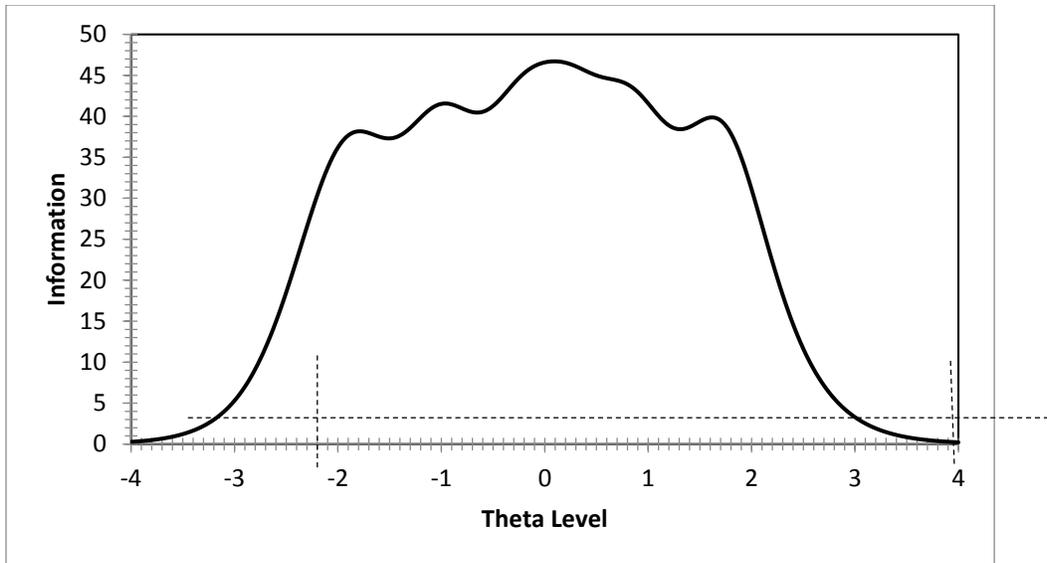


Figure 9-5. Test information function: Irrational Delay (14 items).

Item Information Curves. Inspection of Item Information Curves (IICs) or Functions (IIFs) helps to evaluate reliability at the item level. Comparing height and width similarities among the item curves helps also the process of item selection. Figure 9-6 shows a comparative presentation of the item information curves. *A curve illustrating the average of item information functions was included in the figure.* The IIFs reveal the presence of 3 to 4 clusters.

There were many similarities in IIFs above the average curves. Items P10, P12, P23, P25, P27, P21 and P14 were noticeably higher than the average curve. The curves for items P23 and P10 as well as for P12 and P25 were very similar. Items P3, P35, P32, and P5 had information curves around the mean, which constituted the middle cluster. In this cluster, item P3 had a relatively similar information curve to the mean information curve. The lower cluster included items P16, P29, and P8. The widths of the curves were in a balanced and acceptable range. The widths were very similar among those around or above the average curve. The items in lowest cluster cover a wider range. The above information was used to reduce redundant items and select the best set of items.

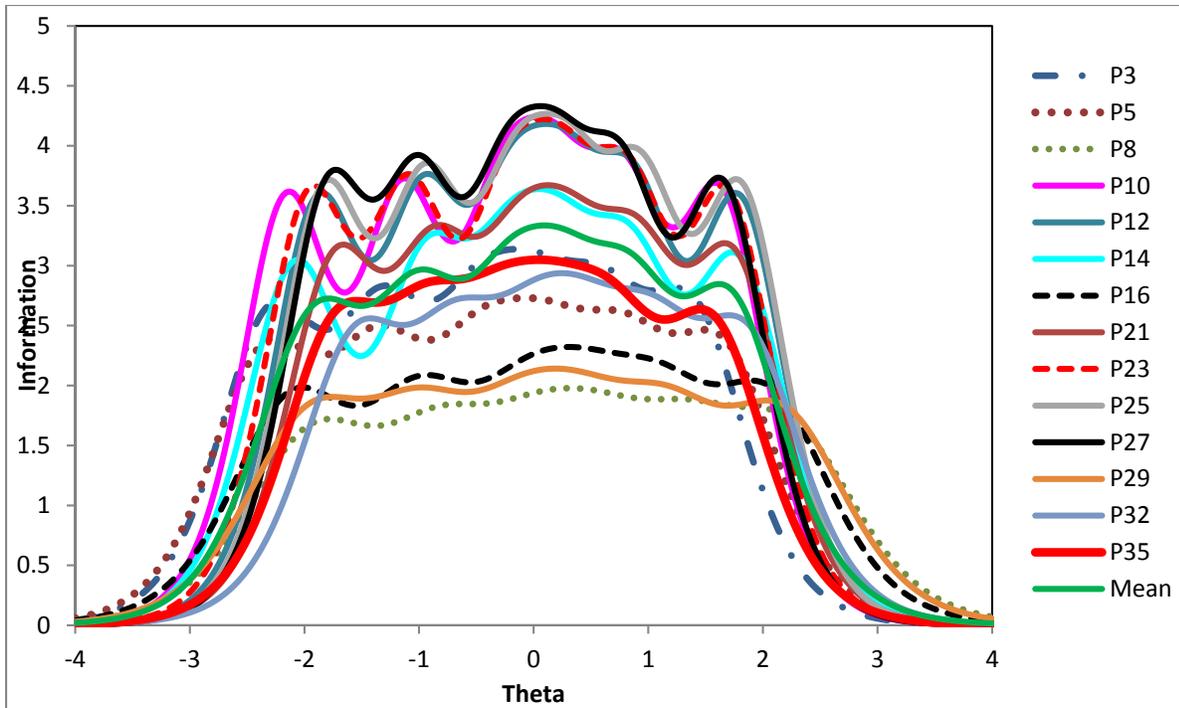


Figure 9-6. The initial Irrational Delay item-information curves

Differential Item Functioning.

Only cases that determine the dichotomy of male and female as their gender were selected ($N=962$). Ordinal logistic regression (OLR) was used to evaluate Differential item functioning between the gender groups. The p -value was calculated using A Monte Carlo simulation approach. There were no items with significant DIF at p -values $\leq .01$. Using an effect-size criterion, no DIF was detected. All of the pseudo R -square statistics were negligible (<0.13). Figure 9-7 presents the total-item function in male and female participants.

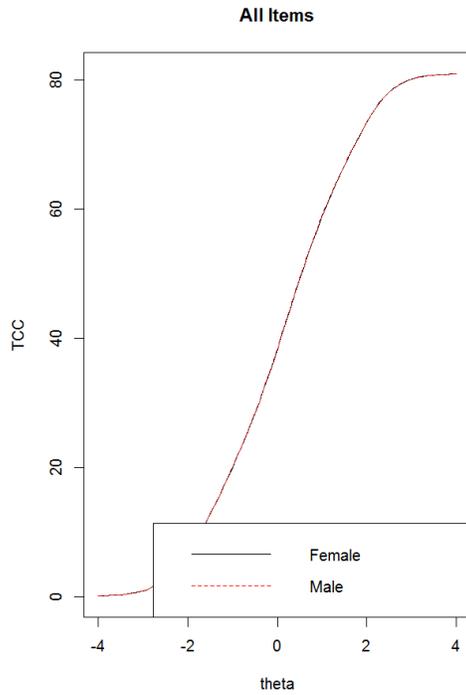


Figure 9-7. Male and Female Total Item Functioning

In addition, a nonparametric approach was used to illustrate possible differences between gender groups further. All of the items' expected scores were monotone between ± 3 latent traits in both groups. There were no noticeable differences in item functioning curves between the female and male groups. An example of the curves produced in the process of estimating nonparametric DIF is presented in Figure 9-8.

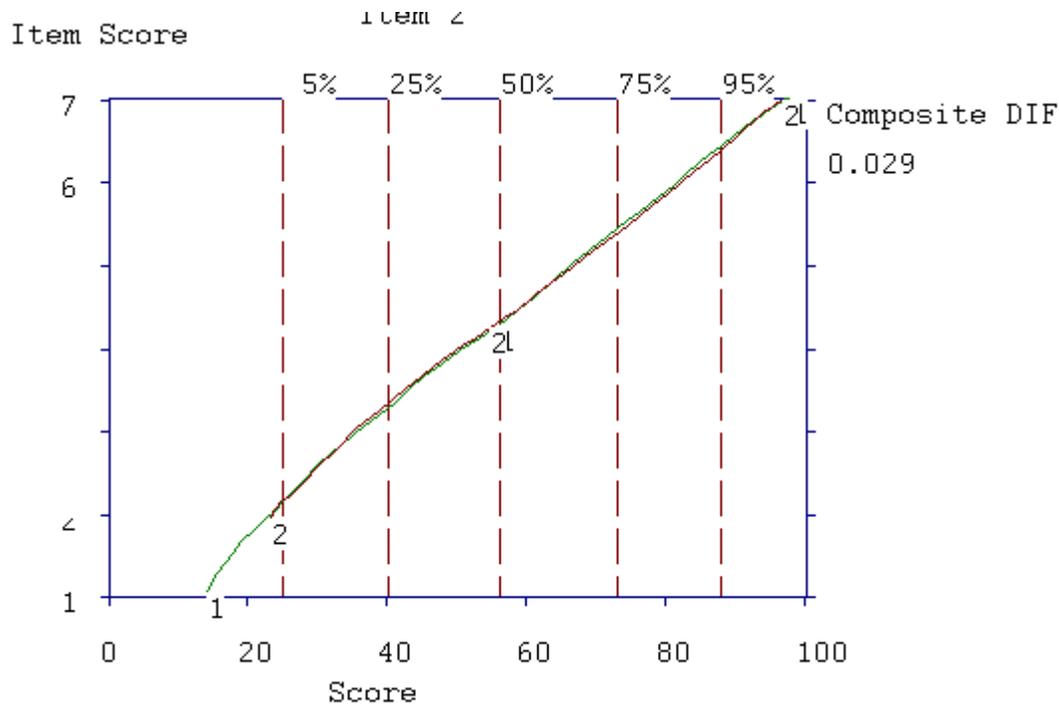


Figure 9-8. Example of Nonparametric DIF Graphs for item Pr5.

Item-Reduction Process.

A hierarchical decision-making process was used to select the best set of items based on a combination of statistical findings related to the items and the conceptual subdomain that each item represented. In the first stage, each item was rated based on the qualities related to its item-information and category-response curves (see Table 9-5). In the second stage, items were grouped based on the concept domain they represent (see Table 9-6). Items with unique and similar content domains were highlighted. Items with unique content were retained, unless the items had a major psychometric problem. When there were several items with similar information curves (statistically redundant items), only one item became a candidate to be retained. When there were several items representing the same content domain (conceptually redundant items) items with better IRT features were selected.

Table 9-5

Item-Reduction Process Stage 1 (Item-response result)

Source	Irrational Delay
Better IIC height (Maximum Info or a parameter)	Excellent (above average): P10, P12, P23, P27, P25, P21, P14 Good (around average): P3, P35, P32, P5 Poor (Below the average): P16, P29, P8
Covered theta in IIC in right end (covering higher theta)	More than the average : P8, P29, P16 Much Less than the average P3, P35, P5, P10, P27
CRC quality (discrimination, location of categories)	All items had good CRC quality
Extreme Similarity in IIC	P12, P25, P 27 P23, P10 P8, P16
Flagged Items (significance of chi-square)	P8, P14, P16, P21, P23, P39, P33, P35
Information Shape (e.g., Unimodal vs. Multimodal)	Extreme incongruent (drop to unreliable area): P14 Reliable Congruent: P3, P21, P32, P35, P5
Nonparametric ICC	No Problematic ICC
DIF	Non parametric: ICC bad: Item 12 (option 1, 2, and 6) Parametric: No problem

Note. IIC = Item Information Curve; CRC = Category Response Curves; ICC = Item Characteristic Curves; DIF = Differential Item Functioning

Table 9-6

Item-Reduction Process Stage 2 (Qualitative information and final decision)

Theoretical and/or phenomenological distinction	Items	IRT Information	Dropped	Selected
Delay despite awareness about emotional consequences:	P8, P21	P8 has Low Reliability	P8 (Low Reliability)	P21 (better height)
Delay without rational reason:	P35, P3, P14, P12	P3 and P35 similar IIC and similar to mean. P12 and P14 similar IIC	P35 (Flagged Fit), P14	P12 (better height) P3 (better Fit)
Postponement despite “Planning”	P23, P10, P27	Similar IIC	P23 (Flagged fit)	P27 (fit, height)
Needless delay	P5, P27 P10	P27 and P10 similar IIC and wording	P5 (Low Reliability)	P27 (fit, height)
Engage in other activities	P32, P29, P25, P16, P14	Divers IIC	P16 (Low Reliability) P29 (Low Reliability)	P25 (height)

The final set of items are presented in Table 9-7.

Table 9-7

Final 5-item Irrational Delay Subscale

Old Code	Item
P3	When academic tasks are assigned, I tell myself that I will not start them late, but I end up delaying them without a good reason.
P12	I keep putting off academic tasks until later without any rational reason.
P21	I needlessly delay working on academic tasks despite the fact that I know I will not be happy about doing so later.
P25	Despite my intention to start and finish academic tasks on time, I engage in other unnecessary activities instead.
P27	When I receive academic tasks, I plan to work on them ahead of time, but I needlessly delay starting them.

Reliability of Irrational Delay Subscale. A GRM model was used to measure items and test information curves for the new sets of items. Figure 9-9 presents the test-information curve for the initial 14-item and the final 5-item irrational-delay scale (Anxious Procrastination). The solid line and dashed line presents .90 and .70 reliability range. The curve demonstrated that the 5-item irrational-delay scale can measure a broad range of the latent trait (approximately ± 2.5) at reliability equal to or greater than .90. That is, approximately 98% of cases can be measured with reliability above .90, assuming the distribution of the latent trait is normal.

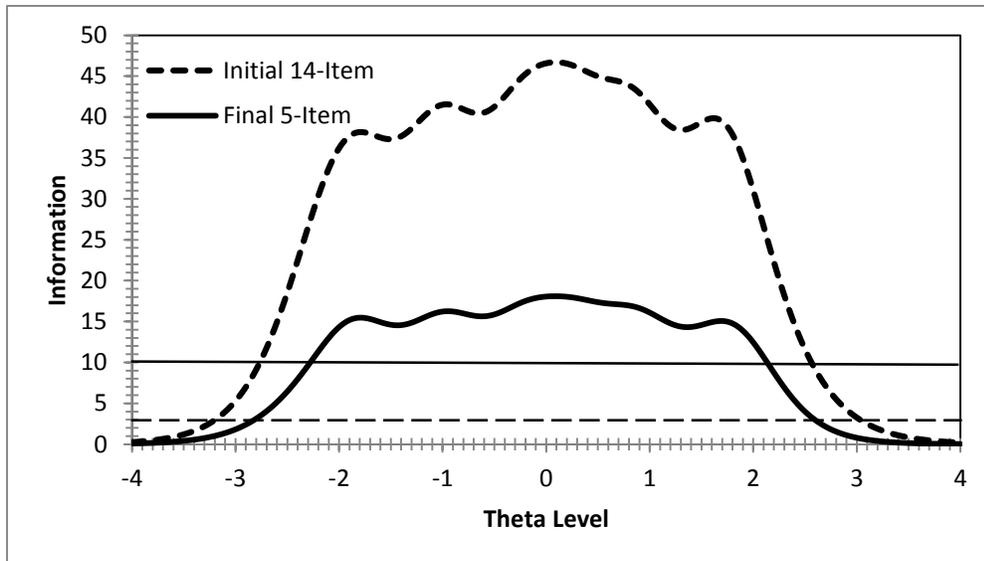


Figure 9-9. Test-Information Curves for initial and final Irrational Delay/Anxious Procrastination subscale. Note. The solid and dashed horizontal lines are approximately equivalent to .90 and .70 reliability. The range on theta axis can be used to determine the theta level that has been measured with high and acceptable reliability.

Unidimensional IRT on Hedonistic Delay Items.

The sample without influential multivariate outliers was used to test the assumption of IRT and to test a Graded Response Model. Previous factor analysis suggested that Hedonistic Procrastination items tapped into one factor supporting the assumption of unidimensionality. Another specific assumption of unidimensional IRT is local independence. A unidimensional CFA model was used to test the assumption of local independence. Modeling the correlations between errors in Irrational Delay items showed that only the association between error terms of items 24 & 30 ($r=.22$) was higher than .20, a criterion for local dependence (Erhart et al., 2010; Reeve et al., 2007). Since both items had similar content domain, the item with lower factor loading, item 30 (H30), was eliminated.

IRT analysis was applied to the remaining 7 items. The chi-square test for the graded response model was significant, indicating that the model did not fit the data. However, given the

sensitivity of the chi-square test to sample size, the decision about the applicability of IRT model should not be made based on this statistic.

Table 9-8 presents the parameter estimates for Irrational Delay items and their standard errors, as well as a fit index for each item. The chi-square index of fit for 3 items was not significant at the .01 level, indicating acceptable item fit. Within each response category, the spread of thresholds (i.e., *b*, severity or difficulty parameters) seemed relatively moderate, implying a moderate level of similarity among items measuring the latent trait.

Table 9-8

Item Parameter Estimates and Item Fit Statistics for the Hedonistic Delay Items

Item	a	b1	b2	b3	b4	b5	b6	χ^2	p
H2	1.19 (0.06)	-1.78 (0.06)	-0.42 (0.04)	0.70 (0.04)	1.35 (0.04)	2.05 (0.06)	2.99 (0.13)	91.95	0.235
H4	1.21 (0.06)	-1.85 (0.06)	-0.66 (0.04)	0.27 (0.03)	0.82 (0.03)	1.54 (0.05)	2.46 (0.09)	104.44	0.056
H13	1.63 (0.09)	-1.43 (0.05)	-0.31 (0.03)	0.48 (0.03)	0.95 (0.03)	1.61 (0.05)	2.49 (0.10)	112.58	0.017
H15	1.33 (0.07)	-1.39 (0.05)	-0.27 (0.03)	0.62 (0.03)	1.14 (0.04)	1.75 (0.05)	2.60 (0.10)	108.09	0.034
H20	1.00 (0.06)	-0.94 (0.05)	0.25 (0.04)	0.97 (0.04)	1.62 (0.05)	2.43 (0.08)	3.29 (0.15)	106.22	0.044
H24	1.40 (0.08)	-1.18 (0.04)	-0.09 (0.03)	0.67 (0.03)	1.24 (0.04)	1.97 (0.06)	2.82 (0.12)	97.61	0.130
H28	1.44 (0.08)	-0.85 (0.04)	0.18 (0.03)	0.79 (0.03)	1.30 (0.04)	1.96 (0.06)	2.87 (0.13)	118.08	0.007

Note. The standard errors for each item parameter estimate are presented in parenthesis; *b*= thresholds, severity or difficulty parameters; *a* = discrimination statistics.

Within each item, the spread of between-categories thresholds along the latent trait for a majority of the items was reasonably broad and in the correct order, implying that a reasonable range of the latent trait Academic Procrastination could be measured by most items. Item discrimination statistics (i.e., *a* or slope parameters) of the items ranged from 1.0 to 1.6, indicating that the items can adequately differentiate various levels of procrastination. The slope parameters were particularly high for items H28, H24, and H13.

Category Response Curves. The CRC for the hedonistic procrastination items were very similar to those found in the Irrational Delay subscales; However, the CRCs were shifted more towards the right end of the latent trait and the middle point of the categories was above the standardized average point for the latent trait (see Figure 9-10). This indicates that items and response sets had discriminatory power for measuring and differentiating cases with a higher level of the latent trait, hedonistic procrastination. Moreover, the midpoint of the response categories for most items was covered by adjacent response categories. Figure 9-11 compares the position of the midpoint along the latent trait axis. Most midpoints have a maximum probability around the latent trait equal to zero, or the mean of the latent trait.

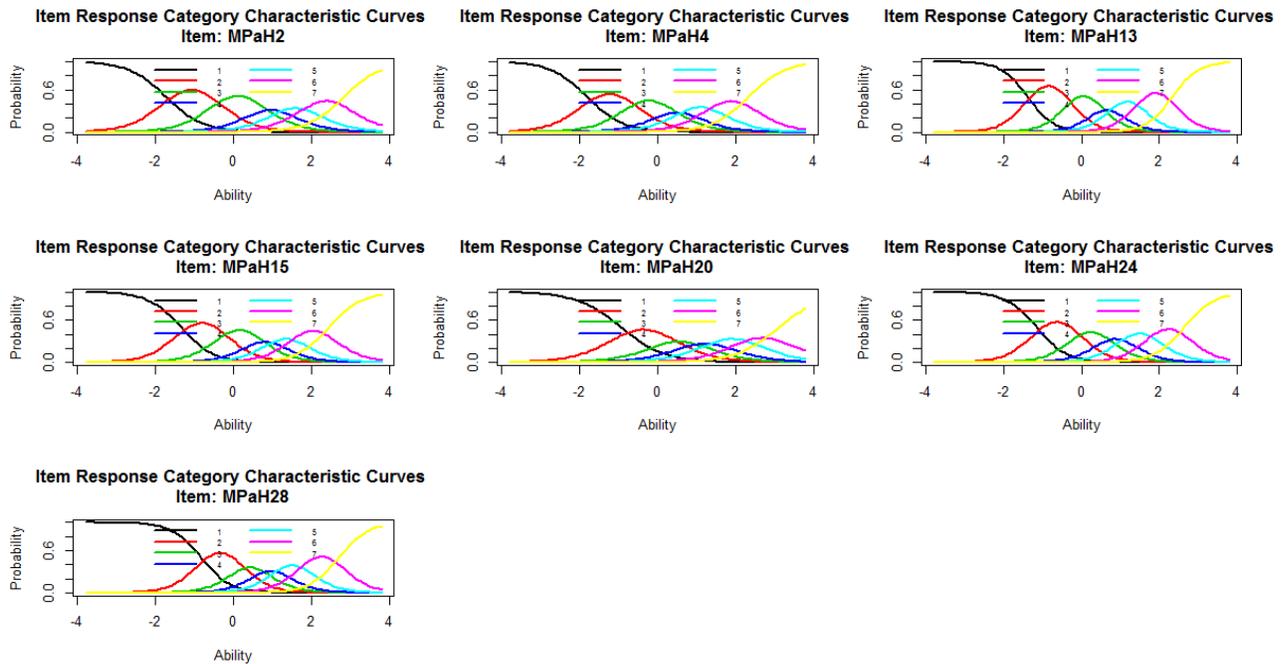


Figure 9-10. Category Response Curves of the HD items.

Item Response Category Characteristic Curves - Category: 4

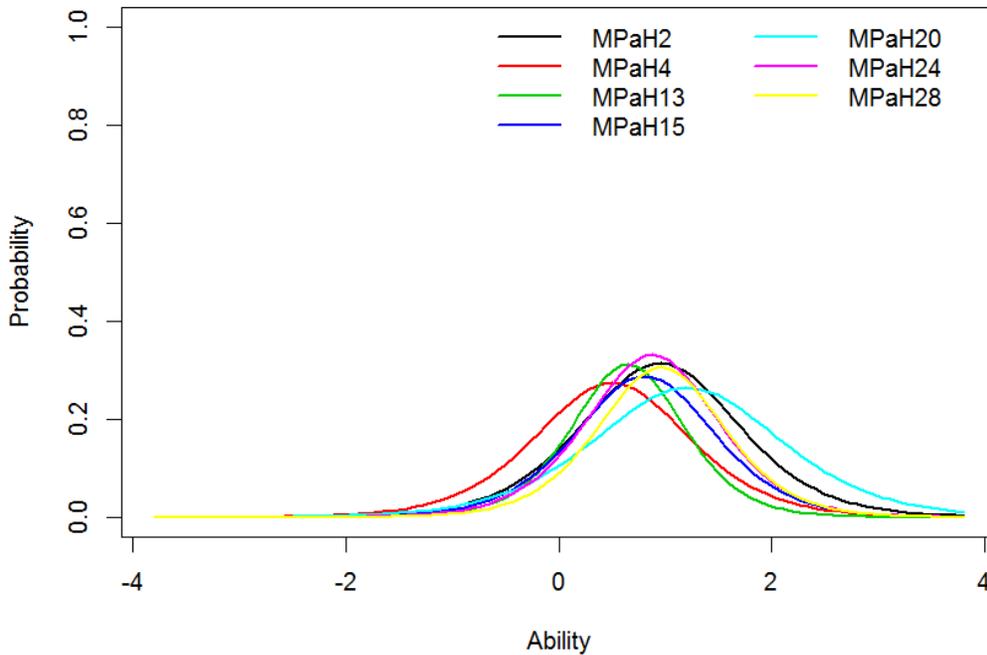


Figure 9-11. Comparison of middle categories in HD items.

Information Curves. Figure 9-12 presents the Test Information Curve for the 7-item version of the Hedonistic Delay scale. The reliability of the scale was above .75 for levels of the latent trait ranging from -2.50 SD below the mean to 3.5 S.D. above the mean. For an approximate range of 2 SD below to 3.25 SD above the mean, the reliability was above .90. These results indicate that the scale reliably measures people with a higher range of hedonistic procrastination.

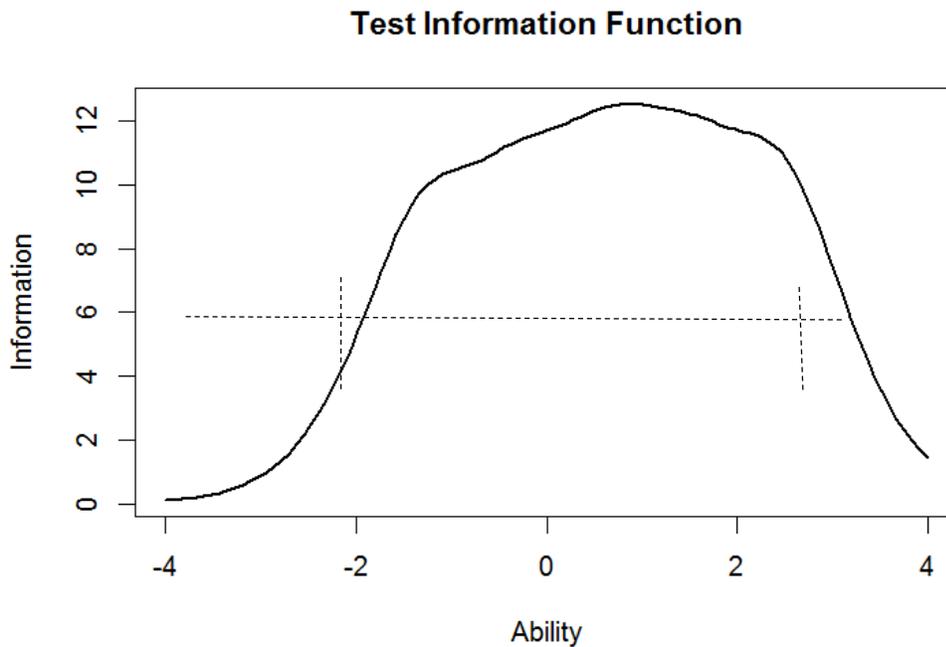


Figure 9-12. Test Information Function (TIF): Hedonistic Procrastination (7 items).

Item Information Curves. Item Information Curves of the 7 items were put together in Figure 9-13 in order to compare item functioning. A curve for the average of item information functions was also drawn.

The height and width of the IIFs differed across items. Item H13 was higher than the other curves and covered a balanced area between low and high levels of the latent trait. Item H13 was interestingly similar to the average of the IIFs, indicating that this item could potentially be used as a single-item measure. However, the reliability of this single item was as low as that of the other hedonistic procrastination items. Items H28 and H24 were above the average curve; items H2, H4, and H20 were below the average curve. Most items were skewed towards higher levels of the latent trait. In particular, items H28, H20 H24 functioned better in measuring higher levels of the latent trait. The above information was used to reduce redundant items and to choose the best set of items that function in a more balanced range as a whole.

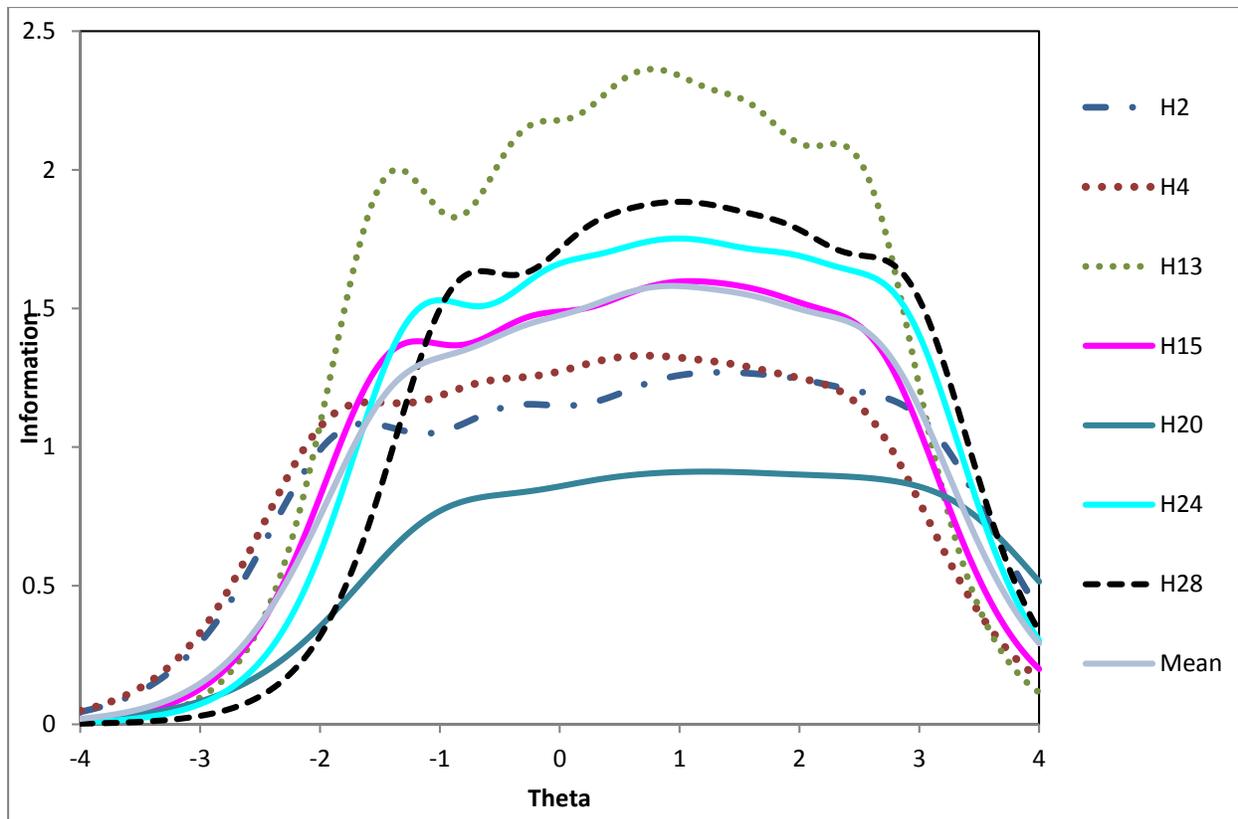


Figure 9-13. The initial HD Item-Information Curves (IIC).

Differential Item Functioning.

Only cases that determined the dichotomy of male and female as their gender were selected. Ordinal logistic regression (OLR) was used to evaluate Differential item functioning between the gender groups. The p -value was calculated using a Monte Carlo simulation approach. There were no items with significant DIFs at a p -value ≤ 0.01 . Similarly, no DIF was detected based on various effect-size criteria. All of the pseudo R -square statistics were negligible (<0.13).

In addition, a nonparametric approach was used to further illustrate possible differences between gender groups (see Figure 9-14 and 9-15). All items' expected scores were monotone between ± 3 latent traits in both groups. There were no noticeable differences in item functioning curves between the female and male groups.

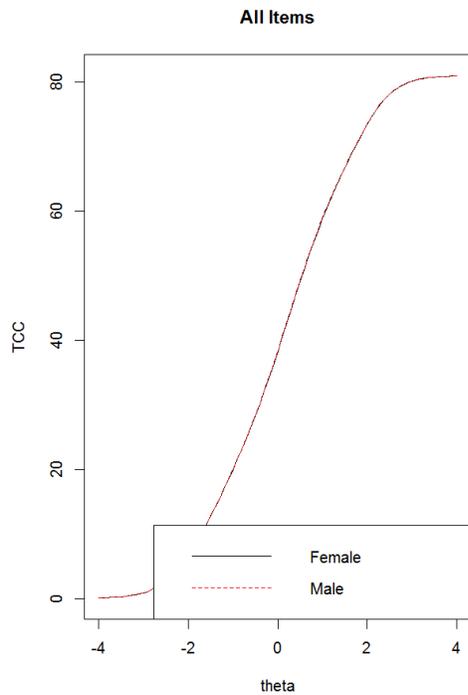


Figure 9-14. Male and female Total Item Functioning.

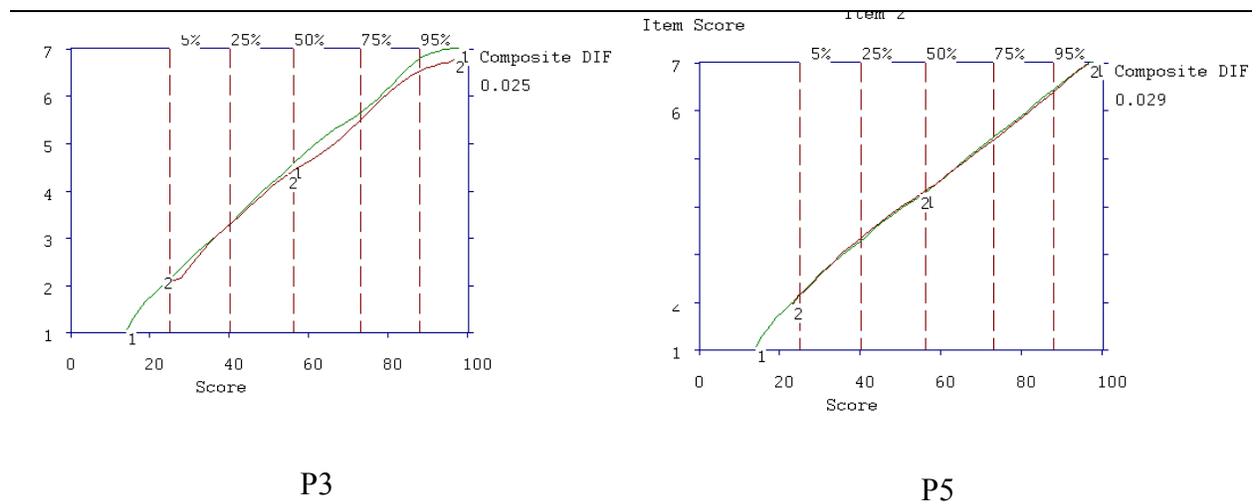


Figure 9-15. Example of nonparametric DIF graphs for ID items.

Item Reduction Process.

The same decision-making procedure that was used for the Irrational Delay items was applied to select the best set of items related to hedonistic delay. The goal was to eliminate the

items that did not function well in measuring hedonistic delay at different magnitudes of the latent trait, and to select items that are unique and that measure the construct reliably in a broad range of the latent trait. Based on the result of the IIFs, items H13 and H15 had unique curves and were therefore selected. Item H20 was eliminated since it had the lowest item- information curve. Items H2 and H4 functioned similarly, so item H2 was selected because of its conceptual uniqueness (no intention). H24 and H28 were similar in functioning, but both were selected because of their conceptual uniqueness. The final set of hedonistic delay items is presented in Table 9-9.

Table 9-9

Final set of Hedonistic Delay Items

Item	Variable
H2	I don't intend or plan to work on academic tasks, and I do other fun things instead.
H13	I am focused on fun and enjoyable activities and do not bother myself with academic tasks until the last minute.
H15	I am not interested in starting academic tasks ahead of time because I would rather do more enjoyable things instead.
H24	I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on school tasks on time.
H28	I choose to do academic tasks at the last minute so I leave more time for fun stuff instead.

Reliability of the Hedonistic Delay Subscale. Similar to the procedure used to develop the ID scale, a GRM model was used to illustrate and compare test-information curves of the initial and final (5-item) version of the HD scale. Figure 9-16 presents the test-information curves. The shape of the final version's curve was very similar to that of the initial version. The curve demonstrated that the 5-item hedonistic delay scale measures a broad range of the latent trait (more towards the higher levels of the latent trait) at a level of reliability equal to or greater than .86. The measure provided reliability .86 or higher for participants with HD scores

approximately 1.8 SD below to 3 SD above the mean. The reliability for HD scores falling between 2.3 SD and 1.8 SD below the mean was .70. The scale is not reliable for those with very low levels of HD.

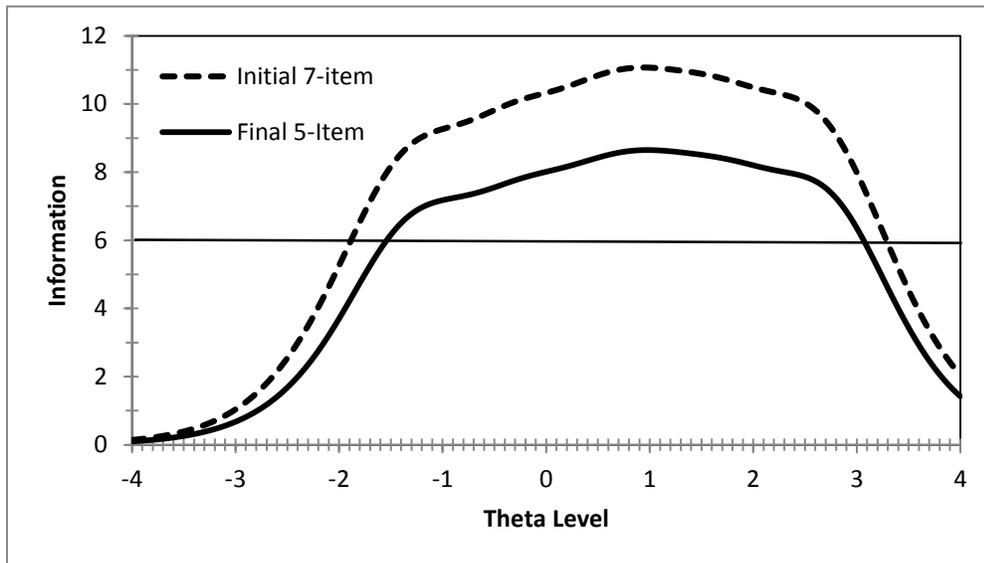


Figure 9-16. Test information function: Hedonistic Procrastination (7 items vs. 5 items).

Exploratory Analysis of Alternative Structures of the PBS

The Procrastination Behaviour Scale consisted of two correlated factors. There were two alternative structures for a correlated factor structure including a bifactor model and hierarchical model. Theoretically, the types of delay in procrastination scales were not considered psychological constructs caused by a higher order factor, but rather two aspects or domains of procrastination. This conceptualization was very similar to a bifactor structure. It should be noted that both bifactor and higher order (hierarchical) factor solutions are not identified when there are only two factors. To solve this, the factor loadings related to general or higher order factors were set to be equal. Figure 9-17 presents the bifactor solution for the PBS. The omega total, an estimate of the reliability of both general and specific factors, was equal to .95. The omega for the general factor was .70. The results indicated that 73% of reliable variance in the measure was

captured by a total score measuring overall procrastination behaviour. The omega total values for irrational and hedonistic delay were .94 and .88 and the omega specific values, or omega for irrational and hedonistic delay after controlling for the general factor, were .37 and .35 respectively. These results indicate that approximately 40% of the variance in the subscales is not covered by the total score. In sum, the findings may support the calculation and usage of the total procrastination behaviour score as well as specific scores for anxious procrastination (i.e., irrational delay) and hedonistic procrastination/delay.

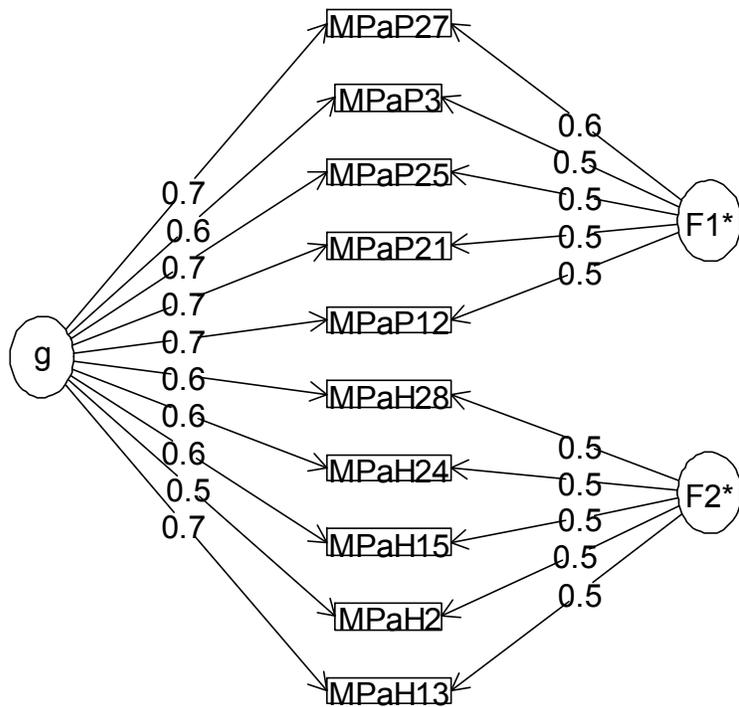


Figure 9-17. Bifactor Exploratory Factor analysis of Procrastination Behaviour.

Factor Analysis on Procrastination Problems

The dataset without influential multivariate outliers was used in analyses related to problem items. The problem items included two measures that were presented to participants separately in order to quantify the emotional and cognitive aspects of procrastination. The first measure, the Perceived Negative Consequences Scale (PNCS), consisted of 40 items that capture various negative outcomes of delay as well as dissatisfaction with procrastination behaviour. The second measure, the Task-related Negative Emotions Scale (TNES), consisted of 14 items that capture negative emotions before starting tasks and while delaying on tasks. At the first stage, each scale was analysed separately to explore the internal structure of the measures.

Multivariate Item Response Theory or Full-information factor analysis was used to explore the structure of the first measure, since it was assumed to have a multidimensional nature. Furthermore, the same analysis was performed twice on two different datasets. The first dataset, the full dataset, included cases with broad ranges of procrastination behaviour (low to high). The second dataset, the selected dataset, included cases with moderate to high levels of procrastination behaviour. The cases were selected based on scores from the refined procrastination behaviour scale discussed in the previous section. Factor analysis was considered appropriate in the selected samples because the items in the procrastination-problem sections (PNCS and TNES) were explicitly and conceptually conditional on having some non-negligible level of procrastination behaviour. The results of the EFA in the full and selected datasets were compared.

In addition to full-information factor analysis, a robust and limited method of factor analysis was performed and then compared with full-information factor analysis. The findings of these methods are not reported unless there were noticeable differences in factor structure and loadings. The decision about whether to use unidimensional or multidimensional IRT was made

after exploring the dimensionality of the measures. In the following sections, the findings related to the PNCS and TNES scales of the MMAP are presented, respectively.

Exploratory Factor Analysis on the PNCS.

The statistical software R was used to explore the number of factors. Various methods showed that the items that were initially developed to measure procrastination dissatisfaction and outcome consisted of one to six factors (see Figure 9-18, A). Parallel analysis based on principal component analysis eigenvalues and maximum likelihood factor analysis eigenvalues indicated three and six factors respectively (see Figure 9-18, B). Very Simple Structure analysis (VSS) with complexity 2 achieved a maximum of 0.81 with two factors. The analysis supports a one- or two-factor solution. Minimum Average Partial (MAP, Velicer, 1976) criterion achieved a minimum of 0.01 with six factors.

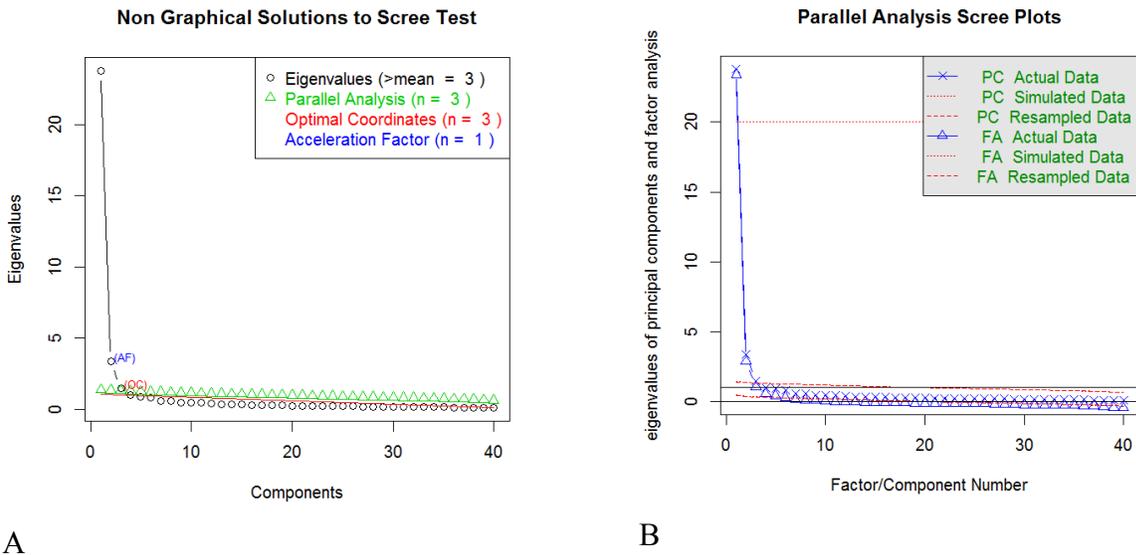


Figure 9-18. Graphical presentation of number of factors underlying the PNCS (N=969). *Note.* PC=Estimations based on Principal Component Analysis; FA= Estimation based on Exploratory Factor Analysis.

Using the MIRT package in R, a full-information factor analysis was applied in order to compare models with one to seven factors. The difference between fit of the factor models is presented in Table 9-10. The results supported a factor solution consisting of six factors. However, when the factor loadings were inspected, the 5- and 6-factor solutions had at least one factor without any marker indicators (an item with acceptably high factor loading). The allocation of items in the 3- and 4-factor solutions had a theoretically and statistically promising factor structure (see Table 9-11 and Table 9-12).

Table 9-10

Factor Models Comparisons based on Full-information Factor Analysis of the Perceived Negative Consequences and Dissatisfaction Scale (N= 970)

Factor	AIC	BIC	Log Likelihood	$\Delta\chi^2$	df	P-value
1 Factor	110941	112306	55190.53			
2 Factors	105414	106970	52388.13	5604.79	39	.000
3 Factors	103714	105454	51499.77	1776.74	38	.000
4 Factors	103464	105385	51337.82	323.90	37	.000
5 Factors	103154	105251	51147.00	381.64	36	.000
6 Factors	102502	104770	50786.09	721.81	35	.000
7 Factors	102672	105105	50836.96	101.73	34	.1

Note. AIC = Akaike’s Information Criterion; BIC = Bayesian Information Criterion.

Table 9-11 presents factor loadings and communalities related to a 3-factor solution in the whole sample without elimination of cases with low procrastination behaviour.

Table 9-11

Factor Loadings and Communalities Based on Full-Information 3-Factor Model with Oblimin Rotation for Perceived Negative Consequences Items (N=970)

Item #	Item	F_1	F_2	F_3	h2
Di24	I don’t like my habitual delay of academic tasks.	0.82			0.77
Di5	I wish I could change my habitual procrastination when I should be working on academic tasks.	0.80			0.67
Di28	I am not happy with my needless delay on academic tasks.	0.78			0.79
Di27	I really would like to learn how to avoid needless delay on academic tasks.	0.75			0.71
Di34	In general, my needless delay on academic tasks bothers me.	0.72			0.76
Di1	I feel down about myself when I delay working on academic tasks without a rational reason.	0.69			0.44
Di16	I am critical of myself for needlessly postponing academic tasks.	0.67			0.66
O30	My failure to follow my plans to work on academic tasks has bothered me.	0.65			0.71

Item #	Item	F_1	F_2	F_3	h2
Di13	I blame myself for the negative consequences of postponing academic tasks on my performance as a student.	0.63			0.65
Di21	I am upset by the negative consequences of delaying academic tasks.	0.51	0.29	0.25	0.73
Di12	I am not satisfied with myself because of my needless delay on academic tasks.	0.48	0.35		0.69
O33	When I have delayed working on academic tasks, it has led me to not be at my best in my personal relationships.		0.86		0.75
O29	My delay on academic tasks has had a problematic effect on my relationships.	-0.30	0.85		0.75
O35	My needless delay on academic tasks has affected my personal life in a negative way.		0.85		0.77
O37	My needless delay on academic tasks has caused me to not enjoy my life.		0.83		0.75
O14	Repeatedly postponing academic tasks until the last minute has had a negative impact on my health.		0.81		0.62
O7	There are negative effects on my health when I delay working on academic tasks.		0.79		0.57
O4	My needless delay on academic tasks has had a negative impact on my relationships with a significant others (e.g., family or partner).		0.79		0.60
O39	Repeated postponing academic tasks until the last minute has had a negative effect on my general life satisfaction.		0.74		0.72
O38	My needless delay on academic tasks does not allow me to fully enjoy social activities.		0.73		0.63
O18	There are negative effects on my well-being when I delay working on academic tasks.		0.71		0.64
Di31	I do not like myself because of the negative consequences of postponing academic tasks until the last minute.		0.66		0.70
O25	Repeatedly postponing academic tasks until the last minute has had a negative impact on my happiness.	0.43	0.64		0.76
O23	There are negative effects on my happiness when I delay working on academic tasks.	0.44	0.59		0.72
Di20	In general, my needless delay of academic tasks negatively affects how I feel about myself.	0.35	0.57		0.74
O3	My needless delay on academic tasks has bothered me emotionally and psychologically.	0.44	0.55		0.60

Item #	Item	F_1	F_2	F_3	h2
O11	Repeatedly postponing academic tasks until the last minute has had a negative impact on my mood.	0.46	0.48		0.61
O8	When I needlessly delay working on academic tasks, significant others (e.g., parents, partner) complain about it.		0.44		0.30
O15	Delaying needlessly on academic tasks has made me a less successful student.			0.91	0.82
O19	My needless delay on academic tasks is one of the factors that has negatively affected my grades.			0.87	0.84
O32	The quality of my work has suffered from my delay on academic tasks.			0.85	0.80
O22	Repeatedly postponing academic tasks until the last minute has had a negative impact on my school work.			0.83	0.82
O9	Putting off academic tasks until the last minute is one of the factors that has negatively affected my performance in school.			0.81	0.75
O26	As a result of delaying academic tasks, my professors are not satisfied with the quality of my work.			0.75	0.62
Di36	In general, my delay of academic tasks negatively affects my satisfaction with my performance at school.			0.66	0.78
Di6	I am not satisfied with my performance at university because of my needless delay on academic tasks.			0.66	0.62
Di17	I am not satisfied with myself because my procrastination on academic tasks has resulted in work that is not my best.	0.38		0.56	0.74
O40	I think if I didn't needlessly postpone academic tasks, my work could be much better.	0.44		0.53	0.64
O10	My needless delay on academic tasks does not allow me to appropriately plan for pleasurable activities.	0.25	0.38	0.25	0.49
O2	Repeatedly postponing academic tasks until the last minute has had a negative impact on my enjoyment of school.	0.41	0.31		0.46

Table 9-12 present factor loadings and commonalities related to a 4-factor solution in the whole sample without elimination of cases with low procrastination behaviour.

Table 9-12

Factor Loadings and Communalities Based on Full-Information 4-Factor Model with Oblimin Rotation for Perceived Negative Consequences Items (N=970).

Item#	Item	F_1	F_2	F_3	F_4	h2
Di28	I am not happy with my needless delay on academic tasks.	0.86				0.80
Di27	I really would like to learn how to avoid needless delay on academic tasks.	0.85				0.72
Di24	I don't like my habitual delay of academic tasks.	0.83				0.76
Di34	In general, my needless delay on academic tasks bothers me.	0.80				0.77
O30	My failure to follow my plans to work on academic tasks has bothered me.	0.70				0.69
Di5	I wish I could change my habitual procrastination when I should be working on academic tasks.	0.66				0.62
Di16	I am critical of myself for needlessly postponing academic tasks.	0.51			0.30	0.61
O40	I think if I didn't needlessly postpone academic tasks, my work could be much better.	0.51		0.41		0.59
Di13	I blame myself for the negative consequences of postponing academic tasks on my performance as a student.	0.47		0.25	0.29	0.59
O33	When I have delayed working on academic tasks, it has led me to not be at my best in my personal relationships.		0.85			0.73
O35	My needless delay on academic tasks has affected my personal life in a negative way.		0.84			0.75
O37	My needless delay on academic tasks has caused me to not enjoy my life.		0.83			0.74
O29	My delay on academic tasks has had a problematic effect on my relationships.		0.82			0.72
O39	Repeated postponing academic tasks until the last minute has had a negative effect on my general life satisfaction.		0.76			0.71
O38	My needless delay on academic tasks does not allow me to fully enjoy social activities.		0.75			0.61
Di31	I do not like myself because of the negative consequences of postponing academic tasks until the last minute.	0.34	0.69			0.69
O4	My needless delay on academic tasks has had a negative impact on my relationships with a significant others (e.g., family or partner).	-0.26	0.57		0.25	0.56
O14	Repeatedly postponing academic tasks until the last minute has had a negative impact on my health.		0.46		0.49	0.63

Item#	Item	F_1	F_2	F_3	F_4	h2
O15	Delaying needlessly on academic tasks has made me a less successful student.			0.93		0.79
O19	My needless delay on academic tasks is one of the factors that has negatively affected my grades.			0.89		0.82
O9	Putting off academic tasks until the last minute is one of the factors that has negatively affected my performance in school.			0.86		0.72
O22	Repeatedly postponing academic tasks until the last minute has had a negative impact on my school work.			0.85		0.78
O32	The quality of my work has suffered from my delay on academic tasks.			0.78		0.76
O26	As a result of delaying academic tasks, my professors are not satisfied with the quality of my work.		0.29	0.69		0.57
Di6	I am not satisfied with my performance at university because of my needless delay on academic tasks.			0.66		0.57
Di36	In general, my delay of academic tasks negatively affects my satisfaction with my performance at school.	0.31		0.59		0.74
Di17	I am not satisfied with myself because my procrastination on academic tasks has resulted in work that is not my best.	0.32		0.55		0.68
O3	My needless delay on academic tasks has bothered me emotionally and psychologically.				0.66	0.65
Di1	I feel down about myself when I delay working on academic tasks without a rational reason.	0.35			0.59	0.48
O7	There are negative effects on my health when I delay working on academic tasks.		0.40		0.56	0.60
O2	Repeatedly postponing academic tasks until the last minute has had a negative impact on my enjoyment of school.			0.26	0.55	0.50
O11	Repeatedly postponing academic tasks until the last minute has had a negative impact on my mood.				0.53	0.60
O18	There are negative effects on my well-being when I delay working on academic tasks.		0.38		0.49	0.63
O23	There are negative effects on my happiness when I delay working on academic tasks.	0.27	0.35		0.41	0.68
Di20	In general, my needless delay of academic tasks negatively affects how I feel about myself.		0.36		0.35	0.69
O25	Repeatedly postponing academic tasks until the last minute has had a negative impact on my happiness.	0.31	0.44		0.35	0.70
Di21	I am upset by the negative consequences of delaying academic tasks.	0.36		0.29	0.32	0.68
Di12	I am not satisfied with myself because of my needless delay on academic tasks.	0.33		0.25	0.31	0.63

Item#	Item	F_1	F_2	F_3	F_4	h2
O10	My needless delay on academic tasks does not allow me to appropriately plan for pleasurable activities.			0.28		0.43
O8	When I needlessly delay working on academic tasks, significant others (e.g., parents, partner) complain about it.		0.32			0.25

The same analysis was done for the dataset containing only cases with reported moderate to high levels of procrastination behaviour (Irrational or Hedonistic Delay, N=849). Various analyses and criteria were used to determine the number of factors. There was no difference between the findings related to the whole and selected samples (see Figure 9-19).

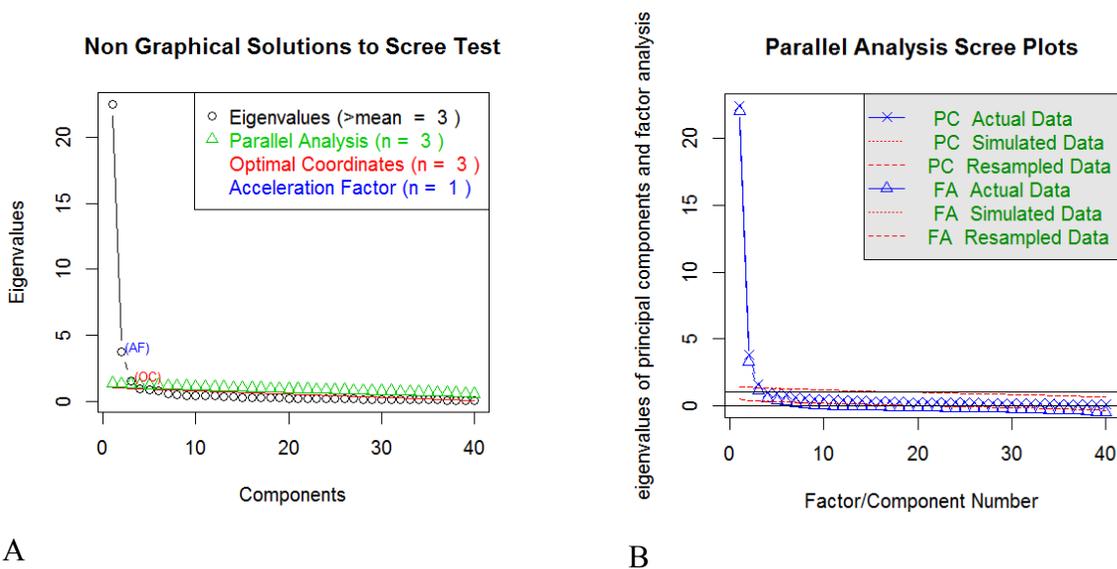


Figure 9-19. Graphical presentation of number of factors underlying items from the PNCS (N=849). Note. PC=Estimations based on Principal Component Analysis; FA= Estimation based on Exploratory Factor Analysis.

Parallel Analysis indicated three components based on the eigenvalues of a principal component analysis and six factors based on the limited-information factor analysis. Table 9-13 presents the results of various methods to determine the number of factors.

Table 9-13

Factor Models Comparisons based on Limited-information Factor Analysis of the Perceived Negative Consequences Scale in High Procrastination Sample (N= 849)

Factor	vss1	vss2	map	RMSEA	BIC	SABIC
1	0.96	0	0.042	0.13	6185	8535
2	0.6	0.83	0.018	0.099	1671	3897
3	0.4	0.61	0.012	0.082	-71	2035
4	0.34	0.52	0.011	0.073	-826	1162
5	0.28	0.41	0.011	0.065	-1311	563
6	0.25	0.38	0.01	0.057	-1709	54
7	0.21	0.32	0.011	0.049	-1947	-293
8	0.19	0.28	0.011	0.045	-1984	-434

Note. VSS=Very Simple Structure; MAP=Minimum Average Partial; AIC = Akaike’s Information Criterion; BIC = Bayesian Information Criterion; SABIC = Sample-Size Adjusted Bayesian Information Criterion.

The VSS complexity two value reached a maximum with two factors. The MAP criterion showed that there are 6 factors. BIC reached a minimum with 6 factors and adjusted BIC achieved a minimum with 8 factors. All factor solutions with more than two factors had acceptable RMSEA values. The inspection of dimensionality based on fit indices of a full-information factor analyses supported the inclusion of 6 factors (see Table 9-14).

Table 9-14

Factor Models Comparisons based on Full-information Factor Analysis of the Perceived Negative Consequences Scale in High Procrastination Sample (N= 849)

Factor	AIC	BIC	Log Likelihood	$\Delta\chi^2$	df	P-value
1 Factor	98005	99333	48722.57			
2 Factors	9802	94316	46082.17	5280.80	39	000
3 Factor	91062	92756	45173.99	1816.35	38	000
4 Factor	90852	97721	45032.03	283.92	37	000
5 Factor	90552	92592	44845.82	372.42	36	000
6 Factor	90066	92272	44568.08	555.49	35	000
7 Factor	90254	92621	44627.73	119.31	34	1

Note. AIC = Akaike’s Information Criterion; BIC = Bayesian Information Criterion.

Given the broad range in the number of factors suggested by various statistical analyses, I used interpretability to make the final decision about number of factors. The factor loadings of at least one factor in the 5- and 6-factor solutions did not have noticeable indicators with high loadings. The factors in 2-, 3-, and 4-factor solutions had interpretable factors with an appropriate number of indicators. Given the significant difference between 4-factor solutions and 2- and 3-factor solutions, the 4-factor solution was chosen.

In the 4-factor solution for cases with moderate to high levels of procrastination behavior, the factor loadings were closer to a simple factor structure. It seems, as expected, that excluding from the dataset participants who report levels of procrastination ranging from none to very low, reduces unwanted response formulation and noise in the dataset. Therefore, the further analysis was done only on a selected dataset with moderately low to extremely high levels of procrastination behaviour.

The results of the 4-factor solution based on polychoric correlations, robust MCD method and full-information NHMR method were compared. In general, both limited-information and full-information methods resulted in very similar measurement models supporting that the notion that the factor structure of the PMCS scale is independent of the analytic method used. However, there were subtle differences in items related to the subscale that measures negative procrastination outcome. The full-information methods produced a theoretically and statistically better quality factor solution (see Table 9-15). This analysis was used in the EFA refinement stages.

Table 9-15

Factor Loadings and Communalities Based on Full-Information and MCD Method for 4-Factor Analysis Model with Oblimin Rotation of Perceived Negative Consequences Items

Item#	Item	Full-Information (N=849)					MCD (N=866)			
		F_1	F_2	F_3	F_4	h2	F_1	F_4	F_2	F_3
Di28	I am not happy with my needless delay on academic tasks.	0.87				0.78	0.77			
Di24	I don't like my habitual delay of academic tasks.	0.85				0.75	0.82			
Di27	I really would like to learn how to avoid needless delay on academic tasks.	0.84				0.68	0.79			
Di34	In general, my needless delay on academic tasks bothers me.	0.83				0.75	0.72			
Di5	I wish I could change my habitual procrastination when I should be working on academic tasks.	0.72				0.61	0.83			
O30	My failure to follow my plans to work on academic tasks has bothered me.	0.71				0.65	0.64			
Di16	I am critical of myself for needlessly postponing academic tasks.	0.58				0.61	0.57			-0.28
Di13	I blame myself for the negative consequences of postponing academic tasks on my performance as a student.	0.57		0.26		0.61	0.59			-0.31
Di1	I feel down about myself when I delay working on academic tasks without a rational reason.	0.54			0.45	0.50	0.68			
O40	I think if I didn't needlessly postpone academic tasks, my work could be much better.	0.49		0.42		0.56	0.47			-0.47
Di21	I am upset by the negative consequences of delaying academic tasks.	0.45		0.31		0.69	0.47			-0.31
O37	My needless delay on academic tasks has caused me to not enjoy my life.		0.84			0.75				-0.89

Item#	item	F_1	F_2	F_3	F_4	h2	F_1	F_4	F_2	F_3
O33	When I have delayed working on academic tasks, it has led me to not be at my best in my personal relationships.		0.82			0.72			-0.74	
O35	My needless delay on academic tasks has affected my personal life in a negative way.		0.80			0.74			-0.76	
O39	Repeated postponing academic tasks until the last minute has had a negative effect on my general life satisfaction.		0.78			0.71			-0.81	
O38	My needless delay on academic tasks does not allow me to fully enjoy social activities.		0.76			0.61			-0.81	
O29	My delay on academic tasks has had a problematic effect on my relationships.	-0.26	0.76			0.71			-0.68	
Di31	I do not like myself because of the negative consequences of postponing academic tasks until the last minute.	0.34	0.69			0.67	0.25		-0.63	
O4	My needless delay on academic tasks has had a negative impact on my relationships with a significant others (e.g., family or partner).		0.55		0.26	0.55			-0.59	
O25	Repeatedly postponing academic tasks until the last minute has had a negative impact on my happiness.	0.38	0.45		0.29	0.69	0.48		-0.48	
O23	There are negative effects on my happiness when I delay working on academic tasks.	0.38	0.38		0.30	0.66	0.52		-0.45	
Di20	In general, my needless delay of academic tasks negatively affects how I feel about myself.	0.27	0.35		0.29	0.67	0.37		-0.38	

Item#	item	F_1	F_2	F_3	F_4	h2	F_1	F_4	F_2	F_3
O8	When I needlessly delay working on academic tasks, significant others (e.g., parents, partner) complain about it.		0.31			0.25			-	0.33
O15	Delaying needlessly on academic tasks has made me a less successful student.			0.93		0.79				-0.93
O19	My needless delay on academic tasks is one of the factors that has negatively affected my grades.			0.91		0.81				-0.87
O22	Repeatedly postponing academic tasks until the last minute has had a negative impact on my school work.			0.86		0.79				-0.84
O9	Putting off academic tasks until the last minute is one of the factors that has negatively affected my performance in school.			0.85		0.71				-0.80
O32	The quality of my work has suffered from my delay on academic tasks.			0.79		0.74				-0.74
O26	As a result of delaying academic tasks, my professors are not satisfied with the quality of my work.		0.26	0.70		0.55				-0.71
Di6	I am not satisfied with my performance at university because of my needless delay on academic tasks.			0.68		0.58				-0.63
Di36	In general, my delay of academic tasks negatively affects my satisfaction with my performance at school.	0.33		0.60		0.75	0.29			-0.57

Item#	item	F_1	F_2	F_3	F_4	h2	F_1	F_4	F_2	F_3
Di17	I am not satisfied with myself because my procrastination on academic tasks has resulted in work that is not my best.	0.34		0.57		0.67	0.33			-0.57
O7	There are negative effects on my health when I delay working on academic tasks.				0.72	0.70		0.97		
O14	Repeatedly postponing academic tasks until the last minute has had a negative impact on my health.		0.30		0.67	0.73		0.90		
O3	My needless delay on academic tasks has bothered me emotionally and psychologically.				0.62	0.63	0.49	0.32	-0.26	
O18	There are negative effects on my well-being when I delay working on academic tasks.		0.27		0.58	0.66		0.45	-0.30	
O11	Repeatedly postponing academic tasks until the last minute has had a negative impact on my mood.	0.30			0.49	0.59	0.48		-0.26	
O2	Repeatedly postponing academic tasks until the last minute has had a negative impact on my enjoyment of school.	0.27			0.40	0.46	0.45			
Di12	I am not satisfied with myself because of my needless delay on academic tasks.	0.38			0.31	0.61	0.44		-0.26	
O10	My needless delay on academic tasks does not allow me to appropriately plan for pleasurable activities.					0.39	0.34		-0.34	

In the first refinement attempt, items with low commonalities ($h^2 < .45$) and/or noticeable cross loadings ($\geq .25$) from the initial factor analysis were eliminated. These include, MPaDi1,” “MPaDi12,” “MPaDi13,” “MPaDi17,” “MPaDi20,” “MPaDi21,” “MPaDi31,” “MPaDi36,” “MPaO2,” “MPaO4,” “MPaO8,” “MPaO10,” “MPaO11,” “MPaO23,” “MPaO25,” “MPaO29,” and “MPaO40.” In the second attempt, the remaining items were entered and based on its factor loading item "MPaO3" was eliminated. The remaining 22 items were entered in a full-

information factor analysis. The factor loadings, communalities, and MIRT threshold parameters of the 22 items are presented in Table 9-16.

Table 9-16

Factor Loadings, Communalities, and MIRT Parameters Based on Full-Information 4-Factor Model with Oblimin Rotation for Perceived Negative Consequences Scale, Reduced Items

item	F_1	F_2	F_3	F_4	h2	d1	d2	d3	d4	d5	d6
O15	0.94				0.82	9.0	5.3	1.9	0.0	-2.7	-5.5
O19	0.90				0.84	9.7	6.1	2.8	0.6	-2.5	-5.4
O9	0.87				0.76	7.8	4.3	1.6	0.0	-2.2	-4.5
O22	0.87				0.83	9.5	6.1	2.4	0.3	-2.3	-5.1
O32	0.82				0.78	8.5	4.8	1.8	0.1	-2.4	-5.1
O26	0.76				0.58	4.5	2.0	0.0	-1.4	-3.0	-4.6
Di6	0.68				0.64	5.7	3.2	1.0	-0.3	-1.7	-3.4
O37		-0.91			0.84	4.9	1.6	-1.0	-3.0	-5.5	-8.0
O38		-0.88			0.73	5.2	2.4	-0.1	-1.8	-3.7	-5.6
O39		-0.83			0.80	5.6	2.5	-0.1	-1.8	-4.1	-6.2
O35		-0.73			0.73	4.4	1.4	-0.5	-2.1	-3.7	-5.4
O33		-0.69			0.67	3.4	1.1	-0.6	-2.1	-3.4	-5.3
Di24			0.90		0.81	10.1	7.3	4.8	2.8	0.0	-2.3

item	F_1	F_2	F_3	F_4	h2	d1	d2	d3	d4	d5	d6
Di28			0.89		0.83	10.6	7.8	4.9	2.9	0.0	-2.6
Di27			0.86		0.72	7.9	6.1	3.9	2.4	0.3	-1.5
Di5			0.83		0.65	8.8	5.7	3.5	2.2	0.4	-1.3
Di34			0.81		0.79	9.0	6.6	3.7	1.9	-0.5	-2.8
O30			0.71		0.71	8.0	5.3	2.7	1.2	-1.2	-3.4
Di16			0.61		0.60	7.0	4.9	2.7	1.3	-0.8	-2.7
O7				-0.96	0.88	6.6	2.6	-0.2	-2.3	-4.8	-7.5
O14				-0.93	0.91	7.1	2.7	-0.5	-3.0	-6.1	-9.6
O18				-0.63	0.72	5.6	2.8	0.7	-0.8	-2.8	-5.4

Note. d = MIRT threshold parameter.

Differential Item Functioning of PNCS

Both uniform and nonuniform Differential Item Functioning were evaluated using Ordinal Logistic Regression. In the first stage, 22 items from the previously discussed factor analysis were included. The results indicated that 8 items might function differently between male and female groups. The flagged items included O26 in factor 1 and all items in factor 3. Since the method uses unidimensional IRT estimation in calculating matching criteria, the DIF analysis was done for each factor separately. The results indicated that no DIF items were present in factor 1. Only one item in factor 3, “I am critical of myself for needlessly postponing academic tasks” (Di16), had DIF (see Figure 9-20 and Figure 9-21). Figure 9-20 shows that the item has non-uniform crossing DIF.

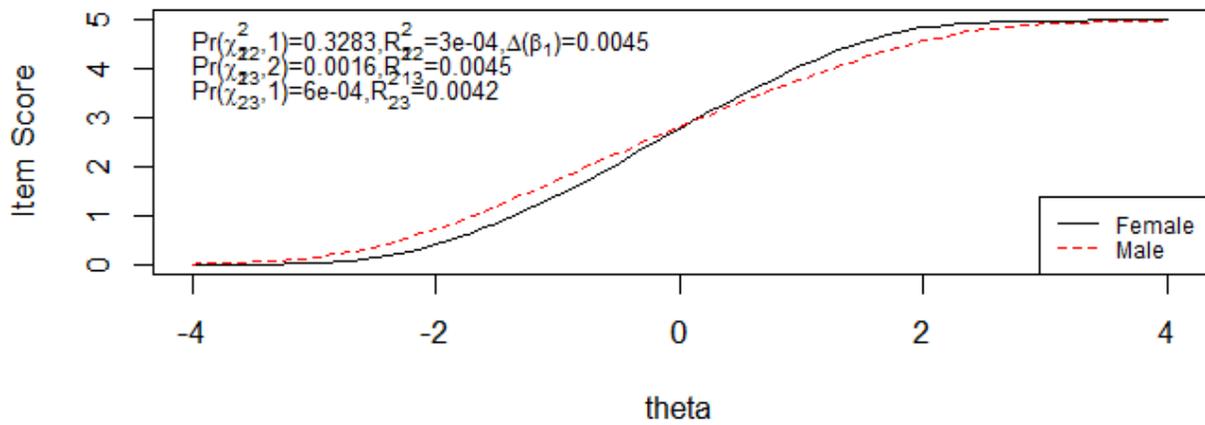


Figure 9-20. Item Characteristic Curves (ICCs) for the item Di16 in male (dashed curve) vs. female (solid curve) groups.

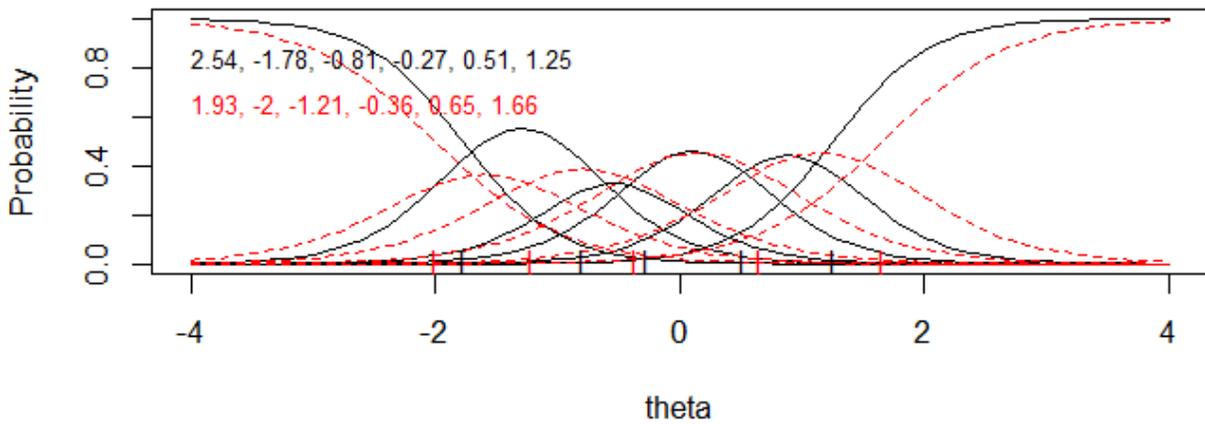


Figure 9-21. Item Di16 response functions for male and female groups.

IRT Analysis of the PNCS

The item information plots in MIRT are multidimensional and therefore are not appropriate for exploring item functioning when there are more than three factors. To overcome this limitation, I inspected and organized the item parameters sorted by factors. The discrimination or slope parameters in MIRT have the same meaning as factor loadings in factor

analysis language. Items with higher factor loading have higher discriminatory power and provide more information.

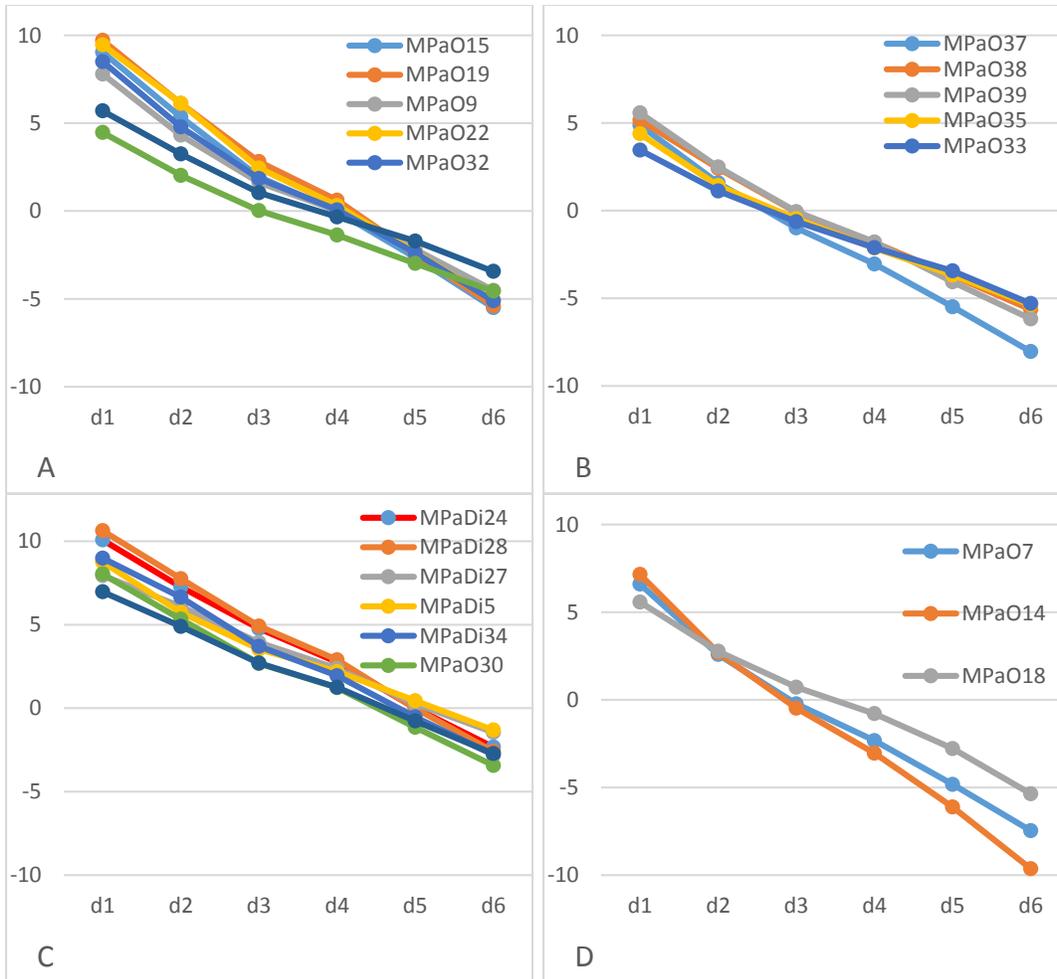


Figure 9-22. The Response Categories Thresholds based on 4-factor MIRT Analysis for PNCS items.

The results showed that indicators of the four dimensions had a very high slope for their corresponding factor and low discriminatory power for other dimensions. The threshold parameters are presented in Table 9-16. Furthermore, the response categories thresholds were plotted and compared from one factor to another (see Figure 9-22, A, B, C, & D).

The thresholds were spread appropriately within each response category. Looking at the severity statistics for each item revealed that the items had a descending trend from response categories *never* to *always* (i.e., correct order) and covered a distinct and broad range of the latent trait. The covered range was different for some items within each factor. The plots also show the similarities of some items within each factor.

The above plots could not provide rich evidence in terms of item functioning and the magnitude of error. Unidimensional IRT for polytomous items was used to produce information curves for factors with more than 5 items (Factors 1 and 3). Before testing the Graded Response Model, local independence was tested using one-factor CFA model. The first factor consisted of 7 items and CFA did not reveal a local dependence problem. In the third factor, Item 30 (o30) had an error term correlations above .20 with items Di34 and Di16, and was eliminated. Figure 9-23 presents the Item-Information Curves for the first and third PNC factors.

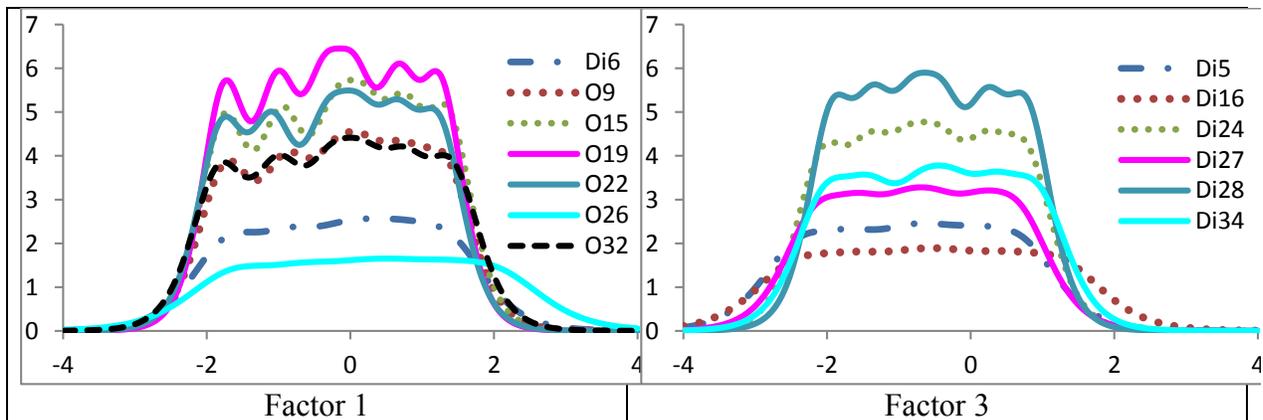


Figure 9-23. Item-Information Curves for PNCs items,

Given that a majority of items had very high factor loading or slope parameters for each factor, the diversity in range and trend as well as content domain was considered in the second stage of item selection/refinement. Items with similar plots and content were deleted. For example, in the first factor (see Figure 9-23), the trend for items 19 and 22 with one another and

for items 15, 32, and 9 with each other were similar; items 15 and 22 had similar information curves. Items 32 and 9 had similar information curves (see Figure 9-23). Items 6 and 26 were relatively similar too. There are subtle conceptual differences between items 19, 22, 15, 32, and 9. All of these items measure negative effects of delay on school work, including subjective performance, grade, and quality.

Between items 15 and 22, item 15 was selected since it had a higher slope and was a shorter item in terms of sentence length. Among items 32 and 9, item 32 was selected because of the necessity of its content domain (effect on quality). Items 19 and 26 had the highest and widest curves, respectively, and therefore were selected. Items 38 and 39 under the second factor seemed very similar, therefore item 39 (smaller slope) was eliminated. Items in the third factor were not clustered at any point along the information axis. However, items 24 and 28 had similar threshold plots and their information curves were above other curves. These items measure dissatisfaction with habitual and needless delay. Given their very high factor loadings and content, items 24 and 28 were kept. Items 27 and 5 both refer to desire to change but had different information curves. They were kept given the importance of the content in the definition of chronic procrastination. Between items 27 and 5, item 27 was kept. Item 34 measured the extent to which one dislikes the procrastination behaviour and was kept. Item 16 had the lowest factor loading. This was dropped since it was not capturing an essential concept congruent with other items and had biased DIF. All the remaining items for the fourth factor were kept. Table 9-17 presents the final set of items for the outcome measure as well as the factor loadings of the final 4-factor EFA model. There were no cross-loaded items with a loading above .20. Given the content of marker items and consistent with initial definitions, the 4 factors

were labeled as Academic Consequences (AC), Personal Consequences (PC), Dissatisfaction, and Health Consequences (HC).

Table 9-17

The Refined PNCS items and Structure

NO	Items	Item	Final Order	Factor Number	Factor Loading
1	O15	Delaying needlessly on academic tasks has made me a less successful student.	1	1	0.93
2	O19	My needless delay on academic tasks is one of the factors that has negatively affected my grades.	5	1	0.90
3	O32	The quality of my work has suffered from my delay on academic tasks.	9	1	0.82
4	O26	As a result of delaying academic tasks, my professors are not satisfied with the quality of my work.	13	1	0.78
5	O37	My needless delay on academic tasks has caused me to not enjoy my life.	2	2	0.88
6	O38	My needless delay on academic tasks does not allow me to fully enjoy social activities.	6	2	0.89
7	O35	My needless delay on academic tasks has affected my personal life in a negative way.	10	2	0.79
8	O33	When I have delayed working on academic tasks, it has led me to not be at my best in my personal relationships.	14	2	0.76
9	Di24	I don't like my habitual delay of academic tasks.	3	3	0.91
10	Di28	I am not happy with my needless delay on academic tasks.	7	3	0.91
11	Di27	I really would like to learn how to avoid needless delay on academic tasks.	11	3	0.87
12	Di34	In general, my needless delay on academic tasks bothers me.	15	3	0.79
13	O7	There are negative effects on my health when I delay working on academic tasks.	4	4	0.97
14	O14	Repeatedly postponing academic tasks until the last minute has had a negative impact on my health.	8	4	0.94
15	O18	There are negative effects on my well-being when I delay working on academic tasks.	12	4	0.63

The PNCS consists of three factors that measure domains of negative outcomes of procrastination behaviour and one factor that measures dissatisfaction with the behaviour. Table 9-18 present the subscales' correlations, Reliability Alpha, means and Standard Deviations (SD). The correlations of total scores and factor scores were very similar, supporting the use of summation to calculate subscale scores. It should be noted that the correlations between subscales were very high, indicating the possibility of combining the subscales. These correlations were uniformly high between the different domains of negative outcomes.

Table 9-18
Correlations, Means, and SDs of PNC Subscales

	AC	PC	Dis	HC	Alpha	n	Mean	M/n	SD
AC	1	0.61**	0.63**	0.47**	0.92	4	16.68	4.17	5.90
PC	0.64**	1	0.33**	0.70**	0.91	4	13.92	3.48	6.08
Dis	0.65**	0.42**	1	0.43**	0.92	4	20.59	5.15	5.67
HC	0.58**	0.72**	0.43**	1	0.92	3	11.16	3.72	4.92

Note. Correlations obtained from total scores are presented below the diagonal and correlations based on factor scores are presented above the diagonal; means are based on sum total scores of each subscale; n = number of items.

Reliability of the Perceived Negative Consequences Factors. A GRM model was used to illustrate and compare test-information curves (TIC) of the initial and final 4-item subscales. Figure 9-24 presents the test information curves. The shape of the TIC in the final version of each subscale was very similar to the TIC of the initial version. All curves cover a broad range of the latent traits with reliability above .90; however, the area of the latent traits covered by each subscale was different from one latent trait to another. More specifically, AC and DIS satisfaction were shifted more towards the lower level of the latent trait while the PC and HC covered a more balanced range of the latent trait more towards higher Theta levels. If we assume that the combination of these subscales represents overall negative consequences, a balanced and broad range of the latent trait is covered.

The overall PNC Test-Information Curve is presented in Figure 9-25. The PNC showed reliability of .90 or higher between -2.6 SD and 2.6 SD. The overall PNC curve assumes that all items can be considered one factor. This required further investigation. The main investigation of an overall factor for PNCS would be done in a new sample by using CFA. However, I used exploratory methods to investigate a structure that supports the usage of one overall factor.

I also investigated how reliability can be affected when the strategy of deleting cases with low procrastination behaviour is implemented after data collection. The TICs were slightly different between samples with and without cases with low procrastination behaviour scores. In the smaller sample, the covered ranges with factors was slightly shifted towards lower levels of the latent trait. Assuming a high correlation between Procrastinating Behaviour and PNCS, this shift is normal. The cases with low trait levels in the larger sample are missing in the smaller sample. By applying the strategy of deleting cases, the lower level trait in the smaller sample should correspond with slightly larger trait scores in the whole sample. That is, since the change is in lower levels of the common trait, we see the change in the lower range of the latent trait between the samples. It should be noted that TICs obtained from the whole sample for four factors was presented here. Figure 9-25 compares the overall TIC for the PNCS total in both samples. The results indicate that the measure can perform reliably regardless of whether or not low-procrastination cases are deleted.

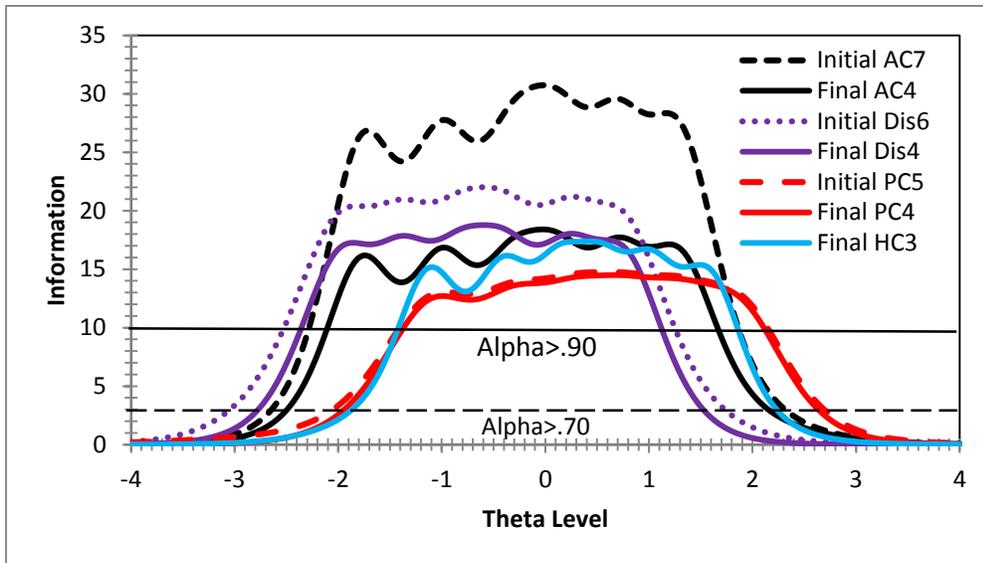


Figure 9-24. Test Information Curves for the PNC Subscale. Note. PC=Personal Consequences; AC= Academic Consequences; Dis=Dissatisfaction; HC=Health Consequences.

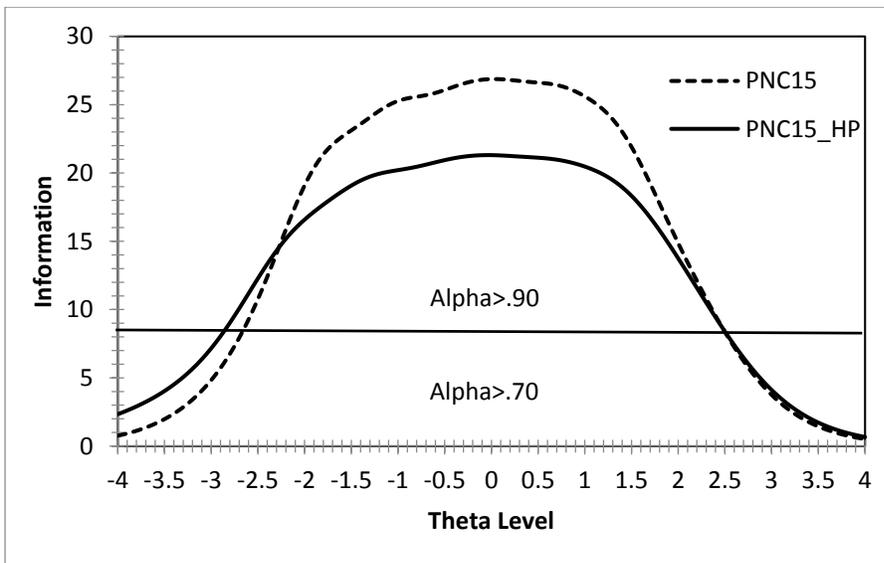


Figure 9-25. Test Information Curve for PNC. Note. PNC15= TIC for PNCS in the whole sample; PNC15-HP=TIC for PNCS in the sample without low procrastination.

Exploratory Analysis of Alternative Structures of PNCS

One of the initial hypotheses and a desired feature was to have a single factor measuring overall negative consequences of procrastination behaviour. As presented in the test for

dimensionality, the single-factor model was not supported based on both fit indices and various dimensionality criteria. Both hierarchical and bifactor models were tested at the exploratory level using the R Psych package. The HEFA and BEFA models consisted of one second-order or general factor and 4 first-order/specific factors measuring various domains of general factors associated with perceived negative consequences. Figure 9-26 and Figure 9-27 present the structure and factor loadings of a 4-factor hierarchical and a bifactor model, respectively.

The composition of four PNCS factors was kept intact and there were no cross-loadings. All of the factor loadings for the g (first order or general factor) were above .50. The explained common variance of the general factor was 0.61. The magnitude of Omega total, an index for the reliability of the multidimensional composite total score, was .97, indicating that the general and specific subscales measure the perceived negative consequences of procrastination reliably. More importantly, the Omega for the general factor (Omega h), was .84, indicating that the proportion of variance in the total score that was attributed to a general factor could explain the major part of the overall variance. The findings indicated that 88% of the reliable variance in PNCS is from the general factor or total score. The magnitude supported the interpretability and justifiability of the total score to represent the overall construct of perceived negative consequences of procrastination.

The Omega total values for the specific factors (AC, PC, Dis, and HC) were 0.95, 0.92, 0.95, and 0.92. The specific omega for AC, PC, Dis, and HC were 0.19, 0.33, 0.42, and 0.42 respectively. The latter statistics are considered indices of the unique reliability of subscales over and above the common information related to the general/total score. The results showed that the majorities of reliable variance in all four subscales was not unique. However, in factors Dis and HC, the magnitude of unique variance is noticeably higher than in other factors. Around 39% of

the reliable variance in dissatisfaction and health consequences is not covered by the general factor.

These results supported hierarchical and bifactor solutions, and therefore, the validity of calculating a total score for the PNCS. It should be noted there is no test of model fit to compare the simple EFA 4-factor model (i.e., correlated-factor model; see Figure, 9-32), EFA hierarchical model (see Figure, 9-30), and EFA bifactor model (see Figure, 9-31). Statistically, they are alternative models with equal model fit. All three models had a RMSEA of .06 with a 90% confidence interval of .05 to .07. Only a theoretical argument/consideration or the results of CFA can support one model over the others.

In sum, calculation of a total score is justifiable and can provide sufficient information regarding the general construct perceived negative consequences of delay. However, given the unique information obtained from the subscales measuring dissatisfaction and health consequences, the specific factors can provide additional information, particularly when these aspects are important for a research or therapeutic project. Further evaluation of the PNCS subscales was performed in the validation phase.

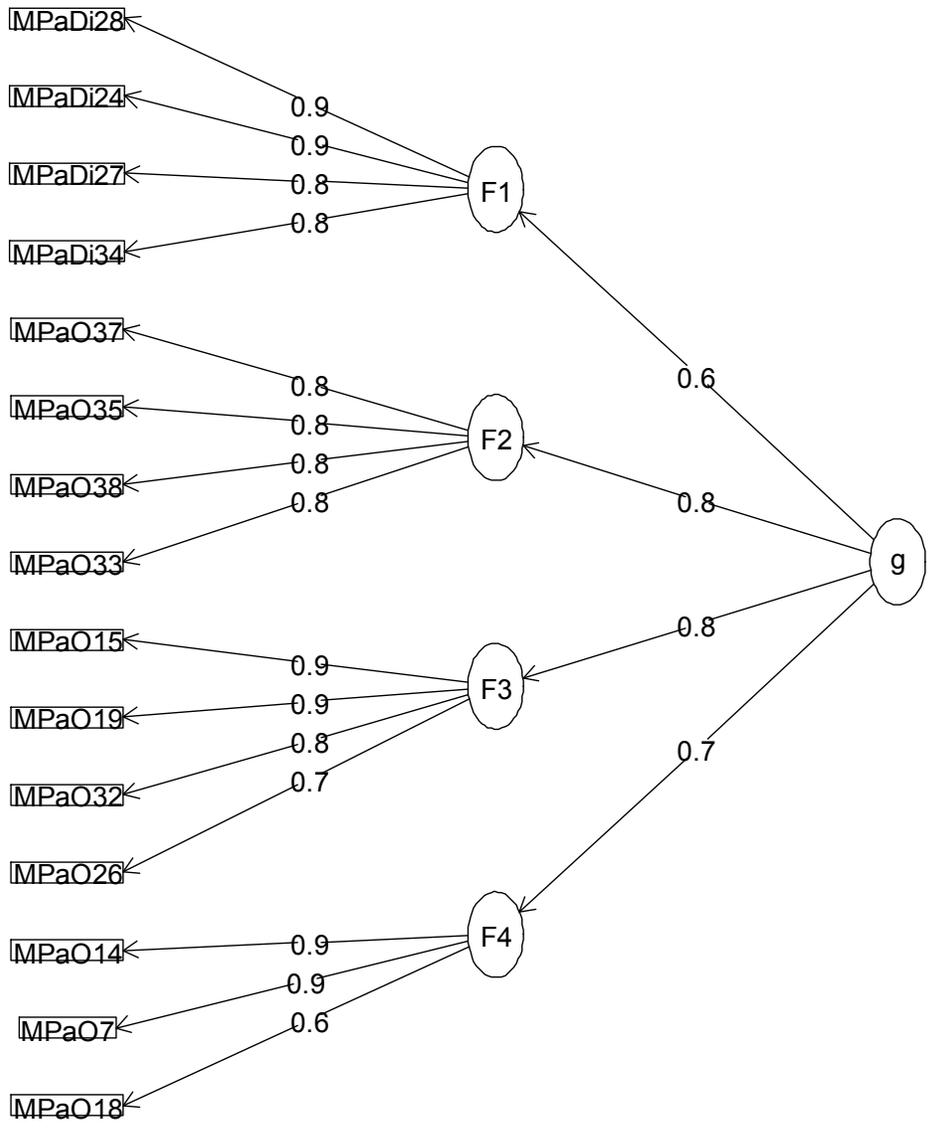


Figure 9-26. Hierarchical Model of PNCS.

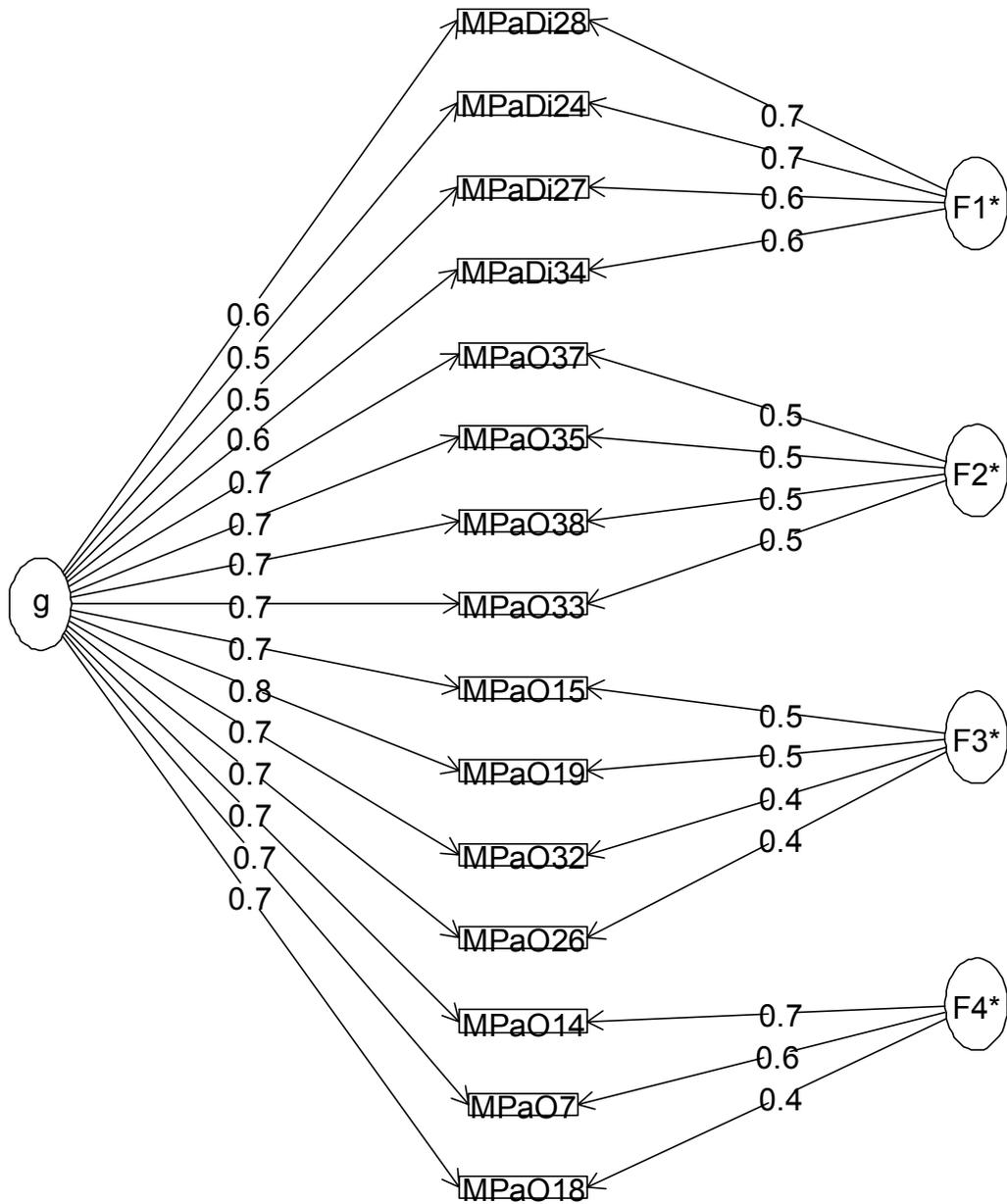


Figure 9-27. Bifactor model of the PCNS.

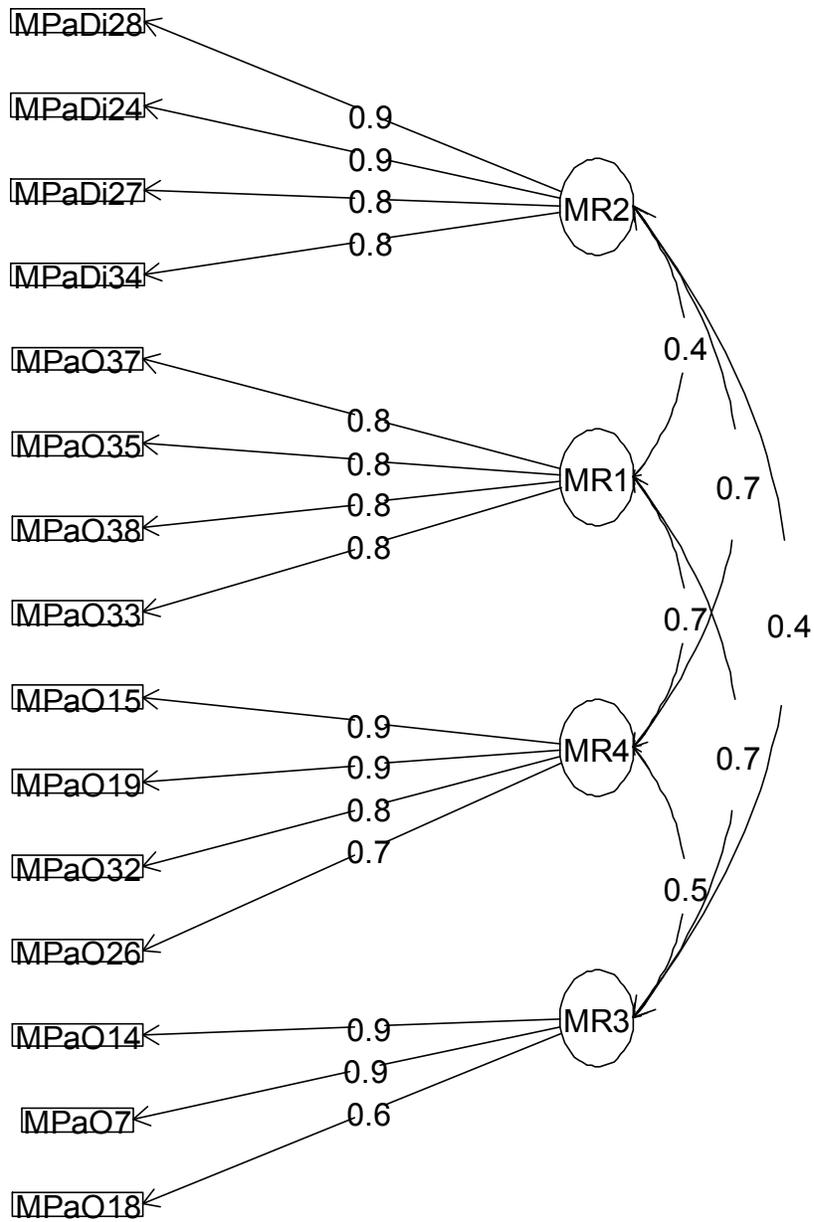


Figure 9-28. Simple Oblimin 4-factor solution diagram (correlated-factor model).

Full-Information Factor Analysis on the Negative Emotions Scale (NES)

Parallel analysis on the NES items suggested that the number of factors was 5 and the number of components was 2 (see Figure 9-29). The Optimal Coordinate showed the presence of two factors. VSS complexity 1 achieved a maximum of 0.89 with 1 factor, and VSS complexity 2 achieved a maximum of 0.69 with two factors. The Velicer MAP achieved a minimum of 0.04 with 1 factor. These results supported the presence of two factors.

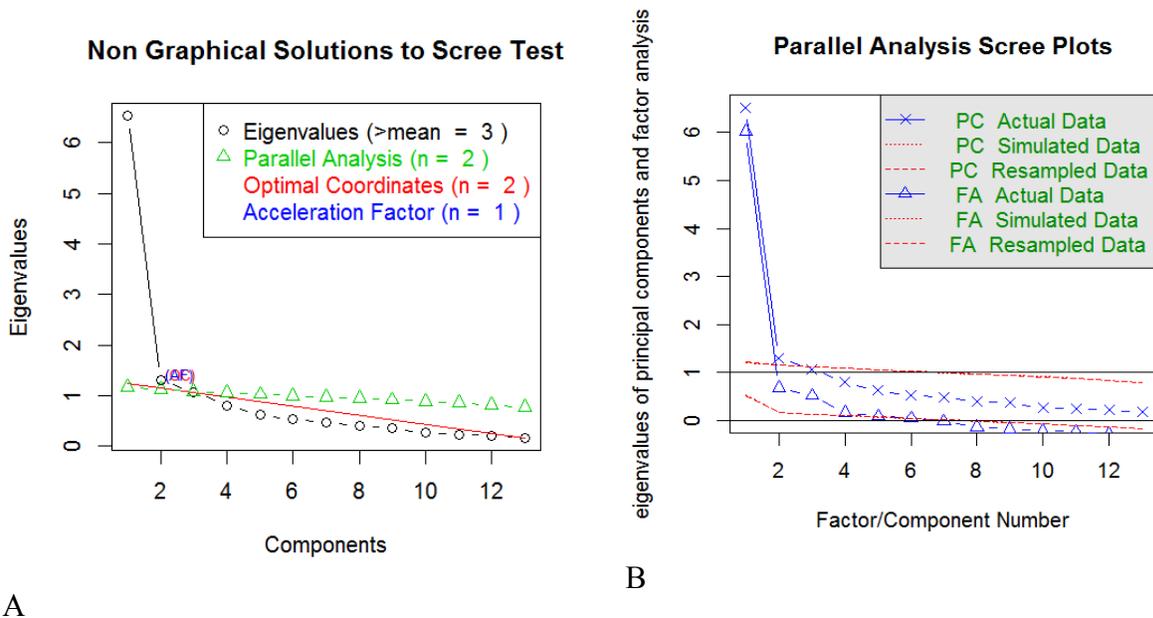


Figure 9-29. Graphical Presentation of Number of Factors Underlying items from the NES. A full-information factor analysis for one to six factor solutions was calculated and compared (see Table 9-19). The difference between the 5- and 6-factor solutions was not significant, supporting the presence of a maximum of five factors. Similarly, the AIC and BIC, calculated based on a full-information factor analysis of the negative-emotion items, suggested the presence of five factors.

To make the final decision, the factor loadings and interpretability of the supported factor solutions were compared.

Table 9-19

Full-information Factor Analysis with 1- to 6-factor Solution: Fit Indices and Comparison

Factor	AIC	BIC	Log Likelihood	$\Delta\chi^2$	df	P-value
1 Factor	35945.25	36377.71	-17881.63			
2 Factors	35498.33	35987.82	-17646.17	470.92	12	0.000
3 Factor	35063.13	35604.89	-17417.57	457.20	11	0.000
4 Factor	34894.59	35483.87	-17323.3	188.54	10	0.000
5 Factor	34773.14	35405.19	-17253.57	139.46	9	0.000
6 Factor	34794.09	35464.16	-17256.04	-4.95	8	1

Note. AIC = Akaike's Information Criterion; BIC = Bayesian Information Criterion.

The 5-factor solution did not lead to a theoretically and empirically meaningful pattern of factor loadings. The fifth factor in the model consisted of only one item with a very low factor loading (.29) as well as a cross-loading problem with the first factor. The results indicated that the inclusion of the fifth factor was not advisable. The 4 factors in the 4-factor solution replicated the initial theoretical structure indicated in the item-development stage (see Table 9-20). The 4-factor solution differentiates between active and passive negative emotions as well as between emotions before the start of the task (Task-Initiation emotions) and while delaying on the task (Task-Delay emotions). Since there was a significant statistical difference between the 4-factor solution and lower factor solutions and the 4-factor solution resembles a well-established theoretical model of negative emotions (see Chapter 6), the 4-factor solution was selected.

Table 9-20

Factor Loadings and Communalities Based on Full-Information 4-Factor Model with Oblimin Rotation for 14 Items from Negative Emotions Scale (N=856).

variable	item	F1	F_2	F_3	F_4	h2	d1	d2	d3	d4	d5	d6
NE25	During: guilty	0.88				0.70	5.12	3.43	1.76	0.55	-1.33	-2.90
NE21	During: anxious	0.77				0.69	5.97	3.78	1.37	0.26	-1.55	-3.42
NE22	During: angry	0.74				0.64	3.32	1.41	-0.05	-1.13	-2.71	-4.73
NE23	During: hopeless	0.70				0.85	5.91	3.24	0.72	-0.99	-3.10	-5.74
NE27	During: emotional distress	0.62		-0.28		0.77	5.16	2.67	0.88	-0.64	-2.34	-4.51
NE24	During: bored		0.90			0.84	5.52	2.27	-0.15	-2.28	-4.37	-7.15
NE26	During: sluggish or sleepy		0.64			0.68	4.73	2.49	0.66	-0.67	-2.30	-4.00
NE15	Before: guilty			-0.81		0.57	1.93	0.22	-1.00	-2.15	-3.42	-5.23
NE17	Before: emotional distress			-0.79		0.80	4.71	1.98	-0.01	-1.37	-3.19	-5.51
NE13	Before: hopeless			-0.78		0.75	4.39	1.77	-0.50	-1.83	-3.41	-5.79
NE11	Before: anxious			-0.57		0.62	4.10	2.07	0.40	-0.65	-2.16	-4.01
NE14	Before: bored				0.73	0.62	5.76	3.41	1.07	-0.28	-1.69	-3.58
NE16	Before: sluggish or sleepy				0.75	0.75	7.12	4.18	1.48	0.05	-1.93	-4.28

The results of the MIRT analysis showed that indicators of the four dimensions have very high slopes or factor loadings for their corresponding factors and low discriminatory power on other factors/dimensions. The severity or difficulty parameters are presented in Table 9-20. The thresholds are spread appropriately within each response category. Looking at the severity statistics for each item reveals that the items had a monotone trend from the response categories *never* to *always* and covered a distinct and broad range of the latent trait. The item NE27 had a small cross-loading. Cross loadings less than .30 are considered minor (McDonald, 1999). Overall, the 4-factor solution after an oblimin rotation resulted in a simple factor structure. Given the acceptable factor loadings and unique content of each item, all 13 items were retained at the EFA stage. There were no subscales that exceeded five items. It should be noted that relatively similar results were found when I used the MCD method of factor analysis with the full dataset.

As noted, the factor solution was consistent with my initial differentiation between task-initiation and task-delay negative emotions. Factors 1 and 2 were initially grouped under task-delay negative emotions, measuring various negative emotions while delaying on an important academic task. Factors 3 and 4 were grouped under task-initiation negative emotions, measuring negative emotions that one experiences before starting a task. With the exception of “hopeless”, the position of items in the final factor solution also matched with differentiation between activating and deactivating emotions (Pekrun et al., 2005; Pekrun 2006). Based on the marker items under each factor and initial differentiation, Factors 1 to 4 were named Task-Delay Negative Activating Emotion (TDNAE), Task-Delay Negative Deactivating Emotion (TDNDE), Task-Initiation Negative Activating Emotion (TINAE), and Task-Initiation Negative Deactivating Emotion (TDNDE).

Exploratory Analysis of Alternative Structures of the NES

The correlations among the factor scores of the four negative-emotions factors are presented in Table 9-21. The moderate-to-large correlations among the factors indicated the possibility of a general factor measuring overall negative emotions.

Table 9-21

Correlations between the four Negative-emotions factors

		F 1	F 2	F 3	F 4
F_1	Task-Delay Negative Activating Emotion (TDNAE)	1.00			
F_2	Task-Delay Negative Deactivating Emotion (TDNDE)	.42	1.00		
F_3	Task-Initiation Negative Activating Emotion (TINAE)	-.66	-.46	1.00	
F_4	Task-Initiation Negative Deactivating Emotion (TDNDE)	.45	.49	-.52	1.00

Both a hierarchical and a bifactor structure can be theoretically justifiable depending on whether a researcher assumes a causal relation between overall negative emotions and specific negative emotions, or considers the specific emotions as various domains of the general negative

emotions. Given the theoretical and empirical advantages of bifactor solutions (discussed in the analysis section) and similarities of the findings at the exploratory level, the results for the bifactor model as an alternative model for the correlated 4-factor model are presented and discussed (see Figure 9-30). The bifactor model was tested with the R Psych Package, using limited-information factor analysis. Despite this major change in the factor analysis method used, the composition of the factors stayed very similar to the ones in the correlated model. All loadings related to the general factor were high, supporting the viability of considering general factor. To test this hypothesis further, various omega statistics were calculated and compared.

The omega total (general and specific factors) was 0.95. The Omega for the general factor, after controlling for the specific factors, was .78, indicating the reliability of calculating a total score for the overall negative-emotions construct. The results indicated that 82% of reliable variance in the negative-emotion scale was covered by the general factor. Omega total for the negative-emotion domains Task-Delay Negative Activating Emotion, Task-Initiation Negative Activating Emotion, Task-Initiation Negative Deactivating Emotion, and Task-Delay Negative Deactivating Emotion was .89, .85, .82, and .81, respectively. Omega specific for the same factors was .26, .22, .48, and .44. The results indicated that, at least for Deactivating Emotions, it is beneficial to report and measure subscales. More than 50 percent of Deactivating Emotion was independent of the general factor or total score.

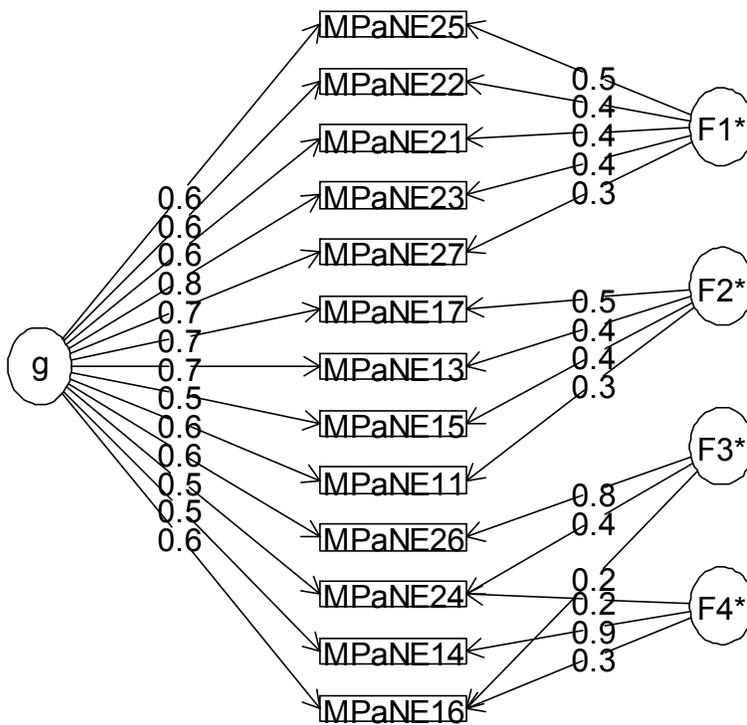


Figure 9-30. Bifactor model of the Negative Emotion Scale Note. F1= Task-Delay Negative Activating Emotion; F2= Task-Initiation Negative Activating Emotion; F3=Task-Initiation Negative Deactivating Emotion; F4= Task-Delay Negative Deactivating Emotion.

In sum, the calculation and use of both the general total score for all negative emotions and total score for specific negative emotions are justified based on EFA analysis. The validity of this conclusion was tested again using CFA.

Reliability of the NES

To investigate the reliability of the total score along the latent trait, a unidimensional GRM was used. Figure 9-31 shows the Test Information Curve for the NES in the whole sample. The NES showed reliability of .90 or above between -2.1 SD and 2.4 SD, and reliability above .70 between -3.3 and 3.4 SD of the latent trait. The results suggest that the NES can provide

reliable scores for a broad range of the latent trait (the negative emotion related to procrastination).

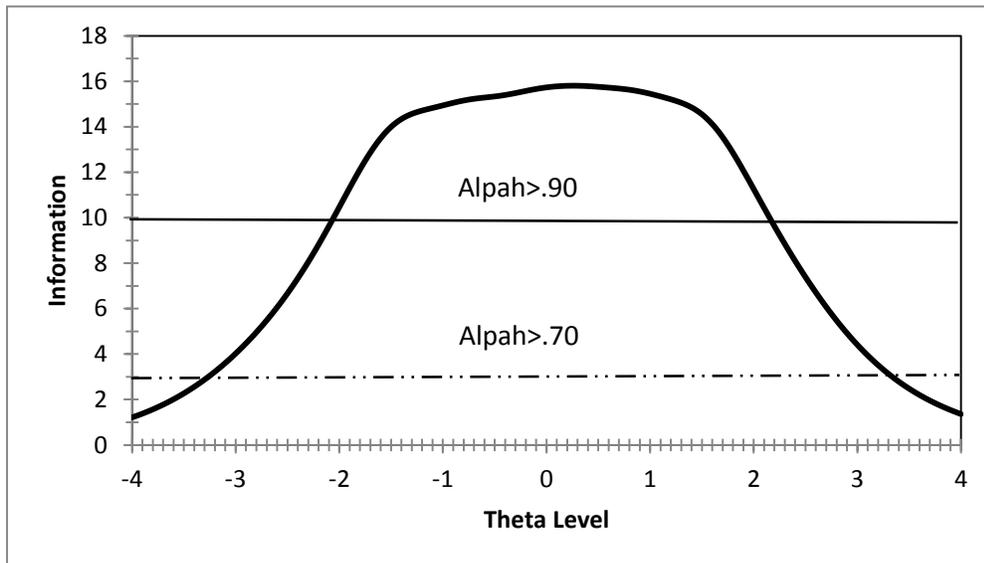


Figure 9-31. Test Information Curve for NES.

Exploratory Factor Analysis on the Procrastination Duration Scale (PDS)

The response categories of the duration items were different from the ones used in other MMAP scales. Firstly, the response categories in duration scale referred to time as opposed to frequency of the behaviour. Secondly, only the Duration scale had a “Not Applicable” category. Two strategies can be used to deal with “Not Applicable” responses. The first strategy is to treat the category as a missing response, and therefore to delete or impute the missing response. In this strategy, researchers treat the responses as if they have never presented the items to participants or participants have refused to respond.

The second strategy, particular to the content of this measure, is to treat the response category as a valid data point indicating no or negligible procrastination duration or behaviour. The latter strategy has a practical advantage. It allows researchers to measure a broader range of

the latent trait and to differentiate individuals with chronic and non-chronic procrastination problems from individual without procrastination problems or with low level of procrastination behaviours (e.g., as a pretest in intervention studies).

However, the second strategy is valid only if there is sufficient evidence to support the assumption that the “Not Applicable” response category indicates no or a negligible duration of procrastination behaviour. Logically, zero duration of a behaviour can be equated to zero frequency of the behaviour. To test this assumption, the relation between “Not Applicable” responses in duration and frequency of procrastination behaviour was analyzed. More specifically, four dichotomous variables were calculated based on mean duration and the procrastination behaviour scales. The first binary variable differentiated cases with “Not Applicable” responses from those with all other responses; the remaining four variables dichotomized two subscales of procrastination behaviour, irrational and hedonistic delay, with two different cut points based on liberal and conservative criteria. The liberal cut-point recoded *occasionally*, *almost never* and *never* to one response category measuring no to low procrastination behaviour, whereas the conservative cut point recoded only *never* and *almost never* as the indication of no to low procrastination behaviour.

Comparing the interaction between dichotomous duration variables and dichotomous procrastination behaviour subscales revealed that, of the 55 cases in the total sample of 947 with duration items equivalent to “Not Applicable,” 52 (95.6%) and 53 (96.4%) students selected “Never”, “Almost Never” or “Occasionally” when reporting irrational and hedonistic delay, respectively. In other words, less than 5% of the participants who selected the “Not Applicable” option reported moderate to high levels of irrational or hedonistic delay. Based on a more

conservative criterion, of the 55 cases, 39 (70.9%), and 46 (83.6%) selected “Never” or “Almost Never” when reporting irrational and hedonistic delay, respectively.

This result supported the assumption that choosing the Not Applicable option can be considered an indication of a negligible level or duration of procrastination behaviour. The strength of this conclusion depends on whether the liberal or conservative cut-point is used to define negligible level of procrastination. Therefore, it was important to use and compare both methods in this study in order to make the final recommendation.

In the following sections, the results of dimensionality and factor analysis using the second strategy are presented when there are no major differences between the strategies. The results of the first strategy are presented, and any difference is highlighted when the difference had significant implications.

In the first stage, the number of factors in the duration scale was evaluated using both visual and quantifying methods. Scree plots showed the presence of two or three factors depending on where the break in the plot was considered to be (see Figure 9-32). Parallel analysis supported the presence of two component or four factors using both strategies. Optimal Coordinates supported the presence of two factors.

Non Graphical Solutions to Scree Test

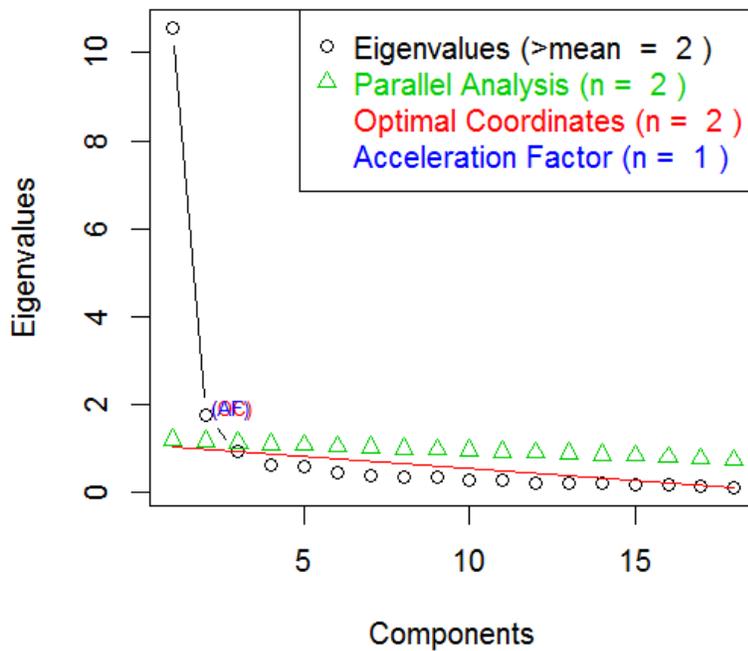


Figure 9-32. Graphical presentation of number of factors underlying the Duration Scale

VSS complexity 1 achieved a maximum of 0.94 with one factor; VSS complexity 2 achieved a maximum of 0.82 with three factors. The Velicer MAP showed the presence of two factors. BIC reached the minimum with six factors. The RMSEA supported any factor solution with three or more factors. It seems that the majority of criteria supported a 2- and 3-factor measurement model.

To evaluate the dimensionality further, full-information factor analysis was used to evaluate measurement models with one to seven factors (see Table 9-22). The results supported a 5-factor solution.

Table 9-22

Full-information factor analysis with 1 to 6 factor solution: fit indices and comparison

Factor	AIC	BIC	Log Likelihood	$\Delta\chi^2$	df	P-value
1	40960.21	41484.36	-20372.10			
2	39395.78	40002.44	-19572.89	1598.43	17.00	0.00
3	39190.04	39874.35	-19454.02	237.74	16.00	0.00
4	39019.68	39776.79	-19353.84	200.36	15.00	0.00
5	39012.38	39837.44	-19336.19	35.30	14.00	0.00
6	39030.66	39918.81	-19332.33	7.72	13.00	0.86

Note. AIC = Akaike's Information Criterion; BIC = Bayesian Information Criterion

In addition to statistical analyses, the interpretability and meaningfulness of factor solutions with two to five factors were compared. Only the 2- and 3-factor solutions had meaningful and reliable factors with a sufficient number of indicators (more than 2 items). However, there were some differences in the magnitude of factor loadings when the two strategies of dealing with the “Not Applicable” responses were applied. When the first strategy was used, the second factor in the two-factor solution consisted of both educational consequences and negative emotions, whereas when the second strategy was applied, the factor only consisted of the negative emotions. In the 3-factor solution, the second factor consisted of more than four items that measure duration of educational consequences, and the third factor consisted of three items that measure duration of negative emotions for both strategies. The 3-factor solution had less cross loading (simple solution) and the third factor had a better quality indicators when the second strategy was used.

Table 9-23 shows the factor loadings and communalities for 2- and 3-factor solutions of the duration scale. The factor loading for the second factor solution for the first strategy is presented in the parenthesis. The results for the 3-factor solution were very similar. Only the results of the second strategy are presented. The 2- and 3-factor solutions respectively accounted for approximately 73% and 74% of the variance in the dataset with all duration items included.

Table 9-23

Factor Loadings and Communalities Based on Full-Information 2- and 3-Factor Model with Oblimin Rotation for Duration Procrastination Scale (N=856).

variable	item	2F_1	2F_2	2F-h2	3F_1	3F_2	3F_3	3F_h2
D1	Now that I think about my past, I have habitually been postponing working on school tasks until the last minute since.....	0.94 (0.94)		0.85	0.90			0.84
D2	Starting school tasks near the deadline despite planning to start earlier is something that I have typically done since.....	0.93 (0.95)		0.83	0.88			0.83
D3	Wasting time by doing other activities instead of working on school tasks is something I have done since.....	0.94 (0.92)		0.78	0.89			0.77
D5	Needlessly putting off school tasks to the last minute has bothered me since.....	0.51 (0.33)	(-.41)	0.47			0.75	0.70
D6	Delaying on school tasks has been part of who I am since.....	0.94 (1.02)		0.84	0.92			0.83
D7	Finishing school tasks at the last minute is something that I have typically done since.....	0.94 (0.98)		0.87	0.91			0.86
D8	I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on school tasks since.....	0.36	-0.38 (-.60)	0.46			0.72	0.68
D9	Repeatedly postponing these types of tasks (writing) until the last minute has hurt my grades since.....		-0.98 (-.99)	0.85		-0.90		0.84

variable	item	2F_1	2F_2	2F-h2	3F_1	3F_2	3F_3	3F_h2
D10	I have not been good at meeting deadlines for school tasks since.....	(.38)	-0.64 (-.56)	0.56		-0.61		0.54
D11	Saying that I will start working on the school task tomorrow is something that I have often done since.....	0.82 (0.73)		0.74	0.81			0.73
D12	Now that I think about my past, the quality of my work has often suffered from my delay on school tasks since....		-0.89 (-.86)	0.86		-0.87		0.86
D13	Delay on school tasks has been a problem in my life since.....	0.79 (0.73)		0.81	0.76			0.80
D14	Putting off school tasks to the last minute is something that I've often done since.....	0.92 (0.93)		0.91	0.92			0.91
D15	Frequent delay on school tasks has often negatively influenced my school performance since.....		-0.93 (-.91)	0.86		-0.91		0.85
D16	I have had a general tendency to keep putting off school tasks until later since.....	0.94 (0.90)		0.87	0.97			0.88
D17	Wasting a lot of time on trivial matters before starting school tasks is something I have done since.....	0.89 (0.84)		0.82	0.88			0.82
D18	I have often delayed finishing school tasks in my life since.....	0.95 (0.93)		0.90	0.96			0.89
D19	Habitually delaying on school tasks has often led to emotional distress in my life since.....		-0.63 (-.73)	0.50		-0.38	0.54	0.61
SS Loading		9.55 (9.20)	3.65 (4.00)		8.84	2.97	1.43	

variable	item	2F_1	2F_2	2F-h2	3F_1	3F_2	3F_3	3F_h2
	Percentage of Variance Explained	53%	20%		49%	17%	08%	

Note. Since the factors was assumed to be correlated with each other and Oblimin rotation was used, the exact percentage of variance explained could not be calculated. In this table, a rough estimate of percentage of variance explained based on common factor model was presented.

Item 8 in the 2-factor solution and item 19 in the 3-factor solution had cross loadings, and therefore were candidates for elimination. However, elimination of item 19 in the 3-factor solution could lead to reduced reliability of the third factor, and therefore this item could be retained in future administrations of the measure. Item 8 did not have noticeable cross loadings when “Not Applicable” responses were treated as missing values. Both items 8 and 19 loaded on the third factor and need to be kept in order to measure this factor.

As reviewed above, there was support for both the 2- and 3-factor solutions. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

The major difference between 2- and 3-factor models was in measuring the duration of negative consequences of procrastination. The 3-factor model differentiated between educational and emotional consequences of procrastination, whereas the 2-factor solution combined these two aspects in one factor. Based on this study (i.e., the EFA stage), both factor solutions are valid and can be used.

The number of items in the first factor was more than the initial number desired for the final measure, therefore this factor needed further refinement/reduction. Since the first factor was the same in both factor models, a unidimensional item-response-theory analysis was used to study item functioning and reduce the number of items. This analysis was also applied to evaluate the unique response categories used in the Duration section.

Unidimensional IRT on the Duration of Procrastination Behaviour Subscale

Samejima's Graded Response Model (GRM, Samejima 1969) was used to analyze the functioning of items that tapped into the first factor, the duration of procrastination behaviour, in order to reach the desired number of items. Before running the IRT model, the assumption of local independence was checked using the CFA method explained in previous sections. The results indicated a problem of local dependence between items 16 and 18, 6 and 7, and 1 and 2. The correlations between the error terms in these pairs were above .20. Items 1, 6 and 18 were eliminated from these locally dependent pairs based on their lower factor loadings as well as the uniqueness of content domain in CFA. The remaining 9 items were entered in the IRT analysis.

Similar to the previous IRT analyses in this study and due to the large sample size, the chi-square test for the graded response model was significant, indicating the model did not fit the data. Moreover, the chi-square index of fit for each item was significant. The Category Response Curves for all items demonstrated the redundancy of the response category *recently*. Figure 9-33 shows the Category Response Curves for all items. The "*recently*" option is coded 2 in CR curves. This response category was covered with the next response category, *starting university*, coded as 3. Given that the sample was largely drawn from first- and second-year students, the overlap was acceptable. The category *recently* can be eliminated or combined with the next category in future research.

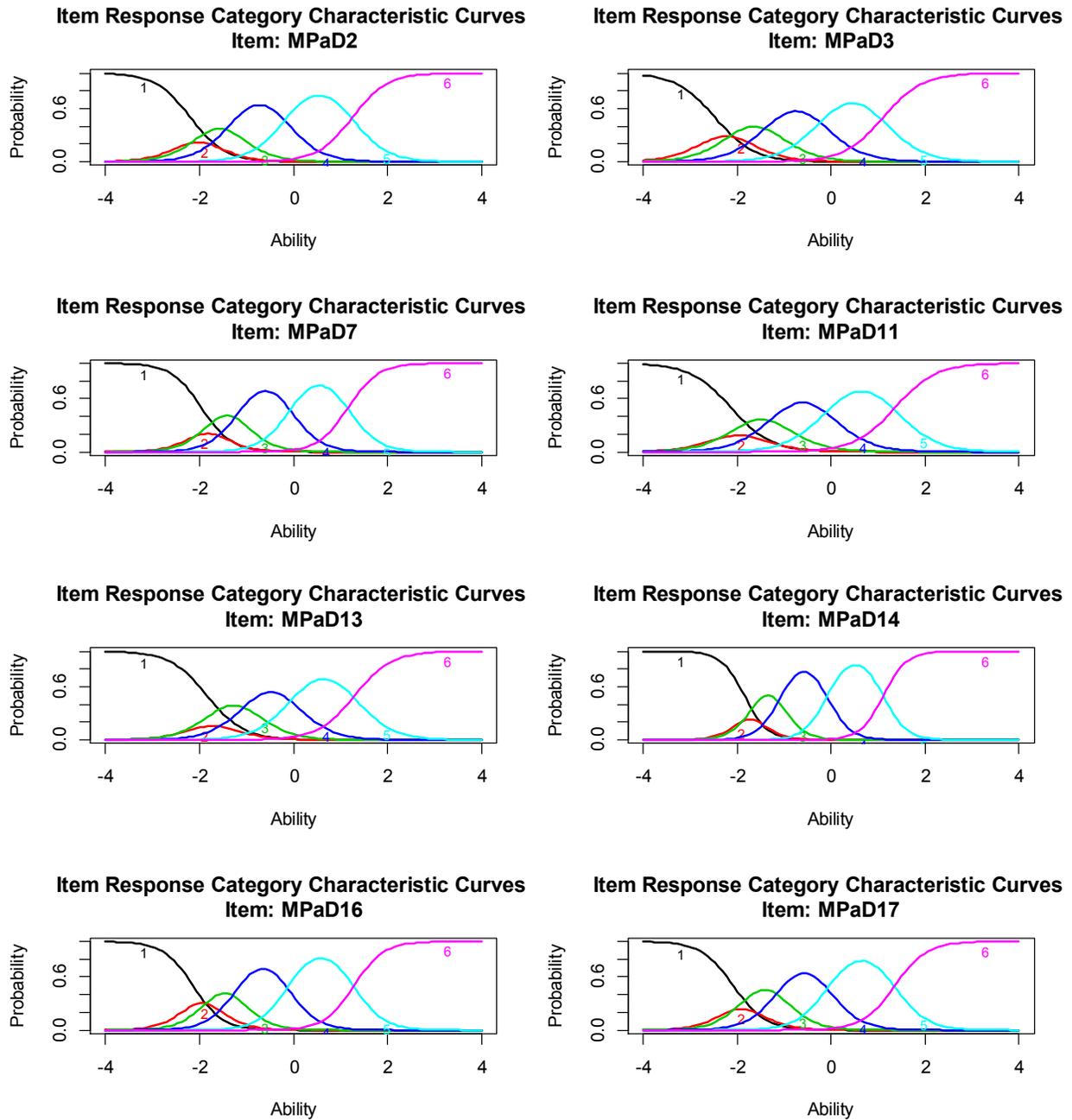


Figure 9-33. Category Response Curves for the items under the Duration of Procrastination Behaviour Subscale (DPB).

Table 9-24 presents the item parameter estimates, item discrimination and thresholds for the items related to the Duration of Procrastination Behaviour. The spread of thresholds and the magnitudes of discrimination statistics seemed similar among items. Item Information Curves are

presented in Figure 9-34. These curves were used to choose the final set of items for the Duration of Procrastination Behaviour subscale. In the first stage, the decision was made on items with noticeable characteristics. The information curve for item 2 was very similar to the mean curve, therefore it was kept. Items 13 and 11 had a similar curve and were below the mean curve. Item 11 was kept since it covered a broader range of the latent trait. Item 13 was eliminated. The IIC of items 14, 16, and 7 were higher than other items providing a higher level of information. Items 7 and 14 had similar content domains. Item 14 was kept since it had the highest curve and larger discrimination. Among items with no noticeable characteristics, both items 3 and 17 covered similar content domain. The IIC for item 3 was lower than the average curve and covered towards the lower level of the latent trait (low level of procrastination), therefore it was dropped.

Table 9-24

Item Parameter Estimates and standard Errors for Duration Behaviour Items

Item ID	a(aSE)	b1(b1SE)	be(b2SE)	b3(b3SE)	b4(b4SE)	b5(b5SE)
D2	2.07 (0.12)	-1.55 (0.04)	-1.32 (0.03)	-0.88 (0.03)	-0.02 (0.03)	1.14 (0.04)
D3	1.89 (0.11)	-1.79 (0.05)	-1.42 (0.04)	-0.89 (0.03)	-0.05 (0.03)	0.96 (0.04)
D7	2.23 (0.13)	-1.40 (0.04)	-1.19 (0.03)	-0.76 (0.03)	0.07 (0.03)	1.05 (0.04)
D11	1.72 (0.10)	-1.60 (0.04)	-1.29 (0.03)	-0.75 (0.03)	0.06 (0.03)	1.20 (0.05)
D13	1.86 (0.11)	-1.34 (0.03)	-1.12 (0.03)	-0.64 (0.03)	0.10 (0.03)	1.14 (0.04)
D14	2.82 (0.18)	-1.33 (0.03)	-1.14 (0.03)	-0.72 (0.03)	0.04 (0.02)	0.99 (0.04)
D16	2.44 (0.15)	-1.52 (0.04)	-1.22 (0.03)	-0.81 (0.03)	0.02 (0.02)	1.05 (0.04)
D17	2.09 (0.12)	-1.52 (0.04)	-1.24 (0.03)	-0.75 (0.03)	0.04 (0.03)	1.14 (0.04)

Note. The standard errors for each item parameter estimate are presented in parenthesis; b= thresholds, severity or difficulty parameters; a = discrimination statistics.

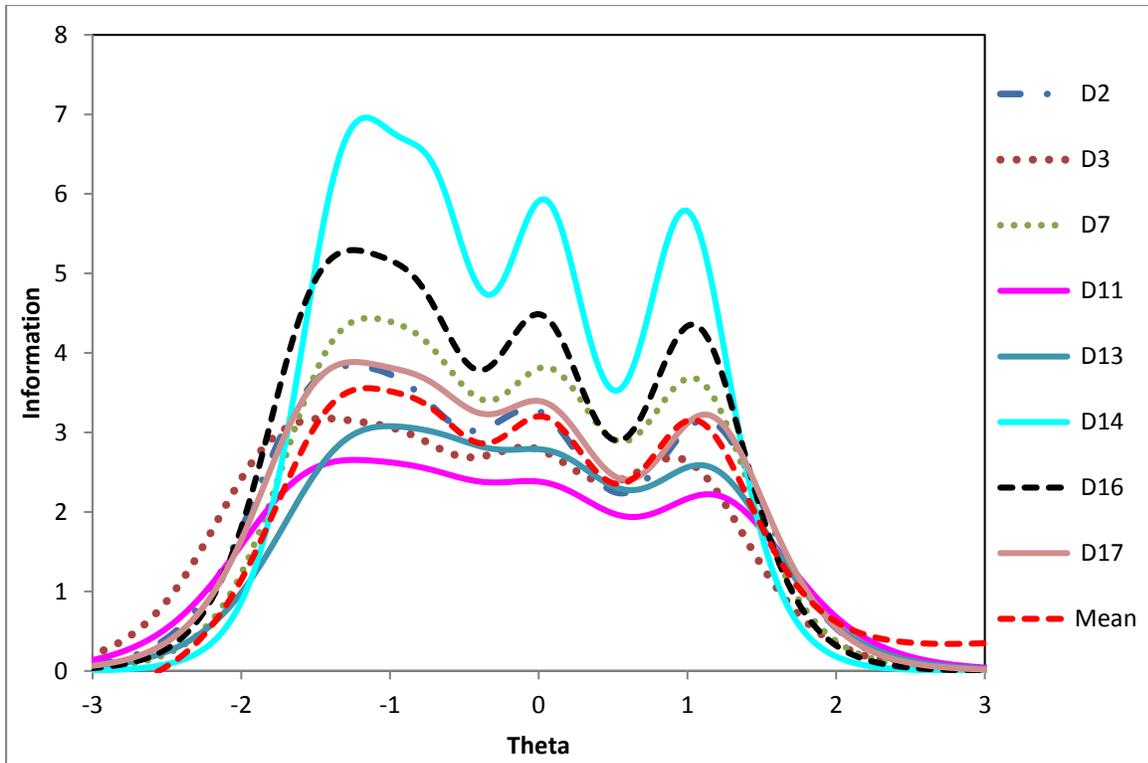


Figure 9-34. Item Information Curves for Duration of Procrastination Behaviour Subscale (DPB).

The Refined Procrastination Duration Scale and its Reliability

The final set of items for the duration subscales are presented in Table 9-25 along with their factor loadings. The test information curve for the refined version of factor one, duration of procrastination behaviour, is presented in Figure 9-35. The subscale reliably measures duration of procrastination behaviour for the trait within a range of -2.5 to 2.2 standard deviations. In the 3-factor solution, the factors were labeled Duration of Procrastination Behaviour (DPB), Duration of Negative Consequences (DNP), and Duration of Negative Emotions (DNE).

Table 9-25

The Refined PDS items and Structure

Old #	New #	item	2F-1	2F-2	2F-h2	3F-1	3F-2	3F-3	3F-h2
D2	1	Starting school tasks near the deadline despite planning to start earlier is something that I have typically done since.....	0.89		0.81	0.83			0.79
D5	3	Needlessly putting off school tasks to the last minute has bothered me since.....	0.51		0.49			-0.74	0.67
D8	6	I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on school tasks since.....	0.41	0.36	0.50			-0.84	0.74
D9	2	Repeatedly postponing these types of tasks (writing) until the last minute has hurt my grades since.....		1.00	0.87		0.93		0.86
D10	8	I have not been good at meeting deadlines for school tasks since.....		0.65	0.58		0.63		0.56
D11	4	Saying that I will start working on the school task tomorrow is something that I have often done since.....	0.86		0.78	0.83			0.77
D12	5	Now that I think about my past, the quality of my work has often suffered from my delay on school tasks since....		0.88	0.87		0.89		0.87
D14	7	Putting off school tasks to the last minute is something that I've often done since.....	0.93		0.92	0.90			0.91
D15	11	Frequent delay on school tasks has often negatively influenced my school performance since.....		0.92	0.86		0.90		0.85
D16	10	I have had a general tendency to keep putting off school tasks until later since.....	0.99		0.91	0.99			0.91

Old #	New #	item	2F-1	2F-2	2F-h2	3F-1	3F-2	3F-3	3F-h2
D17	12	Wasting a lot of time on trivial matters before starting school tasks is something I have done since.....	0.94		0.86	0.89			0.85
D19	9	Habitually delaying on school tasks has often led to emotional distress in my life since.....		0.60	0.52		0.30	-0.62	0.62
Rotated SS Loading			4.75	3.60		4.07	2.96	1.67	
Percentage of Variance Explained			40%	30%		34%	25%	14%	

Note. 2F = 2-factor Model; 3F = 3-factor Model; 3F-1 = Factor 1 = Duration of Procrastination behaviour; 3F-2 = Factor 2 = Duration of Negative Consequences; 3f-3 = Factor 3 = Duration of Negative Emotion; h2 = communality; Since factors was assumed to be correlated and Oblimin rotation was used, the exact percentage of variance explained could not be calculated. Here, a rough estimate based on common factor model was reported.

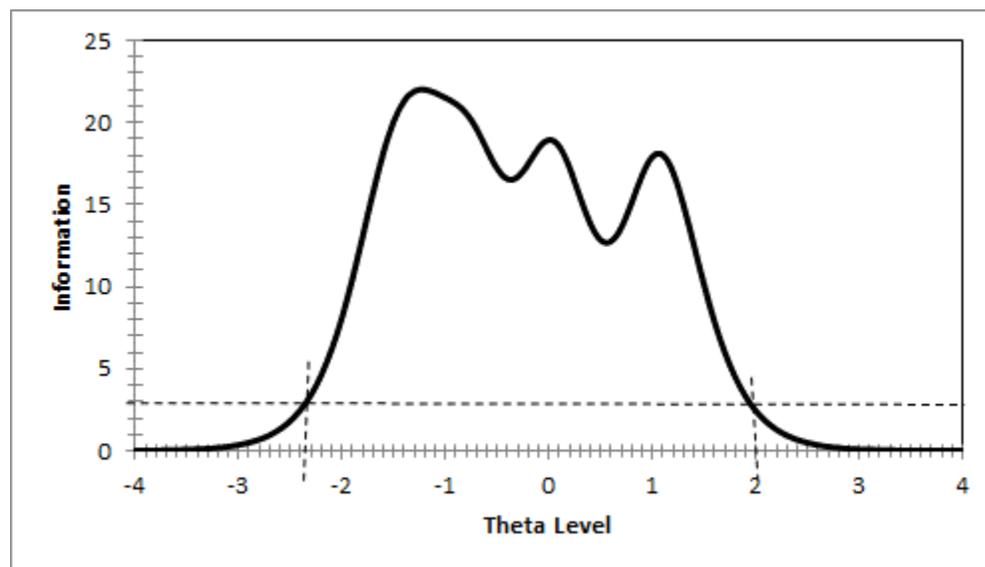


Figure 9-35. Test Information Curve for PDS Factor 1 (DPB)

The correlations between the three factors were high (more than .60). This finding suggested the plausibility of considering a hierarchical structure or aggregating the three

subscales to form a measure of total duration of procrastination behaviour. Figure 9-36 shows Test Information Curves for all Duration items. The TICs indicated that the instrument can measure duration of procrastination problems with a reliability of more than .75 in a broad range, approximately - 2.65 to +3.00 standard deviations along the continuum of the latent trait. The Alpha reliabilities for the total score of Factors 1, 2 and 3 were 0.92, 0.93, 0.87, and 0.77, respectively.

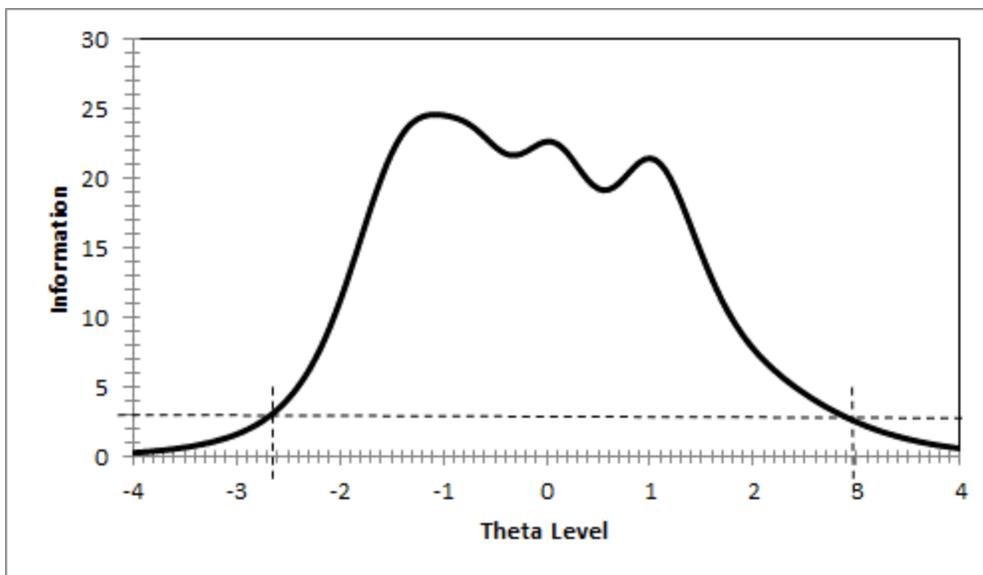


Figure 9-36. Test Information Curve for the PDS.

Exploratory Analysis of Alternative Structures of the PDS

The three factors of the duration scales were highly correlated, indicating the presence of a general factor. To further investigate the validity of a calculating a total score, a canonical bifactor model was defined at the exploratory level. Figure 9-37 represents the factor structure and factor loadings of the bifactor model. Despite using a limited-information method, in this model the composition of factors stayed the same as the correlated factor model tested in the MIRT analysis. The loadings for the general factor were all above the acceptable level.

The omega Total for the whole duration scale was .95 and the omega for the general factor was .77. The results indicated the reliability and structural validity of calculating a general or total score. The total score explained approximately 81% of the reliable variance, indicating that a total score can be considered a justifiable index of duration of procrastination. To test whether specific domains provide meaningful extra information over and above a general factor, the omega total and specific for three factors were calculated and compared. Omega total for the Duration of Procrastination Behaviour, Duration of Negative Consequences, and Duration of Negative Emotion were 0.93, 0.88, and 0.78 and the omega specific values were 0.32, 0.35, and 0.21, respectively. The results indicated that at least 40% of the reliable variance in the duration of negative consequences was not covered by a total score for the scale. The magnitudes for the other factors were lower than 40%.

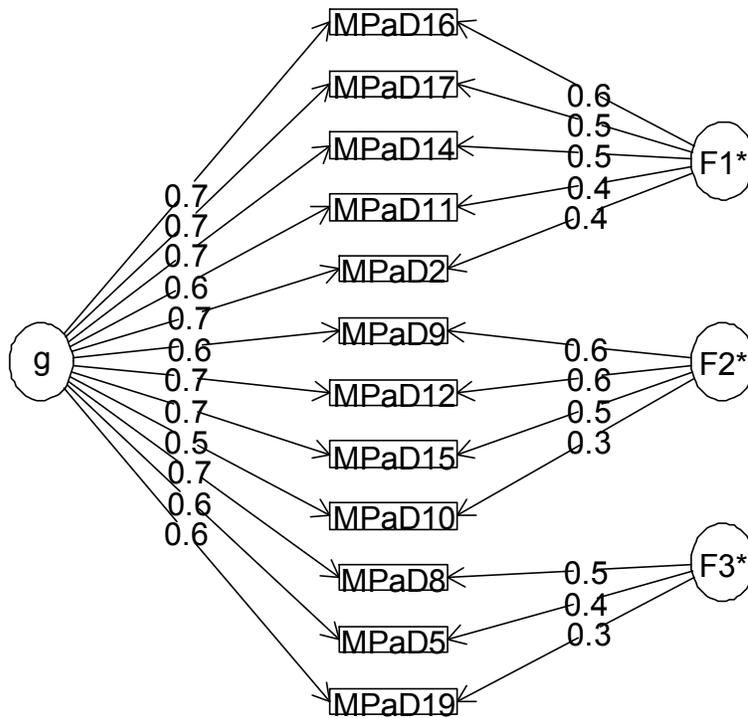


Figure 9-37. Bifactor model for the PDS.

The findings support the calculation of a total score for duration. The majority of reliable variation in the duration scale can be attributed to a general factor measuring duration of procrastination. The importance of calculating specific factors was statistically questionable at this stage. The unique contribution of the subscales requires further investigation, particularly in the validation phase.

In sum, exploratory analyses of the four MMAP scales resulted in robust measurement models (factor solutions) that were conceptually meaningful. The reliability analyses suggested excellent-to-good reliability of the factors or subscales under these models. The Procrastination Behaviour Scale clearly showed the advantages of a two-dimensional over a unidimensional

measurement model in explaining the variance in the procrastination-behaviour items. Specifically, the results supported calculating anxious procrastination and hedonistic procrastination separately. The test of alternative models for other scales under the MMAP provided initial support for the usefulness and meaningfulness of calculating scores for total as well as some of the subscale scores for the Perceived Negative Consequences Scale, the Perceived Negative Emotions Scale and the Procrastination Duration Scales.

Although the results support the multidimensional nature of the above scales, in order to choose an optimal model among the alternative and competing models for these scales and to determine the usefulness of total and subscale scores, further analysis was required. This included testing and comparing the models using a confirmatory factor analysis framework in a large new sample and studying the relation of the total and subscale scores with important causal and outcome variables. Finally, the exploratory analysis was not done on the MMAP as whole, given the complexity of its structure. The overall measurement model of the MMAP, which was developed based on the refined version of the above scales, was tested in the confirmatory stage.

CHAPTER 10: EXPLORATORY ANALYSIS OF THE DQ'S STRUCTURE

The Delay Questionnaire refined in the content analysis stage was administered to a large sample of undergraduate students (Study 7). The main purpose of this study was to explore the dimensionality of the DQ, reduce the number of items, check item functioning, and check the reliability of scores measuring various forms of delay.

Method

Sample and Procedure

The initial dataset consisted of 624 students who registered for the study via the Experiment Sign-up System of the Department of Psychology at Carleton University. The final dataset consisted of 584 participants. Once registered, participants received a link to the online survey that included the consent form, instructions for navigating through the survey and taking breaks, a set of instruments, and finally a debriefing form. Participants were encouraged to take as many break as they found necessary. Participants were allowed to save their incomplete survey any time during the survey session and return to where they left off later.

Once registered, all participants were directed to the consent form at the beginning of the survey where they were given various options. The first option involved completing the newly developed measures (DQ) and the initial validation questionnaires in one stage. The second option involved two stages (test and retest). The test stage was similar to option one – completing the DQ and other questionnaires. The re-test stage involved filling out the DQ after three to five weeks.

After signing the consent form, participants were asked if they were interested in receiving a course credit or entering a draw with the opportunity to win either a \$100 gift card from Amazon.ca or Amazon.com, or a procrastination self-help book (i.e., *The Procrastinator's Digest: A Concise Guide to Solving the Procrastination Puzzle*).

Email was used to encourage participants who had registered for the study but had not started or completed the survey. The invitation to participate in the second part of study (re-test) was also sent via email. Reminder emails were used to encourage those who did not complete the second stage. Participation in all studies was voluntary and no penalties were applied when participants refused to fill in the questionnaire.

Measures

Delay Questionnaire (DQ). The DQ was a new measure that I developed as a part of my doctoral study to capture different prototypes of delay: procrastination, hedonistic, purposeful, and inevitable. It uses a 7-point Likert scale and consists of 37 stories; nine stories for procrastination, seven stories for hedonistic delay, six stories for purposeful delay, and eight stories for inevitable delay (see Appendix E).

Demographics and Identifying Questionnaire. The demographic questionnaire includes information such as gender, date of birth, ethnicity, country of origin, first language, field of study, year of study, GPA, etc. The identifying questionnaire includes name, email and student number.

Social Desirability. The Marlowe-Crowne Social Desirability Scale (MCSD; Crowne & Marlowe, 1960) was used to measure the degree to which participants tend to give socially desirable responses. The MCSD consists of 33 items in true-false response format. The items are

presented in Appendix B. In addition to the overall MCSD score, I used two subscales measuring the sum of positively keyed items (MC-Pos) and negatively keyed items (MC-Neg), based on the recommendation of Strahan (2007). This may control problems associated with item keying direction in the MCSD and provide a different pattern of correlations between social desirability and the procrastination measures employed (see Appendix G).

Big Five Personality Traits. Neuroticism, Conscientiousness, Extraversion, Agreeableness and Openness were measured by the Big Five Personality Inventory (BFI; John & Srivastava, 1999; John, Donahue & Kentle, 1991, as cited in John, Naumann, & Soto, 2008). The BFI consists of 44 items and employs a 5-point Likert scale scored from 1 (“disagree strongly”) to 5 (“agree strongly”). Items can be found in Appendix G. The BFI has demonstrated an adequate level of internal consistency as well as convergent and divergent validity (John, Naumann, & Soto, 2008).

Analyses

Exploratory analysis and item-response techniques similar to those used in developing the MMAP were used for evaluating and refining the Delay Questionnaire (DQ). The results of these analyses are summarized below.

Results

Data Preparation

Initial data collection for the Delay Questionnaire was done in a separate study. To prepare the dataset for factor analysis of the DQ, I used procedures similar to those used in the MMAP study. Before conducting missing-values analyses, the dataset was inspected for duplicate cases. For duplicate cases, the records with fewest missing values or the ones

completed earlier were retained. After the elimination of 47 duplicate records, the final dataset consisted of 584 participants. Little's MCAR test Chi-Square was 1733.86, with DF equal to 1560 and a p -value of .001. Although the results suggested that we cannot assume data missing at random, the percentage of missing values was too small to be considered a serious concern. There were no DQ items with more than 2% missing values. The Expectation Maximization method was used to substitute missing values in the DQ using SPSS missing values module.

Normality was checked via inspection of histogram and Q-Q normality plots. Similar to the MMAP items, a rating scheme was created to evaluate normality. Here, items were rated from 1 (normal distribution) to 5 (severe departure from normality) by two raters. Among the 37 vignettes, one had severe departure from normality and two had a relatively high level of non-normality. All three of the non-normal vignettes were related to Hedonistic Delay. The remaining vignettes had very low to moderate levels of non-normality. The non-normal vignettes had low variability and were positively skewed, indicating low social validity of their contents. Therefore, these vignettes were eliminated from further analysis.

Linearity and homoscedasticity were checked by looking at random pairwise scatter plots as well as scatter plots between items with moderate univariate non-normality (see Figure 10-1).

No departure from linearity was detected.

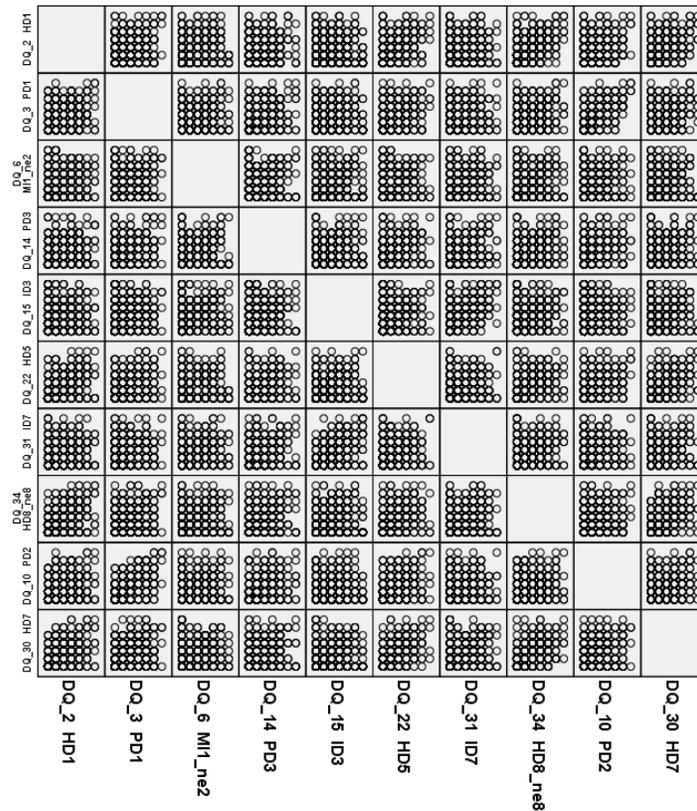


Figure 10-1. Scatter Plots among Selected Number of the DQ Items.

To identify influential multivariate outliers in the DQ dataset, I used procedures similar to those used in the MMAP study. Mahalanobis distances for the 37 DQ items were calculated to identify multivariate outliers. After the detection of outliers, Cook's distances were calculated to identify influential data points. The results indicated that 35 cases had Mahalanobis distance with p -values less than .001. However, only seven of the outlier cases were influential based on Cook's distance. These cases were eliminated ($N=573$).

No error was detected when EFA was performed, supporting singularity (Tabachnik & Fidell, 2007). Similar to the MMAP analyses and results, no tolerances were above .1 (no VIF above 10), and no inter-item correlations were above .90. The conditional index was lower than

.30. These findings indicated that there are no problematic effects of collinearity on the estimates.

Bartlett's Test of Sphericity was significant ($p=.000$) for factor analyses on the DQ items. The off-diagonal relations of the anti-image matrix had small magnitudes. The Kaiser-Meyer Olkin measure of sampling adequacy was above .90. These findings support factorability of the DQ data.

Social Desirability. Almost half of the DQ's items had a significant correlation with social desirability. However, a majority of the significant correlations were small based on Cohen's (1988) guidelines. All of the significant associations were with vignettes that were developed to measure irrational and hedonistic delay. None of the items developed to measure inevitable delay were significant.

Exploratory Factor Analysis on the Delay Questionnaire.

The initial Delay Questionnaire consisted of vignettes or stories about students delaying behavior; these were developed to measure various forms of delay among students. The initial constructs used as the basis for the vignette development included irrational, hedonistic, purposeful, and inevitable delay. In the content validity study, students identified forms of delay that were missing from the vignettes, therefore these were added to the initial set. The later vignettes consisted of delay due to mental illness or temporary emotion problems (grief), and delay due to task aversiveness.

Exploratory factor analysis was used to investigate the factor structure of the DQ. In the first stage, various methods were used to explore the optimal number of factors, including scree plot, numerical test for scree test such as parallel Analysis, Optimal Coordinates, Acceleration factors as well as VSS and the fit-statistic tests. Figure 10-2 illustrates the scree plots and

numeric solutions used to determine the major break. The scree plot indicated the presence of six factors, as did the Eigenvalues above mean criterion; parallel analysis indicated that the number of factors and components was four. Similar results were obtained using Optimal Coordinates. VSS complexity 2 and the Velicer MAP suggested a three-factor solution. BIC reached its minimum with six factors. RMSEA suggested that the factor solution should have more than three factors. The above results are based on limited-information factor analysis. These findings support the presence of three, four and six factors to explain item variances.

Full information factor analyses for three- to seven-factor solutions were calculated and their fit indices were compared (see Table 10-1). The differences between subsequent models were significant from one- to six-factor models. The difference between the six- and seven-factor solutions was not significant at the .001 level, supporting the presence of a maximum of six factors. Similarly, the AIC and BIC calculated based on a full-information factor analyses of the DQ suggested the presence of six factors.

Non Graphical Solutions to Scree Test

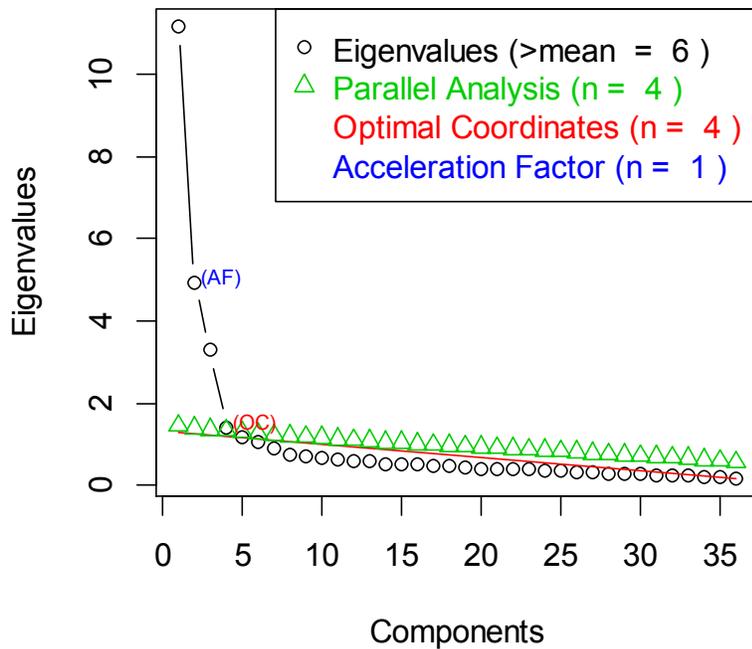


Figure 10-2. Graphical presentation of number of factors underlying the DQ.

Table 10-1

Full-information Item Factor Analysis with 1- to 7-factor Solution: Fit Indices and Comparison

Factor	AIC	BIC	Log Likelihood	$\Delta\chi^2$	df	P-value
1 Factor	65138.87	66235.29	-32317.43			
2 Factors	62076.43	63325.14	-30751.22	3132.435	35	0
3 Factor	60651.41	62048.04	-30004.71	1493.023	34	0
4 Factor	60482.95	62023.17	-29887.48	234.458	33	0
5 Factor	60323.46	62002.9	-29775.73	223.492	32	0
6 Factor	60240.91	62055.23	-29703.45	144.553	31	0
7 Factor	60244.68	62189.52	-29675.34	56.232	30	.003

Based on the above results, a six-factor model was selected for further inspection and for the process of item reduction. Table 10-2 presents the factor loadings and communalities for the initial six-factor model. The number of items under each factor and the quality of factors (i.e., the

factor loading magnitudes) differed across the six factors illustrated above. Various strategies and criteria were used to refine each subscale and reach the desired number of items. There are three desirable sets of items. To reduce the time required for participants to read and rate vignettes, it would be ideal to limit each factor to just two items. However, since having a minimum of three items can be considered a condition for “identification” in Structural Equation Modeling at the item level, the three-item version was selected when possible.

Table 10-2

Factor Loadings and Communalities Based on Full-Information 6-Factor Model with Oblimin

Rotation for the DQ

Order	variable	F_1	F_2	F_3	F_4	F_5	F_6	h2
37	DQ37Pr9	0.88						0.82
25	DQ25Pr6	0.88						0.78
12	DQ12Pr3	0.86						0.82
17	DQ17TA2n	0.81						0.71
8	DQ8Pr2	0.85						0.69
18	DQ18Pr4	0.76						0.70
1	DQ1Pr1	0.80						0.66
21	DQ21Pr5	0.71						0.72
29	DQ29TA3n	0.69						0.61
32	DQ32Pr8	0.66						0.70
7	DQ7TA1n	0.58						0.46
15	DQ15ID3		0.74					0.64
11	DQ11ID2		0.68					0.49
24	DQ24ID5		0.68					0.63
28	DQ28ID6	0.34	0.60					0.55
31	DQ31ID7		0.60	-0.25	0.26			0.67
35	DQ35ID8	0.27	0.59					0.57
4	DQ4ID1		0.44					0.31
5	DQ5NDn		0.44			0.28		0.41
30	DQ30HD7			-0.82				0.75
34	DQ34HD8n			-0.80				0.74
26	DQ26HD6			-0.80				0.75
13	DQ13HD3			-0.76				0.72
9	DQ9HD2			-0.75				0.72
2	DQ2HD1			-0.71				0.67
22	DQ22HD5			-0.65			-0.27	0.73
16	DQ16MI2n				0.81			0.70
6	DQ6MI1n				0.74			0.62
36	DQ36MI3n			-0.28	0.42			0.46
27	DQ27PD6					0.88		0.77
23	DQ23PD5					0.74		0.58
33	DQ33ND2n					0.66		0.59
3	DQ3PD1						-0.81	0.76
10	DQ10PD2						-0.89	0.83
20	DQ20PD4						-0.63	0.58
14	DQ14PD3					0.30	-0.36	0.37

Refinement Process for Factor 1, Irrational Delay.

The first factor consisted of 11 vignette-style items that were designed to measure Irrational Delay, which generally has been considered as procrastination. Under this factor, almost all of the items had acceptable factor loadings and contributed to a simple factor solution. To reduce the number of items, a unidimensional Item Response Theory model was applied.

Item Response on Irrational Delay Items. Before applying IRT, local dependence among items was tested by modeling the correlations between errors in a one-factor CFA model of the items under factor 1. The results showed that only the association between the error terms of items 17 and 18 ($r=.28$) was higher than .20, a criterion for local dependence (Erhart et al., 2010; Reeve et al., 2007). Since the stories are not unique, the story with a lower factor loading, item 18 (DQ18), was eliminated, thereby removing the local dependence among items.

IRT analysis was applied on the remaining 10 items. Interestingly, the overall chi-square misfit test of the GRM model was not significant, suggesting that the IRT model fit the data [$\chi^2 = 893.12$, $df=830$, $p=.06$]. Furthermore, comparing constrained and non-constrained GRM models resulted in significant differences, supporting the model that assumed non-equality among discrimination parameters [$\Delta\chi^2 = 180.81$, $df=9$, $p<.001$]. This indicates that the unconstrained model is more appropriate for the data.

Table 10-3 presents the parameter estimates for the irrational delay items, their standard errors as well as item-fit statistics. Chi-square indices of fit for the majority of the vignettes were not significant at the .01 level indicating acceptable item fit. Items 7 and 21 had significant χ^2 , indicating item misfit. The spread of threshold parameters and the magnitude of discrimination parameters seem satisfactory for most items. Discrimination power was high, particularly for items DQ25, DQ37, and DQ12.

Table 10-3

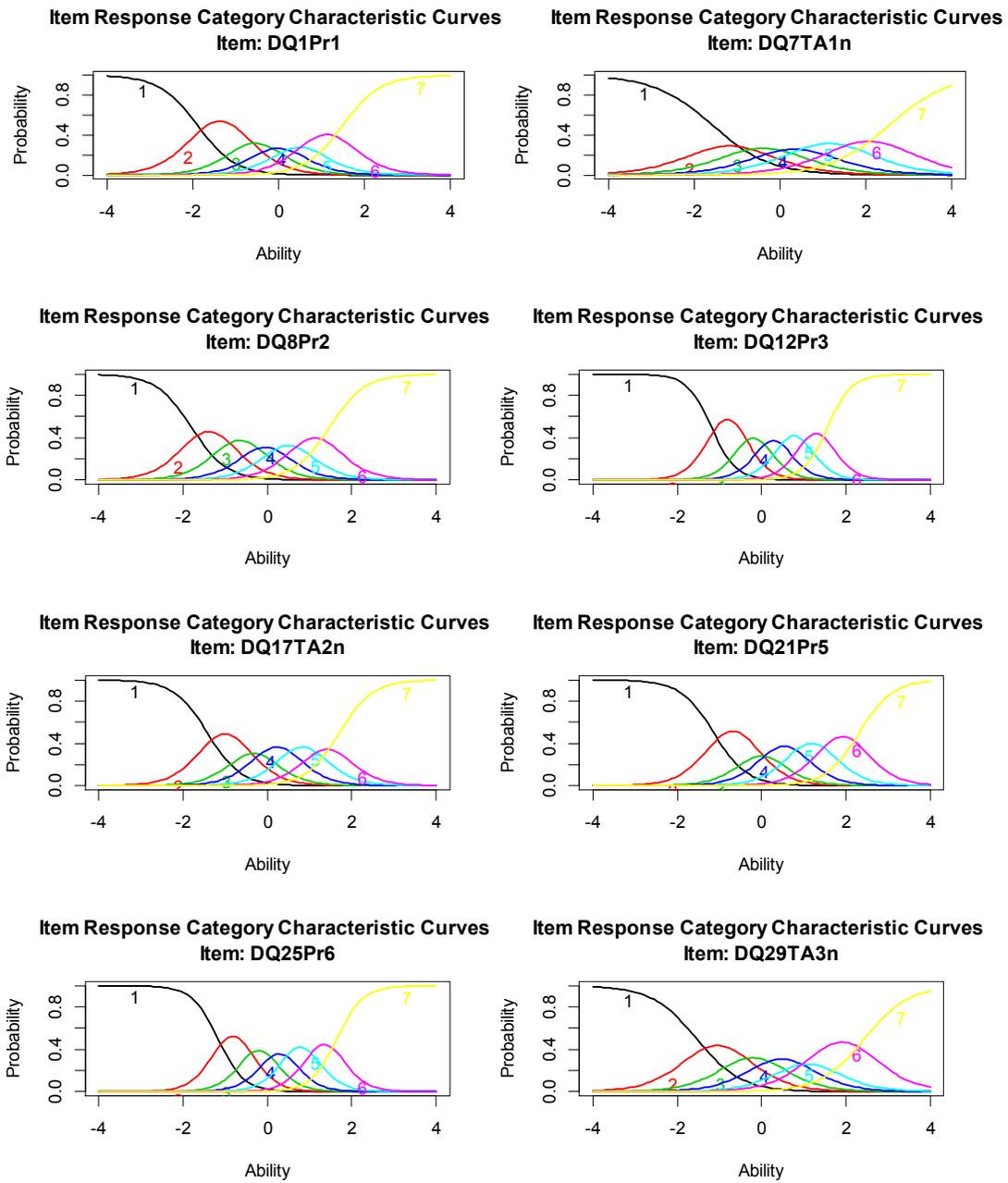
Item Parameter Estimates and Item Fit Statistics for the Irrational Delay Items of the DQ

Item	a	b1	b2	b3	b4	b5	b6	χ^2	p
DQ1	1.37 (0.09)	-1.90 (0.08)	-0.86 (0.05)	-0.28 (0.04)	0.19 (0.03)	0.69 (0.04)	1.44 (0.06)	69.25	0.860
DQ7	0.90 (0.06)	-1.58 (0.07)	-0.79 (0.05)	-0.06 (0.05)	0.64 (0.05)	1.51 (0.07)	2.43 (0.11)	117.67	0.007
DQ8	1.44 (0.10)	-1.82 (0.08)	-1.01 (0.05)	-0.36 (0.04)	0.16 (0.04)	0.72 (0.04)	1.42 (0.06)	80.73	0.550
DQ12	1.95 (0.14)	-1.23 (0.05)	-0.49 (0.04)	0.01 (0.03)	0.47 (0.03)	0.99 (0.04)	1.54 (0.06)	53.53	0.995
DQ17	1.49 (0.10)	-1.45 (0.06)	-0.62 (0.04)	-0.12 (0.04)	0.48 (0.04)	1.09 (0.04)	1.66 (0.06)	66.58	0.906
DQ21	1.47 (0.10)	-1.17 (0.06)	-0.28 (0.04)	0.18 (0.03)	0.80 (0.04)	1.48 (0.06)	2.28 (0.10)	165.94	0.000
DQ25	1.82 (0.13)	-1.22 (0.05)	-0.52 (0.04)	0.00 (0.03)	0.46 (0.03)	1.02 (0.04)	1.62 (0.06)	88.83	0.311
DQ29	1.15 (0.08)	-1.55 (0.07)	-0.59 (0.05)	0.10 (0.04)	0.76 (0.04)	1.31 (0.05)	2.36 (0.11)	94.07	0.191
DQ32	1.38 (0.10)	-1.03 (0.05)	-0.32 (0.04)	0.19 (0.04)	0.74 (0.04)	1.25 (0.05)	1.88 (0.08)	94.56	0.182
DQ37	1.94 (0.14)	-1.29 (0.05)	-0.63 (0.04)	-0.10 (0.03)	0.41 (0.03)	0.83 (0.03)	1.32 (0.05)	61.97	0.959

Note. The standard errors for each item parameter estimate are presented in parenthesis; b= thresholds, severity or difficulty parameters; a = discrimination statistics; DF=83

Category Response Curves. The response options in the DQ consisted of 1=Not like me at all, 2=A little bit like me, 3=Somewhat like me, 4=Moderately like me, 5=Very like me, 6=Very much like me, and 7=Almost 100% like me. Figure 10-3 shows how these category responses functioned along the latent trait (i.e., Irrational Delay) for each of the 10 vignettes. The location and order of the CRCs were in the expected places. The middle category (4=Moderately like me) was around the mean of the latent trait and the spread of the CRC seemed to cover a broad range of the latent trait. The height of most items was normal. However, the height for items DQ7 and DQ29 was low in comparison with other items. The height of the third option (somewhat like me) and to a lesser extent the height fifth option (very like me) was low, covered

by adjacent response categories. This indicated the redundancy of the third and fifth response options in these items.



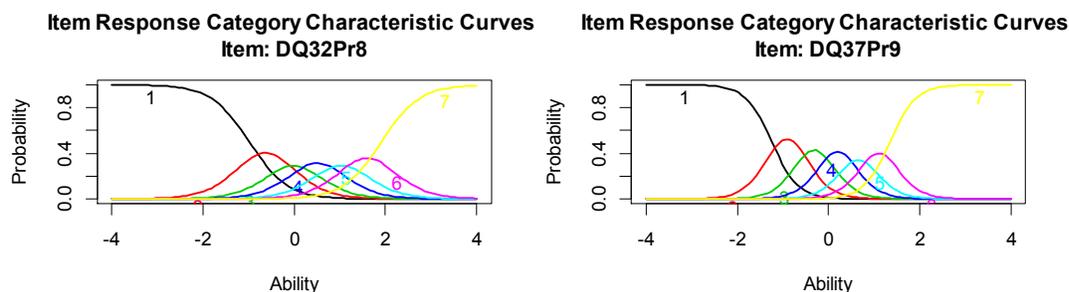


Figure 10-3. Category Response Curves of the DQ's Irrational Delay items (Factor1-DQ).

Item Information Curves. Figure 10-4 presents Item Information Curves for the 10 items measuring Irrational Delay using a vignette approach. In addition to the previous findings, Item Information curves were used to eliminate items with low reliability and redundancy.

There were two clusters of curves of similar height, one far above the mean of all item information curves and one around the mean. The spread or location of the reliable measurement was different for items of similar height. The items with the highest curves included items 37, 12 and 25. Items 37 and 12 had similar curves in terms of height, but the width of item 12 was much better. This item was selected. Items 17, 8, and 21 were very similar in height and shape to the mean item information curve. Among them, item 21 had significant fit, therefore, was eliminated. Both items 17 and 8 functioned well around the mean. However, the content and the areas of the latent trait covered by the items were different. Item 17 represented the task aversiveness aspect of the construct and covered both high and low areas of the latent trait equally. Item 8's curve was shorter, captured the notion of repeated irrational postponement, and was endorsed by a larger number of students and therefore covered more towards the left side of latent trait. Item 8 was selected since it covered a unique area that was not covered by the items selected in the other clusters. Since item 25 had a high and unique curve, it was added to the 3-item version of the irrational-delay subscale. For the 5-item version of the irrational-delay

subscale, items 1 and 17 were also kept. Table 10-4 presents the final set of items for the irrational-delay subscale.

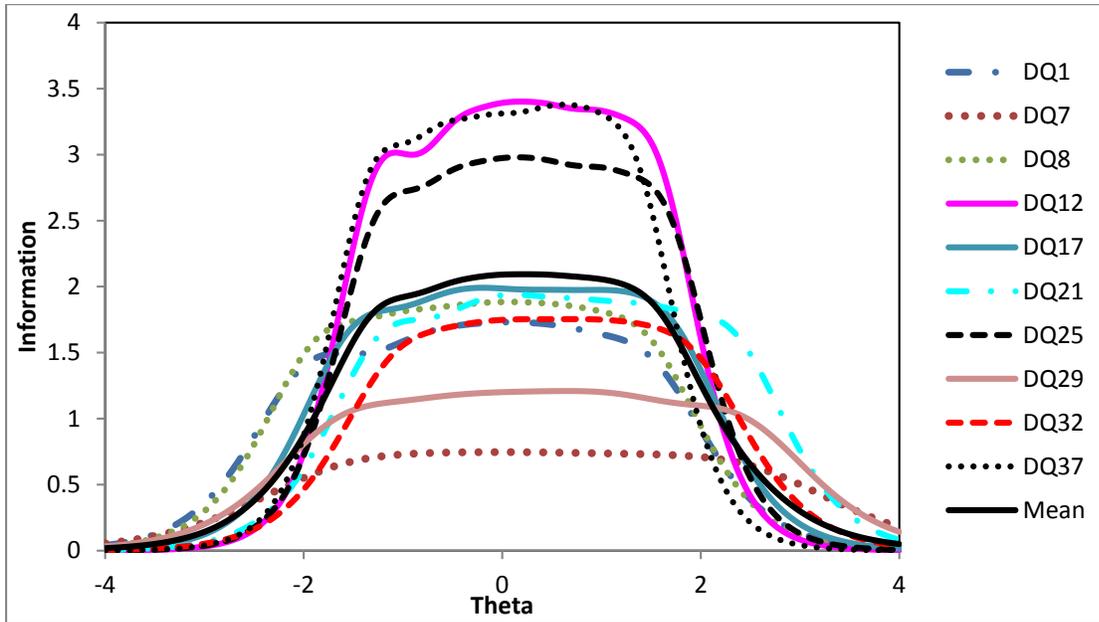


Figure 10-4. Item Information Curves for Irrational Delay (Factor 1-DQ).

Table 10-4

The final set of items related to Irrational Delay using vignette approach.

Var.	Vignette
DQ12	Lorenzo keeps putting off working on his schoolwork until later and later until it's too late to produce his best work. He often tells himself he won't do this again, but it seems like whenever he has schoolwork he should be doing, he does all sorts of other things instead, like watching TV, text messaging, surfing the Internet, etc. Lorenzo is generally not happy about his study habits and would like to find a way to change it.
DQ8	Andrea is about to start studying for her exam, but she tells herself she will start after she checks her email. But after she checks her email, she finds herself checking the news, then Facebook, then taking a break for lunch, and before she knows it, the day is over and she hasn't studied at all. Another time, before her last assignment, she found herself cleaning the house, calling her friends, and organizing her desk. She keeps postponing her school work until the last minute. She feels stressed about having to rush and believes her work is not as good as it could be if she could get started earlier or put more time into it.
DQ25	Although Alex usually intends to get his school work done ahead of time, he ends up wasting time on things he knows are less important. He ends up having to rush to finish his school work at the last minute, which causes him to be stressed out. He thinks he would do better in school if he could break this habit.
DQ17	Jo knows she has a large assignment due. She tells herself she will start ahead of time and finish the assignment with time to spare. However, every time she goes to work on the assignment, she feels unmotivated. Working on assignments is not fun and feels very isolating. The work is stressful and difficult, even tedious at times. Jo postpones writing her assignment because it is something unpleasant she rather not go through. Eventually, time runs out and she accepts that the assignment must be done. She hastily works on it and ends up causing herself extra stress and misery. She knows the assignment wouldn't have been so bad had she started sooner and vows to never work like this again, even though she knows that's not true.
DQ1	John often delays doing school work such as studying for exams, doing his assigned readings, and working on projects. He always intends to start well ahead of the deadline and work steadily, but very rarely does so. Instead, he tends to engage in other non-important activities such as texting/tweeting friends, checking Facebook, playing video games or watching TV, doing laundry, etc. He knows he is just delaying his school work, however, the little tasks always seem important to complete at the time. He experiences negative emotions (e.g., anxiety, guilt, or distress) due to this.

Refinement Process for Factor 2, Inevitable Delay.

The second factor in the initial 6-factor solution consisted of eight vignettes with factor loadings ranging from .44 to .74. All items that were initially developed to capture inevitable

delay¹³ loaded under the second factor. In addition to these items, one item that was identified by students as missing content loaded on this factor.

Among items that loaded on the second factor, two had loadings less than .50, and three had cross loadings above .25 on factor 1, 3 or 4. These items were deleted (see Table 10-2). The remaining items include DQ11, DQ15, and DQ24. Items DQ15 and DQ24 were selected as the two-item version of the second factor. Item DQ 15 had the largest factor loading and DQ24 had unique content not provided by items DQ11 and DQ15. Given the content of the items, this factor was labelled inevitable delay.

Refinement Process for Factor 3, Hedonistic Delay.

All seven stories that were developed or identified to measure Hedonistic Delay loaded under factor number 3 in the initial 6-factor solution (see Table 10-2). One of these seven items had a cross-loading above .25 and was deleted. All remaining items had loadings above .70. I used univariate item response to select the optimal 2-, 3-, and 5-item versions of the subscale.

¹³ Inevitable and unavoidable can be used as a descriptors for this form of delay. Inevitable (2015a, 2015b, 2015c) and unavoidable (2015a, 2015b, 2015c) are synonyms and can be used interchangeably based on many dictionaries and thesauruses including the *American Heritage Dictionary of the English Language* (inevitable 2015a; unavoidable 2015a), *Merriam-Webster Dictionary and Thesaurus* (inevitable 2015b; unavoidable 2015b), and *Oxford English Dictionary* (inevitable 2015c; unavoidable 2015c). However, there is a subtle difference between these two words as summarised by Wiktionary (inevitable, 2015d):

unavoidable has nuances of “could not have happened any other way, even if circumstances were different”, while inevitable connotes “given circumstances, this is the necessary result.”..... "inevitable" indicates "unable to avoid due to natural or necessary matters", "unavoidable" indicates "unable to avoid due to incidental matters"

Both differentiated content domains (necessary and incidental matters) were covered in the initial and final definition and stories for this form of delay (see Chapters 3 and 12), therefore both terms are appropriate descriptors. However, given the importance of emphasising “necessity” and “circumstances” or contextual factors in the conceptualization of this form of delay, the word “inevitable” was selected to describe it.

Confirmatory factor analysis showed that correlations between the error terms of items DQ26 and DQ34 ($r=0.24$) were above .20, a criterion for local dependence (Erhart et al., 2010; Reeve et al., 2007). Since these two stories did not reflect unique content domains, the story with lower factor loading, DQ26, was eliminated.

Testing an IRT graded response model on the remaining six items showed that the overall chi-square fit index was not significant [$\chi^2 = 398.30$, $df=415$, $p=.71$]. There was a significant difference between constrained and non-constrained GRM models, supporting the latter, the model with non-equality of discrimination parameters [$\Delta\chi^2 = 10.98$, $df=4$, $p=.027$].

Table 10-5 presents the parameter estimates of the irrational delay items, their standard errors as well as item-fit statistics. The items' chi-square indices of fit were not significant at the .01 level, implying an acceptable fit. The spread of threshold parameters seems inadequate on the left side of the latent trait axis. In particular, discrimination power was higher for the item DQ9.

Table 10-5

Item Parameter Estimates and item fit statistics for the DQ hedonistic delay subscale

Item	a	b1	b2	b3	b4	b5	b6	χ^2	p
DQ2	1.30 (0.10)	-0.38 (0.05)	0.43 (0.04)	0.92 (0.04)	1.53 (0.06)	2.21 (0.09)	2.95 (0.17)	104.30	0.06
DQ9	1.69 (0.14)	-0.09 (0.04)	0.55 (0.04)	1.02 (0.04)	1.55 (0.05)	2.25 (0.10)	3.13 (0.24)	57.81	0.98
DQ13	1.51 (0.11)	-0.47 (0.04)	0.23 (0.04)	0.80 (0.04)	1.37 (0.05)	2.16 (0.09)	2.92 (0.18)	91.74	0.24
DQ30	1.49 (0.12)	-0.03 (0.04)	0.57 (0.04)	1.09 (0.04)	1.71 (0.06)	2.24 (0.09)	3.02 (0.20)	58.11	0.98
DQ34	1.29 (0.10)	-0.06 (0.05)	0.60 (0.04)	1.07 (0.04)	1.70 (0.06)	2.25 (0.08)	3.03 (0.18)	86.33	0.38

Note. The standard errors for each item parameter estimate are presented in parenthesis; b= thresholds, severity or difficulty parameters; a = discrimination statistics; DF=83

Both Item Response Category Curves (Fig 10-5) and Item Information Curves (Figure 10-6) showed that items do not capture lower levels of the latent trait well. Considering the

height and width of IICs, items DQ9 and DQ13 were selected for the two-item version. Item DQ2 was added to form the three-item version (see Table 10-6).

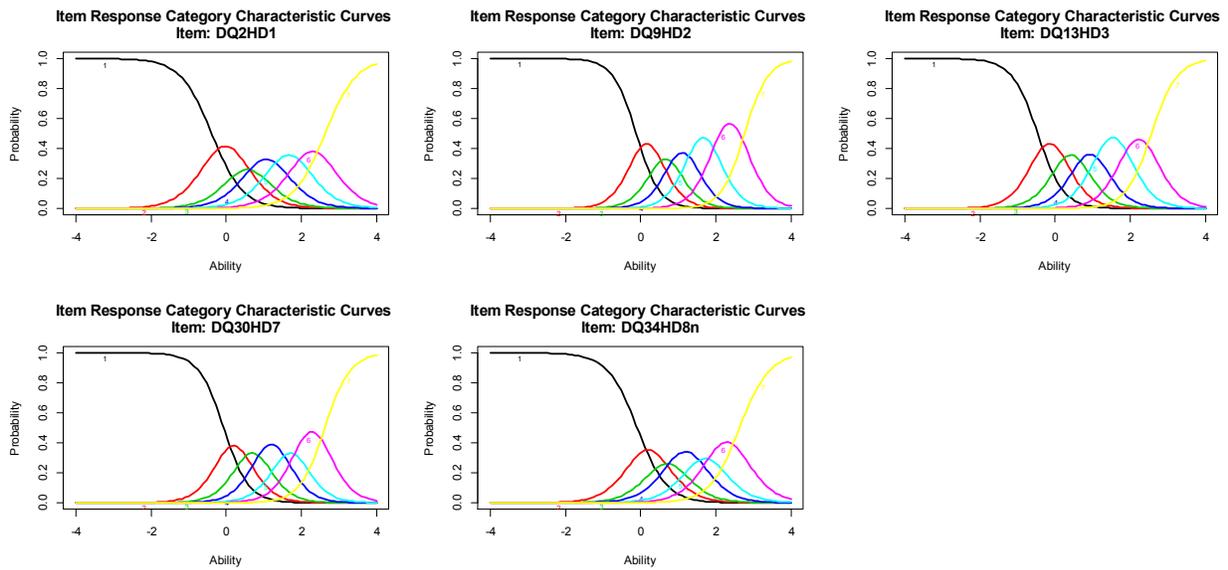


Figure 10-5. Category Response Curves of the DQ's Hedonistic Delay items (Factor3-DQ).

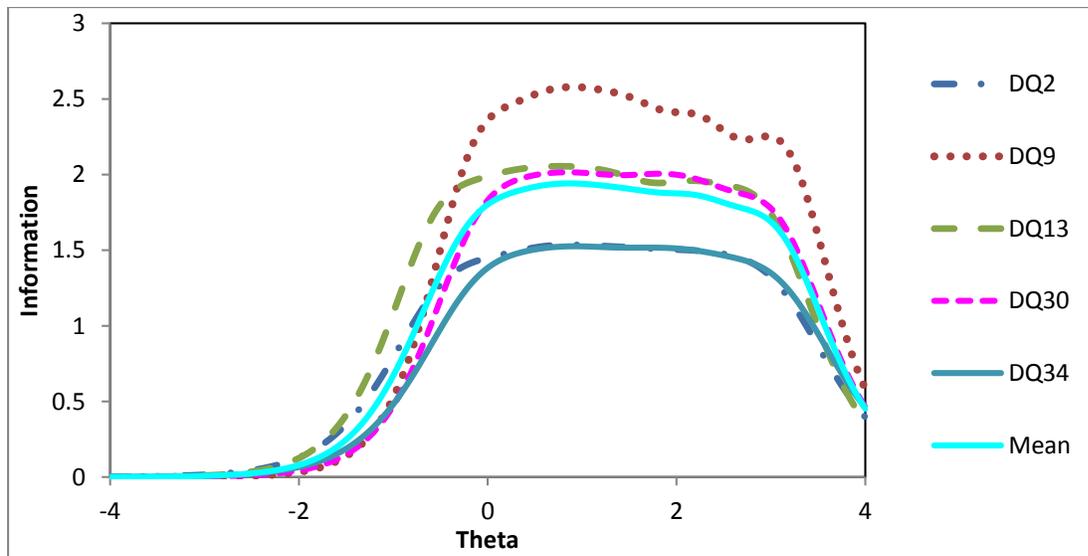


Figure 10-6. Item Information Curves for Hedonistic Delay (Factor 3-DQ).

Table 10-6

Final set of Hedonistic Delay items using vignette approach.

Var.	Vignette
DQ9	Colin says that he doesn't care about school work as much as the more enjoyable aspects of campus life. He often doesn't have any intention or desire to start school tasks on time. Colin enjoys having time to relax and doesn't see the point of pushing himself to get an early start on studying and assignments.
DQ13	Dimitri has been postponing doing his assigned readings and lab reports for a while now. It seems like something more fun always comes up. He knows his grades are not as good as they could be, but he's having a good time and that's what he really cares about right now.
DQ2	Others (e.g., Professors or parents) say that Tina should put more time and effort into her school work. But the truth is, she prefers to hang out with her friends and download music. Generally she likes to do things that are fun and interesting, and schoolwork doesn't qualify. As a result, she often works on her school work near the deadline and does not get very good grades. Tina does not see her behaviour or grades as a problem.
DQ30	Sebastian almost never starts his assignments as early as professors recommend. He always has something else he'd rather be doing. Other people might think Sebastian is a slacker when it comes to school, but he doesn't stress about it. He feels he just isn't the type to spend tons of time on school work, since he's not that motivated by it. Right now, he's more interested in having a good time and does not care about the grades he gets on his assignments. As far as Sebastian is concerned, it's all fine just as long as he's still passing the courses.
DQ34	Kevin knows that he needs to attend his classes and start working on his assignments but he prefers going out and having fun. Kevin is pretty popular and gets many invitations to parties. He stays out late with his friends having fun rather than attending his 8:30 a.m. class or starting his assignments. This lifestyle has affected his grades but this does not change his tendency to put pleasure before work.

Refinement Process for Factors 4, 5, and 6.

The remaining three factors consisted of three to four items and there was no need to use IRT. The fourth factor consisted of three items that measure delay due to an active emotional problem. Items DQ6 and DQ16 covered mental disorder and depression and item DQ36 covered

loss of a loved one and active grief. Item DQ36 had a factor loading less than .50 and cross-loaded on factor 3.

In fact, in line with recommendations to screen out participants with a mental disorder and emotional problem such as depression (Ferrari et al., 1995; Mele, 2012), item DQ36 (in addition to two other items in Factor 4) was initially developed as a screening tool, not a construct in my initial theoretical model. Indeed, item DQ36 covered a unique aspect of emotional problems. Factor analysis supported the notion that delay due to an emotional problem should be differentiated when studying procrastination or other forms of delay. Therefore, item DQ36 was kept because of its utility as a screening tool in future research. The two-item version of the fourth factor consisted of items DQ6 and DQ36. Since DQ6 covered all types of mental disorder, it was selected despite having a lower factor loading than DQ16. The three-item version consisted of all three items. If researchers wish to screen out students with mental disorders and active grief, two scores should be used—the average of DQ6 and DQ16, and the raw response to DQ36. In research, the average of these two scores can be calculated and studied as "delay due to an active emotional problem". This factor was labeled as the Delay due to Emotional Problem (DEP).

Factor 5 consisted of two items that measured "purposeful delay to optimize one's schedule" and one item that initially developed to measure "no delay." In fact, the content of all three items overlapped and included: no delay in most tasks when there are competing agendas; a temporary postponement in a few tasks; and finally accomplishing all tasks on time. Items DQ23

and DQ27 were selected for the two-item version. The three-item version consisted of all three items. Given the content of these items, the fifth factor was labeled Purposeful Delay¹⁴.

Factor 6 was highlighted by three items that originally were developed to measure the content domains related to arousal delay. All three items (DQ3, DQ10, DQ20) had high factor loadings, and were therefore considered for the three-item version of the factor. Items DQ3 and DQ10 were selected for the two-item version of the subscale. This factor was labeled Arousal Delay. It should be noted that the term purposeful delay was initially used to cover two content domains: purposeful-strategic delay and arousal delay. These content domains have been labelled positive/active procrastination in the literature (Chu & Choi, 2005; Choi & Moran, 2009). Based on the results of factor analysis, the two content domains constitute two unique factors.

Refined DQ Items and Factor Structure

The final version of the DQ are presented in Table 10-7. Table 10-8 presents reliability of the three-item versions of factors and the factor loadings and communalities of the refined 12- and 18-item versions of the DQ. Both versions demonstrated a simple factor solution.

¹⁴ Another appropriate label for this factor was strategic delay proposed by Klingsieck (2013). Given the purposeful delay was used from the beginning of the project, the label was kept. Moreover, strategic delay, as defined by Klingsieck (2013) can cover other forms of delay such as arousal delay.

Table 10-7

The Refined DQ items

Variable	Order	Vignette	Types: 6-Factor Model
DQ12	1	Lorenzo keeps putting off working on his schoolwork until later and later until it's too late to produce his best work. He often tells himself he won't do this again, but it seems like whenever he has schoolwork he should be doing, he does all sorts of other things instead, like watching TV, text messaging, surfing the Internet, etc. Lorenzo is generally not happy about his study habits and would like to find a way to change it.	F1: Irrational
DQ15	2	Even though Lisa makes plans and works hard, she gets to the end of the day with lots of things (e.g., school work) left to do. In addition to school, she has two part-time jobs and is doing volunteer work to improve her resume. She also has to help care for her older brother, who has special needs. She feels bad about putting off school work, but it seems like important demands that she can't control always come up to get in the way of her plans.	F2: Inevitable
DQ9	3	Colin says that he doesn't care about school work as much as the more enjoyable aspects of campus life. He often doesn't have any intention or desire to start school tasks on time. Colin enjoys having time to relax and doesn't see the point of pushing himself to get an early start on studying and assignments.	F3: Hedonistic
DQ6	4	James has a midterm exam and an assignment due in 2 weeks. He knows that he needs to do the work to pass the course but he has a difficult time to focusing on his work due to his mental health condition. He has suffered from this condition for some time. This has affected his performance in school and often led him to delay his work. James generally does not postpone his tasks when the symptoms of his mental illness are under control.	F4: DEP
DQ27	5	Professor Johnson assigns a term paper that is due in two weeks. Peter looks at his schedule, which is already quite full with ongoing commitments and deadlines, to find an optimal time to write the first draft and a revision. Most of the time, Peter can schedule time to work on his assignments ahead of deadline, but sometimes he has to choose a time that's quite close to the deadline to make the best use of his time and/or to be able to fulfill his other commitments . Everything in Peter's life is planned and gets done according to his schedule.	F5: Purposeful
DQ10	6	Sabrina intentionally postpones working on her school assignments. She finds it kind of exciting to come face to face with a deadline. Some of her friends get all stressed out when they have to do work at the last minute, but Sabrina is satisfied with her work and doesn't feel any negative effects from postponing her assignments.	F6: Arousal

Variable	Order	Vignette	Types: 6-Factor Model
DQ8	7	Andrea is about to start studying for her exam, but she tells herself she will start after she checks her email. But after she checks her email, she finds herself checking the news, then Facebook, then taking a break for lunch, and before she knows it, the day is over and she hasn't studied at all. Another time, before her last assignment, she found herself cleaning the house, calling her friends, and organizing her desk. She keeps postponing her school work until the last minute. She feels stressed about having to rush and believes her work is not as good as it could be if she could get started earlier or put more time into it.	F1: Irrational
DQ24	8	Martha is the type of student who is a busy "doer," working non-stop with no time to waste. Her schedule is crazy busy with no room for anything extra, but she still tries to find time if someone important to her asks for something. In terms of school work, she sometimes changes her initial plans again and again to meet other important commitments, and therefore postpones some of her school work until near the deadline. She is generally not satisfied with the way she does her school tasks and her busy lifestyle.	F2: Inevitable
DQ13	9	Dimitri has been postponing doing his assigned readings and lab reports for a while now. It seems like something more fun always comes up. He knows his grades are not as good as they could be, but he's having a good time and that's what he really cares about right now.	F3: Hedonistic
DQ36	10	Marta usually plans to work on her school tasks ahead of time and is able to accomplish most of her tasks on time, according to her plan. However, recently she suffered a loss of someone very close and has a hard time concentrating on anything. She is grieving and therefore cannot focus on her school work. She knows that the delay will likely have a negative effect on her academic performance, considering she will need to catch up on a lot of stuff.	F4: DEP
DQ23	11	Professor Johnson assigns a writing assignment that is due in two weeks. Joe looks at his calendar and realizes that the best time—or maybe the only time—for him to work on the assignment is the two days before it's due. It's not that he puts off working on the paper until the last minute for unnecessary reasons or activities; but because he has to travel for his sport team on the weekend and he has two other assignments due before this paper. He knows that the optimal time for him to focus on that assignment is 2 days before it's due, and he knows that's enough time for him to do a good job. This is how Joe organizes his time and activities. He has a reasonable number of commitments and tasks and generally makes good use of his time. He schedules some tasks well ahead of the deadline and others close to the deadline. He is usually able to stick to his schedule.	F5: Purposeful

Variable	Order	Vignette	Types: 6-Factor Model
DQ3	12	Devon gets a kick out of working under pressure, so he intentionally puts off writing papers and studying for exams. Last semester, he wrote two essays and a lab report in three days on very little sleep, then had less than a week to catch up on his readings and study for his exams. He doesn't think this affected his grades and he found it exciting to rush at the last minute.	F6: Arousal
DQ25	13	Although Alex usually intends to get his school work done ahead of time, he ends up wasting time on things he knows are less important. He ends up having to rush to finish his school work at the last minute, which causes him to be stressed out. He thinks he would do better in school if he could break this habit.	F1: Irrational
DQ11	14	Adam tends to have lots of demands on his time from work, school, family and friends. For example, Adam has a lot going on this semester; he is taking a full course load, has a part-time job, is involved in extracurricular activities and also has to put some time aside for his family and friends. Adam wants to work on his school tasks ahead of the deadline, but he often has to put them off to fulfill other commitments. Adam sometimes feels emotional distress when has to postpone academic tasks and is generally not happy about his delay.	F2: Inevitable
DQ2	15	Others (e.g., Professors or parents) say that Tina should put more time and effort into her school work. But the truth is, she prefers to hang out with her friends and download music. Generally she likes to do things that are fun and interesting, and schoolwork doesn't qualify. As a result, she often works on her school work near the deadline and does not get very good grades. Tina does not see her behaviour or grades as a problem.	F3: Hedonistic
DQ16	16	Kevin was generally able to focus on his school tasks and complete his work in a timely fashion. However, at this point of his life, Kevin is feeling sad and depressed and feels he may need help to overcome his depression and other negative emotions. Due to his emotions he is having trouble staying focused on the tasks at hand for school, and finds it hard to get motivation to work on assignments. He knows that putting off his school work will hurt his grades, but he has difficulty to bring himself to get any work done.	F4: DEP
DQ33	17	Claire always makes plans and is good at prioritizing various tasks. Even though she is very busy and has a full schedule of activities, she always manages to get things done. This semester, she has 4 midterms and a lab report due all in one week as well as her usual part-time job and other commitments. She chose some tasks to begin working on early while leaving the rest to start right before the deadline. This sometimes causes her some stress but she generally manages to follow her initial plan and complete all of her assignments on time.	F5: Purposeful

Variable	Order	Vignette	Types: 6-Factor Model
DQ20	18	Anna does most of her assignments right before the deadline, sometimes staying up all night to get something handed in on time. This is a pretty intense experience, but she doesn't mind working under pressure. In fact, Anna felt she actually achieved better results when she did her assignments and papers right before they were due.	F6: Arousal

Table 10-8

Factor Loadings and Communalities Based on Full-Information, 6-Factor Model with Oblimin Rotation for the final 12-Item and 18-Item Delay Questionnaire (N=580).

	HD	AD	IrD	DEP	InD	PD	h2
DQ12			-0.81 (0.81)				0.84 (0.80)
DQ8			-0.81 (0.84)				0.69 (0.73)
DQ25			-0.83				0.77
DQ15					0.81 (0.79)		0.72 (0.68)
DQ24					0.57 (0.66)		0.57 (0.62)
DQ11					0.68		0.5
DQ9	0.79 (0.71)						0.78 (0.71)
DQ13	0.82 (0.83)						0.77 (0.83)
DQ2	0.72						0.69
DQ6				-0.64 (0.76)			0.56 (0.60)
DQ36				-0.40 (0.40)			0.43 (0.40)
DQ16				-0.94			0.87
DQ27		-0.92 (0.75)					0.80 (0.64)
DQ23		-0.75 (0.90)					0.60 (0.77)
DQ33		-0.63					0.59
DQ10						-0.92 (0.78)	0.85 (0.79)
DQ3						-0.83 (0.87)	0.78 (0.86)
DQ20						-0.68	0.57
SSL	1.99 (1.29)	1.91 (1.36)	2.22 (1.48)	1.47 (0.76)	1.53 (1.14)	2.07 (1.50)	
Alpha (n=580)	0.84	0.77	0.87	0.69	0.72	0.81	

Final Notes on EFA on the DQ

The six factors in the six-factor solution presented above had meaningful and expected conceptual differences. Table 10-9 presents correlations among the six factors based on initial factor scores.

Table 10-9
Correlations Among DQ Factors

	IrD	HD	InD	PD	AD	DEP
IrD	1.00					
HD	0.44 ^b	1.00				
InD	0.15 ^b	0.21 ^b	1.00			
PD	-0.24 ^b	-0.02	0.42 ^b	1.00		
AD	0.28 ^b	0.59 ^b	0.22 ^b	0.08 ^a	1.00	
DEP	0.28 ^b	0.43 ^b	0.32 ^b	0.16 ^b	0.32 ^b	1.00

Note. IrD = Irrational Delay (Anxious Procrastination); HD = Hedonistic Delay (Hedonistic Procrastination); InD = Inevitable Delay; PD = Purposeful Delay; AD = Arousal Delay; DEP = Delay due to Emotional Problems; a ≤ .05; b ≤ .01; N=580

The interesting result was that the correlation between factor 3, hedonistic delay, and factor 6, arousal delay, was very high, indicating overlap between the factors. In fact, the shared variances between these factors can be explained conceptually and theoretically. The common and main themes in both factors are pleasure seeking (pursuing fun and excitement) and having no initial intentions to do academic tasks on time.

The overlap and large correlations suggested the possibility of combining the factors if a five-factor solution was chosen. Analysis of a five-factor solution supported the idea of combining the hedonistic- and arousal-delay factors (see Table 10-10 and Table 10-11). Table 10-10 presents five-factor solution on the initial 36 items and Table 10-11 displays results of the EFA on the refined 18 items.

Table 10-10

Factor Loadings and Communalities Based on Full-Information 5-Factor Model with Oblimin Rotation for the initial Delay Questionnaire (N=580).

Order	F_1	F_2	F_3	F_4	F_5	h2	6 Factor Delay Constructs
25	0.91					0.78	F1: Irrational
37	0.88					0.82	F1: Irrational
12	0.88					0.81	F1: Irrational
8	0.86					0.68	F1: Irrational
17	0.83					0.71	F1: Irrational
1	0.80					0.65	F1: Irrational
18	0.77					0.69	F1: Irrational
21	0.75					0.72	F1: Irrational
29	0.70					0.61	F1: Irrational
32	0.68					0.70	F1: Irrational
7	0.60					0.46	F1: Irrational
15		0.73				0.62	F2: Inevitable
11		0.66				0.48	F2: Inevitable
24		0.65				0.62	F2: Inevitable
31		0.63	-0.26	0.30		0.67	F2: Inevitable
35	0.30	0.59				0.57	F2: Inevitable
28	0.34	0.59				0.55	F2: Inevitable
4		0.46				0.28	F2: Inevitable
5		0.39			0.31	0.38	F2: Inevitable
10			-0.91	-0.25		0.73	F6: Arousal
3			-0.81			0.68	F6: Arousal
22			-0.79			0.72	F3: Hedonistic
26			-0.75	0.25		0.74	F3: Hedonistic
30			-0.73			0.72	F3: Hedonistic
9			-0.72			0.69	F3: Hedonistic
20			-0.69			0.54	F6: Arousal
13	0.28		-0.64			0.69	F3: Hedonistic
2			-0.62			0.64	F3: Hedonistic
34			-0.58	0.36		0.71	F3: Hedonistic
14			-0.55		0.28	0.39	F6: Arousal
16	0.27			0.57		0.49	F4: Emotional Problem
6				0.55		0.45	F4: Emotional Problem
36				0.44		0.45	F4: Emotional Problem
27					0.88	0.77	F5: Purposeful
23					0.76	0.60	F5: Purposeful
33					0.63	0.55	F5: Purposeful

Table 10-11

Factor Loadings and Communalities Based on Full-Information 5-Factor Model with Oblimin Rotation for the 18-item Delay Questionnaire (N=580).

	F 1	F 2	F 3	F 4	F 5	h2	6-Factor
DQ12			-0.85			0.84	F1: Irrational
DQ15					0.83	0.73	F2: Inevitable
DQ9	0.61					0.68	F3: Hedonistic
DQ6				-0.82		0.69	F4: DEP
DQ27		-0.88				0.76	F5: Purposeful
DQ10	0.97					0.83	F6: Arousal
DQ8			-0.85			0.71	F1: Irrational
DQ24					0.58	0.58	F2: Inevitable
DQ13	0.53		-0.25			0.65	F3: Hedonistic
DQ36				-0.45		0.42	F4: DEP
DQ23		-0.76				0.59	F5: Purposeful
DQ3	0.85					0.75	F6: Arousal
DQ25			-0.87			0.77	F1: Irrational
DQ11					0.69	0.52	F2: Inevitable
DQ2	0.52		-0.25			0.63	F3: Hedonistic
DQ16				-0.75		0.62	F4: DEP
DQ33		-0.67				0.58	F5: Purposeful
DQ20	0.69					0.56	F6: Arousal

In sum, there were empirical support for both 5 and 6- factor measurement models of the Delay Questionnaire based on the result of exploratory factor analyses. The only difference was related to items and factors related to arousal and hedonistic delay. The composition of other factors in the five-factor solution was surprisingly very similar to the ones in the six-factor model.

Whether or not to differentiate hedonistic and arousal delay could not be determined statistically at this stage. Both measurement models can also be supported theoretically and conceptually. This decision can be made after the CFA and validation stages where the validity of a six-factor solution would be tested and the uniqueness of correlations between the factors and validation variables would be investigated. If no meaningful and unique finding is obtained, the factors would be combined.

CHAPTER 11: CONFIRMATORY ANALYSIS OF THE MMAP'S STRUCTURE

In the first stages of measurement development, I used Exploratory Factor Analysis to explore and refine the structure of a new psychological measure. In the next stage of measurement development, described in this chapter, I used Confirmatory Factor Analysis. In the confirmatory stage, I further tested the structure of the MMAP that emerged in the exploratory stage. In the following sections, I summarize the confirmatory study and the results of Confirmatory Factor Analyses on each of the MMAP scales.

Method

Participants and Procedures

The total sample in this study was 1162 students for time one and 205 for time two. These numbers were reached after eliminating cases with duplicate records, obviously biased and invalid records, or more than 25% missing values when responding to the main questionnaires. A detailed description of the data-cleaning procedures is presented in the following section.

The recruitment procedure and steps for presenting the questionnaire package were similar to those described in the EFA stage, however there were several differences. The main difference was that the CFA study had two stages. In stage one (test), participants were required to complete the task-specific version of the MMAP as well as several validity measures discussed in Chapter 13 (e.g., Big Five Personality Traits, Tuckman Procrastination Scale) In stage two (re-test), participants completed the procrastination questionnaire a second time. Participants were given the option to accept or decline participation in stage two when they completed their consent form in stage one.

Students who had chosen to participate in stage two received a link to the MMAP questionnaire package 3 to 5 weeks later via email. All participants received further information about the study on the debriefing form at the end of the survey.

Before receiving the debriefing form, participants were asked if they were interested in receiving a course credit (2% for stage one; 1% for stage two) or, as an alternative, entering a draw with the opportunity to win a gift card (\$100 for participation in stage one and \$200 for participation in both stages) from Amazon.ca or Amazon.com or one of the four procrastination self-help books (i.e., *The Procrastinator's Digest: A Concise Guide to Solving the Procrastination Puzzle*).

The mean and median time for completing stage one was about 81 and 73 minutes respectively. The approximate time for completing stage two was 60 minutes. Similar to the EFA studies, at the beginning of the survey, participants were informed that they could take as many breaks as they needed during testing session to reduce the fatigue effect. Moreover, in the middle of stages one and two, participants were presented a message reminding them that they could take a short or a long break, including the possibility of saving their incomplete survey and returning to it later. Since the main purpose of this study was to test the structure of the new scales, all of the new scales were presented at the beginning of the survey to reduce the likelihood of fatigue effect on the responses related to the new measures. The actual duration (filling out surveys and short breaks) had a mean of 99 ($SD = 107$) minutes and median of 75 minutes in the whole sample ($N = 1162$). One hundred fifty-one participants in stage one took a long break and filled out the package in more than one survey session.

Data collection was done over the course of three semesters. At least one email reminder was sent to encourage participants who had registered for the first stage but did not start or

complete the survey. For those who agreed to participate in stage two, several reminders were sent.

Data Cleaning.

There are often two types of data in online surveys, completed records (those who reach to the end of survey and click on the finish button) and uncompleted records (those who agreed with the consent but leave the survey before clicking on the finish button). Because the MMAP was presented at the beginning of the survey and the CFA was applied only on MMAP data, both completed and uncompleted records could be used as long as participants completed the MMAP portion of the survey. I entered both completed and uncompleted records in the process of data cleaning. The initial dataset consisted of 1432 records.

Several strategies were used to clean the dataset. First, duplicate cases were identified based on their name and email. In case of a duplicate record, the completed record, the record with fewer missing values or higher scores on quality-check items, or the record with more reasonable timing was kept. Second, the total completion time and sum of the quality-check items were calculated. The dataset was sorted by completion time. The first person who answered all of the quality-check questions (an indication of reading all items) correctly completed the survey in 19 minute and the second person completed in 30 minutes. A completion time of 15 minutes (i.e., significantly less than 19 minutes) was considered to define a liberal criterion for inclusion. Cases were kept if they had completion times 15 minutes or more *and* if they answered at least three of five quality-check items. Finally, the records with more than 25% missing values on the main measure were eliminated. One hundred and fourteen records were eliminated due to duplicate problem; 52 cases were eliminated because of low completion time and low total quality-items. The final sample after data cleaning was 1162.

Measures

The measures in this study were similar to the ones used in EFA stage (see Chapter 9). However, the task-specific version of the MMAP was used in this study. The difference between task-general and task-specific versions is discussed in the next section.

Analyses

Confirmatory Factor Analysis. Confirmatory factor analysis is used to test (i.e., confirm) the final measurement models that are designed theoretically and/or found in the exploratory stages of research. More specifically, after exploratory analyses, the overall latent structure and function of hypothesised measurement models as well as the quality of subscales (item-factor relations) are often tested using Confirmatory Factor Analysis (CFA) conducted on a new sample (Brown, 2015). CFA can also be used to test the measurement effect and provide information about reliability of total scores as well as sub-scores. Based on this recommendation, Confirmatory Factor Analysis was conducted in a new dataset using Mplus version 7.2 (Muthén & Muthén, 1998-2015).

It should be noted that two versions of the MMAP were developed – General Academic Tasks and Specific Academic Tasks. In the general version, the phrase “academic tasks” was used in the wording of the items. That is, the type of task was not specified in the wording of items. In the task-specific version, the same items were presented but instead of “academic tasks,” specific academic tasks such as writing, reading and studying for exams were used in the wording of items. The exploratory factor analysis was conducted on the general version (MMAP-General). The confirmatory analysis was conducted on the specific version (MMAP-Specific) in an independent sample. Thus, the models obtained from EFA were tested three times using CFA: first for writing tasks, second for tasks related to studying for exams, and finally for

reading tasks. This order was chosen based on the importance of the tasks as reported by student participants in the EFA stage: 42% identified writing, 26% identified reading, and 26% identified studying for exam as the major task that they procrastinate on in the academic setting. Therefore, the data related to writing tasks were chosen as the main data for initial confirmatory model testing and possible and subsequent processes of model's trimming and refinements. The initial model and the refined model obtained from the writing task data, then were tested in data related to other tasks. I report and discuss detailed results of the CFA for writing tasks, but only summarize the results of the CFAs for studying for exams and reading tasks. When the differences between the CFA results related to various tasks are noticeable, I highlight the differences.

The findings of the exploratory phase were used as a guide in the confirmatory phase. The confirmatory analyses of the structures were used to test the models and obtain the optimal structure for the MMAP scales. In addition to testing the EFA-refined multidimensional models, I compared the one-factor solution and multidimensional solution to further evaluate the MMAP's multidimensionality. When the EFA did not strongly suggest a unique factor structure and supported multiple factor solutions, the competing models were compared in CFA. In sum, for each scale, the single-factor model, correlated multidimensional factor model(s), and hierarchical or bifactor factor model(s) were tested. Since a majority of the scales in EFA supported the inclusion of a general or second order factors, the models with a general /second order factor were tested and considered as the main and desired models. Model modification and trimming were applied on the models with general or second order factors. This procedure is in line with the general sequence used in higher-order CFA where first-order solutions are tested before testing a second-order factor structure (see Brown, 2015).

It should be noted that when the number of first-order factors is two or three, the model fit of the correlated factor solution is the same as the fit of the corresponding second-order factor solution as well as the corresponding bifactor solution. This is because the latent factor models in these cases are just identified. In these circumstances, the final model is chosen and recommended based on theoretical and conceptual grounds.

One of the advantages of CFA over EFA is the possibility of modeling the correlation between error terms to control for method effects or any other effects that explain shared variance among items within each dimension (e.g., social desirability, similar wording). In this study, modification indices were used to identify such sources of shared variance among items and to trim the models accordingly. Only modification indices were accepted that represented an explainable source of shared variance such as method effect, similar wording, reading difficulty, social desirability, or demand characteristics (Brown, 2015). In this way, CFA helps identify any artificial and/or weak factors in the measurement models. The final factor structure and items, therefore, were determined based on the results of CFA (i.e., model comparison and trimming).

Estimation Method As discussed in the EFA section, there are many methods of estimation that can be used in factor analysis, including Maximum Likelihood (ML), weighted least squares (WLS), robust weighted least squares (e.g., WLSMV), and unweighted least squares (ULS) (for a review, see Flora & Curren, 2004). ML estimation is commonly used in CFA and SEM. The major assumptions and requirements for the ML method are multivariate normality, a large sample size, and close to interval level indicators (see Brown, 2015; West, Finch & Curran, 1995).

The MMAP did not meet these assumptions and requirements. The MMAP items used Likert scales (i.e., ordinal or ordered categorical scale as opposed to interval scale), and the

assumption of multivariate normality was not met even after eliminating multivariate outliers. Therefore, based on the methodological literature, using full or robust WLS (i.e., use of asymptotic distribution free) for categorical data and/or treating variable as polytomous should have been the first choice for method of estimation in CFA (e.g., Brown, 2015). Based on methodological research, I expected that defining the items as continuous variables and using regular Maximum Likelihood estimation in the case of non-normality might artificially worsen the model fit (e.g., increase chi-square, reduce CFI) and underestimate the standard errors (increase type-one error) as well increase the probability of non-converging solution) in comparison to the use of polytomous correlation and/or WLSMV.

However, the result of EFA did not support treating the items as ordered categorical variables and related methods (using polytomous correlations, or WLSMV estimation) despite the use of a large sample size. To test the methodological recommendation further, I compared the estimation methods in CFA using a large new sample to test the refined model. I chose the Procrastination Behaviour Scale marked floor effect (a large number of participants selected the lowest responses in hedonistic procrastination items, a sign of non-normality) to be tested in both common and recommended methods. More specifically, I first defined the procrastination behaviour items as continuous indicators and used the ML estimation (i.e., ignore multivariate normality) in Mplus 7.2 and AMOS 20. Next, I defined the items as categorical variables (polytomous) and used asymptotic distribution free covariance weights as well as WLS method in Lisrel 8.5 as well as WLSMV in Mplus v. 7.2 (Muthén & Muthén, 1998-2015). The results of the recommended methods (treat items as polytomous, using WLSMV) were noticeably worse than the ML method. It should be noted that one of the requirements for the use of the recommended methods for an ordinal scale is a sample size between 1000-5000 (West et al., 1995) and/or 10

times more than the number of free parameters in the model (Byrne, 2010). These conditions were met in the present study. Therefore, the low performance of ordered categorical methods (i.e., using polytomous or WLS) could not be due to sample size.

The findings of the EFA and the CFA described demonstrate that treating the MMAP items as continuous indicators produced much better results theoretically (interpretability) and statistically (e.g., better overall fit, lower area of misfit). I believe that the results generally imply that blindly following methodological recommendations regarding estimating fit with Likert scales can be problematic, both theoretically and practically. The majority of articles making these recommendations are based on simulation data that are generated based on numerical and statistical features of the variables (e.g., number of categories; see for example, Flora & Curren, 2004). In addition to the number of categories (numerical consideration), I would argue that the functioning and inherent level of measurement of various types of Likert scales can differ, depending on the anchors attached to the numerical categories, the format and wording of the items, and the inherent nature of the construct that is measured. In methodological research, the limitations of simulation data mean that these defining features are dismissed or overlooked.

In this study, the majority of response categories measured frequency of behaviours. Based on the above argument, it can be speculated that item functioning could have been different if, for example, agreement-type or satisfaction-type response options had been used. Items measuring agreement versus disagreement or satisfaction versus dissatisfaction are closer in nature to ordered categorical measures than to items measuring the frequency of a behaviour. Based on the results, it seems that the nature of the MMAP questions was closer to an interval level of measurement.

The other factors that might have affected the performance of the Likert scale used within the ordered categorical method was the number of categories and overlap between middle categories and other categories shown in the item-response theory analysis. It is well known that a larger number of response categories makes scales closer to interval variables. Most recommendations have been based on data that use binary or 5-point Likert-type scales (e.g., Flora & Curren, 2004). If we use a smaller number of response categories, the optimal method may be different. In fact, factor analysis based on polytomous correlations perform better when five or fewer categories are used (Flora, LaBrish, & Chalmers 2012).

Based on the above results, I decided to consider and define the indicators as close to interval variables and chose a ML estimation method. Despite having good evidence and a strong rationale for treating the items as continuous and using ML estimation, there was still a question as to whether or not the parameter estimation and overall fit of the model might be biased due to multivariate non-normality. There are several methods to reduce the effect of multivariate non-normality when defining items as having close-to-interval properties. These include the use of bootstrapping in all levels of estimation, methods for adjusting the chi-square, item parceling, data transformation, and robust estimation of standard errors. The reader can find an extensive review of this topic in Enders (2010) and Brown (2015). At this writing, one of the most advanced and recent methods among these remedies is to use robust Maximum Likelihood for continuous indicators where both chi-square and standard errors are adjusted to be robust towards non-normality. Robust ML includes two types, MLM (produces Sattorra-Bantler χ^2 ; Satorra & Bentler, 1994) and MLR (produces Yuan-Bentler fit statistic; Yuan & Bentler, 2000). These methods perform very well in data with a moderate level of non-normality as well as in

large samples such as in this study. I used the newer method, MLR, and defined the items as close to interval level for confirmatory factor analyses¹⁵.

Model Evaluation. To evaluate a model within a CFA framework, overall goodness of fit indices are used. The choice of fit statistics and the magnitude of cut-off are two important decisions in any CFA research. Based on the recommendation of various methodologists including Brown (2015), Hu and Bentler (1995, 1999), and R. B. Kline (2005), I used a combination of fit statistics that cover three major categories of model-fit indices, including absolute fit, parsimony-adjusted fit, and comparative or incremental fit. The rationale for using a set of fit indices is that categories may represent different aspects of model fit or adjust the model fit differently (see, Brown, 2015, and R. B. Kline, 2005 for a detailed discussion). For each model, in addition to examining the chi-square model fit, I also used the standardized root mean square residual (SRMR) for absolute fit, the root mean square error of approximation (RMSEA; Steiger & Lind, 1980) for parsimony correction, and the comparative fit index (CFI; Bentler, 1990) and Tucker–Lewis index (TLI; Tucker & Lewis, 1973) for comparative or incremental fit. The cut off in this study was adopted based on the recommendations of several authors (e.g., Bentler, 1990; Brown, 2015; Hu & Bentler, 1999; MacCallum, Browne, & Sugawara, 1996) and are presented in Table 11-1.

¹⁵ For a detailed rationale for the choice of model estimation in data with multivariate normality, see R. B. Kline (2005), Byrne, (2010), and Brown, (2015).

Table 11-1

Goodness of fit Indices and Cut-offs

Index	Cut-offs	Category	Note
χ^2	not significant ($p \geq .05$)	absolute fit	It is always significant with a large sample size; therefore, is not used for decision in this study.
SRMR	$\leq .08$ acceptable fit	absolute fit	It ranges from zero to 1. There is no cut-off.
RMSEA	$\leq .06$: good Fit .06 - .08: reasonable fit 0.08 - 0.10: mediocre fit > .10 rejection; need for re-specification	parsimony-adjusted fit	Adjusted for the degrees of freedom to consider the complexity of the model in model fit.
CFI	$\geq .95$: good fit $\geq .90$: reasonably good or acceptable fit <.90 rejection	incremental fit	
TLI	$\geq .95$ $\geq .90$: reasonably good or acceptable fit < .90 rejection	incremental fit	
GFI	$\geq .90$ Good fit	absolute fit	

The evaluation of models should not be based solely on model fit (Brown, 2015). After checking model fit, it is important to look for *potential areas of localized strain* (i.e., the area of misspecification) and to answer the question of whether all parts of the model have performed as expected (i.e., unexpectedly weak or strong reproduced correlations among indicators, specific bad fit). In addition, it is important to examine the interpretability and appropriateness of parameter estimates (i.e., justifiability, magnitude and significance of parameters). Standardized

factor loadings greater than one, negative variance, non-significant parameter estimates, and unexpected direction and size of parameter estimates are all considered problematic and require attention (R. B. Kline, 2005; Brown, 2015). In this study, residuals (differences between actual and reproduced variance-covariance matrices) and modification indices were used to check for any potential areas of strain (Brown, 2015) in the model. Factor loadings and variance as well as error variance were checked to identify unexpected and problematic estimates.

Modification indices were used for evaluating areas of ill-fit in models as well as subsequently trimming models. A modification index shows how changing a fixed (e.g., undefined) or constrained parameter can improve overall model fit. In a small to medium sample, a significant modification index ($MI > 4$ or $p \leq .05$) is considered important and problematic. Since modification indices are inflated in large samples, one may free the parameters flagged by a modification index and consequently examine the magnitude of the new parameter estimate (Brown, 2005). In this study the top flagged modification indices were checked to see if applying the change resulted in a significant parameter estimate with appropriate direction (i.e., positive or negative sign). A modification index with p -value of less than .01 was considered significant in this study. In model trimming and re-specification of models, only flagged modifications that were conceptually and theoretically justifiable were implemented. For a set of justifiable and significant modifications, the process of freeing relevant parameters was implemented step by step from the largest index as Jöreskog (1993) recommended. The change was accepted only if it resulted in an interpretable and significant parameter estimate. If the overall fit of the model had an acceptable magnitude, the post hoc analysis or model trimming was performed (Byrne, 2010; MacCallum, Roznowski, & Necowitz, 1992). If the fit index was marginal based on various fit indices, only extreme modification indices were highlighted and considered for implementation.

Finally, in addition to theory, the results of exploratory factor analyses were reviewed to see if there was any empirical support for the modification.

I used three statistics to compare nested models, chi-square difference, Akaike information criterion (AIC), and Bayesian information criterion (BIC). For non-nested models, only AIC and BIC were used. Both AIC and BIC consider parsimony. There is no cut-off or significance test for AIC or BIC. The lower the AIC and/or BIC, the better the model.

Since I used MLR, the calculation of chi-square differences is not simply performed by subtracting chi-squares and degrees of freedom. A “rescaled likelihood ratio test” or rescaled chi-square difference (Scaled Difference in Chi-Square; SDCS) was calculated manually based on steps recommended by Satorra and Bentler (2001, 2010; in Muthén, & Muthén, 2015):

Step 1: Identify the models

Model with more df (e.g., no correlated errors; higher-order models) = more restricted, Nested Model: Model 0

Model with smaller df (e.g., has correlated errors; correlated-factor model) = less restricted Comparison Model: Model 1

Step 2: Compute the difference test scaling correction cd:

$$cd = (d0 * c0 - d1*c1)/(d0 - d1)$$

d0 and d1 are the degrees of freedom in the nested and comparison models

c0 and c1 are the scaling correction factor for the nested comparison models, respectively.

Step 3: Compute the Satorra-Bentler scaled chi-square test statistic (SDCS-Ts):

$$SDCS-Ts = (T0*c0 - T1*c1)/cd$$

T0 and T1 are the MLR chi-square for Model 0 and Model 1

Instead of chi-square, SDCS-Ts can be found using loglikelihood values and related scaling correction factors obtained with the MLR estimator.

Step 4: Treat SDCS-Ts as chi-square difference and check the significant level ($df = d0 - d1$). If the difference statistic is significant (e.g., $T_s > 3.84$ for $df = 1$), the comparison model has a better fit.

Results

MMAP Dataset Preparation and Assumptions

Linearity and Homoscedasticity. Random pairwise scatter plots were inspected as well as scatter plots between items that had relatively stronger skewness. Both quadratic and cubic curves were fitted and compared with linear fit when the scatter plots were not informative. No noticeable contribution above the linear model was found when quadratic and cubic curves were used. In sum, no clear departure from the linearity assumption was detected.

Multivariate Outliers. Similar to the criteria and procedures used in the EFA studies, Mahalanobis Distance and Cook's Distance (CD) were used to identify influential multivariate outliers for each CFA analysis. However, multivariate outliers were not eliminated in the CFA for the following reasons. First, testing the model in the sample with and without outliers produced very similar results in a majority of the EFA and in the initial CFA. Second, a recent evaluation of the necessary assumptions for common factor analysis suggests that researchers use robust estimation as opposed to deleting such cases (Flora, LaBrish, & Chalmers, 2012).

Multicollinearity and Singularity. The factor analysis produced a result without warnings or errors, indicating that matrix R was not non-positive definite, and matrix inversion was possible. This finding supported the absence of singularity (Tabachnik & Fidell, 2007) and

multicollinearity (Flora et al., 2012). Moreover, there was no correlation above .90 between items, and tolerance (1 – squared multiple correlation) for all items was above 0.1. In fact, all of the writing, reading, and exam items under the PBS had a tolerance above .2 and VIF less than 5. These findings indicate the absence of multicollinearity problems in task-specific procrastination behaviour items. Similar results were found for task-specific items in the procrastination problem scales.

Social Desirability at the Item Level A majority of items had significant correlations with total social desirability as well as with the sum of positive and negative social-desirability items. However, the strength of these associations was small, based on Cohen's (1988) guidelines, ranging from .00 to .25. Eighty-nine percent of the correlations were below .20. The relation between total scores of items and social desirability scales were also small based on Cohen's (1988) guidelines. Furthermore, the magnitude of the relation of procrastination items with social desirability seemed similar or less than the magnitude of the relation of social desirability with Big Five items (John, Naumann, & Soto, 2008). The correlations in some of the personality items reached the highest value of 0.35 ($N = 1162$).

Normality. I checked univariate normality before running any analyses on the data. Skewness and kurtosis, z-test, and the Kolmogorov-Smirnov test did not support the univariate normality of the items. Given the large sample size in this study and sensitivity of the standard error of skewness and kurtosis as well as Kolmogorov-Smirnov test to large sample size, I inspected graphs (i.e., histograms and Q-Q normality plots) to evaluate univariate normality (Tabachnik & Fidell, 2007).

A visual rating scheme was created to quantify non-normality according to probability plots. Items were rated from 0 (normal distribution) to 5 (severe departure from normality) by

two raters. The average rating was used to evaluate the normality of each item. The results supported the normality assumption of the refined set of items.

Multivariate Normality. Multivariate kurtosis for each indicator in the model and Mardia's multivariate kurtosis statistic (Mardia, 1970, 1974) were calculated to test the assumption for the entire model (i.e., scale). The multivariate normality statistic was significant in all of the scales. Therefore, Robust Maximum Likelihood estimation was used to adjust overall model fit indices and produce robust parameter estimates. After this adjustment, multivariate normality was reached.

Confirmatory Factor Analysis of the Procrastination Behaviour Scale

The EFA study suggested that the refined measure of procrastination behaviour (PBS) consisted of two factors and had a simple structure. To test the scale's multidimensionality and structure further, I used confirmatory factor analysis in a new sample of undergraduate participants (see Method section) and evaluated a one-factor and the correlated two-factor solution suggested by the EFA. The models were first tested for writing tasks. The missing values were substituted using direct maximum likelihood before the estimation of models. Five cases who did not answer all PBS items were eliminated. Twenty-four patterns of missing values were produced. The first pattern had no missing values in all items and had the largest frequency ($n = 1089$) of accordance in comparison to other patterns. The patterns with missing values had a relatively small frequency, ranging from 1 to 8. There were no patterns containing all missing values in one scale.

Fit statistics were calculated and are presented in Table 11-2. The fit statistics and cut-offs presented in Table 11-1 in the Method section were used to evaluate how the various models fit with the above data. As expected, based on all indices of model fit, the CFA results indicated

that the one-factor model had poor fit and therefore it was rejected. In contrast, the hypothesised two-factor model had “acceptable” fit based on RMSEA and good fit based on CFI, TLI and SRMR (see Table 11-2).

Table 11-2

Overall Goodness of Fit Tests for the PBS Models

Model	n.i	n.p	χ^2	cd	DF	p	CFI	TLI	RMSEA	LRMSEA	HRMSEA	SRMR
1F	10	30	1315.8	1.493	35	s3	0.782	0.720	0.178	0.170	0.186	0.122
2CF Writing	10	31	232.9	1.392	34	s3	0.966	0.955	0.071	0.063	0.080	0.037
2CF Tau-Eq. ID	10	27	250.9	1.326	38	s3	0.964	0.957	0.07	0.062	0.078	0.040
2CF Tau-Eq. HD	10	27	278.7	1.353	38	s3	0.959	0.951	0.074	0.066	0.082	0.057
2CF Exam		31	520.4	1.549	34	s3	0.964	0.952	0.069	0.061	0.078	0.044
2CF Reading	10	31	251.1	1.715	34	s3	0.953	0.938	0.075	0.066	0.083	0.045

Note. 2CF = Two Correlated Factor Model; 1F = one-factor model; Tau-Eq. ID = Tau-Equivalent ID Items Only; n.i. = number of items; n.p = number of estimated parameters; cd = scaling correction; p = p-value; LRMSEA = RMSEA Lower CI; HRMSEA = RMSEA Higher CI; s3 = p-value < .0001

Table 11-3

Nested Models Difference Test for the PBS Models

Models:	Test of -2 Δ LL Difference							
	LL	LL.cd	n.p	Δ LL	Δ cd	S- Δ LL	Δ df	P
1F	-17919.59	1.16	30					
2CF	-17099.23	1.28	31					
Difference				1640.72	4.94	332.26	1	0.0000
2CF Tau-Eq. ID	-17103.41	1.36	27					
2CF	-17099.23	1.28	31					
Difference				8.36	0.76	10.99	4	0.0267
2CF Tau-Eq. HD	-17125.65	1.32	27					
2CF	-17099.23	1.28	31					
Difference				52.85	1.02	51.70	4	0.0000

Note. Tau-Eq. ID = Tau-Equivalent ID Items Only; n.p = number of estimated parameters; LL = Log-likelihood; Δ = difference; cd = scaling correction; S- Δ = scaled difference; P = p-value

Normalized residuals for differences between sample and implied covariances were calculated. The normalized values can be treated as z-scores. Only the residuals related to

covariance between P12 and H13 had a z-score above 4.00. The positive sign indicated that the model underestimated the relation between these two items. Modification indices supported this finding. The covariance between the error terms related to these items had the highest modification index (MI = 47). The corresponding standardized EPC (Expected Parameter Change) was above .30 (.31). There is no theoretical basis or strong conceptual justification for including the correlation between the error terms, therefore it was not included. The second and third highest MI and EPC were related to the error correlation of item H24 with items H28 and H25. However, the standardized EPC of the associations were below .30.

All of the factor loadings were significant and had very high magnitudes, ranging from .70 to .90, supporting the two-factor solution of the procrastination behaviour scale (see Table 11-4). R-square factor loadings indicated that around 61% to 81% of the variance in indicators was explained by two factors, Irrational Delay and Hedonistic Delay. The correlation between the subscales was .66, supporting the discriminant validity of the subscales. The factor determinacies for both subscales were very high (.97 for ID and .95 for HD), indicating a strong relation between the estimated and true factor scores.

Table 11-4

Unstandardized and Standardized Parameter Estimates of 2-Factor PBS-Writing

Model Parameter	Unstandardized		Standardized		P-Value
	Estimate	S.E	Estimate	S.E	
ID Factor Loadings					
WRP3	1.000	0.000	0.857	0.012	0.000
WRP12	1.039	0.020	0.9	0.009	0.000
WRP21	1.056	0.024	0.879	0.011	0.000
WRP25	0.999	0.022	0.894	0.01	0.000
WRP27	1.023	0.021	0.901	0.008	0.000
HD Factor Loadings					
WRH2	1.000	0.000	0.698	0.021	0.000
WRH13	1.302	0.052	0.854	0.013	0.000
WRH15	1.180	0.052	0.778	0.017	0.000
WRH24	1.143	0.053	0.79	0.017	0.000
WRH28	1.156	0.050	0.802	0.016	0.000
Factor Covariance					
	0.989	0.063	0.655	0.023	0.000
Item Residual Variances					
WRP3	0.772	0.055	0.266	0.02	0.000
WRP12	0.540	0.044	0.19	0.016	0.000
WRP21	0.699	0.057	0.227	0.019	0.000
WRP25	0.534	0.049	0.2	0.019	0.000
WRP27	0.519	0.038	0.189	0.015	0.000
WRP2	1.126	0.069	0.513	0.03	0.000
WRP13	0.674	0.055	0.271	0.022	0.000
WRP15	0.971	0.065	0.395	0.027	0.000
WRP24	0.840	0.061	0.376	0.027	0.000
WRP28	0.790	0.053	0.356	0.025	0.000
R2 for Item Variances					
WRP3			0.734	0.02	0.000
WRP12			0.81	0.016	0.000
WRP21			0.773	0.019	0.000
WRP25			0.8	0.019	0.000
WRP27			0.811	0.015	0.000
WRH2			0.487	0.03	0.000
WRH13			0.729	0.022	0.000
WRH15			0.605	0.027	0.000
WRH24			0.624	0.027	0.000
WRH28			0.644	0.025	0.000

Note. ID = Irrational Delay or Anxious Procrastination; HD = Hedonistic Delay/Procrastination

Figure 11-1 shows the scatter plot between the subscales. For a majority of the sample, the magnitude of ID (Irrational Delay or Anxious Procrastination) and HD (Hedonistic Delay or Procrastination) were relatively matched in a linear fashion in a positive direction. However, the plot shows that a noticeable number of participants with a high level of ID do not report a high level of HD. Figure 11-2 presents the distribution of the ID and HD factor scores. The plot shows a sign of positive skewness in the Hedonistic Delay subscale.

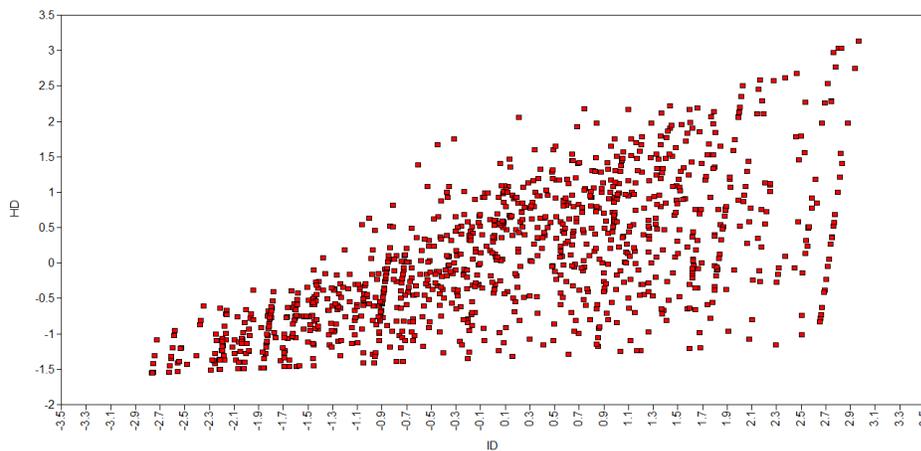


Figure 11-1. Scatter Plot of ID and HD factor scores.

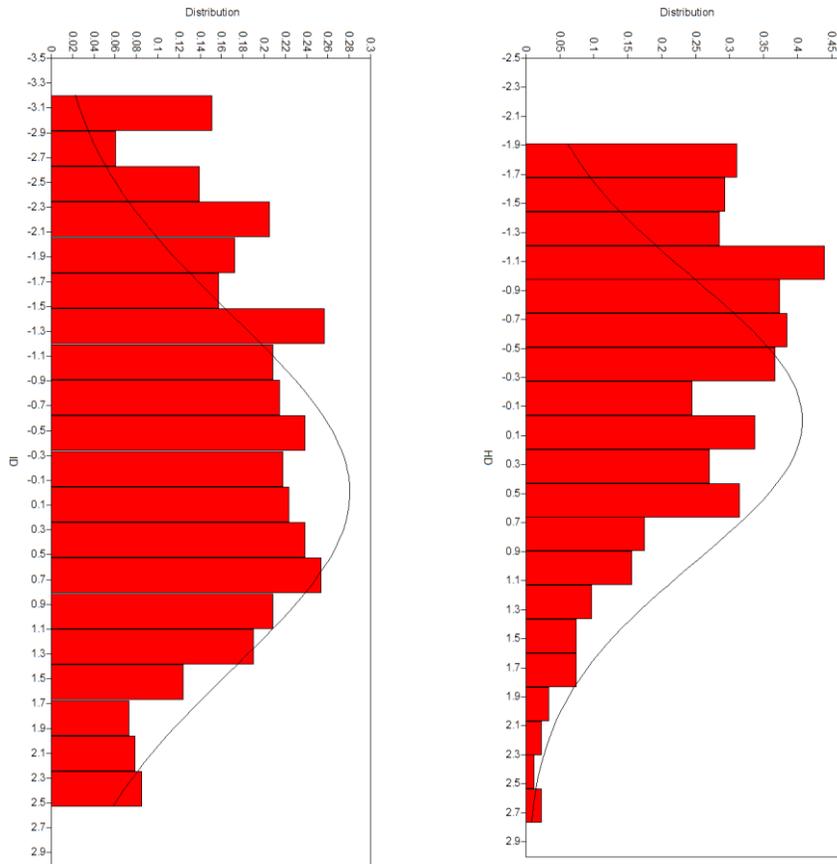


Figure 11-2. Distribution of the ID and HD factor scores.

Since there was no error covariance and all items loaded on one factor in the final solution, the solution was considered congeneric. This condition allowed me to test the Tau-Equivalence of the PBS, to see whether the items measure procrastination subscales equally. That is, I tested whether the tau-equivalence model (i.e., constraining factor loadings to be equal in the original two-factor model) had an acceptable fit, and whether the fit was not significantly lower than the original factor model. Tau-equivalent constraints were implemented for each subscale separately to create two Tau-equivalent models for ID and HD items. The models were tested using the MLR estimation method and then compared with the main correlated factor model using the scaled model differences procedure based on log-likelihood differences (see

Table 11-2 and 11-3). Despite acceptability of the overall model fit in Tau-Equivalent models for ID and HD items, the fit of the models was significantly lower than original factor model without equality constraints at the .05 level, indicating that the Tau-equivalent property was not supported for the new measure. This result highlighted the importance of using factor scores instead of aggregated scores.

Similar 2-factor models were specified and tested for two other important academic tasks, reading and studying for exams. Both models showed good or acceptable fit (see Table 11-2). The standardized factor loadings and their standard deviations are presented in Figure 11-3.

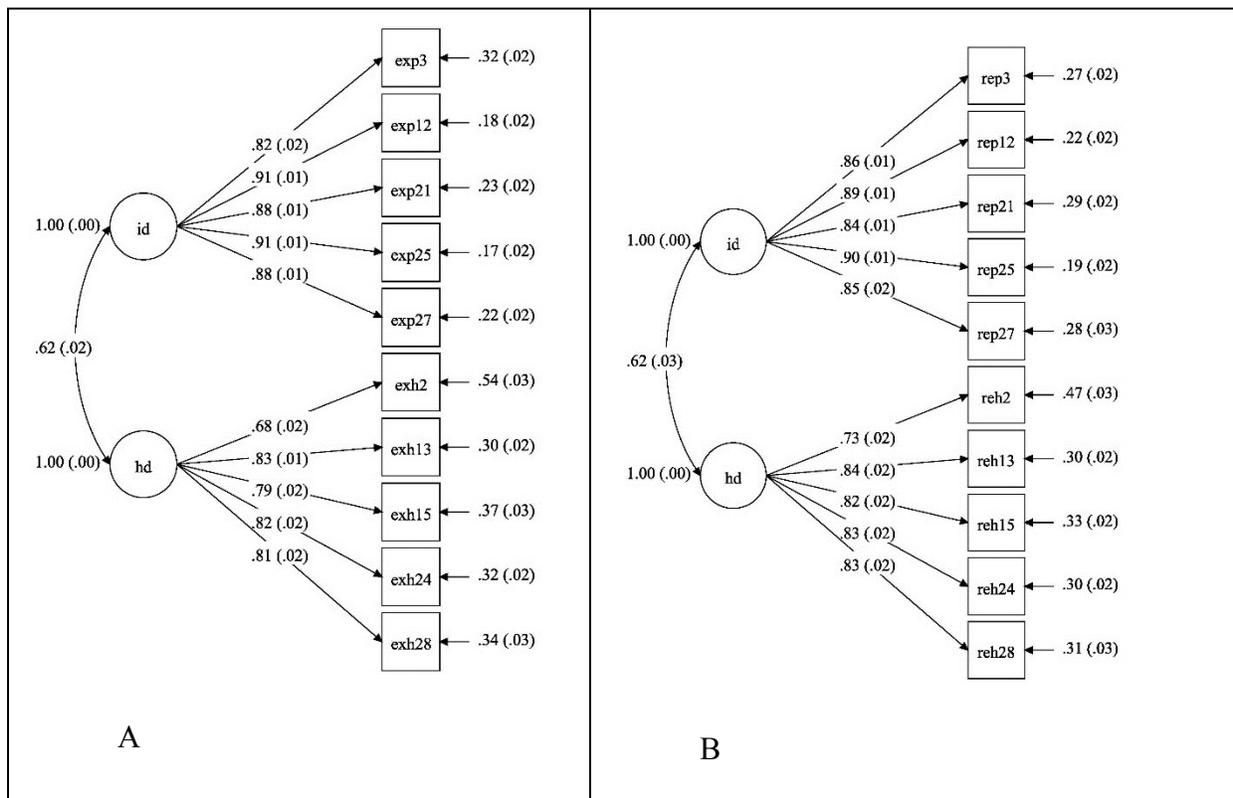


Figure 11-3. Two-factor measurement models of the PBS-Exam (A) and PBS-Reading (B) with standardized parameter estimates.

In general, the model was supported both at overall and specific levels of model evaluation. The reliability, inter-item relation and factor loadings of the PBS were very high.

These findings suggested the possibility of shortening the scale further by eliminating items that show moderate signs of localized misfit, such as items P12, H13 and H24. Item P12 had similar IIC (Item Informational Curve) as items P27 and P25 (see Table 9-5 in Chapter 9). From a conceptual point of view, P12 and P3 both measure delay that occurs without a rational reason. This implies that eliminating item P12 would not reduce the reliability and content validity of the ID subscale. Similarly, item H24 had several high modification indices, pointing to moderate problematic areas in the model. Reviewing the results of the exploratory and IRT analyses in previous chapters in addition to the performance of these items in the CFA study indicated that the items could be eliminated without jeopardizing the psychometric properties of the measure.

Confirmatory Factor Analysis of the Procrastination Problem Scale

In addition to the Procrastination Behaviour Scale, three separate scales - the Perceived Negative Consequences Scale (PNCS), the Negative Emotions Scale (NES), and the Procrastination Duration Scale (PDS) - were developed to operationalize procrastination as a psychological problem. It will be recalled that these were the scales initially evaluated and refined using Exploratory Factor analysis (see Chapter 9). In this section, I present the final models for each scale tested within a CFA framework. It should be noted that in the EFA study, the scales were refined and tested in the whole sample as well as in a subsample from which I eliminated cases reporting little or no procrastination. After comparing EFA results for the complete sample and for the subsample, the subsample results were used to guide item elimination. In the CFA, both strategies were initially used in testing the models to see if there was a practically non-negligible difference between them. There were no important differences between the results from two samples. Given this finding and since the estimation methods worked better in a larger sample, the results of model testing in the whole sample are reported.

Moreover, since elimination of cases can always be disputable and methodologically controversial, this choice can be complementary to the method used in EFA and enhance the generalizability of the models and findings.

Confirmatory Factor Analysis of the Perceived Negative Consequences Scale (PNCS)

Similar software, estimation methods and procedures that were used for the PBS models were also used in testing various PNCS models. Missing value analysis showed that 9 cases had missing values on all PNCS items. These cases were eliminated. Of the 1153 cases, 1065 did not have any missing values. The patterns with missing values had relatively small frequency, ranging from 1 to 9. There were five patterns that contained missing values in all items under at least one of the four potential factors. The frequency of the patterns was less than three.

Substituting missing values in such cases may potentially enhance the relation between factors or between-factor error terms. However, since the number of cases (i.e., frequency of patterns) was very small, the effect was considered negligible; therefore cases with missing values were kept. In fact, when I compared the result of the CFA on writing items with and without the above cases, the differences were in the third decimal for standardized parameter estimate.

The EFA resulted in a model with four correlated factors, Personal, Academic and Health consequences as well as Dissatisfaction (AC, PC, DIS and HC) and 15 items. Comparing omega statistics within the higher-order and bifactor EFA model supported the inclusion of both general and specific factors. The initial EFA analysis also indicated a 3-factor model where the PC and HC subscales were merged. In the CFA stage, in addition to the 4-correlated factors model, I examined and compared a unidimensional model of PNCS, a hierarchical (one second-order and four first-order factors), as well as a canonical bifactor model (one general and four specific factors). Similar to the analysis of the procrastination behaviour scale, CFA was conducted for

the writing items (PNCS-Writing) first. The selected and modified models were then tested using the other academic tasks, reading and studying for an exam. Figure 11-4 shows the conceptual presentation of the 1-factor and 4-factor PNCS models.

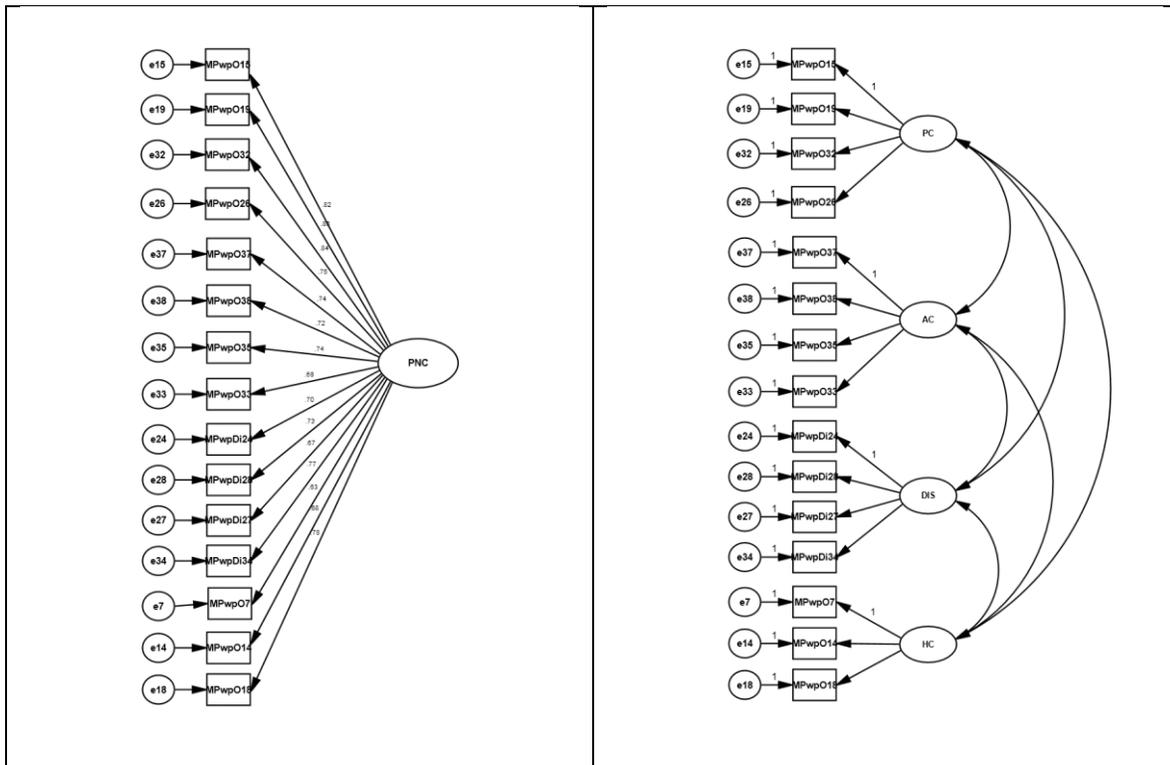


Figure 11-4. Unidimensional and 4-factor Correlated Trait Models of the PNCS

The results of testing the overall fit of the above models are presented in Table 11-5. As expected, the correlated-factor model with four factors (CFM4-Wr) had acceptable fit based on RMSEA and good fit based on CFI and SRMR. More specifically, the fit of this model was superior to the unidimensional model (F1), three correlated factor model (CFM3), higher order (HFM) and orthogonal bifactor model (O-BFM) based on various fit indices including BIC and AIC. The scaled chi-square differences procedure described in the Method section was used to evaluate whether the nested models differences were significant (see Table 11-6). The correlated

factor model with four factors (AC, PC, DIS, and HC) had a significantly better fit than the one-factor model and three-correlated-factor model (CFM3-Wr). The correct order of nested (hierarchical factor model with five factors, HFM5-Wr) versus parent models (CFM4-Wr) resulted in a negative scaled correction factor, making the use of scaled nested model comparison impossible. However, reversing the location of the models in the formula resulted in significant differences. Overall, the results were in favour of the correlated factor model with four factors (CFM4).

Table 11-5

Overall Goodness of Fit Tests for the PNCS Models

Model	n.i.	n.p.	χ^2	c.d.	DF	CFI	TLI	RMSEA	L.RMSEA	H.RMSEA	SRMR	AIC	BIC
F1-Wr	15	45	3527.41	1.412	90	0.673	0.619	0.182	0.177	0.187	0.108	57354.0	57581.3
CFM3-Wr	15	48	1064.06	1.326	87	0.907	0.888	0.099	0.093	0.104	0.049	53790.5	54032.9
CFM4-Wr	15	51	563.52	1.318	84	0.954	0.943	0.070	0.065	0.076	0.048	53128.5	53386.1
HFM5-Wr	15	49	839.99	1.272	86	0.928	0.913	0.087	0.082	0.093	0.070	53450.1	53697.5
O-BFM5-Wr	15	60	654.55	1.189	75	0.945	0.923	0.082	0.076	0.088	0.061	53182.3	53485.3
C-BFM5-Wr	15	66	253.55	1.256	69	0.980	0.970	0.048	0.042	0.055	0.028	52734.4	53067.7
C-BFM5-Wr_M	15	63	266.51	1.245	72	0.982	0.973	0.048	0.042	0.055	0.033	52741.9	53060.0
CFM4-M1-Wr	15	54	325.74	1.296	81	0.977	0.970	0.051	0.045	0.057	0.037	52814.0	53086.7
CFM4-Re	15	51	508.36	1.488	84	0.958	0.947	0.067	0.061	0.072	0.045	50578.2	50834.9
CFM4-Ex	15	51	557.32	1.444	84	0.954	0.942	0.070	0.065	0.076	0.047	52122.4	52379.2
CFM4-Re_M1	15	54	391.03	1.446	81	0.969	0.960	0.058	0.052	0.064	0.038	50393.1	50665.0
CFM4-Ex_M1	15	54	387.40	1.419	81	0.970	0.961	0.058	0.052	0.064	0.038	51873.2	52145.1
C-BFM5-Re	15	66	248.39	1.405	69	0.982	0.973	0.048	0.042	0.054	0.023	50200.9	50533.2
C-BFM5-Ex	15	66	259.02	1.357	69	0.981	0.972	0.049	0.043	0.056	0.024	51699.1	52031.4

Note. 1F = one-factor model; Wr, Re, and Ex = model for writing, reading, and exam preparation tasks, respectively; CFM3 = correlated factor model with 3 factors; CFM4 = correlated factor model with 4 factors; HFM5-Wr = Hierarchical factor model with 5 factors; O-BFM = Orthogonal Bifactor model, C-BFM5 = Correlated Bifactor Model, C-BFM5-M = Correlated Bifactor Model modified; M1 = First Modification; n.i.= number of items; n.p.= number of estimated parameters; c.d.= scaling correction; p = p-value; LRMSEA = RMSEA Lower CI; HRMSEA = RMSEA Higher CI; all chi-squares were significant at p-value < .0001

Table 11-6

Nested Models Difference Test for the PNCS

	n-np	p-np	n-cd	p-cd	Δ -LL	Δ -cd	S- Δ LL	Δ -df	P
F1-W _r vs. CFM4-W_r	45	51	1.11	1.30	4237.51	2.73	1552.12	6.00	0.00
CFM3-W _r vs. CFM4-W_r	48	51	1.29	1.30	667.96	1.55	431.58	3.00	0.00
HFM5-W _r vs. CFM4-W_r	49	51	1.38	1.30	325.58	-0.66	-491.81	2.00	Error
CFM4-W _r vs. CFM4-M1-W_r	51	54	1.30	1.34	320.51	1.92	167.22	3.00	0.00
CFM4-W _r vs. O-BFM5-W_r	51	60	1.30	1.47	-35.78	2.39	-14.98	9.00	Error
HFM5-W _r vs. O-BFM5-W_r	49	60	1.38	1.47	289.79	1.83	157.99	11.00	0.00
CFM4-W _r vs. C-BFM5-W_r	51	66	1.30	1.37	424.12	1.60	264.65	15.00	0.00

Note. n-cd = log likelihood scaling correction for nested model; p-cd = log likelihood scaling correction for parent model; n-np = number of estimated parameters in nested model; p-np = number of free parameters in parent model; LL= Log-likelihood; Δ = difference; cd = scaling correction; S- Δ = scaled difference; df = degrees of freedom; P = p-value; bolded is chosen model based on significant test; 1F = one-factor model; W_r = model for writing tasks; CFM3 = correlated factor model with 3 factors; CFM4 = correlated factor model with 4 factors; HFM5 = Hierarchical factor model with 5 factors; O-BFM = Orthogonal Bifactor model, C-BFM5 = Correlated Bifactor Model.

The nested comparison between the orthogonal bifactor model and the CFM4-Wr was not possible due to the lower chi-square values of the bifactor model. This finding was not expected, given that the bifactor model had more free parameters; rather, it was expected to find a greater magnitude for the chi-square fit index related to the bifactor model. The greater model fit of the canonical/orthogonal bifactor model in comparison to the correlated factor model that had larger degrees of freedom indicated a problem in specification of the canonical/orthogonal bifactor model for the PNCS data. This issue and its resolution are discussed below, after completing the evaluation of the main model, CFM4.

Overall the findings related to model fit supported the main correlated factor model found in the EFA. The parameter estimates of CFM4-Wr were inspected to evaluate the specific parts of the model. All items loaded well on the specified factors. The unstandardized and standardized factor loadings and their standard errors of estimation are presented in Table 11-7. The standardized factor loadings for all factors were above .80 and less than 1, and the standard errors were small. No negative factor or error variances were produced. The R-square of 15 items showed that between 59 and 84 percent of their variance was explained by four correlated factors (see Table 11-7). The results provided more support for the 4-factor model of PNCS.

Table 11-7

Unstandardized and Standardized Parameter Estimates of 4-Factor PNCS-Writing

Model Parameter	Unstandardized		Standardized		P-Value
	L	S.E	L	S.E	
Factor Loadings					
AC					
WRO15	1	0	0.884	0.01	0
WRO19	1.059	0.019	0.92	0.008	0
WRO32	1.001	0.022	0.885	0.01	0
WRO26	0.826	0.026	0.766	0.017	0
PC					
WRO37	1	0	0.871	0.011	0
WRO38	0.917	0.02	0.802	0.017	0
WRO35	1.035	0.028	0.885	0.012	0
WRO33	0.964	0.031	0.816	0.017	0
DIS					
WRDI24	1	0	0.862	0.012	0
WRDI28	1.054	0.022	0.896	0.01	0
WRDI27	0.973	0.025	0.83	0.015	0
WRDI34	1.027	0.023	0.893	0.01	0
HC					
WRO7	1	0	0.872	0.013	0
WRO14	1.04	0.02	0.919	0.01	0
WRO18	0.946	0.028	0.846	0.016	0
Residual Variances					
WRO15	0.663	0.049	0.219	0.017	0
WRO19	0.483	0.047	0.154	0.015	0
WRO32	0.655	0.051	0.216	0.018	0
WRO26	1.134	0.069	0.413	0.026	0
WRO37	0.701	0.054	0.242	0.019	0
WRO38	1.023	0.075	0.356	0.027	0
WRO35	0.653	0.063	0.217	0.022	0
WRO33	1.025	0.081	0.334	0.027	0
WRDI24	0.821	0.064	0.256	0.021	0
WRDI28	0.646	0.062	0.196	0.019	0
WRDI27	1.017	0.076	0.311	0.024	0
WRDI34	0.634	0.053	0.202	0.018	0
WRO7	0.804	0.077	0.239	0.023	0

Model Parameter	Unstandardized		Standardized		P-Value
	L	S.E	L	S.E	
WRO14	0.512	0.058	0.156	0.018	0
WRO18	0.908	0.085	0.284	0.027	0
R-Square					
WRO15			0.781	0.017	0
WRO19			0.846	0.015	0
WRO32			0.784	0.018	0
WRO26			0.587	0.026	0
WRO37			0.758	0.019	0
WRO38			0.644	0.027	0
WRO35			0.783	0.022	0
WRO33			0.666	0.027	0
WRDI24			0.744	0.021	0
WRDI28			0.804	0.019	0
WRDI27			0.689	0.024	0
WRDI34			0.798	0.018	0
WRO7			0.761	0.023	0
WRO14			0.844	0.018	0
WRO18			0.716	0.027	0

Note. AC = Academic Consequences; PC = Personal Consequences; DIS = Dissatisfaction, HC = Health Consequences

The correlations among factors were high (see Table 11-8) but they still did not violate the criterion for discriminant invalidity (see Brown 2015). Neither one higher-order factor in a hierarchical model nor one general factor in an orthogonal bifactor model could capture the correlations.

Table 11-8

Estimated Correlations among PNCS Subscales and their Standard Deviations of Estimate

	AC	PC	DIS	HC
AC	1			
PC	0.709 (0.021)	1		
DIS	0.781 (0.018)	0.542 (0.024)	1	
HC	0.625 (0.027)	0.802 (0.018)	0.506 (0.027)	1

Note. AC = Academic Consequences; PC = Personal Consequences; DIS = Dissatisfaction, HC = Health Consequences

The reliability of the measures was evaluated in the EFA. I replicated the test for reliability in the CFA study, using Omega reliability statistics. In order to calculate Omega based on unstandardized factor loadings and error variances, I changed the identification constraint (i.e., latent scaling strategy) from item-marker to factor variance. The omega reliability coefficients for AC, PC, DIS, and HC subscales were .92, .91, .93, and .91 respectively. These results replicated the EFA reliability results and indicated excellent reliability of the subscales.

In the next stage of model evaluation, the normalized residuals were examined to find any potential areas of misfit. Although these statistics can be inflated in large samples, the results indicated that a majority of the inter-item relations reproduced closely. Only the normalized residuals related to association between Wro18 and Wro19, Wro26 and WrDi34, and WrDi34 and Wro38 were above +4.00. The signs of the residuals were positive, indicating that the model underestimated the inter-relation among the items. To study the areas of misfit further, I looked at modification indices and EPC values. The highest modification indices underscored the importance of specifying error term covariance between the following pairs, WrO38 and WrO37, WrO33 and WrO35, and WrO14 and Wr07, and of allowing WrO18 to load on the AC and DIS factors.

Generally, having an acceptable to good overall model fit and excellent parameter estimates and reliability supports the validity of the PNCS structure. However, the above modification indices can be used to explore another model that might fit the data better. I used the estimated EPCs for model trimming. The EPCs indicated that only the modifications related to error terms covariance were noticeably high. The standardized EPC for error covariance were .49, .53, and .95 respectively. The standardized EPC for factor loadings flagged by modification

indices were less than .30; therefore the suggested modification for factor loading was not applied.

To determine whether the modifications related to the error covariances were justifiable, I looked at the items' location, wording, and content. Items O7, O14 and O18 were loaded onto the HC factor. The large EPC for error term correlation between O7 and O14 was justifiable due to extreme similarity between the wording and content of the two items in comparison to item O18. The other two pairs were under the PC factor, and the association was justifiable due to the pairwise similarity of wording and content. As the covariances were related to the same factor and were conceptually justifiable, I specified the covariance as free estimated parameters. This modified model was named CFM4-M1-Wr, where M1 stands for modified model 1.

The fit of the modified CFM4 model for writing tasks was very good based on all of the fit indices (see Table 11-6) and the cut-offs presented in the Method section. Moreover, in line with the EPC values, the estimated correlations were .32, .34, and .51 for the error terms relation of WrO38 with WrO37, WrO33 with WrO35 and WrO14 with WrO7 respectively. All of the correlations were significant at $p < .05$.

A scaled nested model comparison was used to compare the four-factor model with and without correlated errors. In this case, the model without error terms covariance nested under the modified model. The overall fit of the modified model was significant (scaled $\Delta\chi^2 = \text{SDCS-Ts} = 168.307$, $\Delta df = 3$; $P = .000$) and a better than the fit of the original model, supporting the modified model. Further evaluation of the modification was done through testing the model for the reading and studying for an exam tasks.

In the first stage, the original 4-correlated factors model was tested for tasks associated with reading and studying for an exam. The overall fit of the models were very similar to the

findings related to writing (see Table 11-6). In fact, the RMSEA for reading tasks was better than for writing and studying tasks. The factor loadings and other parameter estimates were significant and very similar among models for the three types of academic tasks. The highest modification indices and EPC were related to similar error terms. The magnitudes of these statistics were smaller in the models for reading and studying for an exam in comparison to the model for writing-task items. The above findings indicated that the structure of the main model and modified models was maintained across three academic tasks, further supporting the structural validity of the 4-factor model.

Bifactor Model of PNCS and Evaluation of General Score Recent literature recommends a canonical/orthogonal bifactor model as the main bifactor model (e.g., Brown, 2015; Chen, West, & Sousa, 2006; Reise et al., 2010, 2013) . The properties of this type of bifactor model are highlighted since the specific factors do not cover any shared variance between items across factors, making the comparison of specific and general factors more appropriate. Therefore, the contribution of specific factors (domain-specific factors) can be differentiated more accurately from the contribution of general factor (Brown, 2015) and the evaluation of a general score in a multidimensional model is more statistically justifiable. In the present study, I evaluated the general and specific factors by comparing factor loadings in the model and/or looking at omega hierarchical and omega specific (see EFA section for comparisons related to omega).

Reise and colleagues (2013) indicated that both higher-order and correlated factor models are nested within a canonical (orthogonal) bifactor model with the same number of specific factors, making the statistical comparison between the models possible. However, I believe that using a bifactor model as the parent model in relation to a correlated multi-dimensional model

can be controversial theoretically and problematic statistically. First, when comparing a nested and parent model, the nested model should be the model with more restrictions as opposed to the parent model. But in this specific case, I argue that a bifactor model is more restricted than correlated factor models in the part of the model that defines the covariation among specific factors. Second, if the covariances among factors are justifiable based on conceptual and theoretical evidence, then forcing no correlations (fixing covariances to zero) in the orthogonal bifactor model is problematic and can worsen the model fit in comparison to the correlated model (a model that supposed to be the nested model). In other words, if correlated-traits is assumed in the first place (when the correlated factor model was developed) based on theory, introducing an orthogonal model in subsequent stages of model development can be artificial and lead to poorer model fit, particularly when the correlations between the factors are high and cannot be captured with one general factor.

Allowing the specific factors to covary in a bifactor model when the correlations are theoretically suggested may resolve the problem of lower model fit. In this case, a correlated bifactor model can be used as a parent model for a correlated trait model. The higher-order factor model, as noted by Reise and colleagues (2013), can be considered nested under the bifactor model regardless of the inclusion of correlations between specific factors.

The results of a correlated-trait bifactor model in this study shows the merit of the above discussion. Comparing a regular correlated-factor model with its counterpart orthogonal bifactor model in PNCS indicated that the bifactor model had a lower fit despite having more free parameter estimates (see Table 11-6). This indicated a possible misspecification of the orthogonal bifactor model for the PNCS data. In line with the above discussion, the modification indices highlighted a severe negative effect on overall model fit when specifying zero-

correlations among specific factors. In fact, the highest modification indices were related to the covariance of AC with DIS, PC with DIS, and PC with HC. All of these correlations conceptually and theoretically are justifiable. More interestingly, the modification indices obtained in testing models for reading and exam-studying tasks indicated that the effect of freeing the covariances between the factors on the models' fit were the same as the one related to the model for writing task. That is, the inclusion of the association was not due to a chance or specific sample but the content and/or constructs that the factors measure.

Based on the above discussion, two correlated bifactor models were defined and tested: a bifactor model with correlations among all specific factors and a bifactor model with correlations between specific factors with high modification and EPC statistics (DIS with AC and PC; HC with PC). The models were named the correlated-bifactor model (C-BFM5-Wr) and the correlated-bifactor model-modified (C-BFM-M1-Wr). Table 11-6 shows the overall factor model fit for these models. The correlated bifactor models had good/excellent fit based on many specified indices discussed in the Method section.

The factor loadings of general and specific factors are presented in Table 11-9. Methodologists suggest using orthogonal bifactor models for evaluation of general factors and for the calculation of omega (Chen et al., 2006; Reise et al., 2010); this is why parameter estimates of this model were presented in addition to estimates for a correlated model. The standardized factor loadings of the general factor for a majority of the items had acceptable magnitude ($> .45$). In terms of specific factors, AC, DIS and HC seemed to have a reasonable magnitude of factor loadings. That is, the specific factors had unique variance above and beyond the general factor regardless of the type of bifactor model. With the exception of item O26, the *R*-square values for items were above .70, indicating that between 70 and 88 percent of the

variance in items was explained by both bifactor models. Sixty percent of variance in item O26 was explained by bifactor models.

Similar models were used for reading and exam tasks and similar results were found. The parameter estimates for the modified 4-factor model and correlated bifactor models are presented in Figures 11-5 and 11-6.

Table 11-9

Unstandardized and Standardized Factor Loading of Orthogonal and Correlated Bifactor Model for PNCS-Writing

Factors	O-BFM5-Wr					C-BFM5-Wr					C-BFM5-M1				
	Unstandardized		Standardized			Unstandardized		Standardized			Unstandardized		Standardized		
	L	S.E.	L	S.E.	P-Value	L	S.E.	L	S.E.	P-Value	L	S.E.	L	S.E.	0.00
AC															
WRO15	0.86	0.09	0.49	0.05	0.00	1.11	0.04	0.64	0.02	0.00	1.10	0.04	0.63	0.02	0.00
WRO19	0.92	0.10	0.52	0.06	0.00	1.20	0.04	0.68	0.02	0.00	1.19	0.04	0.67	0.02	0.00
WRO32	0.76	0.12	0.44	0.07	0.00	1.09	0.04	0.62	0.02	0.00	1.07	0.04	0.62	0.02	0.00
WRO26	0.50	0.09	0.30	0.06	0.00	0.73	0.05	0.44	0.03	0.00	0.72	0.05	0.43	0.03	0.00
PC															
WRO37	0.57	0.19	0.34	0.11	0.00	-0.21	0.12	-0.12	0.07	0.09	-0.16	0.09	-0.09	0.05	0.09
WRO38	0.42	0.20	0.25	0.12	0.03	-0.72	0.30	-0.43	0.18	0.02	-0.60	0.26	-0.35	0.15	0.02
WRO35	0.91	0.07	0.52	0.04	0.00	0.29	0.20	0.17	0.12	0.15	0.36	0.16	0.21	0.10	0.03
WRO33	0.87	0.07	0.50	0.04	0.00	0.39	0.20	0.22	0.12	0.06	0.47	0.17	0.27	0.10	0.01
DIS															
WRDI24	1.09	0.08	0.61	0.04	0.00	1.33	0.05	0.74	0.02	0.00	1.31	0.04	0.73	0.02	0.00
WRDI28	1.14	0.09	0.63	0.05	0.00	1.40	0.04	0.77	0.02	0.00	1.38	0.04	0.76	0.02	0.00
WRDI27	1.10	0.07	0.61	0.04	0.00	1.31	0.05	0.72	0.02	0.00	1.29	0.04	0.71	0.02	0.00
WRDI34	0.97	0.08	0.54	0.05	0.00	1.25	0.05	0.70	0.03	0.00	1.22	0.04	0.69	0.02	0.00
HC															
WRO7	1.17	0.08	0.64	0.04	0.00	1.14	0.06	0.62	0.03	0.00	1.13	0.06	0.62	0.03	0.00
WRO14	1.07	0.09	0.59	0.05	0.00	1.06	0.06	0.58	0.03	0.00	1.06	0.06	0.58	0.03	0.00
WRO18	0.58	0.07	0.33	0.04	0.00	0.70	0.06	0.39	0.03	0.00	0.68	0.05	0.38	0.03	0.00
GEN															
WRO15	1.29	0.07	0.74	0.04	0.00	1.07	0.04	0.61	0.02	0.00	1.08	0.04	0.62	0.02	0.00

Factors	O-BFM5-Wr					C-BFM5-Wr					C-BFM5-M1				
	Unstandardized		Standardized			Unstandardized		Standardized			Unstandardized		Standardized		
	L	S.E.	L	S.E.	P-Value	L	S.E.	L	S.E.	P-Value	L	S.E.	L	S.E.	0.00
WRO19	1.36	0.08	0.77	0.04	0.00	1.12	0.05	0.63	0.02	0.00	1.13	0.04	0.64	0.02	0.00
WRO32	1.32	0.08	0.76	0.04	0.00	1.09	0.05	0.63	0.02	0.00	1.10	0.05	0.63	0.02	0.00
WRO26	1.17	0.05	0.71	0.03	0.00	1.05	0.05	0.64	0.02	0.00	1.06	0.05	0.64	0.02	0.00
WRO37	1.33	0.09	0.78	0.05	0.00	1.47	0.05	0.86	0.02	0.00	1.48	0.04	0.87	0.02	0.00
WRO38	1.28	0.08	0.76	0.04	0.00	1.41	0.07	0.83	0.04	0.00	1.43	0.05	0.85	0.02	0.00
WRO35	1.30	0.07	0.75	0.04	0.00	1.55	0.05	0.89	0.02	0.00	1.53	0.05	0.88	0.02	0.00
WRO33	1.20	0.07	0.68	0.03	0.00	1.45	0.06	0.83	0.03	0.00	1.43	0.05	0.82	0.03	0.00
WRDI24	1.09	0.09	0.61	0.04	0.00	0.79	0.07	0.44	0.03	0.00	0.82	0.06	0.46	0.03	0.00
WRDI28	1.16	0.09	0.64	0.05	0.00	0.84	0.07	0.46	0.03	0.00	0.87	0.06	0.48	0.03	0.00
WRDI27	1.04	0.08	0.58	0.04	0.00	0.75	0.07	0.42	0.04	0.00	0.78	0.06	0.43	0.03	0.00
WRDI34	1.26	0.08	0.71	0.04	0.00	0.98	0.06	0.55	0.03	0.00	1.00	0.05	0.57	0.03	0.00
WRO7	1.17	0.07	0.64	0.04	0.00	1.19	0.05	0.65	0.02	0.00	1.19	0.05	0.65	0.02	0.00
WRO14	1.28	0.07	0.71	0.04	0.00	1.30	0.05	0.72	0.02	0.00	1.30	0.05	0.72	0.02	0.00
WRO18	1.44	0.04	0.80	0.02	0.00	1.33	0.04	0.74	0.02	0.00	1.34	0.04	0.75	0.02	0.00

Note. AC = Academic Consequences; PC = Personal Consequences; DIS = Dissatisfaction, HC = Health Consequences; ACL = factor loadings; S.E. = standard error of estimate; O = Orthogonal; C = Correlated; BFM5 = Bifactor Model with 1 general and 4 specific factors; Wr = Writing tasks

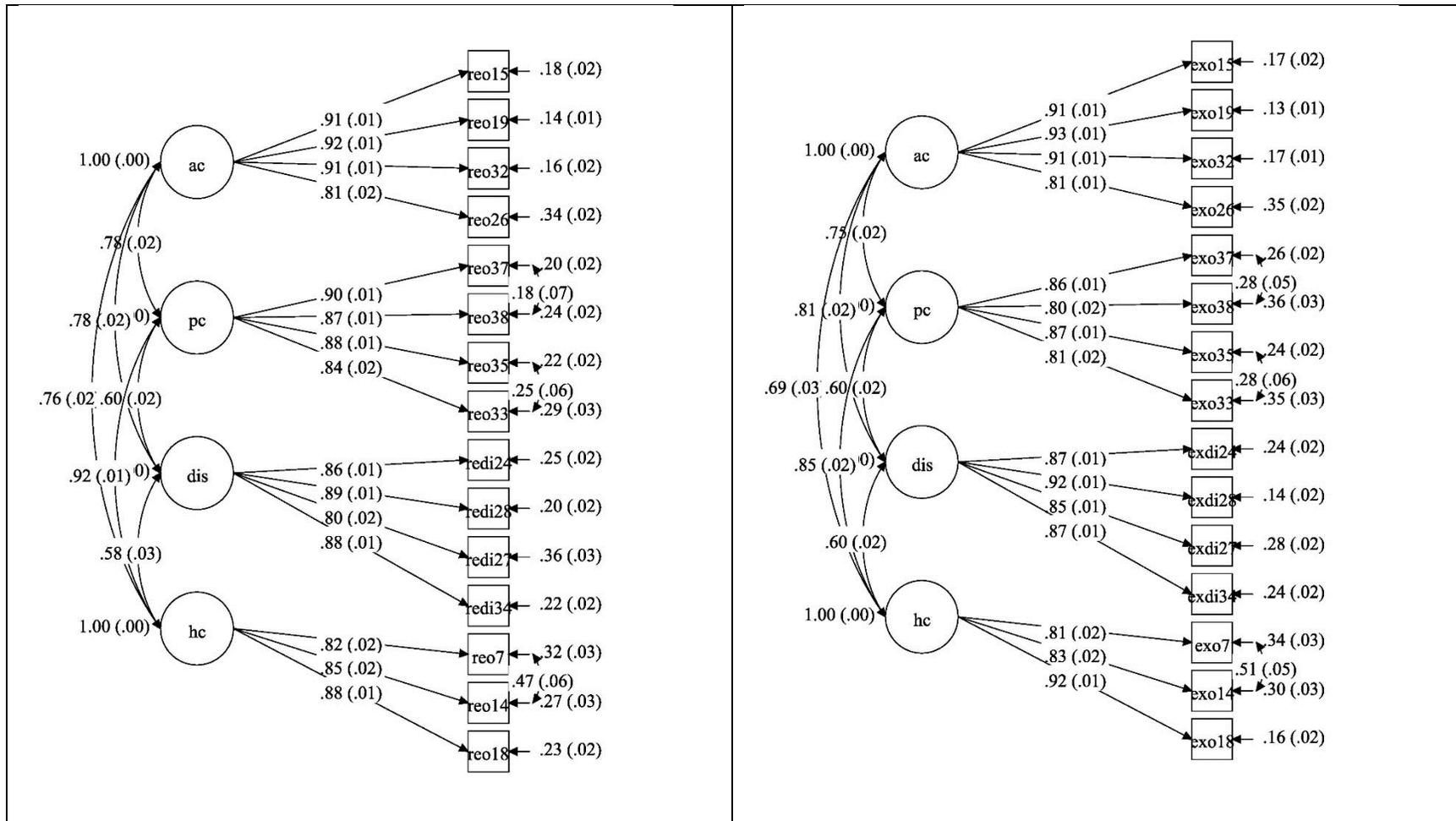


Figure 11-5. Modified four factor model of the PNCs for reading and exam tasks and their standardized parameter estimates. Note. The model for reading is on the left.

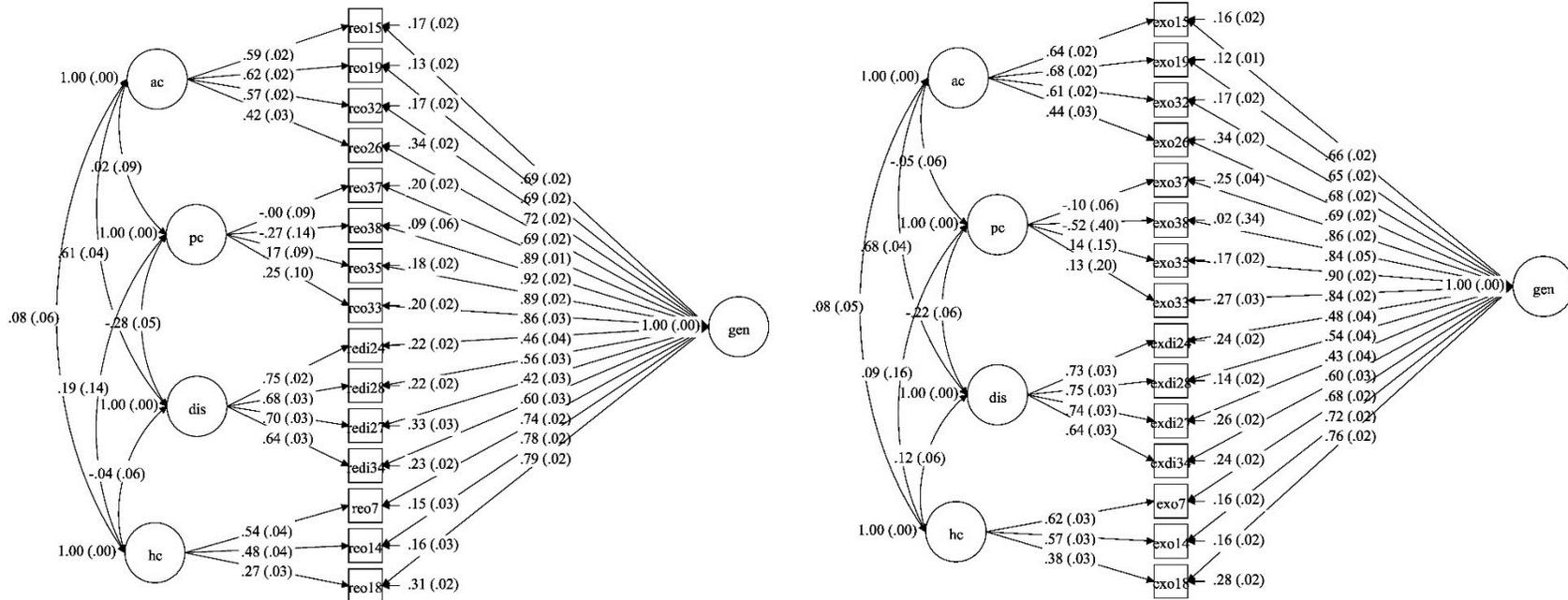


Figure 11-6. Bifactor model of PNCs for reading and exam tasks and their standardized parameter estimates. Note. The Reading model is on the left

Confirmatory Factor Analysis for the Negative Emotions Scale (NES)

The pattern of missing values analysis had one major difference for the NES in comparison to the PBS and PNCS. For writing items, 243 cases did not receive seven of the negative emotion items due to a technical problem in setting up the online survey. The negative emotion items were presented to those individuals only for the reading and exam tasks. Because of the large number of missing values for writing tasks, the initial process of model evaluation and subsequent model modification was done on items related to reading. In the next stage, the models were tested for writing and studying tasks.

The refined set of items in the NES consisted of 13 items. The NES consisted of two sets of items, measuring emotions related to task initiation and to task delay. Since the task-initiation items were presented separately from the task-delay items in both the EFA and CFA studies, these sets of items were factor analyzed separately. In the EFA, both sets of items were entered into the analysis together. In the CFA, I first evaluated task-initiation and task-delay items separately then evaluated the models related to both sets of items. The separate models were part of the larger model. Testing sub-models before the major model is a strategy that is recommended by methodologists (e.g., Brown, 2015). However, this choice was due to practical reasons since researchers may use scales measuring task delay and task initiation for different purposes. Only a task delay model is necessary when the goal of a research is to screen for chronic procrastination. If the goal of research/intervention evaluation is to understand the emotional etiology of procrastination, then the task-intimation model can be used. In fact, when theoretical understanding of procrastination is important, both models can be useful.

There are two similar two-factor models that define the structure underlying task-initiation and task-delay emotions. The two-factor model is based on emotion theories that

categorize negative and positive emotions as activating and deactivating emotions (see Pekrun 2006). Consequently, the two-factor models in this study differentiate activating and deactivating emotions; one model for items measuring emotions that arise before initiation of tasks (Task Initiation) and the other for items measuring negative emotions that arise while delaying tasks that should have been initiated (Task Delay). Both two-factor models comprised two subscales, the Activating Emotions Subscale (AES) and the Deactivating Emotions Subscale (DES). In the following section, I present the results of the task-initiation and task-delay models separately and then the results of the combined model that was obtained in EFA.

Task-Initiation Negative Emotions. A two-factor model for negative emotions related to initiation of reading tasks (TI-2CFM-Re) was specified and tested. The model consisted of two factors, the Activating Emotions Subscale (TI-AES) and Deactivating Emotions Subscale (TI-DES). The two-factor model fit the data very well based on all three types of fit index and for all three academic tasks (see Table 11-10). The one-factor model did not produce acceptable fit and therefore was rejected. Figure 11-7 presents the standardized parameter estimates. All of the parameter estimates including factor loadings were significant and in an acceptable range. Normalized residuals for covariances were small. The modification indices were lower than 10. The standardized EPC was less than .14 for the significant modification indices. These results provided more support for the model.

Table 11-10

Overall Goodness of Fit Tests for Task Initiation and Task Delay Emotions Models

Model	n.i.	n.p.	χ^2	c.d.	DF	CFI	TLI	RMSEA	LRMSEA	HRMSEA	SRMR	AIC	BIC
TI-F1-Re	6	18	427.2	1.561	9	.801	.669	.200	.185	.217	.105	23923.0	24013.9
TI-CFM2-Re	6	19	30.4	1.402	8	.989	.980	.049	.031	.068	.022	23300.9	23396.9
TI-CFM2-Wr	6	19	26.0	1.375	8	.989	.980	.044	.026	.063	.017	24559.3	24655.4
TI-CFM2-Ex	6	19	53.7	1.365	8	.977	.957	.070	.053	.089	.024	24317.8	24413.7
TD-F1-Re	7	21	361.6	1.602	14	.877	.815	.147	.134	.160	.068	28084.2	28190.3
TD-CFM2-Re	7	22	72.0	1.536	13	.979	.966	.063	.049	.077	.023	27617.6	27728.7
TD-CFM2-Wr	7	22	62.2	1.459	13	.975	.960	.064	.049	.081	.030	22310.3	22416.3
TD-CFM2-Ex	6	22	95.1	1.444	13	.970	.951	.074	.060	.088	.030	28200.5	28311.6

Note. TI = task initiation emotions; TD = Task-Delay Emotions; F1 = one-factor model; Wr, Re, and Ex = models for writing reading and exam preparation tasks respectively; CFM2 = correlated factor model with 2 factors; n.i. = number of items; n.p. = number of estimated parameters; c.d. = scaling correction; LRMSEA = RMSEA Lower CI; HRMSEA = RMSEA Higher CI; all chi-squares are significant at p-value < .0001

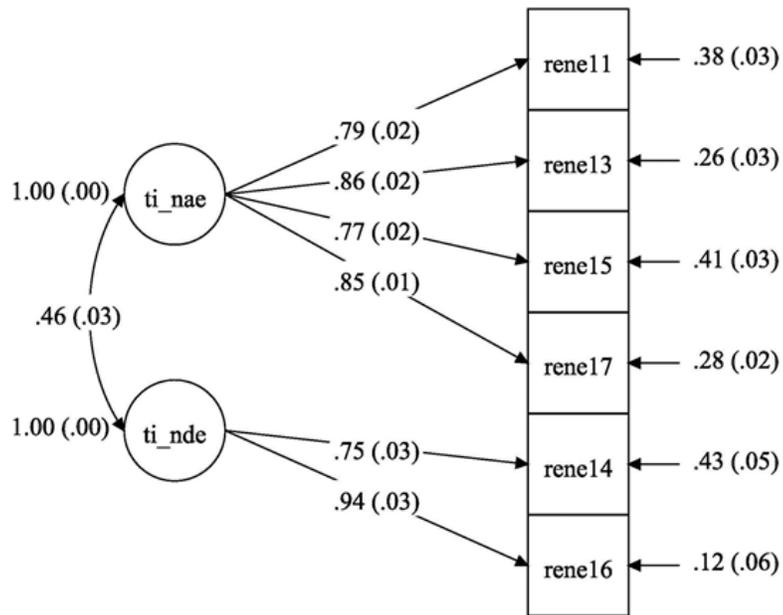


Figure 11-7. Two-factor model of the Initiation Negative Emotions items and their standardized parameter estimates for reading tasks. Note. Standard errors (SEs) of the parameter estimates are presented in parentheses; ti = task initiation emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameters were significant at $p < .001$.

The same model was tested for writing and exam-preparation tasks. The results of the overall evaluation of these models for writing and reading items are presented in Table 11-10. The results were very similar both in terms of overall model fit and specific evaluation of estimated parameters and possible sources of misfit. Figure 11-8 and 11-9 present the parameter estimates for writing and exam tasks, respectively. The results indicate that the two-factor model worked across academic tasks. Moreover, the correlations between factors in all models provided initial support for discriminant validity ($r < .85$).

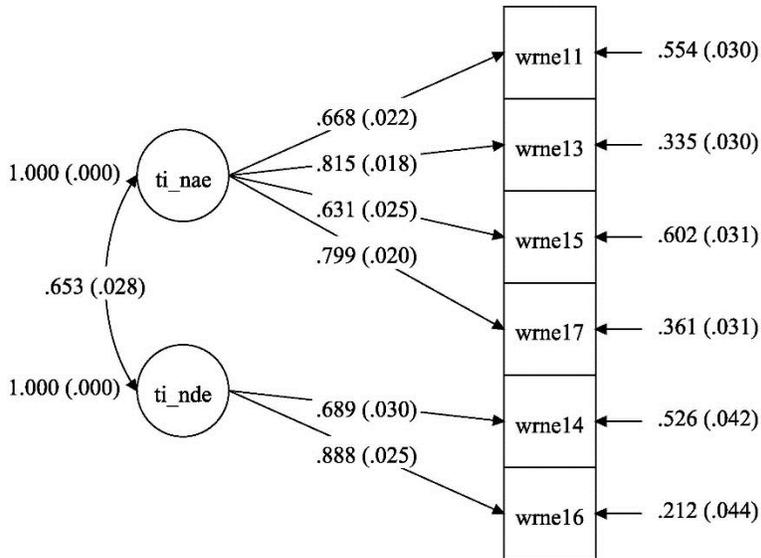


Figure 11-8. Two-factor model of the Initiation Negative Emotions items and their standardized parameter estimates for Writing Tasks. Note. Standard errors (SEs) of the parameter estimates are presented in parentheses; ti = task initiation emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameter were significant at $p < .001$.

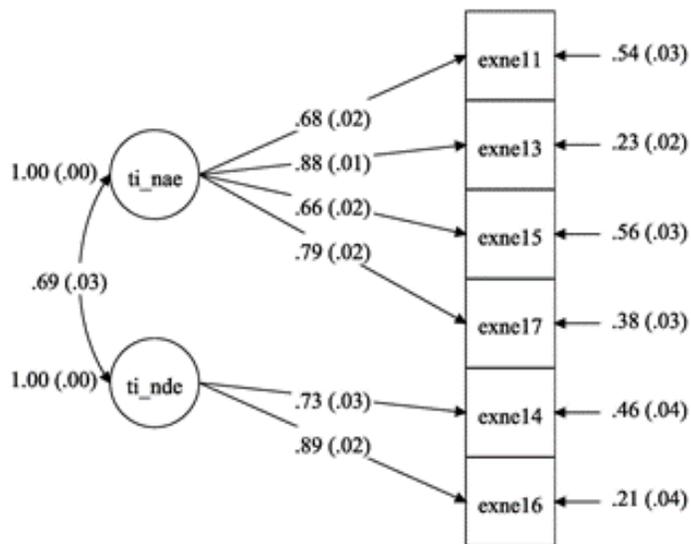


Figure 11-9. Two-factor model of the Initiation Negative Emotions items and their standardized parameter estimates for exam tasks. Note. Standard errors (SEs) of the parameter estimates are presented in parentheses; ti = task initiation emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameter were significant at $p < .001$.

Delay Negative Emotions. Similar to Task Initiation, a two-factor model was specified to differentiate activating from deactivating emotions while delaying on important academic tasks (Task-Delay Negative Emotions). For each task, the model consisted of two subscales, Activating Emotions Subscale (TD-AES) with five items and Deactivating Emotions Subscale (TD-DES) with six items. Table 11-10 presents the results of overall model test for reading, writing, and exam-preparation tasks, and Figures 11-10, 11-11 and 11-12 present the structure of these models and their standardized parameter estimates. All of the results strongly support the two-factor model. As expected, the correlations between these two factors were high but less than the cut-off for the redundancy of factor scores (i.e., lack of discriminant validity).

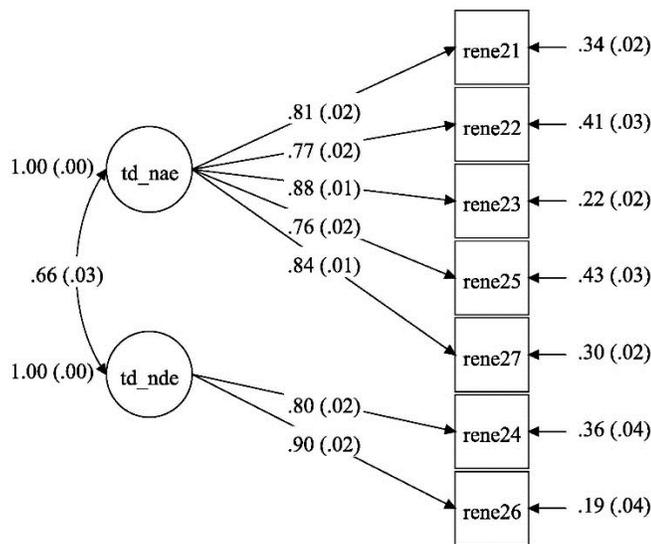


Figure 11-10. Two-factor model of the Delay Negative Emotions and their standardized parameter estimates for reading tasks. Note. Standard errors (SEs) of the parameter estimates are presented in parentheses; td = task-delay emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameter were significant at $p < .001$.

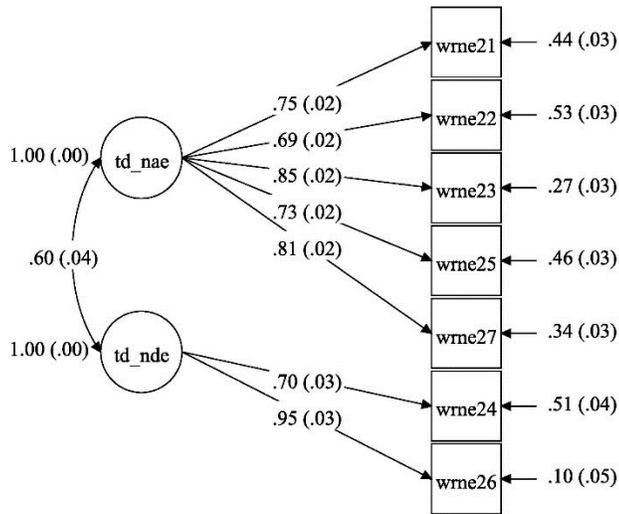


Figure 11-11. Two-factor model of the delay negative emotions and their standardized parameter estimates for writing tasks. Note. Standard errors (SEs) of the parameter estimates are presented in parentheses; td = task-delay emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameter were significant at $p < .001$.

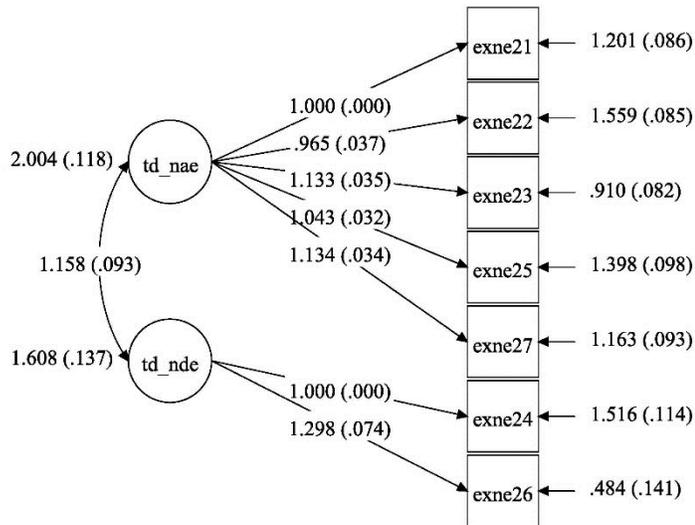


Figure 11-12. Two-factor Model of the Delay Negative Emotions and their standardized parameter estimates for exam tasks. Note. Standard errors (SEs) are presented in parentheses; td = task-delay emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameters were significant at $p < .001$.

Testing Combined NES Models. As explained in Chapter 9, all negative emotions items of the NES were entered in the EFA. The final and refined product was a 4-factor correlated-trait model with 13 items. The factors were labeled as Task-Delay Negative Activating Emotions (TDNAE) with 4 items, Task-Delay Negative Deactivating Emotions (TDNDE) with 2 items, Task-Initiation Negative Activating Emotions (TINAE) with 5 items, and Task-Initiation Negative Deactivating Emotions (TDNDE) with 4 items. This model was considered the main model in the confirmatory phase of this study.

In addition to the 4-factor correlated model, there were many alternative models for the NES that were theoretically justifiable. For example, since the refined model was a correlated-trait factor model that differentiated activation and deactivation emotions, a hierarchical model that sums up the aspects under two higher order factors was a justifiable alternative model. Furthermore, negative emotions were conceptualized and measured using a single-factor measurement model for decades (e.g., Watson, Clark & Tellegen, 1988; Tellegen, Watson, & Clark, 1999). Building on the traditional conceptualization of negative emotions, a unidimensional model and/or a model with a single higher-order or a single third-order factor are all justifiable alternative models. The discussed models are presented in Figure 11-13.

Model A is the correlated model proposed initially and refined in the EFA. This model differentiates negative emotions based on a combination of activation-deactivation categories and task-initiation and task-delay categories. Model B is the unidimensional model. Models C and D are two-factor models that differentiate the items based on either activation versus deactivation (Model C) or based on task initiation versus task delay (Model D). Model E is a hierarchical factor model that defines overall negative emotions as a second-order factor. This model combines the classical conceptualization of negative emotions and the model refined in

EFA. In other words, the correlations among the four factors in the four-factor model are modeled by one factor (overall negative emotions) in Model E. In model F, the correlations are modeled by two higher-order factors measuring activation and deactivation emotions across task-engagement stages. Model G is statistically equivalent to Model F (i.e., no statistical difference), however the former theoretically suggests that a third-level factor (overall negative emotions) causes both activation and deactivation emotions. In this model, the factor loadings of the third-level factor with second-level factors were constrained to be equal in order to make the model “identified.” Model H is a combination of bifactor and hierarchical models. Instead of considering indirect relations between the third-order factors (overall negative emotions) in model G, a general factor that has a direct association with specific emotions (items) was considered. There are other possible bifactor models that can substitute general factors with direct relations for the higher-order factors in the hierarchical models (e.g., Models E and F). However, given the stronger theoretical justification for a hierarchical model in the NES, the additional bifactor model is not presented. In fact, the models with one general factor or two general factors did not converge using the NES data.

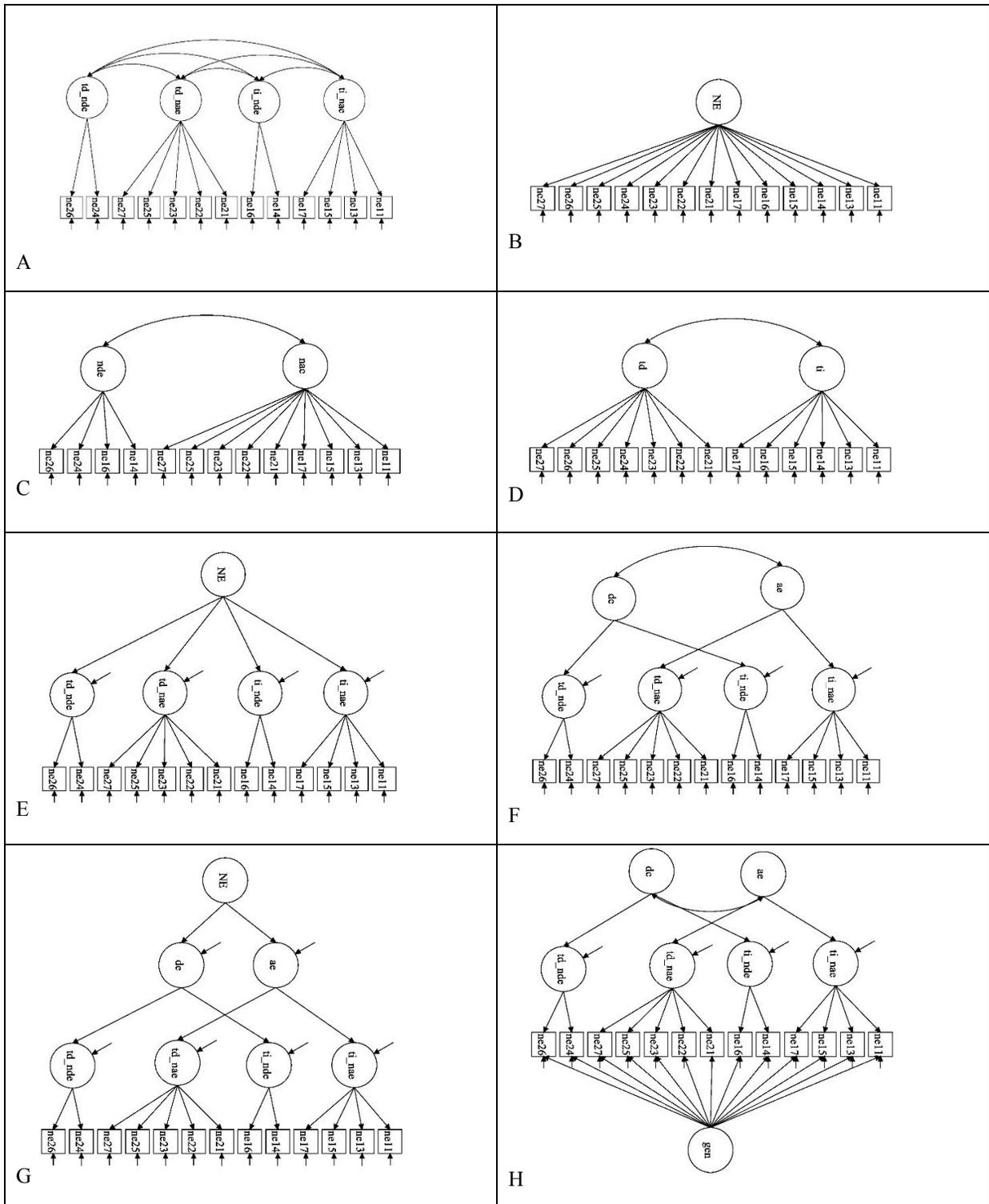


Figure 11-13. The NES conceptual models. Note. Model A = 4-factor correlated model; Model B = unidimensional model; Models C and D = 2-factor correlated models; Models E, F, and G = hierarchical models; Model H = bifactor and hierarchical model.

The above models were analyzed using robust maximum likelihood estimation method (MLR) with Mplus 7.2. Table 11-11 presents the overall goodness of fit indices showing how well the model reproduced covariances among items (observed variables). Based on the results of this analysis, models B, C, and D were rejected. Model A, the 4-factor refined model, demonstrated acceptable goodness of fit but the values were marginal. Since I used the MLR estimation method, a scaled difference test of nested models was used to compare the main models with models E, F, and G. The results indicated that the overall fit of these models was significantly lower than the fit of Model A. The same result was obtained when the models were compared based on BIC values. Model A had lower BIC than models E, F, and G. In contrast, model H, a complex bifactor and hierarchical model, showed a significantly better fit in comparison to Model A.

Table 11-11

Overall Goodness of Fit Tests for Combined Negative Emotions Models

Model	n.i.	n.p.	χ^2	cd	DF	CFI	TLI	RMSEA	LRMSEA	HRMSEA	SRMR	AIC	BIC
Model A	13	45	556.80	1.430	59	0.925	0.900	0.085	0.079	0.092	0.034	49678.4	49905.8
Model B	13	39	1103.12	1.398	65	0.674	0.609	0.166	0.158	0.175	0.102	26088.1	26258.1
Model C	13	40	1082.08	1.376	64	0.680	0.610	0.166	0.157	0.175	0.099	26036.7	26211.1
Model D	13	40	1007.01	1.367	64	0.704	0.639	0.160	0.151	0.169	0.106	25924.3	26098.6
Model E	13	43	722.12	1.436	61	0.900	0.872	0.097	0.091	0.103	0.057	49915.2	50132.5
Model F	13	44	564.70	1.432	60	0.924	0.901	0.085	0.079	0.079	0.035	49688.7	49911.1
Model G	13	44	564.70	1.432	60	0.924	0.901	0.085	0.079	0.092	0.035	49688.7	49911.1
Model H	13	55	425.14	1.371	49	0.943	0.909	0.081	0.074	0.089	0.033	49485.2	49763.2

Note. n.i. = number of items; n.p.= number of estimated parameters; cd = scaling correction; LRMSEA = RMSEA Lower CI; HRMSEA = RMSEA Higher CI; all chi-squares are significant at p-value < .0001; see Figure 11-13 for explanation of the models.

Since the structure of models A and H were related hierarchically, a two-stage strategy was used in model trimming (see Brown, 2015). In the first stage, model A was modified to enhance its borderline fit by resolving the source of the misfit in specific areas of the model. In the second stage, the same changes were applied to the more complex model, Model H, and then the overall goodness of fit of the modified model was tested.

In the trimming process for model A, only a subset of highlighted changes for enhancing fit was employed even though all of the modifications were justifiable. The final modified models A and H were retested using writing and reading tasks and the model that performed well across all tasks was selected as the final model.

Inspecting parameter estimates for Model A indicated that all of the estimated unstandardized and standardized parameters were statistically significant ($p < .001$). The magnitude of the factor-loading parameters for the four factors was high, ranging from .77 to .91. The results indicated a strong association between factors and items. The R-square values of items were also high, ranging from .54 to .83 (see Table 11-12). Inspection of normalized residuals did not show any areas of misfit. However, the modification indices were high for several covariances between error terms, including covariance among the same emotions in different factors/categories and different emotions in different categories. This result may indicate that the differentiation between stages of task engagement (initiation and delay tasks) was not strong enough to cover the covariation between similar emotions. This was particularly the case for anxiety, hopelessness, boredom, and emotional distress; their error term covariances had the highest modification indices (70.99 to 91.64). Interestingly, a similar pattern was found in the bifactor-hierarchical model (Model H for reading), indicating that even inclusion of higher-order factors and one general factor in the model could not fully explain all of the shared

variance between the items that covered the same emotions in different stages of task involvement.

To deal with this issue, two strategies could be used. First, I could sum the items with similar emotions and then enter in the factor analysis. Second, within CFA, I could define the covariance between the items. Since this was a measurement development study, the second strategy was used. In the first stage of modification, only the covariances between error terms of the same emotions across different factors with the highest modification indices were set to be freely estimated in the models. The modification indices were high for the cross-factor correlations for anxiety, hopelessness, boredom, emotional distress, and feeling sleepy.

Testing the first modified model for reading tasks indicated that correlations were significant and had a medium effect size for boredom (.42) and anxiety (.38), and a small effect size for hopelessness (.28), emotional distress (.28), and feeling sleepy (.17). Similar findings were uncovered in the modified model H. In the second modification stage, correlations for feeling sleepy were removed. In sum, the final modified model for reading tasks had four correlated error terms added to Model A (see Figure 11-4).

The 4-factor model for reading fit the NES data for reading tasks well, based on various goodness of fit indices and their suggested cut-offs (for cut-offs see Method section): RMSEA = .056 (90% CI = .049 to .063, p-RMSEA = .087); CFI = .97; TLI = .96; and SRMR = .030. Satorra–Bentler scaled $\chi^2 = 251.99$, $df = 55$, $c.d. = 1.405$. Figure 11-14 presents the standardized parameter estimates of the modified model. All estimated parameters had small standard errors of estimate and were significant. The factor loadings were high, supporting the reliability of the factors and the structural validity of the model.

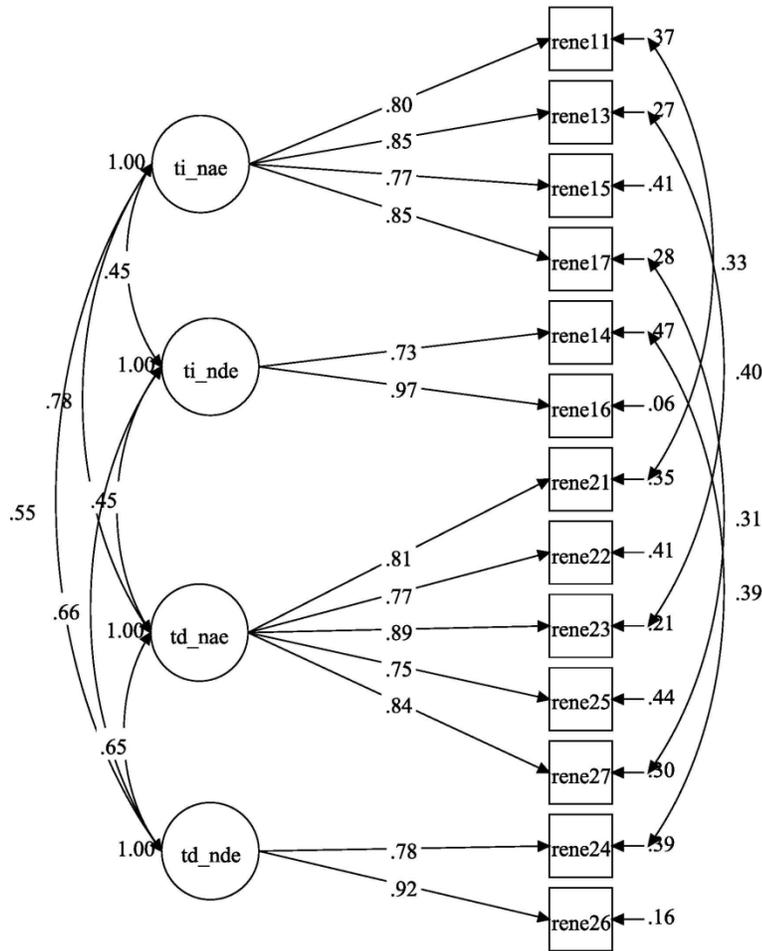


Figure 11-14. Modified four-factor Correlated-Trait Model (Modified Model A) of the NES-Reading. Note. ti = task-initiation emotions; td = task-delay emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameter were significant at $p < .001$.

To evaluate the appropriateness of a total score for all items and two total scores for activation and deactivation emotions, model H was modified and tested. The same changes were applied to model H as to model A. The modified model H for reading fit the data well: RMSEA = .052 (90% CI = .044 to .060, p-RMSEA = .334); CFI = .98; TLI = .96; and SRMR = .022. The traditional goodness of fit index was significant due to the large sample size: Satorra-Bentler scaled $\chi^2 = 176.951$, $df = 43$, $c.d. = 1.1162$. The scaled nested model comparison for robust

reliability and structural validity of the factors. Similarly, the second-order factor loadings were very high, supporting the validity of the activation and deactivation factors. Omega for the general factor was .88 indicating reliability, despite the low factor loadings mentioned above. No meaningful specific areas of ill-fit were found when the normalised residuals matrix was inspected.

The modified models were tested for writing and exam preparation tasks. Only the trait model (Model A) converged without any problems. Modified model H resulted in non-positive definite latent variables covariance matrix. The overall fit of the model and the relation between items and first-order factors were not affected, but the relation among second-order factors could not be estimated. The technical result indicated that the problem was due to an out-of-range correlation between the task-initiation deactivation-emotions factor and the overall deactivation-emotions factor (first-order factor). Encountering such a problem can be due to the complexity of the model (Brown, 2015).

Given the convergence of results and despite superior fit of model H for reading items, the four-factor correlated-trait model (Model A modified) was accepted as the final model. The model fit well across tasks and had very similar goodness of fit indices to Model H.

The inspection of modified model A in writing and exam tasks indicated that overall goodness of fit and strength of parameter estimates were satisfactory, similar to the reading-tasks model. Table 11-11 shows the overall model fit for all three tasks and figure 11-16 and 11-17 show the standardized parameter estimates of model A for exam and writing tasks. Table 11-12 also shows the detailed parameter estimates of the final model A for reading tasks and Table 11-13 shows the correlations between the factors.

Table 11-13

Unstandardized and Standardized Parameter Estimates and Standard Errors of Initial and Modified Model A for Reading Items in NES.

Parameters	Initial Model A Reading				Modified Model A Reading			
	Unstandardized		Standardized		Unstandardized		Standardized	
	L	S.E.	L	S.E.	L	S.E.	L	S.E.
Factor Loadings								
TI_NAE								
RENE11	1	0	0.791	0.017	1	0	0.795	0.017
RENE13	1.054	0.033	0.857	0.014	1.028	0.032	0.853	0.014
RENE15	0.911	0.035	0.757	0.019	0.91	0.034	0.766	0.019
RENE17	1.101	0.036	0.858	0.013	1.071	0.035	0.851	0.014
TI_NDE								
RENE14	1	0	0.774	0.025	1	0	0.729	0.025
RENE16	1.176	0.064	0.91	0.024	1.328	0.072	0.971	0.023
TD_NAE								
RENE21	1	0	0.805	0.015	1	0	0.809	0.015
RENE22	0.897	0.032	0.77	0.018	0.889	0.033	0.768	0.018
RENE23	1.097	0.028	0.893	0.009	1.087	0.027	0.888	0.01
RENE25	0.919	0.029	0.734	0.019	0.93	0.029	0.747	0.019
RENE27	1.038	0.027	0.843	0.013	1.018	0.027	0.838	0.014
TD_NDE								
RENE24	1	0	0.806	0.021	1	0	0.782	0.021
RENE26	1.1	0.046	0.89	0.018	1.169	0.045	0.917	0.014
Residual Variance								
RENE11	1.076	0.077	0.374	0.027	1.075	0.078	0.368	0.026
RENE13	0.721	0.064	0.265	0.024	0.733	0.065	0.273	0.025
RENE14	1.212	0.116	0.401	0.039	1.427	0.113	0.469	0.037
RENE15	1.11	0.077	0.426	0.029	1.075	0.076	0.413	0.029
RENE16	0.519	0.13	0.171	0.043	0.175	0.137	0.058	0.045
RENE17	0.778	0.065	0.263	0.022	0.805	0.067	0.275	0.023
RENE21	1.193	0.08	0.352	0.025	1.175	0.081	0.346	0.024
RENE22	1.214	0.078	0.408	0.027	1.221	0.08	0.41	0.028
RENE23	0.672	0.054	0.203	0.017	0.706	0.058	0.212	0.018
RENE24	1.149	0.11	0.351	0.034	1.266	0.104	0.388	0.033
RENE25	1.586	0.097	0.461	0.029	1.518	0.094	0.441	0.028
RENE26	0.673	0.1	0.208	0.032	0.514	0.084	0.158	0.026
RENE27	0.964	0.07	0.29	0.022	0.98	0.072	0.299	0.023
R-Square								
RENE11			0.626	0.027			0.632	0.026
RENE13			0.735	0.024			0.727	0.025
RENE14			0.599	0.039			0.531	0.037

Parameters	Initial Model A Reading				Modified Model A Reading			
	Unstandardized		Standardized		Unstandardized		Standardized	
	L	S.E.	L	S.E.	L	S.E.	L	S.E.
RENE15			0.574	0.029			0.587	0.029
RENE16			0.829	0.043			0.942	0.045
RENE17			0.737	0.022			0.725	0.023
RENE21			0.648	0.025			0.654	0.024
RENE22			0.592	0.027			0.59	0.028
RENE23			0.797	0.017			0.788	0.018
RENE24			0.649	0.034			0.612	0.033
RENE25			0.539	0.029			0.559	0.028
RENE26			0.792	0.032			0.842	0.026
RENE27			0.71	0.022			0.701	0.023
Error Covariances								
RENE23 w RENE13					0.287	0.043	0.399	0.045
RENE24 w RENE14					0.527	0.068	0.392	0.037
RENE21 w RENE11					0.374	0.055	0.333	0.042
RENE27 w RENE17					0.273	0.048	0.308	0.046

Note. . ti = task-initiation emotions; td = task-delay emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameter were significant at $p < .001$.

Table 11-13

Estimated Correlations among the four NES Subscales and their Standard Deviations of Estimate

	TI-NAE	TI-NDE	TD-NAE	TD-NDE
TI-NAE	1.00			
TI-NDE	0.449 (0.029)	1.00		
TD-NAE	0.781(0.019)	0.446(0.033)	1.00	
TD-NDE	0.554(0.029)	0.664(0.028)	0.651(0.028)	1.00

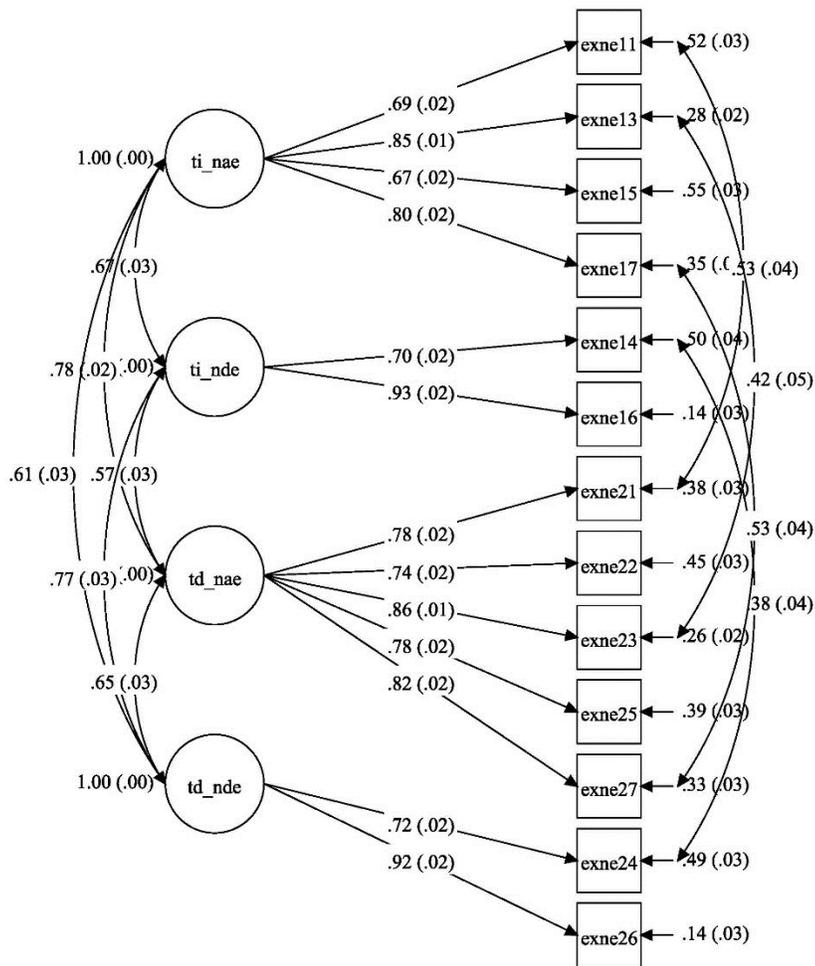


Figure 11-16. Modified four-factor Correlated-Trait Model (Modified Model A) of the NES-Exam. Note. ti = task-initiation emotions; td = task-delay emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameters were significant at $p < .001$.

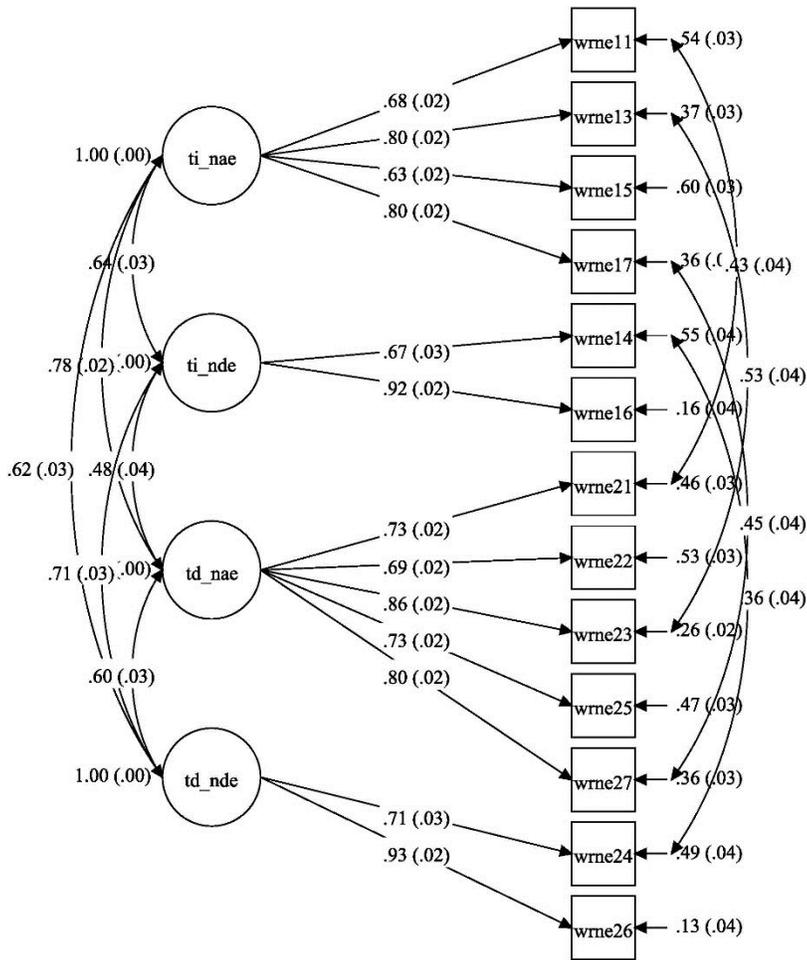


Figure 11-17. Modified Four-Factor Correlated-Trait Model (Modified Model A) of the NES-Writing. Note. ti = task-initiation emotions; td = task-delay emotions; nae = negative activating emotions, nde = negative de-activating emotions; all parameter were significant at $p < .001$.

In sum, testing models that included the same emotions experienced at different stages of task engagement (i.e., initiation and delay) caused many specific areas of misfit. In these combined models, the covariances between similar emotions were so strong that the models required correlation between error terms. Multicollinearity at the latent-variable level may have been raised, resulting in a non-positive definite matrix and leading to errors in calculating

parameter estimates related to latent variables. As a cautionary note, future researchers might wish to use task-initiation factors in separate analyses (e.g., regression) from task-delay factors.

Confirmatory Factor Analysis for the Procrastination Duration Scale (PDS)

A 3-factor correlated-trait model (3CFM) solution was obtained and refined during the EFA stage. The factors included Duration of Procrastination Behaviour (DPB), Duration of Negative Consequences (DNC), and Duration of Negative Emotions (DNE). In addition, EFA showed that an alternative 2-factor correlated-trait model (2CFM) produced interpretable and strong factors. In the 2-factor model, the DNC and DNE were merged as one factor. An equivalent bifactor model (4BFM) for the 3-factor solution was also inspected where the results supported the application of the one overall factor (general duration factor). These three models were named 3CFM, 2CFM, and 4BFM in the CFA analysis and were tested and compared.

As mentioned before, the response categories of the duration items in the PDS were different from the ones used in other MMAP scales. The duration items had a not-applicable option in addition to the six other response categories. To include the not-applicable option in the analysis, I used a similar strategy to the one I had used in the EFA. It should be also noted that the wording of several of the duration items differed across different tasks. To accommodate these differences, confirmatory analysis and possible trimming procedures for the three academic tasks were done separately and then compared. Therefore, in contrast to other MMAP scales, the PDS was allowed to have different model trimming, and therefore different final models, if necessary.

Duration Models for Writing Tasks. Confirmatory analysis was used to evaluate the two- and three-factor correlated trait models as well as the orthogonal bifactor model. The results of the overall model fit are presented in Table 11-14. The 3CFM and 2CFM models converged

normally without any unusual parameter estimates. However, the 4-factor bifactor model converged, but with an abnormal case of negative residual variance related to the item Wr8 under the third factor. The item was “I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on writing assignments since...”. This item had a cross-loading problem in the EFA, but was kept due to its unique content and in order to be further evaluated in the CFA. Changing the starting values and specifying a correlated bifactor model did not resolve the problem. Only elimination of the item produced a better result.

The results showed that the three correlated-factors model fit the data very well based on various fit indices. The 2-factor model had acceptable overall fit with the data. The nested-model comparison showed that the goodness-of-fit of the 3-factor correlated-trait model was significantly better than the 2-factor model: Scaled $\Delta \chi^2 = 180.9$, $\Delta df = 2$, $p = .000$. Figure 11-18 presents the 3-factor model and its standardized parameter estimates.

Table 11-14

Overall Goodness-of-Fit Tests for PDS Models

Model	n.i	n.p	χ^2	cd	DF	CFI	TLI	RMSEA	LRMSEA	HRMSEA	SRMR	AIC	BIC
3CFM-Writing	13	39	194.0	1.808	51	0.973	0.965	.049	.042	.057	.030	40624.4	40821.3
2CFM-Writing	13	37	420.4	1.827	53	.931	.914	.078	.071	.085	.057	41037.6	41224.4
4BFM-Writing	13	48	152.2	1.823	42	.979	.967	.048	.040	.056	.023	40568.9	40811.3
3CFM-Reading	13	39	241.6	2.162	51	.964	.953	.057	.050	.064	.040	37432.5	37629.4
2CFM-Reading	13	37	403.5	2.175	53	.934	.918	.076	.069	.083	.050	37783.6	37970.4
4BFM-Reading	13	48	178.9	2.061	42	.974	.959	.053	.045	.061	.028	37296.9	37539.2
4C-BFM-Reading	13	51	133.7	1.840	39	.982	.970	.046	.038	.055	.018	37180.3	37437.8
3CFM-Exam	13	39	507.7	2.333	51	.917	.892	.088	.081	.095	.040	37086.8	37283.9
2CFM-Exam	13	37	649.5	2.362	53	.891	.865	.099	.092	.106	.047	37432.7	37619.6
4BFM-Exam	13	48	195.8	2.121	42	.972	.956	.056	.048	.064	.037	36335.6	36578.1

Note. n.i.= number of items; n.p.= number of estimated parameters; cd = scaling correction; LRMSEA = RMSEA Lower CI; HRMSEA = RMSEA Higher CI.

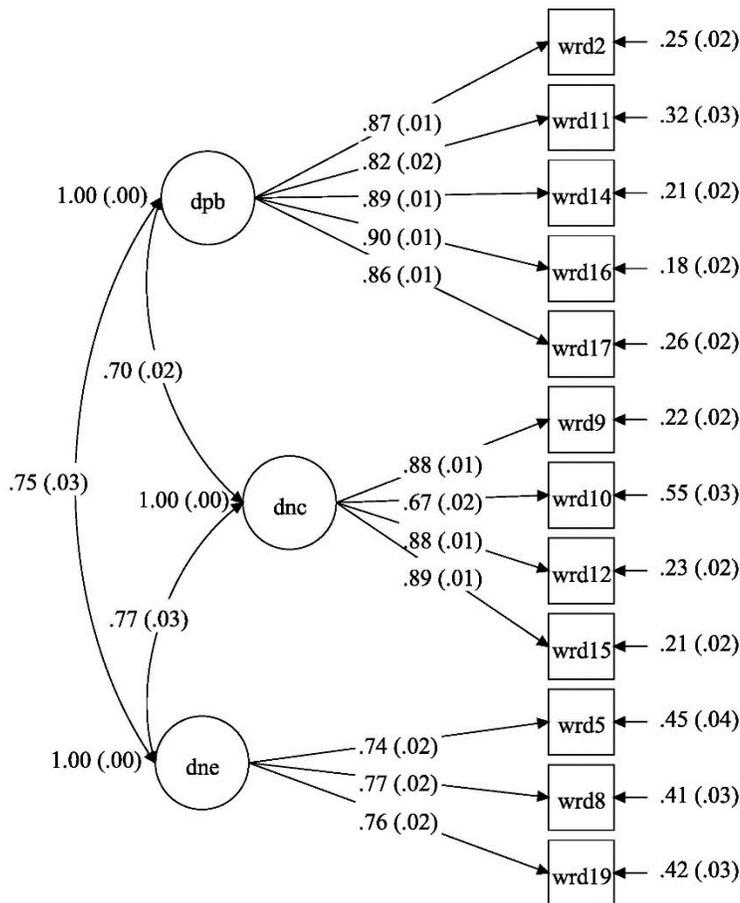


Figure 11-18. Three-factor Correlated-Trait Model of the PDS-Writing. Note. dpb = duration of procrastination behaviour; dnc = duration of negative consequences; dne = duration of negative emotions; all parameter estimates were significant at $p < .001$.

Duration Models for Reading Tasks. Similarly, confirmatory analysis was used to test the models for reading tasks. The result of overall goodness of fit is presented in Table 11-14. The 3-factor model (3CFM) fit the data very well based on various fit indices and the cut-offs explained in the Methods section; the 2-factor model (2CFM) had acceptable fit (borderline value of model fit). Both models converged normally. The orthogonal bifactor model (4BFM) had superior model fit values but did not converge normally. Similar items flagged in analyzing the 4BFM model for writing tasks had small negative residual variance in the orthogonal bifactor

model for reading tasks (4BFM-reading). The correlated bifactor model (the correlations between three specific factors were defined to be freely estimated), however, converged without any errors.

The nested model was used to test the significance of the difference between the 2CFM-Reading and the 3CFM-Reading. The 3CFM's overall fit was significantly higher: scaled $\Delta \chi^2 = 141.86$, $\Delta df = 2$, $p = .000$. Comparing the 3CFM and the correlated version of the 4BFM using a scaled nested model comparison showed that the 4BFM had a significantly better overall model fit: scaled $\Delta \chi^2 = 86.141$, $\Delta df = 12$, $p = .000$.

The 3-factor correlated-trait model and 4-factor correlated bifactor model and their standardized estimates are presented in Figures 11-19 and 11-20. All of the parameter estimates of the 3-factor model were significant and had appropriate values. More specifically, the model had high factor loadings. The correlations between factors supported the discriminant validity of the 3-factor model.

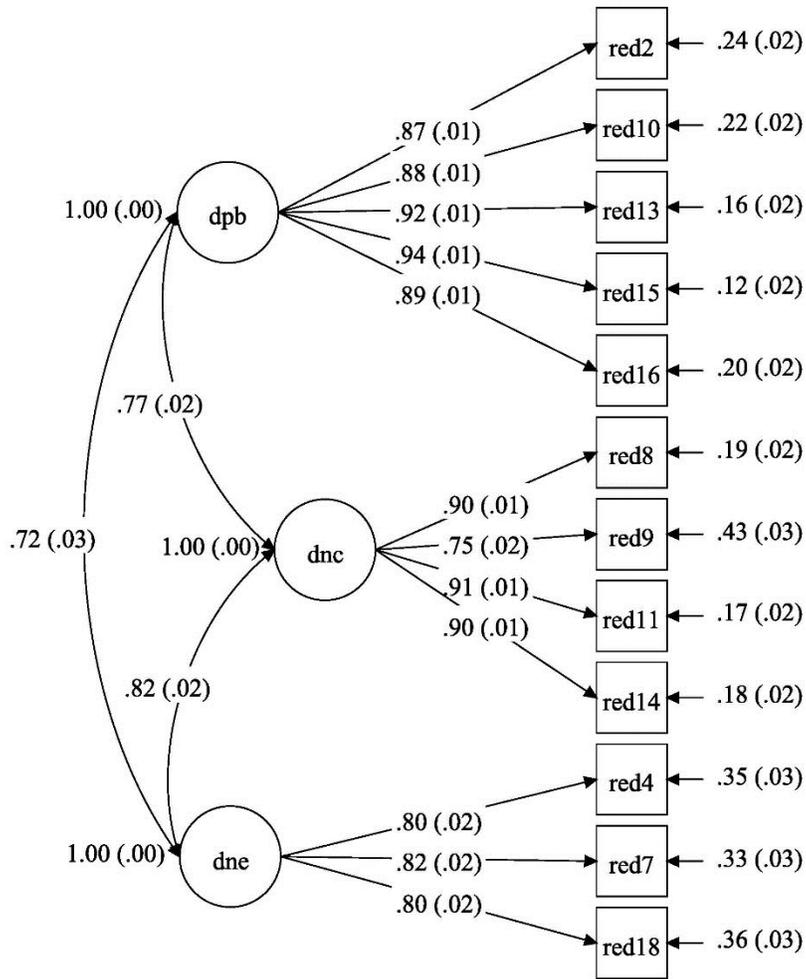


Figure 11-19. Three-Factor Correlated-Trait Model of the PDS-Reading. Note. dpb = duration of procrastination behaviour; dnc = duration of negative consequences; dne = duration of negative emotions; all parameter estimates were significant at $p < .001$.

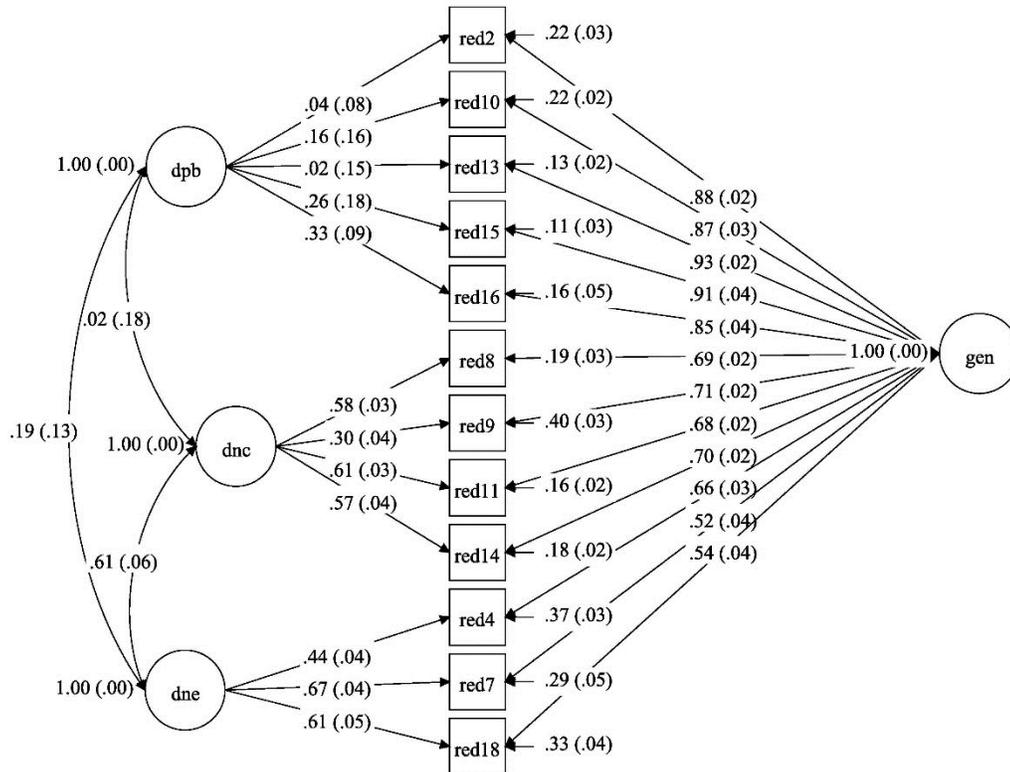


Figure 11-20. The Correlated Bifactor Model of the PDS-Reading. Notes. dpb = duration of procrastination behaviour; dnc = duration of negative consequences; dne = duration of negative emotions; gen = general factor. The DPB factor loadings, with the exception of Red16, were not significant. The correlation between DPB and DNC was not significant. All other parameter estimates were significant at $p < .001$.

Loadings on the general factor were high, supporting the calculation of the general factor and its reliability. In terms of specific factors, the factor loadings of DNC and DNE were in the acceptable range but the factor loadings of the DPB were very low, indicating that the latter factor may not contribute any additional information over and above the general factor. Because correlations between factors in a correlated bifactor model can potentially influence the magnitude of factor loadings of general and specific factors, the conclusion about the role of

general versus specific factors should be treated with caution. In fact, there were discrepancies between the results of the orthogonal bifactor model when compared with the correlated bifactor model. In the orthogonal model, the DPB showed a unique contribution to the model.

Duration Models for Exam Tasks. Similar analyses were conducted on the exam items. The results related to various indices of model fit are presented in Table 11-14. Estimation of the 2-factor correlated trait model (2CFM), 3-factor correlated-trait factor model (3CFM), and the orthogonal bifactor model (4BFM) terminated without any abnormal values (“Heywood Cases”). The results of overall model fit were inspected for all of the models (see Table 11-14). The 2CFM did not have acceptable CFI or TLI and its RMSEA was marginal; this model was rejected. The 3CFM had an acceptable fit based on a majority of fit indices and their cut-offs, but the values were borderline. The bifactor model fit the exam-task data very well based on RMSEA, CFI, and TLI statistics. The bifactor model had a superior model fit in comparison to the 3CFM and 2CFM models.

To evaluate if the difference between models with acceptable fit was statistically significant, nested model comparison was used. The difference between the orthogonal bifactor model (4BFM) and the correlated-trait model with three factors (3CFM) was significant in favour of the 4BFM: scaled $\Delta \chi^2 = 231.63$, $\Delta df = 9$, $p = .000$. Comparing the BICs of the models also suggested that the orthogonal bifactor model had a better fit than the 3-factor correlated-trait model in data related to studying for exams.

Even though the bifactor model was chosen as the best model for explaining exam-task data, the three-factor model was further studied here. This is because the 3CFM was the only model that had acceptable fit across all three task types. Figure 11-21 presents the 3CFM for exam tasks and its parameters standardized estimates. The magnitudes of the factor loadings in

the three-factor model were high, suggesting the internal consistency and validity of the subscale. However, contrary to the other tasks, the correlations between factors were abnormally high, suggesting excessive overlap between duration subscales when measuring duration of the delay on exam preparation. More specifically, the results imply that the DPB and DNC subscales may need to be combined or that the measure is unidimensional. However, the results of testing a unidimensional model were not satisfactory: RMSEA = .101 (.094- .107), CFI = .89, TFI = .86. As well, fitting a 2-factor model where the DPB and DNC were combined had a significantly lower overall model fit: scaled $\Delta \chi^2 = 17.068$, $\Delta df = 2$, $p = .0002$. These results imply the superiority of the bifactor model for exam items where a general factor could capture part of the shared variance among the factors and allow the calculation of an overall factor.

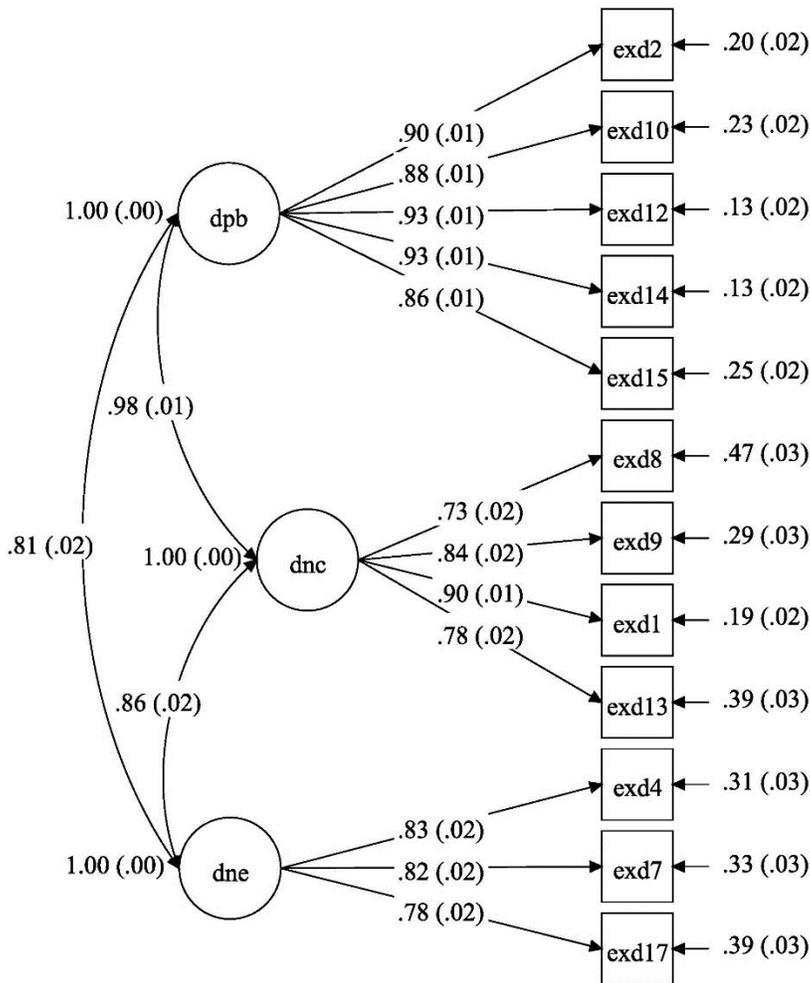


Figure 11-21. Three-factor Correlated-Trait Model of the PDS-Exam. Note. dpb = duration of procrastination behaviour; dnc = duration of negative consequences; dne = duration of negative emotions; all parameter estimates were significant at $p < .001$.

The orthogonal bifactor model for exam tasks and the standardized parameter estimates are presented in Figure 11-22. The factor loadings on the general factor were high, indicating the reliability and appropriateness of calculating a general factor. In fact, the omega for the general factor was .97. All of the factor loadings for the first specific factor were low, indicating that the factor did not provide a unique explanation of indicator variance over and above a general factor. In contrast, the third specific factor seemed to provide unique information. The factor loadings of

the first two items under the second factor were in acceptable range. The final evaluation regarding the uniqueness of the three specific factors required studying and comparing the relation of these factors to other psychological constructs.

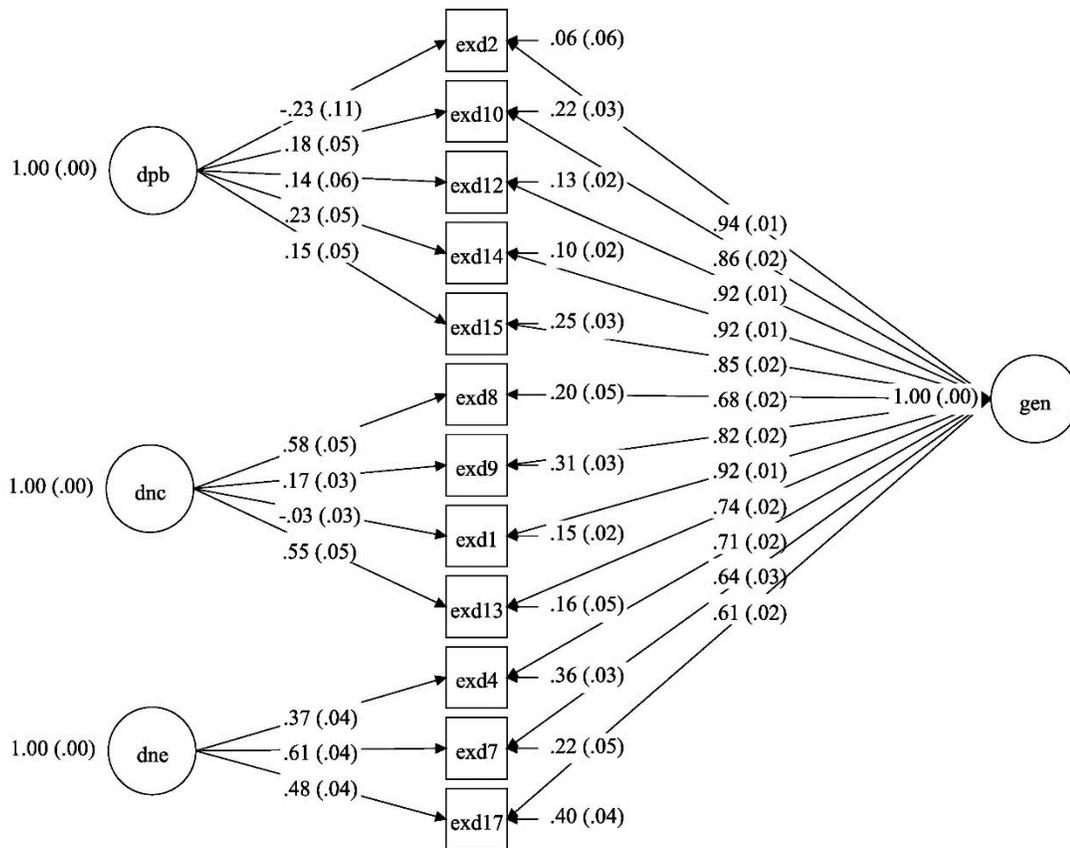


Figure 11-22. The Bifactor model of the PDS-Exam. Note. dpb = duration of procrastination behaviour; dnc = duration of negative consequences; dne = duration of negative emotions; gen = general factor. The DPB factor loadings, with the exception of Red16, were not significant. The correlation between DPB and DNC was not significant. All other parameter estimates were significant at $p < .001$.

In sum, based on the analysis of the correlated-trait models, the three factors obtained in the EFA seemed to explain the data related to various tasks at a statistically acceptable level.

Even though the bifactor model produced abnormal values for writing tasks, the bifactor model was superior and the factor loadings of the general factor were high. Similar to the EFA analysis, the results of the CFA supported the calculation of total scores, particularly for reading and exam tasks. The reliability of calculating specific factors scores was supported for all task types. However, whether the specific factors provide unique information over and above the general factor (discriminant validity) remains to be determined in future research.

A hierarchical model of the PDS is another way to conceptualize the relations among three factors. A hierarchical model with one second-order factor and three first-order factors is equivalent to a 3-factor correlated-trait model. Hence, there is no statistical difference between them. It can be concluded that the hierarchical model of the PDS had acceptable fit across three tasks. However, the goodness-of-fit values for exam tasks were borderline. Finally, the item “I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on [academic tasks] since...” seemed to create issues in the CFA models as well as in the EFA. Eliminating this item could resolve statistical errors associated with Heywood cases in the orthogonal bifactor models for writing and reading tasks. This may be the first choice if one were to use pure statistical justification for model trimming. However, the item was kept due to its unique content value and conceptual/theoretical importance. The item may be eliminated in research where statistical perfection is very important for a researcher, or when the scale is used as a part of a complex structural model. In such cases, factor loadings of the remaining two items under DNE factor should be set to be equal.

Confirmatory Factor Analysis of the entire MMAP Model

In the previous sections, the MMAP scales were factor analyzed separately in two stages, Exploratory Factor Analysis and Confirmatory Factor Analysis. Based on the findings of EFA

and CFA presented so far, the scales can be used as separate measures and their refined and confirmed measurement models can be used to calculate subscale and total scale scores.

However, the separate factor analyses did not provide answers to many questions, including how well the overall MMAP model fit the data; how the set of scales could be used in measuring procrastination problems as a whole; and whether subscale and scale scores of each scale should be used when the measures are used together, or whether a single score should be calculated based on all items? Finding the answers to these questions required testing an overall model of the MMAP and including all of its scales.

The main measurement model discussed theoretically in this dissertation suggests that procrastination problems consist of four main facets: three facets measuring the current intensity of the problem and one facet measuring the duration or history of the problem. Empirically, separate scales were developed to measure each of these facets. The final MMAP consisted of four multidimensional scales including the Procrastination Behaviour Scale (PBS), the Perceived Negative Consequences Scale (PNCS), the Negative Emotions Scale (NES), and the Procrastination Duration Scale (PDS). The first three scales measured the current intensity of procrastination problems and used a 7-point Likert scale referring to the frequency of problematic behaviour, negative subjective experience, and emotions related to the behaviours. The fourth scale, the duration scale, measured the history of the problem and used 5-point scales referring to five different times in the educational journey from elementary school to university, as well as one not-applicable response option. In the item-generation process and subsequent factor analyses, major facets were divided into multiple dimensions to capture major content domains under each facet. The final set of scales included 11 subscales (dimensions).

The first option in modeling the overall MMAP was to include all four facets and their underlying dimensions in a hierarchical and/or bifactor model. This strategy combined three intensity facets with frequency response categories (PBS PNCS, NES) and a duration facet (PDS) with a time-response categories. This is empirically possible, as all statistical software packages are blind to the nature of latent variables (constructs) and do not differentiate between response categories with different anchors. However, it was theoretically problematic because the nature of the constructs differs. The first three facets measure the “current” frequency of the various aspects of a phenomenon (procrastination), while the duration facet measures the history of the phenomenon or more specifically, the onset of the procrastination problem. The first three facets provide information about the current intensity of procrastination, while the other looks at its onset and duration over time regardless of its intensity. It is theoretically and logically wrong to consider duration as an index of intensity, because an earlier onset of procrastination is not necessarily equal to a higher intensity of the problem. A person with a recent onset of procrastination problems can have similar frequency of procrastination behaviour and negative emotions as a person who has been procrastinating for decades.

In MMAP conceptualization and operationalization, the duration /onset of procrastination problems and the intensity of procrastination problems are parallel but different ways of looking at the phenomenon and should always be treated as separate but complementary pieces of information about procrastination problems. For the same reason, adding the duration scales simultaneously in an analysis can cause multicollinearity problems, particularly at latent trait levels, resulting in a non-positive definite matrix and/or untrustworthy estimation.

As previously mentioned, two sets of alternative models were used to test the interconnection between intensity facets and their dimensions and overall procrastination. The

first set of models consisted of orthogonal (Model A) or correlated (Model B) bifactor models that define the overall procrastination problem (intensity of procrastination) as a general factor. The general factor had direct relations with indicators (behaviours, subjective experience of the behaviours and its consequences). In these models, the facets were considered specific aspects of the general factor and provided additional information above what was provided by the general procrastination factor. The facets then had hierarchical relations with their dimensions. The difference between the correlated and orthogonal bifactor models was that the correlations between second-order factors (facets) were specified in the correlated model. The orthogonal model did not include covariances among latent variables. In addition to models with hierarchical components (Model A and B), it was possible to specify and test models without hierarchical components (pure bifactor model), but this required eliminating either facets or dimensions from the conceptualization of procrastination, therefore losing specific information. For this reason, these models were not specified or tested.

The second possible conceptualization was a pure hierarchical model. The first hierarchical model included three second-order factors that defined the nine emotions that were found and supported in previous factor analyses. Six correlations were used to define the relation between second-order factors (facets). This model did not define an overall procrastination factor. The second hierarchical model (Model C) had two levels of higher-order factors. A third level factor was added to represent overall procrastination and was used instead of correlations between second-order factors. Because there were only three second-order factors, the two-level hierarchical model was statistically equivalent to the model with three correlated second-order factors. Therefore, the results of the two-level hierarchical model were presented.

Figures 11-23 and 11-24 present conceptual diagrams of the orthogonal (Model A) and selected hierarchical model (Model C). Table 11-15 presents the overall fit of the three models across tasks. The results indicated that the complex bifactor-hierarchical models had a better fit than the pure higher-order models based on various fit indices. In general, both bifactor models (Models A and B) had good fit based on RMSEA and acceptable fit based on CFI and TLI. The scaled nested model difference test (see Table 11-16) and the magnitude of AIC and BIC (see Table 11-15) indicated the superiority of Models A and B over Model C. The results were also in favour of the correlated model (Model B) when it was compared with the orthogonal model (Model A). However, the orthogonal model may provide more accurate information about the roles of general and specific factors (i.e., dimensions) in defining observed variances.

Table 11-17 presents the standardized and unstandardized parameter estimates for data on writing tasks. Factor loadings for the majority of items were above .45; however the factor loadings for hedonistic delay items and negative deactivating emotions were low. This finding suggests that the general factor may not provide information for these variables. The omega reliability score for overall procrastination was .97, indicating strong reliability. The loadings of specific dimensions and therefore overall facets were in an acceptable range in most cases, indicating that the factors may provide unique information above and beyond the general factor. Only dissatisfaction seemed to not provide unique information over and above the general factor.

The factor loadings also support the reliability of specific dimensions and higher order facets. Whether dimensions provide unique information over and above the total score in facets could not be determined based on this analysis. The answer to this question can be found in the specific exploratory and confirmatory factor analysis of each scale as well as their omega reliability. Factor determinacies for most factors including overall factor, and first- and second-

order factors, were above .90 indicating the good quality of the factors (Brown, 2015). The factor determinacies for dissatisfaction, overall negative emotions, and overall procrastination behaviour were .84, .86 and .88 respectively. These values were well above the cut-off (.80) for minimum acceptable factor determinacies (see Brown, 2015).

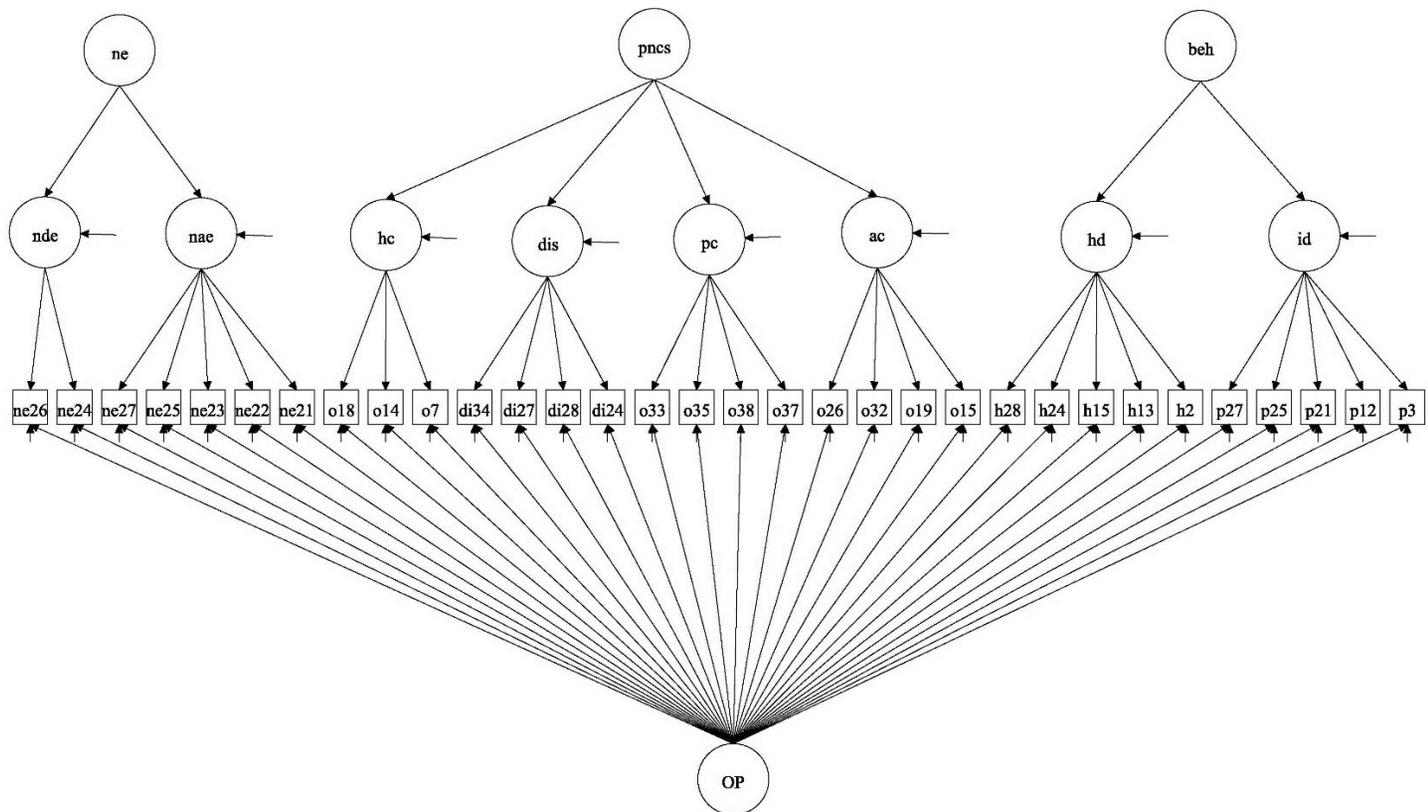


Figure 11-23. Overall Procrastination Problems –conceptual Model A. Note. Model B is similar to Model A with additional covariances between second-order factors. The factor loadings of two-factor higher-order sub-models were constrained to be equal for identification. OP = overall procrastination; id = irrational delay; hd = hedonistic procrastination; ac = academic consequences; pc = personal consequences; dis = dissatisfaction; hc = health consequences; nae = negative activating emotions; nde = negative deactivating emotions.

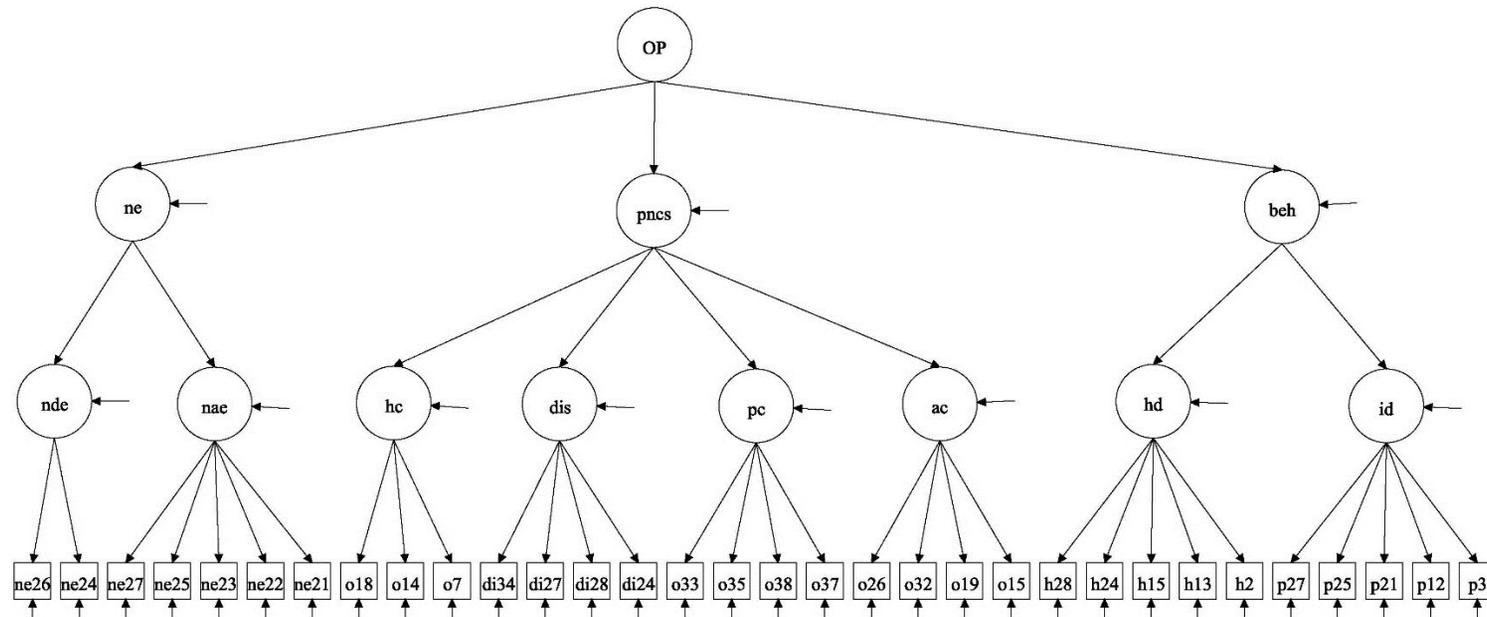


Figure 11-24. Overall Procrastination Problems –conceptual Model C. Note. This model is pure hierarchical covariances. The factor loadings of two-factor higher-order sub-models were constrained to be equal for identification. OP = overall procrastination; id = irrational delay; hd = hedonistic procrastination; ac = academic consequences; pc = personal consequences; dis = dissatisfaction; hc = health consequences; nae = negative activating emotions; nde = negative deactivating emotions.

Table 11-15

Goodness of Fit Tests for the Overall MMAP Models

Model	Task/Data	χ^2	cd	DF	CFI	TLI	RMSEA	L.RMSEA	H.RMSEA	SRMR	AIC	BIC
A	Writing	1381.4	1.213	427	0.96	0.95	0.044	0.041	0.046	0.069	108420.4	109093.1
B	Writing	1156.8	1.214	424	0.97	0.96	0.039	0.036	0.041	0.042	108155.2	108843.1
C	Writing	2268.4	1.214	457	0.92	0.91	0.058	0.056	0.061	0.095	109439.2	109960.2
A	Reading	1499.2	1.323	427	0.95	0.95	0.046	0.044	0.049	0.080	112062.2	112734.9
B	Reading	1222.3	1.326	424	0.97	0.96	0.040	0.038	0.043	0.043	111706.4	112394.2
C	Reading	2411.3	1.322	457	0.91	0.92	0.061	0.058	0.063	0.104	113206.2	113727.2
A	Exam	1453.7	1.272	427	0.96	0.95	0.045	0.043	0.048	0.056	113186.2	113858.9
B	Exam	1259.2	1.279	424	0.96	0.96	0.041	0.039	0.044	0.041	112954.1	113642.0
C	Exam	2323.4	1.278	457	0.92	0.91	0.059	0.057	0.062	0.095	114245.5	114766.5

Note. Model A = Orthogonal Bifactor-Hierarchical; Model B = Correlated Bifactor-Hierarchical Writing-Hierarchical; Model C = 2-level Hierarchical.

Table 11-16

Scaled Nested Model Differences of Overall Procrastination Models

Model	Tasks	$\Delta\chi^2$	Δcd	Scaled $\Delta\chi^2$	Δdf	P-Value
C vs. A	Writing	1078.2	1.228	877.85	30	0.0000
A vs. B	Writing	271.1	1.043	259.86	3	0.0000
C vs. A	Reading	1204.6	1.311	919.08	30	0.0000
A vs. B	Reading	361.9	0.814	444.61	3	0.0000
C vs. A	Exam	1120.3	1.363	821.68	30	0.0000
A vs. B	Exam	238.2	0.240	991.24	3	0.0000

Note. Model A = Orthogonal Bifactor-Hierarchical; Model B = Correlated Bifactor-Hierarchical Writing-Hierarchical; Model C = 2-level Hierarchical.

The modification indices were inspected for any localized area of misfit. In both Model A and Model B, the highest modification index was related to covariance between the error terms of two items under personal consequences. This replicated what was found in the factor analysis of the PNCS. I did not include any modifications due to complexities of the overall MMAP model. In fact, given the good to excellent values of model fit related to Models A and B, there was no need for small modifications.

Table 11-17

Unstandardized and Standardized Parameter Estimates and Standard Errors of Model A and B for Writing Items.

Factors	Model A					Model B				
	Unstandard.		Standardized		p	Unstandard.		Standardized		p
	L	S.E.	L	S.E.		L	S.E.	L	S.E.	
ID										
WRP3	1.00	0	0.60	0.021	0	1.00	0	0.63	0.022	0
WRP12	1.14	0.035	0.69	0.02	0	1.14	0.034	0.73	0.022	0
WRP21	1.09	0.041	0.63	0.022	0	1.10	0.043	0.67	0.025	0
WRP25	1.05	0.04	0.66	0.021	0	1.07	0.041	0.70	0.023	0
WRP27	1.02	0.036	0.63	0.021	0	1.02	0.038	0.66	0.025	0
HD										
WRH2	1.00	0	0.65	0.024	0	1.00	0	0.70	0.021	0
WRH13	1.29	0.057	0.78	0.018	0	1.24	0.047	0.82	0.016	0
WRH15	1.20	0.057	0.73	0.019	0	1.14	0.048	0.76	0.018	0
WRH24	1.17	0.058	0.75	0.02	0	1.13	0.049	0.79	0.018	0
WRH28	1.26	0.058	0.81	0.015	0	1.18	0.05	0.83	0.014	0
AC										
WRO15	1.00	0	0.55	0.032	0	1.00	0	0.74	0.028	0
WRO19	1.00	0.04	0.54	0.035	0	1.03	0.026	0.75	0.03	0
WRO32	0.87	0.054	0.48	0.041	0	0.95	0.033	0.71	0.032	0
WRO26	0.93	0.06	0.54	0.043	0	0.95	0.036	0.73	0.026	0
PC										
WRO37	1.00	0	0.70	0.042	0	1.00	0	0.86	0.015	0
WRO38	0.80	0.032	0.57	0.046	0	0.89	0.022	0.77	0.022	0
WRO35	1.09	0.043	0.75	0.037	0	1.05	0.029	0.89	0.013	0
WRO33	1.04	0.047	0.71	0.035	0	0.99	0.033	0.83	0.017	0
DIS										
WRDI24	1.00	0	0.11	0.103	0.274	1.00	0	0.40	0.049	0
WRDI28	1.04	0.365	0.12	0.115	0.315	1.08	0.064	0.42	0.053	0

Factors	Model A					Model B				
	Unstandard.		Standardized			Unstandard.		Standardized		
	L	S.E.	L	S.E.	p	L	S.E.	L	S.E.	p
WRDI27	1.26	0.395	0.14	0.125	0.262	0.96	0.064	0.38	0.053	0
WRDI34	-0.40	1.265	-0.05	0.105	0.664	1.30	0.084	0.52	0.045	0
HC										
WRO7	1.00	0	0.77	0.024	0	1.00	0	0.87	0.013	0
WRO14	1.04	0.028	0.81	0.027	0	1.04	0.021	0.92	0.01	0
WRO18	0.78	0.045	0.62	0.044	0	0.91	0.03	0.82	0.022	0
NAE										
WRNE21	1.00	0	0.59	0.03	0	1.00	0	0.64	0.025	0
WRNE22	1.04	0.079	0.61	0.032	0	1.08	0.062	0.68	0.026	0
WRNE23	1.27	0.078	0.71	0.03	0	1.34	0.059	0.81	0.021	0
WRNE25	1.02	0.054	0.56	0.03	0	1.04	0.046	0.61	0.027	0
WRNE27	1.24	0.067	0.68	0.031	0	1.32	0.057	0.78	0.02	0
NDE										
WRNE24	1.00	0	0.63	0.032	0	1.00	0	0.72	0.024	0
WRNE26	1.41	0.116	0.88	0.038	0	1.22	0.059	0.88	0.025	0
PROCPB										
WRP3	1.03	0.046	0.61	0.023	0	0.99	0.054	0.58	0.028	0
WRP12	0.97	0.046	0.58	0.023	0	0.91	0.056	0.54	0.03	0
WRP21	1.06	0.046	0.61	0.023	0	0.99	0.057	0.56	0.029	0
WRP25	0.98	0.043	0.60	0.022	0	0.91	0.054	0.56	0.029	0
WRP27	1.06	0.042	0.64	0.021	0	1.03	0.052	0.62	0.027	0
WRH2	0.33	0.05	0.23	0.033	0	0.15	0.055	0.10	0.036	0.007
WRH13	0.52	0.05	0.33	0.03	0	0.36	0.06	0.23	0.037	0
WRH15	0.39	0.051	0.25	0.031	0	0.23	0.058	0.15	0.036	0
WRH24	0.37	0.052	0.25	0.034	0	0.16	0.059	0.11	0.039	0.006
WRH28	0.22	0.051	0.15	0.034	0	0.00	0.059	0.00	0.039	0.973
WRO15	1.21	0.055	0.70	0.027	0	0.84	0.077	0.48	0.042	0
WRO19	1.31	0.054	0.74	0.026	0	0.95	0.077	0.54	0.041	0
WRO32	1.29	0.054	0.74	0.027	0	0.93	0.076	0.53	0.041	0
WRO26	0.94	0.063	0.56	0.035	0	0.49	0.08	0.30	0.048	0
WRO37	0.86	0.095	0.50	0.054	0	0.23	0.091	0.13	0.053	0.012
WRO38	0.96	0.08	0.57	0.045	0	0.43	0.085	0.25	0.05	0
WRO35	0.85	0.098	0.49	0.055	0	0.17	0.093	0.10	0.053	0.06
WRO33	0.76	0.098	0.43	0.054	0	0.11	0.093	0.06	0.053	0.244
WRDI24	1.53	0.045	0.86	0.018	0	1.37	0.059	0.77	0.028	0
WRDI28	1.62	0.04	0.89	0.016	0	1.43	0.063	0.79	0.031	0
WRDI27	1.49	0.048	0.82	0.02	0	1.33	0.064	0.74	0.032	0
WRDI34	1.60	0.035	0.90	0.011	0	1.30	0.065	0.74	0.032	0
WRO7	0.77	0.085	0.42	0.045	0	0.16	0.091	0.09	0.049	0.071
WRO14	0.82	0.088	0.46	0.047	0	0.18	0.092	0.10	0.051	0.054
WRO18	1.06	0.086	0.59	0.046	0	0.49	0.095	0.28	0.052	0

Factors	Model A					Model B				
	Unstandard.		Standardized			Unstandard.		Standardized		
	L	S.E.	L	S.E.	p	L	S.E.	L	S.E.	p
WRNE21	0.86	0.063	0.49	0.033	0	0.65	0.071	0.38	0.04	0
WRNE22	0.58	0.075	0.33	0.042	0	0.25	0.076	0.15	0.044	0.001
WRNE23	0.87	0.078	0.48	0.04	0	0.50	0.082	0.28	0.045	0
WRNE24	0.59	0.067	0.33	0.036	0	0.31	0.074	0.18	0.041	0
WRNE25	0.90	0.064	0.49	0.033	0	0.79	0.066	0.43	0.034	0
WRNE26	0.65	0.069	0.37	0.037	0	0.36	0.077	0.20	0.043	0
WRNE27	0.83	0.082	0.45	0.043	0	0.43	0.087	0.24	0.047	0
PNCS										
AC	0.50	0.091	0.52	0.075	0	1.03	0.059	0.80	0.023	0
PC	1.16	0.082	0.97	0.034	0	1.37	0.046	0.94	0.017	0
DIS	-0.13	0.088	-0.62	0.256	0.016	0.63	0.079	0.89	0.047	0
HC	1.03	0.078	0.73	0.041	0	1.34	0.045	0.84	0.02	0
NE										
NAE	0.77	0.029	0.76	0.04	0	0.91	0.031	0.84	0.028	0
NDE	0.77	0.029	0.69	0.035	0	0.91	0.031	0.71	0.026	0
BEH										
ID	0.77	0.029	0.76	0.027	0	0.91	0.031	0.85	0.025	0
HD	0.77	0.029	0.82	0.03	0	0.91	0.031	0.86	0.024	0
Residual Variance										
WRP3	0.77	0.054	0.27	0.02	0	0.76	0.054	0.26	0.02	0
WRP12	0.53	0.044	0.19	0.016	0	0.53	0.042	0.19	0.016	0
WRP21	0.70	0.057	0.23	0.019	0	0.70	0.056	0.23	0.019	0
WRP25	0.54	0.048	0.20	0.019	0	0.54	0.047	0.20	0.018	0
WRP27	0.52	0.037	0.19	0.015	0	0.51	0.036	0.19	0.014	0
WRH2	1.14	0.069	0.53	0.03	0	1.13	0.068	0.50	0.027	0
WRH13	0.69	0.053	0.28	0.021	0	0.68	0.049	0.27	0.019	0
WRH15	0.98	0.066	0.40	0.027	0	0.99	0.065	0.40	0.026	0
WRH24	0.83	0.061	0.38	0.027	0	0.82	0.06	0.37	0.027	0
WRH28	0.71	0.05	0.33	0.024	0	0.69	0.051	0.31	0.024	0
WRO15	0.65	0.053	0.21	0.018	0	0.66	0.05	0.22	0.017	0
WRO19	0.49	0.051	0.16	0.017	0	0.49	0.046	0.16	0.015	0
WRO32	0.67	0.051	0.22	0.018	0	0.65	0.05	0.22	0.017	0
WRO26	1.08	0.078	0.39	0.029	0	1.02	0.069	0.37	0.026	0
WRO37	0.75	0.063	0.26	0.022	0	0.73	0.059	0.25	0.021	0
WRO38	1.03	0.072	0.36	0.025	0	1.00	0.071	0.35	0.025	0
WRO35	0.60	0.06	0.20	0.021	0	0.62	0.058	0.21	0.02	0
WRO33	0.96	0.081	0.31	0.027	0	0.97	0.08	0.32	0.026	0
WRDI24	0.80	0.067	0.25	0.022	0	0.81	0.062	0.25	0.02	0
WRDI28	0.64	0.064	0.19	0.02	0	0.66	0.062	0.20	0.019	0
WRDI27	1.00	0.086	0.30	0.027	0	1.03	0.075	0.31	0.024	0

Factors	Model A					Model B				
	Unstandard.		Standardized			Unstandard.		Standardized		
	L	S.E.	L	S.E.	p	L	S.E.	L	S.E.	p
WRDI34	0.59	0.052	0.19	0.017	0	0.59	0.047	0.19	0.016	0
WRO7	0.76	0.072	0.23	0.022	0	0.79	0.074	0.23	0.022	0
WRO14	0.45	0.057	0.14	0.018	0	0.49	0.057	0.15	0.018	0
WRO18	0.86	0.067	0.27	0.021	0	0.83	0.071	0.26	0.022	0
WRNE21	1.27	0.093	0.42	0.03	0	1.27	0.091	0.45	0.029	0
WRNE22	1.54	0.101	0.51	0.035	0	1.51	0.1	0.52	0.034	0
WRNE23	0.87	0.085	0.26	0.026	0	0.84	0.082	0.26	0.026	0
WRNE24	1.55	0.131	0.50	0.04	0	1.40	0.117	0.45	0.032	0
WRNE25	1.55	0.103	0.45	0.03	0	1.50	0.105	0.44	0.03	0
WRNE26	0.28	0.181	0.09	0.058	0.13	0.57	0.122	0.18	0.041	0
WRNE27	1.17	0.088	0.34	0.027	0	1.13	0.084	0.34	0.026	0
ID	0.44	0.064	0.43	0.042	0	0.32	0.063	0.28	0.042	0
HD	0.30	0.062	0.34	0.049	0	0.29	0.06	0.26	0.041	0
AC	0.67	0.073	0.73	0.078	0	0.59	0.063	0.36	0.038	0
PC	0.09	0.093	0.06	0.065	0.344	0.24	0.07	0.11	0.033	0.001
DIS	0.03	0.056	0.62	0.316	0.05	0.11	0.055	0.21	0.084	0.05
HC	0.94	0.116	0.47	0.06	0	0.74	0.092	0.29	0.034	0
NAE	0.45	0.104	0.43	0.061	0	0.35	0.074	0.30	0.046	0
NDE	0.64	0.12	0.52	0.049	0	0.82	0.103	0.50	0.037	0

Note. ID = Irrational Delay; HD = Hedonistic Delay; AC = Academic Consequences; PC = Personal Consequences; DIS = Dissatisfaction; HC = Health Consequences; NAE = Negative Activating Emotions; NDE = Negative Deactivating Emotions; PI = Procrastination Intensity (Overall Procrastination); PNC = Perceived Negative Consequence (second-order Factor equivalence of total PNCS); NE = Negative Emotions (second-order Factor equivalence of total NES); BEH = Procrastination Behaviour (second-order Factor equivalence of total PBS); Unstandard = Unstandardized Estimates; Model A = Orthogonal Bifactor Model; Model B Correlated Bifactor Model.

Test-Retest Reliability of the MMAP

In addition to evaluating the reliability of the MMAP based on test-information curves, omega, and Alpha, the questionnaire was administered twice to measure the test-retest reliability of the MMAP total scores. The 4- to 5-week test-retest correlations of the total intensity/severity scale was .79, .76, and .74 for writing, exams, and reading tasks. The test-retest correlation for the duration scale was above .75. Table 11-18 presents the test-retest correlations for facet and dimension scores. The results supported the reliability of scores. Given the gap of more than one

month between testing, the magnitudes of the test-retest correlations for all of the scores are considered good.

Table 11-18

Test retest Reliability of MMAP

Score	Writing		Reading		Exam	
	r	N	r	N	r	N
PI	0.79	203	0.74	205	0.76	205
PBS	0.70	200	0.68	201	0.72	205
AP/ID	0.75	201	0.64	202	0.73	205
HP/HD	0.56	201	0.58	202	0.63	205
PNC	0.74	199	0.67	198	0.71	204
AC	0.76	200	0.69	195	0.72	203
PC	0.73	198	0.68	195	0.67	203
DIS	0.68	199	0.65	195	0.65	202
HC	0.61	202	0.65	198	0.62	204
NE_TI	0.68	203	0.69	204	0.72	205
TI_NA	0.67	203	0.66	203	0.70	205
TI_ND	0.62	204	0.62	204	0.65	205
NE_TD	0.74	101	0.69	201	0.66	203
TD_NA	0.66	102	0.68	201	0.63	203
TD_ND	0.71	101	0.59	202	0.54	203
DTS	0.76	202	0.75	201	0.77	205
DPB	0.76	203	0.73	201	0.75	205
DNC	0.75	202	0.72	201	0.78	205
DNE	0.62	202	0.57	201	0.62	205

Note. PI= Procrastination Intensity/Severity; AP/ID =Anxious Procrastination/Irrational Delay; HP/HD = Hedonistic Procrastination or Hedonistic Delay; PNC = Perceived Negative Consequence; AC = Academic Consequences; PC = Personal Consequences; DIS = Dissatisfaction, HC = Health Consequences; NE = Negative Emotions; TI= task-initiation emotions; TD = task-delay emotions; NAE = negative activating emotions, NDE= negative de-activating emotions; DTS=total Duration Scale/ Duration of Procrastination Problems; DPB = duration of procrastination behaviour; DNC = duration of negative consequences; DNE = duration of negative emotions

In sum, the results of the CFA on models related to specific measures (facets) under the MMAP and the overall model of the MMAP supported the validity of the factor structure of the measures. All supported models were in line with the proposed conceptualization of procrastination problems as well as the refined models suggested based on the result of EFA. The

results of test-retest correlations supported the reliability of the factors extracted based on EFA and CFA studies.

CHAPTER 12: CONFIRMATORY ANALYSIS OF THE DQ'S STRUCTURE

The structure of the DQ was explored using Exploratory Factor Analysis. The extracted factors were refined using univariate and multivariate item-response theory. In the next stage, confirmatory factor analysis was used to evaluate the refined measurement model of the DQ in a new sample (Study 9). In this chapter, the results of the confirmatory factor analysis study are presented.

Method

Participants and Procedures

Because the DQ, the main questionnaire, was presented to participants at the beginning of the survey, all of the records (incomplete and complete) were entered in the process of data cleaning. The initial dataset consisted of 832 records including completed and incomplete records. In the first stage, cases with more than 25% missing values on the DQ were eliminated. The sample without these cases was reduced to 567. In the next stage, the data were cleaned of duplicate responses. The duplicate records were identified based on participants' email, name and student numbers. For each set of duplicate records, duplicated records with a low index of data quality, a larger number of missing values on the DQ, or a larger number of missing values on the whole survey were deleted. The final dataset after elimination of duplicate cases was 528.

The recruitment procedure and steps in presenting the questionnaire were similar to the EFA stage of the DQ. The main difference between EFA and CFA data collection was that the

CFA study had two stages and participants were given a chance to choose one of the two participation options. The first option involved completing the DQ and the validation questionnaires in one stage. The second option (test and retest) involved two stages. The first stage was similar to option one, which involved completing the DQ and the validation questionnaires. The second stage involved filling out the DQ without the validation questionnaires after three to five weeks.

Participation in stage one required completing the full version of the DQ and several validity measures that were mentioned in the EFA study. Participation in stage two involved completing the full version of the DQ questionnaire for a second time. Participants were given a chance to choose one of the two options at the bottom of the consent form or could decline to participate. Before receiving the debriefing form, participants were asked to voluntarily provide their email and identifying information in order receive a course credit (2% for stage 1; 1% for stage 2) and to be used to clean the data and match datasets. On average, participants spent 56 minutes completing the stage one questionnaire package. The mean and median time for the completion of stage two was approximately 40 and 38 minutes¹⁶. To reduce the fatigue effect for the confirmatory analysis of the new measure, the DQ was presented at the beginning of the survey. Moreover, in the middle of stage one, participants were presented a message reminding them of the possibility of taking a break (i.e., saving their incomplete survey and returning to complete it later).

¹⁶ In addition to the DQ, a new scale that measured some of the dimensions underlying various forms of delay was used in stage 2. Given the large scope of the dissertation and the fact that the dimensional measure was not part of the original prospectus, the dimensional measure was not analysed and presented in the dissertation.

Data collection was done in more than one semester. Both the beginning and end of semester were covered. At least one email reminder was sent to encourage participants who had registered for stage one but did not start or complete the survey. For those who agreed to participate in stage two, more than one reminder was sent before the deadline for completing the stage two (re-test) survey.

Measures.

The measures in this study were identical to the ones used in EFA stage (see Chapter 10).

Analyses

Confirmatory Factor Analysis. The confirmatory factor analysis estimation method used to analyze the MMAP was employed to test (i.e., confirm) the refined measurement model of the DQ obtained from EFA. More specifically, the MLR estimation method that produces the Yuan–Bentler fit statistic (Yuan & Bentler, 2000) was used. As mentioned before, this estimation method is robust towards possible departures from normality and allows for minimal assumption testing and transformation or trimming of the dataset. The same estimation method was used in substituting missing values. The pattern of missing values was tested before analysis. Direct maximum likelihood with MLR estimation method was used to substitute missing values in the dataset before each analysis. For more details of the CFA analysis such as fitting criteria, cut-offs, and rationale for data analysis, readers can refer to Chapter 11. Mplus 7.2 was used for the confirmatory factor analysis, missing values analysis, and substitutions. SPSS 20.00 and AMOS were used for testing assumptions.

Results

MMAP Dataset Preparation and Assumptions

Linearity and homoscedasticity. Random pairwise scatter plots were inspected as well as scatter plots between items that had relatively stronger skewness. Both quadratic and cubic curves were fitted and compared with linear fit when the scatter plots were not informative. No noticeable contribution above the linear model was found when quadratic and cubic curves were used. In sum, no clear departures from linearity assumption were detected.

Multivariate Outliers. Similar to the criteria and procedures used in the EFA and MMAP CFA studies, Mahalanobis Distance and Cook's Distance (CD) were used to identify influential multivariate outliers. However, the cases with multivariate outliers were not eliminated in the CFA. Based on the recommendation of Flora, LaBrish, and Chalmers (2012), I used robust estimation (i.e., MLR) rather than delete such cases.

Multicollinearity and Singularity. Evaluation of multicollinearity and singularity was conducted using a method similar to that used in the CFA of the MMAP. There was absence of non-positive definite when testing the main models, supporting the absence of singularity (Tabachnik & Fidell, 2007) and multicollinearity (Flora et al., 2012). Moreover, the tolerance and VIF values did not show multicollinearity problems.

Normality. Skewness and kurtosis z-tests as well as a Kolmogorov-Smirnov test did not support the univariate normality of the items. Given the large sample size in this study, I employed graphical methods of evaluating univariate normality, including inspection of histograms and Q-Q normality plots (Tabachnik & Fidell, 2007). The results supported the normality assumption of most items. The HD items and item DQ6 under the DEP factor showed some level of univariate non-normality (i.e., positive skewness). As I expected, Mardia's

multivariate (Mardia, 1970, 1974) statistic was significant ($p < .001$) indicating multivariate non-normality (multivariate kurtosis). Robust Maximum Likelihood estimation was used to adjust for non-normality in the datasets.

Confirmatory Factor Analysis for Delay Questionnaire.

The EFA study concluded with a 6-factor correlated-trait model. The factors included Irrational Delay (IrD), Inevitable Delay (ID), Hedonistic Delay (HD), Purposeful Delay (PD), Arousal Delay (AD), and Delay due to Emotion Problems (DEP). The model was justified theoretically. In addition, a five-factor model, where HD and AD were combined, had a reasonable factor structure based on results of the EFA. Finally, the EFA showed cross loading and low factor loading related to one of the main items under the DEP subscale. Therefore, I suggested that the DEP subscale could be used separately as a screening tool for delay due to current emotional problems, as it was not part of the theoretical model.

Given the EFA findings and theoretical evidence, the CFA for both 6- and 5-factor models with DEP was employed. Since the 5-factor model was nested within the 6-factor model and all items were the same, scaled nested model comparison was used to choose the superior model. The chosen model was then tested again but without DEP items. Statistical comparison between models with and without DEP was not possible since the items were different.

Missing value analysis and substitution was performed before the CFA analyses using direct maximum estimation with MLR method. Twenty-eight patterns of missing values were reported. The largest frequency was related to a pattern with no missing values in all items (Freq = 465). With the exception of pattern 11, the patterns with missing values had a frequency less than 3. There were no patterns that contained all missing values on one scale. Pattern 11 included DQ2, DQ6, and DQ3. These items were related to different scales.

Table 12-1 presents the results of the overall models' evaluation. Model A, the main 6-factor solution, fit the data well based on various fit indices, particularly RMSE, CFI, and SRMR. Model B, which combined the hedonistic delay factor with the arousal delay factor, did not have an acceptable CFI and TLI. Comparing Model B with Model A revealed that combining the factors significantly worsened the fit of the model: scaled $\chi^2 = 162.910$, $\Delta df = 5$, $p = .0000$. Based on this result, model B was rejected.

Model A and its standardized factor loadings and the correlations among the six factors are presented in Figure 12-1. Unstandardized estimates and R-square values for items are presented in Table 12-2. The results indicate that all factor loadings were above .50, supporting the validity of a 6-factor structure. The standardized errors of estimates were small. All factor loading, with the exception the DEP items, were above .65.

Table 12-1.

Overall Goodness of Fit Tests for the Delay Questionnaire Models

Model	N	n.i.	χ^2	cd	df	CFI	TLI	RM.	LRM.	HRM.	SRMR	AIC	BIC
A	528	18	248.4	1.190	120	0.95	0.94	0.045	0.037	0.053	0.048	33249.0	33543.6
B	528	18	420.2	1.193	125	0.89	0.86	0.067	0.060	0.074	0.058	33444.7	33717.9
C1	528	15	152.3	1.203	80	0.97	0.96	0.041	0.031	0.051	0.041	27347.4	27582.2
C2	404	15	134.8	1.172	80	0.97	0.96	0.041	0.029	0.053	0.042	20437.2	20657.2
C3	323	15	128.6	1.169	80	0.96	0.95	0.043	0.029	0.057	0.045	16390.7	16598.4

Note. Model A = 6-factor with DEP; Model B = 5-factor with DEP; Model C = 5-factor without DEP items in the whole sample (C1) and samples without cases with high level DEP (C2 and C3); n.i. = number of items; cd = scaling correction; RM = RMSEA; LRM = RMSEA Lower CI; HRM = RMSEA Higher CI; all chi-squares are significant at p-value < .0001.

The R-square values were above .50 for a majority of the items. The lowest R-square was related to the DEP items (see table 12-2). Even though there were only three items under each factor, the omega values were above .70 for all factors, with the exception of the DEP. The omega statistics for IRD, IND, HD, DEP, AD, and PD were .83, .73, .80, .63, .76, and .80 respectively. The factor correlations ranged from .05 to .67, indicating discriminant validity of

the six factors. The correlations were significant with the exception of the ones related to the relation of PD with HD, DEP, and AD. Table 12-3 presents the factor correlations and their standardized errors. The largest correlation was related to HD with AD.

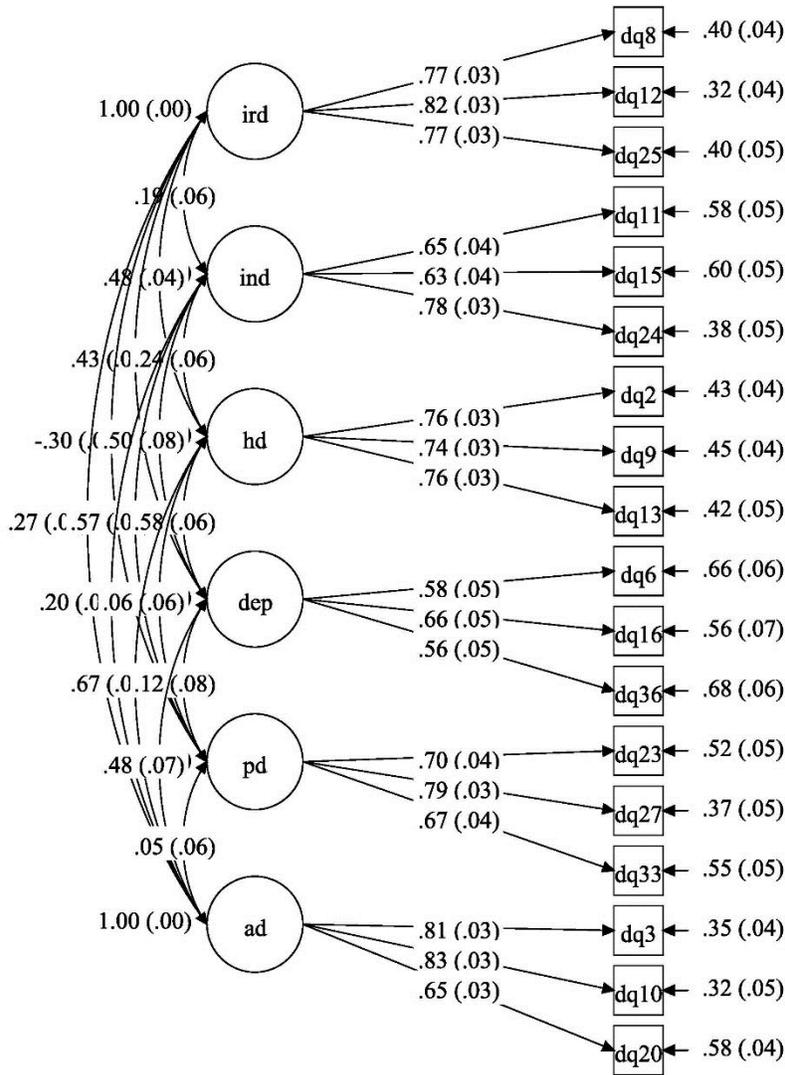


Figure 12-1. Final factor model of the Delay Questionnaire and standardized parameter estimates and standard errors. Note. Standard Errors (SEs) of the Parameter Estimates are presented in parentheses; ird = irrational delay; ind = inevitable delay; hd = hedonistic delay, dep = delay due to emotional problems; pd = purposeful delay; ad = arousal delay; all parameters were significant at $p < .001$, with the exception of correlations of PD with HD, DEP, and AD.

Table 12.2.

Unstandardized and Standardised Factor Loading of the DQ Models

	Model A				Model C1			
	Unstandardized		Standardized		Unstandardized		Standardized	
	L	S.E.	L	S.E.	L	S.E.	L	S.E.
IRD								
DQ8	1.00	0.00	0.77	0.03	1.00	0.00	0.77	0.03
DQ12	1.14	0.06	0.82	0.03	1.14	0.07	0.83	0.03
DQ25	1.02	0.06	0.77	0.03	1.02	0.06	0.77	0.03
IND								
DQ11	1.00	0.00	0.65	0.04	1.00	0.00	0.65	0.04
DQ15	0.96	0.10	0.63	0.04	0.92	0.10	0.62	0.04
DQ24	1.17	0.09	0.78	0.03	1.17	0.10	0.79	0.03
HD								
DQ2	1.00	0.00	0.76	0.03	1.00	0.00	0.77	0.03
DQ9	0.91	0.07	0.74	0.03	0.90	0.07	0.73	0.03
DQ13	0.93	0.07	0.76	0.03	0.91	0.07	0.76	0.03
DEP								
DQ6	1.00	0.00	0.59	0.05				
DQ16	1.19	0.12	0.66	0.05				
DQ36	0.93	0.14	0.56	0.05				
PD								
DQ23	1.00	0.00	0.70	0.04	1.00	0.00	0.70	0.04
DQ27	1.07	0.07	0.79	0.03	1.07	0.07	0.79	0.03
DQ33	0.94	0.08	0.67	0.04	0.94	0.08	0.67	0.04
AD								
DQ3	1.00	0.00	0.81	0.03	1.00	0.00	0.81	0.03
DQ10	0.97	0.07	0.83	0.03	0.96	0.07	0.83	0.03
DQ20	0.86	0.06	0.65	0.03	0.86	0.06	0.65	0.03
Residual Var.								
DQ8	1.24	0.13	0.40	0.04	1.24	0.13	0.40	0.04
DQ12	1.13	0.16	0.32	0.05	1.12	0.16	0.32	0.05
DQ25	1.28	0.16	0.40	0.05	1.28	0.16	0.40	0.05
DQ11	1.63	0.15	0.58	0.05	1.61	0.16	0.57	0.05
DQ15	1.61	0.15	0.60	0.05	1.67	0.15	0.62	0.05
DQ24	1.00	0.13	0.39	0.05	0.96	0.14	0.37	0.05
DQ2	1.07	0.11	0.43	0.04	1.03	0.11	0.41	0.04
DQ9	0.99	0.11	0.45	0.05	1.01	0.11	0.46	0.05
DQ13	0.91	0.10	0.42	0.05	0.92	0.10	0.43	0.05
DQ6	2.04	0.21	0.66	0.06				
DQ16	1.91	0.24	0.56	0.07				
DQ36	1.95	0.20	0.68	0.06				
DQ23	1.39	0.15	0.52	0.05	1.39	0.15	0.52	0.05

	Model A				Model C1			
	Unstandardized		Standardized		Unstandardized		Standardized	
	L	S.E.	L	S.E.	L	S.E.	L	S.E.
DQ27	0.88	0.11	0.37	0.05	0.88	0.11	0.37	0.05
DQ33	1.39	0.13	0.55	0.05	1.39	0.13	0.55	0.05
DQ3	0.96	0.12	0.35	0.04	0.95	0.12	0.35	0.04
DQ10	0.77	0.12	0.32	0.05	0.78	0.12	0.32	0.05
DQ20	1.81	0.16	0.58	0.04	1.80	0.16	0.58	0.04
R square								
DQ8			0.60	0.04			0.60	0.04
DQ12			0.68	0.05			0.68	0.05
DQ25			0.60	0.05			0.60	0.05
DQ11			0.42	0.05			0.43	0.05
DQ15			0.40	0.05			0.38	0.05
DQ24			0.62	0.05			0.63	0.05
DQ2			0.57	0.04			0.59	0.04
DQ9			0.55	0.05			0.54	0.05
DQ13			0.58	0.05			0.57	0.05
DQ6			0.34	0.06				
DQ16			0.44	0.07				
DQ36			0.32	0.06				
DQ23			0.49	0.05			0.48	0.05
DQ27			0.63	0.05			0.63	0.05
DQ33			0.45	0.05			0.45	0.05
DQ3			0.65	0.04			0.65	0.04
DQ10			0.69	0.05			0.68	0.05
DQ20			0.42	0.04			0.42	0.04

Table 12-3.

Estimated Correlations among the DQ Subscales and their Standard Deviations of Estimate

	IrD	InD	HD	DEP	AD	PD
IrD	1.00					
InD	0.194(.06)	1.00				
HD	0.483(.044)	0.245(.063)	1.00			
DEP	0.431(.059)	0.498(.079)	0.582(.061)	1.00		
AD	0.27(.051)	0.199(.062)	0.671(.046)	0.481(.068)	1	
PD	-.301 (.056)	0.574(.054)	0.057(.06)	0.118(.082)	0.051(.057)	1

Note. IrD = Irrational Delay; InD = Inevitable Delay; HD = Hedonistic Delay, PD = Purposeful Delay; AD = Arousal Delay

The DEP factor was eliminated from the 6-factor solution and the model was tested (see Model C in Table 12-1) in three samples. C1 refers to the whole sample. C2 refers to the sample without cases who had endorsed one of the DEP items by selecting options equal to or above “very much like me” (6). C3 refers to the sample with eliminated cases endorsing options equal to or above “moderately like me” (4). The fit of the model was excellent based on all fit indices in all three samples. As well, the factor loadings were in an acceptable range (see Figure 12-2 and Table 12-2).

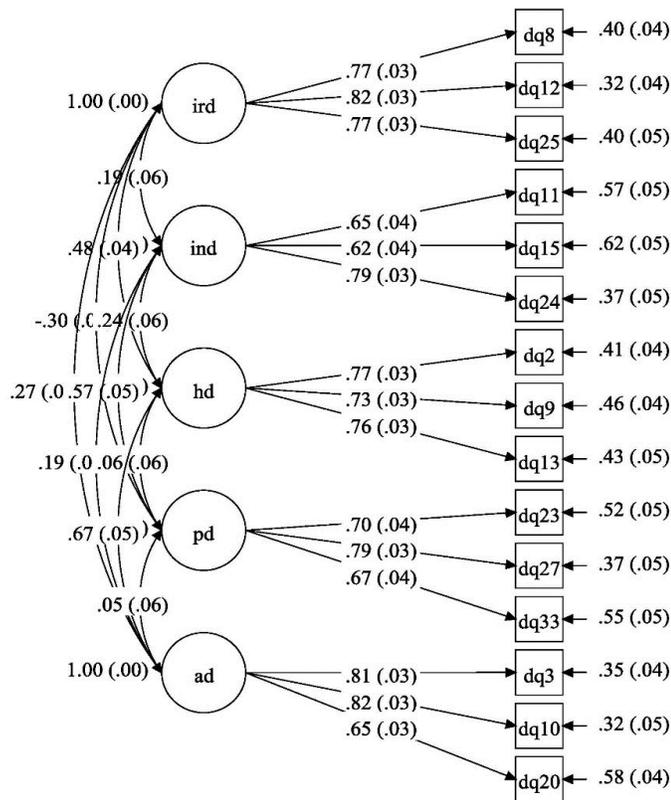


Figure 12-2. Standardised parameter estimates of the final factor model of the Delay Questionnaire without the DEP. Note. The estimates are based on the whole sample (N = 528); Standard errors (SEs) of the parameter estimates are presented in parentheses; ird = irrational delay; ind = inevitable delay; hd = hedonistic delay, dep = delay due to emotional problems; pd = purposeful delay; ad = arousal delay; all parameters were significant at $p < .001$ with the exception of correlations of PD with HD, DEP, and AD.

The omega reliability of the IRD, IND, HD, AD, and PD were .82, .75, .78, .77, and .81 respectively in a sample with stricter criteria specified to retain cases without DEP. Testing the model did not result in noticeable differences in model fit or in the factor loading pattern between samples. The effect of eliminating cases with high DEP may need to be tested when the relation between the five factors and other variables are studied (e.g., validation study).

Test-Retest Reliability of the DQ

In addition to evaluating the reliability of the DQ based on omega and Alpha statistics, the questionnaire was administered twice to measure the test-retest reliability of the prototypes. The 3- to 5-week test-retest correlations of the IrD, HD, InD, PD, AD, and DEP were .78, .70, .63, .60, .64 and .67, respectively ($N=89$). Given the gap of approximately one month between testing, the magnitudes of the test-retest correlations for all of the scores can be considered as very good, supporting reliability of the subscales.

Refining the Definitions

The information from the qualitative part of the DQ content analysis and the findings related to the factor structure and marker items under each factor in factor analysis phase implied the need to redefine the new constructs. The content validity analysis and exploratory and confirmatory factor analysis provided ample conceptual and empirical information that, together, could be used to clarify and further refine the definitions. It was particularly important to refine the forms of delay that were defined and measured for the first time in this research, and whose definitional boundaries were therefore still fuzzy during the item-creation stage. The refined definitions that reflect the new understanding of the construct of delay in general, and its form in particular, is essential when interpreting findings related to various types of delay. Moreover, the

final definitions can be used as a basis for further content validity analysis of the existing measure, future refinement of the measure, as well as future development of new measures of delay.

There are several changes to definitions that are important to note. First, the initial content for the purposeful delay construct emerged as two prototypes, arousal delay and purposeful-strategic delay. Second, delay due to emotional problems emerged at the end of the content-validity phase and was confirmed as an unique form of delay at the end of the factor-analysis studies. Third, the distribution of responses and item-information curves related to hedonistic delay highlighted the need to shift the operational definition of the latent trait from using severe to less severe descriptors for a university-student population. Finally, the initial definitions of delay referred to forms of delay in the academic domain. To provide a basis for expanding the research from academic to other domains such as everyday life and organizational domains, it was necessary to rewrite the definitions in order to present a variety of types of tasks and domains. Taking these points and the results of the factor analyses into account, the refined definitions are presented below.

Hedonistic delay is a form of postponing *assigned or expected* tasks as a consequence of failing to form an initial intention to do the task due to a preference for alternative fun or pleasurable activities and/or a lack of care/concern about the task. The delayer chooses pleasurable alternative activities instead of forming a clear reasonable intention or plan to work on the task, despite expecting that postponement of the tasks may have negative consequences. Hedonistic delay as an enduring behavioural pattern often leads to poor performance related to the assigned or expected tasks and is related to a deficiency in self-regulation. Given the negative

outcomes and self-regulation failure, hedonistic delay is a form of procrastination: hedonistic procrastination.

Arousal delay is a form of postponing *assigned or expected* tasks and is defined by a deliberate *intention to postpone doing tasks to near the deadline* based on a clear preference for working under pressure or for experiencing the excitement of finishing at the last minute. Arousal delay as an enduring behavioural pattern is accompanied by a lack of concern for experiencing pressure when doing tasks near the deadline as well as a lack of concern about the possible consequences of postponing the tasks.

Inevitable delay occurs when one postpones working on tasks from an intended and optimal time ahead of deadline to a later time closer to the deadline because of external constraints beyond one's control at the time of delay. Inevitable delay as an enduring behavioural pattern is linked to a tendency to have a busy schedule, accept many commitments and/or have time-management difficulties. This behavioural pattern is accompanied by dissatisfaction related to the delay and its consequences, and by feeling some level of stress and negative activating emotions such as anxiety or guilt.

Purposeful delay is defined by the rational and strategic postponement of an important task in favour of other important tasks in order to optimize one's schedule without experiencing dissatisfaction and negative emotions. As an enduring behavioural pattern, purposeful delay reflects the ongoing necessity of setting priorities and is an outcome of practical reason, therefore it is linked to overall satisfaction about the behaviour and positive outcomes related to the tasks.

Irrational delay is a needless delay of a task despite an initial intention to start and/or finish it at certain time and despite the awareness that the delay will be self-defeating and/or rationally criticizable. The delay is not imposed by other or external force. As an *enduring*

behavioural tendency, it is often accompanied by negative emotions, personal dissatisfaction, and/or negative consequences. This behavioural pattern is rooted in self-regulation deficiency. Given the negative outcomes, self-regulation failure, and dominance of negative emotions, irrational delay is a form of procrastination: anxious procrastination.

As a psychological problem, irrational delay is necessarily accompanied by a moderate to high level of negative emotions, dissatisfaction, and/or negative consequences related to one or more aspects of one's life. A more precise definition of severe procrastination problems is presented at the end of the validity chapter and the discussion section. A preliminary operational definition for chronic procrastination problems is presented at the end of the discussion section.

In sum, the theoretical model of dilatory behaviour in academic settings, operationalized as the Delay Questionnaire, was supported. This was true regardless of whether the screening factor, delay due to emotional problems (DEP), was included in the model and regardless of whether cases with high levels of DEP were kept or eliminated. Use of the DEP scale in measuring dilatory behaviour is therefore optional based on the results of this study. The prototypes of delay also seemed to have good reliability based on various reliability statistics including omega and test-retest correlations. The factors in the DQ model seemed to have unique information based on the results of the inter-factor correlations. In order to gather more discriminant validity evidence, the relations of these factors (prototypes of delay) and various personality and outcome variables were investigated in multiple studies. The findings of these studies are presented and discussed in the next chapter.

CHAPTER 13: VALIDITY

According to the latest standards for educational and psychological testing, validity is defined as “the degree to which evidence and theory support the interpretations of test scores for the proposed uses of tests” (Standards by American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 2014, p. 11), and validation is one of the most important processes in measurement development and evaluation. The conceptualization of validity and validation has been constantly changing since the middle 20th century (Newton & Shaw, 2013). Readers can find a comprehensive review of these changes in Newton and Shaw (2013), Newton (2012), and Zumbo (2006). Sierci (2007) concisely presents these changes and emphasizes four fundamental aspects of validity (p. 477):

1. Validity is not a property of a test. Rather, it refers to the use of a test for a particular purpose.
2. To evaluate the utility and appropriateness of a test for a particular purpose requires multiple sources of evidence.
3. If the use of a test is to be defensible for a particular purpose, sufficient evidence must be put forward to defend the use of the test for that purpose.
4. Evaluating test validity is not a static, one-time event; it is a continuous process.

Another important feature of modern validity theory is the unitary conceptualization of validity, as suggested by leading validity theorists (e.g., Messick, 1975, 1980; Fitzpatrick, 1983) and described in the Standards. Based on this view, all aspects of validity are part of construct validity, therefore it is not appropriate to talk about various types of validity (e.g., content, criterion, convergent) as classical validity theories suggested. Not surprisingly, this perspective is still controversial. Some researchers explicitly disagree with not using the traditional types of validity (e.g., Sierci, 2007; McIntire & Miller, 2007), and many recent published works intentionally or unintentionally fail to adhere to the recommendation of the Standards (see Newton & Shaw, 2013).

Based on a unitary theory of validity, validation should be approached as an argument, one that is built on theoretical discussion and empirical evidence to evaluate or support a particular usage of a test (Kane, 2006). The concept of a validity argument marries the traditional and new conceptualizations of validity. Based on the Standards, “a sound validity argument integrates various strands of evidence into a coherent account of the degree to which existing evidence and theory support the intended interpretation of test scores for specific uses” (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014, p. 21). From this point of view, any source of information, including correlations of the new test with other variables, can be used in the validation argument and support the validity of inferences made from the test scores in particular situations. In other words, convergent, divergent, and criterion evidence should be considered *aspects* of validity and be used only to organise the validity evidence and to facilitate building the validity argument.

This usage is different from traditional and still-common validity approaches which tend to present correlational evidence for a specific type of validity and imply that “the test” has (or lacks) a particular type of validity. The validation of a specific score for a specific usage neither means that the other calculated scores from the test are valid, nor that the same score used for a different purpose is valid (Standards, 2014). Each specific score in each specific usage requires validation. Furthermore, measuring all aspects of validity is not necessary for each interpretation of a score and each specific usage. The aspects needed for the validity argument depends on the proposed interpretations of test scores and their specific usage. For example, criterion validity evidence is more important when a test score is to be used in a practical decision about the test

taker than when a test score is to be used for basic research toward understanding the phenomenon.

The process of validating and evaluating a construct can be a life-long project that requires multiple studies and multiple methods (Anastasi & Urbina, 1997), particularly if we follow the unitary view of validity. Based on this point of view, establishing construct validity is not limited to evaluating hypotheses about convergent and divergent validity. Indeed, these sources of information could be considered weak source of validity evidence (Zumbo, 2006). Instead, gathering information to build an argument about validity is part of all stages of measurement development, including the theoretically driven definition of the construct, item development, content-related evaluation and evidence related to structure (exploratory and confirmatory factor analysis), reliability analysis, correlational evidence (convergent and divergent criterion), and other empirical evidence related to the proposed uses of a test (intervention, diagnosis, experiment).

So far in the dissertation, I have presented an extensive evaluation of the content (items, responses, definition, instruction, format) and structure (exploratory factor analysis, confirmatory factor analysis, IRT and DIF) of the new measures. The final product of these evaluations was a set of measures and multiple scores including total, scale and subscale scores. In the next and final stage of this project, I present the convergent, discriminant, and criterion sources of validation information to further enrich the validation argument supporting the usage of various test scores. Because I expect the MMAP and the DQ to be used for basic research to enhance our understanding of procrastination and other forms of delay, the correlational evidence (convergent, discriminant, and criterion validity evidence) should provide an important source of information for researchers. In addition, the MMAP was intended to be used in intervention

studies or counselling settings for student populations. In this latter case, the correlational findings should be considered a preliminary source of validity evidence for such usages. It was just as important for applied usage of this measure to evaluate the stability of procrastination scores over time (see Chapter 11) and the relation between the factors and outcome variables such as academic achievement, psychological well-being, and physical health. Over the course of multiple studies, I was able to cover many of these topics and to organise and use the evidence they generated to build a validity argument.

Gathering and evaluating convergent and discriminant evidence related to the MMAP and DQ scores did not require administration of the test in an independent sample, even according to a traditional conceptualization of validity that emphasises the importance of this information (e.g., Hinkin, 1998; DeVellis, 2003). Based on the suggestion of these authors, correlational information was gathered in the first and second administrations of the test in the target population (i.e., in the EFA and CFA studies). The validity information gathered during these stages was used to evaluate the refined scales and subscales that are presented in this chapter.

Although data collected from my original samples were appropriate for validation, there were a number of limitations in the validation process. First, I used a limited number of validity measures (those used for correlational evidence in the validity argument) in the item-reduction and refinement studies (i.e., Studies 6 to 9). Furthermore, these studies did not include the MMAP and DQ at the same time, making it impossible to provide broad comparisons between the two measures. Finally, the studies were not anonymous, which may have affected the validation evidence. Given these limitations, I conducted a separate measurement validation

study to gather additional evidence of convergent and divergent and criterion validity using completely anonymous participation method.

For the measurement validation study, I used the refined versions of the MMAP and DQ as well as a broader but different set of validation measures. In addition to the above sources of validation data, I merged the datasets from the EFA and CFA stages of the DQ and MMAP (i.e., Studies 6 to 9), along with two studies that were conducted to develop and evaluate a new measure of health-related procrastination. After matching on participant identification data and eliminating duplicate records, the identifying information was eliminated from the final dataset. This merged dataset provided additional sources of correlational evidence.

Large amounts of validation data were obtained from five studies in this dissertation and two peripheral studies, and their merged datasets. More specifically, Study 6 examined the relations between MMAP-General and a validation scales. The specific and merged validation scales for Study 6 included personality and self-system variables (e.g., self-regulation, self-efficacy), as well as GPA. Study 8 measured MMAP-Specific (i.e., measuring procrastination in three main academic tasks separately) as well as a similar validation package (i.e., set of external measures used for validation) to that used in Study 6. Studies 7 and 9 included the DQ and personality and self-system measures. Finally, Study 10 included the refined versions of the MMAP-General and DQ simultaneously, as well as a large number of external validation scales including personality and self-system variables that were not covered in the previous studies such as a large set of theoretically related constructs (e.g., perfectionism, fear of failure) and a broad set of mental and physical health variables. Additional validation scales for Studies 6 to 9 were obtained based on merging data from participants who participated in both DQ and MMAP

studies as well as two peripheral studies related to developing a health procrastination scale. The merged data were used to look at pairwise validity relations across datasets.

Using the above strategies to investigate validity had several advantages. Collecting data during different stages of measurement development and matching the datasets not only provided broad validation data but also comparative validation information for the task-specific and general versions of the MMAP. Repeating some of the variables in different datasets replicated the research and validated findings for both measures, enhancing the generalizability of the validity findings.¹⁷

In addition to the large number of validation scales, there were many new scales that required validation, which made the validation stage a lengthy and complicated process. Based on the refined measurement models obtained at the end of the CFA stage, there were 12 dimensional scores, four scale (facet) scores and one total score under the MMAP. The DQ included six scores, two of which were related to the same constructs measured in the MMAP (i.e., Anxious Procrastination/Irrational Delay and Hedonistic Delay or procrastination). Moreover, all of the above dimensions and subscales were theoretically interrelated, so their comparison could be important in validity arguments. In addition, the large number of validation scales, the fact that they were used and replicated across multiple studies, and the possibility of calculating more than 20 MMAP and DQ scores meant that providing a detailed validation discussion for every piece of information and for all calculated scores was far beyond the scope

¹⁷ The strategies had one limitation regarding comparison of the validity coefficients; the sample sizes were different when relations were compared across datasets or when the relations were calculated based on the merged dataset.

of this dissertation. Instead, I focus on presenting validity information relating to a set of important MMAP and DQ scores and focusing on their main intended uses.

Among the MMAP and DQ scores, I chose to present detailed validity information on 10 scores and subscores. First, I chose the overall procrastination intensity score and total procrastination duration scores, because these can be used to define the severity of procrastination problems and chronic procrastination. In addition, I chose Anxious Procrastination (Irrational Delay), and Hedonistic Procrastination (Hedonistic Delay) behaviour. Anxious Procrastination is similar to earlier procrastination scales, and therefore can bridge between the new measure and previous studies. Hedonistic procrastination is a new subscale for procrastination behaviour and was therefore important to evaluate. Finally, because there were only six subscales under the DQ and they were equally important and interrelated, a fully validity discussion is provided for all DQ subscales.

Validation arguments often start with a validation proposition or hypothesis. However, the large number of scales, studies, and correlations in this project made it important to organise the evidence systematically in order to present a validation argument that is not overly complicated. Consequently, I chose to organize the discussion according to Antecedents, Consequences, and Conceptually Related Correlations. Antecedents and Consequences refer to the fact that the DQ and MMAP could be used in future research as predictor (independent) variables or predicted (dependent or outcome) variables, as well as in a counselling setting. The specific Antecedents and Consequences were derived from prior theory and research. In the third section, Conceptually Related Correlations, I discuss correlates that had no solid theoretical justification as to whether they are causes or consequences of procrastination, and correlates that had a shared cause. The latter was only used in the final validation study.

Comparing the results of various validation studies and highlighting similar findings across studies could facilitate validity arguments. Testing similar/same relations across studies helped in evaluating the generalizability of the findings and reduced the likelihood of capitalizing on chance in the final conclusions. For the MMAP, the results of studies 6 and 8 are presented in terms of total procrastination intensity, total procrastination duration, anxious procrastination and hedonistic delay. For the DQ, the results of studies 7 and 9 are presented for 6 prototypes¹⁸ of delay. The validation package in studies 6 to 9 included the major antecedents of goal-directed behaviour including personality factors and self-system variables (i.e., self-regulation; self-competence, self-efficacy) as well as important outcome variables in academic settings, GPA and academic performance.

With the exception of irrational delay (anxious procrastination), most of the constructs in this study were new, including all prototypes of delay and procrastination duration. There was insufficient prior empirical evidence to form hypotheses about these new constructs. Consequently, I based most of the hypotheses on theoretical and conceptual properties of the new constructs.

In contrast, there was extensive empirical evidence on anxious procrastination or irrational delay. Two major meta-analytic reviews (Steel, 2007; van Eerde, 2003) and two major books (Ferrari et al., 1995; Schouwenburg et al., 2004) provided rich information to hypothesize about pairwise associations with anxious procrastination and to some extent procrastination

¹⁸ In order to differentiate between continuous and categorical operationalisation of delay three words, prototypes, types and forms, were used with specific purposes and meaning in this document. Prototype used only to refer to continuous measure of delay which uses a Likert scale. Type refers to categorical operationalisation of delay when participants can choose only one forms of delay. Form was used to refer to constructs regardless of being measured as a categorical or interval variable.

problems/severity. Along with my own extensive literature review presented in chapters 1 through 5, these resources allowed me to form initial validation propositions for anxious procrastination, procrastination severity, and procrastination duration.

Although I reduced the number of scales and usages to be considered in the validation discussion, the number of possible validity relations and propositions remained extremely high. A rough estimate of the possible zero-order correlations between the selected scales and validation scales in the five studies was more than 1000. Counting other evidence such as findings related to evaluating mean differences, hierarchical regression, and semi-partial correlations brings this number even higher. Presenting a detailed discussion would be impossible.

Several strategies were used to resolve this issue. At the end of chapter 5, I presented general hypotheses about the relations between the major validity instruments and procrastination intensity and anxious procrastination behaviour. Validity propositions were developed for the relations between all of the selected scores and the broad set of validity scales and these are presented in table format in this chapter. Since there were various amounts of empirical evidence available for the selected scores and many of the scores were measured for the first time at the time of conducting the research, the validity propositions had a different level of specificity. When justified by empirical evidence and/or logical analysis, the proposition refers to a specific range of effect sizes and the direction of the relations. When the empirical, theoretical, or logical rationale was insufficient, the propositions are less specific with respect to direction or effect size. When prediction was impossible or the relation was not expected to be stable, I simply report the correlations for exploratory purposes.

Most hypotheses were tested in a large sample. The main advantage of testing in large samples is that it increases the generalizability of the findings. Although it is debatable, the disadvantage of using very large samples for validation is that very small correlations can become statistically significant. This is why it was important for the validity propositions to include effect size in addition to significance and direction when possible. Considering Cohen's (1988) guidelines, a series of cut-offs was used to evaluate previous research evidence and to include effect size in validity propositions. Table 13-1 presents defining phrases with the corresponding level of specificity discussed above as well as corresponding cut-offs and expected results. These codes are used in the presentation of validity hypotheses and results.

Table 13-1

Defining Phrases and Codes in Validity Propositions for Correlational Evidence and Their Corresponding Cut-offs

Code	Validity Proposition	Expected Results/Cut-offs
SN	small negative correlation	- 0.1 to - 0.2
MN	a moderate negative correlation	- 0.3 to - 0.4
LN	a large negative correlation	- 0.5 and above
SP	a small positive correlation	+ 0.1 to + 0.2
MP	a moderate positive correlation	+ 0.3 to + 0.4
LP	a large positive correlation	+ 0.5 and above
PZ	practically zero or negligible	less than .10 (Hopkins, 1997)
SR(N)	significant relation (in	p ≤ .05, PZ to LN, PZ to LP
SR(P)	positive/negative direction)	
SR	significant relation	p ≤ .05
NR	non-significant relation	p > .05
NDV	No Discriminant Validity	r > .80 or .85

For each set of validity propositions, I discuss a selected number of important hypotheses and their related results. Since propositions, results, and discussion are considered as a part of validity arguments, these three sections are combined. The validity argument section is preceded by methodological information and an evaluation of assumptions.

Method

In this section, the detailed methodological information for Study 10 is presented. The participants' composition, recruitment, and procedures for Studies 6 to 9 were similar to those presented in Chapters 6 to 9 respectively, and are not repeated here. The validity measures for these studies are presented at the end of this section.

Participants and Procedures

The initial sample size was 614. The final sample after elimination of the problematic cases using a vigorous data cleaning strategy became 490. A detailed description of the data cleaning procedure is presented in the following section.

Data Cleaning. Data cleaning was done in two stages. In the first stage, cases with more than 25% missing values were identified and eliminated. This dataset was kept for some of the analyses related to hedonistic delay that might be affected by data cleaning in the next stage.

In the second stage of data cleaning, rigorous strategies and criteria were used to eliminate potentially invalid responses, particularly because the study was anonymous, lengthy and conducted online which can result in low-quality records. A combination of two criteria was used to identify arbitrary records: quality-check items (see Method section) and the average time spent reading each item. Three quality-check items were used to identify participants who did not read items but provided arbitrary responses. These quality-check items were positioned throughout the survey. In addition, respondents who spent less than 5 seconds per item were identified based on overall time completion of the survey. A combination of both criteria was then used to eliminate cases. More specifically, respondents with unreasonable timing who also arbitrarily responded to two or more quality-check items were filtered out from the main dataset. The sample became 490 after elimination of 120 cases. This sample was labeled as the Main/high-quality sample and was used for a majority of the analyses. Comparisons between the initial sample ($n = 610$), labelled “whole sample,” and the high-quality sample were conducted, particularly when the results were counterintuitive and may have been affected by the rigorous elimination of cases.

Composition of Samples. Female participants constituted a majority of the research participants (see table 13-2). Participants were allowed to choose multiple ethnic backgrounds. In the refined sample, a majority of participants reported White/European ethnicity as one their ethnic backgrounds. After European ethnicity, Black, South Asian, and Arab had respectively higher percentages in comparison to other ethnicities in both the initial and final sample.

Interesting findings emerged comparing the ethnicity of participants who skipped reading items (eliminated cases) and participants who were retained in final sample. The major differences were between White/European, East Asian, and Arab participants. Comparing eliminated cases with the selected or initial sample showed that the percentage became lower for White/European but higher for East Asian and Arab ethnic category (see Table 13-2).

Table 13-2

Mean Age and Percentages of Gender and Ethnicity Groups for Initial, Final and Eliminated Samples

	Initial Sample	Selected sample	Eliminated Cases
Sample Size	614	490	120
Gender (Female)	68.7	72.9	58.3
Ethnicity			
White/European	59.8	64.3	42.5
Aboriginal	2.3	2.4	1.7
Arab	8	6.7	13.3
Black	11.2	11.2	10.8
East Asian	8.6	7.1	15
Latin American	2.8	2.7	3.3
South Asian	7	6.9	7.5
Southeast Asian	1.8	1.2	3.3
West Asian	1.6	1.6	1.7
Prefer not to answer	0.5	0.4	0.8
Mean Age	19.83	19.87	19.63
Age SD	3.96	4.21	2.79
Median Age	19	19	19

Note. Participants could chose multiple ethnic backgrounds.

When the overall percentage of each ethnic group in producing high quality data vs. low quality data was compared in the sample, only East Asian and Arab groups had a different pattern from other groups. Thirty four and 32 participants who reported having an East Asian and Arab ethnic backgrounds, respectively, did not answer the quality check items correctly and spent less than 5 seconds per item. The percentage of low-quality responses by each ethnic background was 14% for White/European and 18 % for Black/African-Canadian groups. There

was no way to ensure if participants who skipped reading items provided honest response to the Ethnicity question.

Looking at the overall quality by each gender revealed that 27 % of male participants produced low-quality responses in contrast to only 17% of female participants. Although interesting, I can only speculate on the reasons for these differences in participants' responding.

Validation Measures for Study 10

Psychological Well-Being (PWB). The 54-item version of the PWB (Ryff, 1989) was used to measure psychological well-being. The PWB has been widely used in various settings including academic setting and general population (Nave, Sherman & Funder, 2008). It consists of six subscales including autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. The PWB employs 6-point Likert-type scale scored from 1 (*Strongly Disagree*) to 6 (*Strongly Agree*). Items can be found in Appendix H. Internal consistency (alpha) coefficients for the subscales ranged from .85 to .92 in many studies (e.g., Ryff, 1989). Internal consistency (alpha) coefficients for the total score and subscales ranged from .75 to .93 in the current study.

Frost Multidimensional Perfectionism Scale (FMPS). The FMPS (Frost, Marten, Lahart, & Rosenblate, 1990) is a 35-item questionnaire that measures five aspects of perfectionism (see Appendix H). These include personal standards, concern over mistakes, parental expectations, doubting of actions, and organization. A 5-point Likert-type scale is used to measure the level of agreement with each of the 35 items. The reliability alpha was adequate to excellent ranging from .77 to .93 for subscales and total score based on the test developer report (Frost, Marten, Lahart, & Rosenblate, 1990). In the present study, the internal consistency

coefficients were .93 for total score, .83 for personal standards, .90 for concern over mistakes, .83 for parental expectations, .78 for doubting of actions, and .90 for the organization subscale.

General Fear of Failure. Fear of failure was measured with the 5-item short-form of the Performance Failure Appraisal Inventory (PFAI: Conroy 2001; Conroy et al., 2002), a multidimensional measure. The PFAI employs a 5-point rating scale ranging from -2= “Do not believe at all” to +2 = “Believe 100% of the Time.” The inventory measures “beliefs that aversive consequences follow failure” (Conroy et al., 2002, p. 79). The PFAI covers fears of: (a) experiencing shame and embarrassment, (b) devaluing one’s self-estimate, (c) having an uncertain future, (d) important others losing interest, and (e) upsetting important others (Conroy et al., 2002, p. 76). Coefficient alpha of the PFAI’s subscales are acceptable, ranging from .73 to .87. Conroy and his colleagues (2002) showed that the construct validity of the five-item short-form of the PFAI is very similar to its complete form. The short form (see Appendix H) measures general fear of failure and covers all of the content domains mentioned above. The coefficient alpha for the short form was .84 in the present study.

Perceived Stress Scale (PSS). The 10-item version of the Perceived Stress Scale (PSS; Cohen, Kamarck & Mermelstein, 1983; Cohen & Williamson, 1988) is widely used to measure the magnitude of stress in life. The measure employs a 5-point Likert-type scale (from 0 = *never* to 4 = *very often*). The items are presented in Appendix H. Cohen & Williamson (1988) reported acceptable level of reliability (Alpha = .78) and supported the construct validity of the measure. In the present study, the reliability coefficient was .85.

The Self-esteem Scale (SES). The SES (Rosenberg, 1965) was used to measure global self-esteem, overall evaluation of self-worth or positive and negative feelings about self. This

measure consists of 10 items and uses a 4-point Likert-type scale (from 1 = *strongly disagree* to 4 = *strongly agree*). The internal consistency (alpha) coefficient for the total score of the Rosenberg Self-Esteem Scale was .90 in the current study.

Self-Control Scale (SCS). The SCS (Tangney, Baumeister & Boone, 2004) was used to measure multiple aspects of self control failure such as control over thoughts, emotional control, impulse control, performance regulation, and habit breaking. The full-version of the measure consists of 36 items, while the short version consist of 13 items. The short version of the SCS was used in this study. Items are presented in Appendix H. Items are rated on a 5-point Likert-type scale (1 = *not at all like me* to 5 = *very much like me*). The scale was found to have adequate internal consistency (Cronbach's alpha = .89) and test-re-test reliability (Pearson $r = .89$) (Tangney, Baumeister & Boone, 2004). In the current study, the Cronbach's alpha was .82.

Achievement Emotion. A selection of items from the Achievement Emotions Questionnaire (AEQ; Pekrun, Goetz, Frenzel, & Perry, 2005) that measures test-related anxiety before and during taking tests was used. This measure was specifically developed for a student population. Items can be found in Appendix H. The measure uses a 5-point Likert-type scale (1 = *completely disagree*, 5 = *completely agree*). In the current study, the Cronbach's alpha coefficients was .95 for total test anxiety, .87 for test-related anxiety before taking tests, and .93 for test-related anxiety during taking tests.

Action Control Scale (ACS-90). The ACS (Khul & Beckmann, 1994) consists of 36 items and each item consists of two responses: a state- and action-orientation response. The action control scale consists of three subscales: failure-related action orientation (AOF, 12) vs. failure-related state orientation (preoccupation, SOF), decision-related action orientation (AOD,

12 items) vs. decision-related state orientation (SOF; hesitation), and action orientation during (successful) performance of activities (intrinsic orientation) vs. volatility (AOP, 12 items). See Appendix H for the items. Individuals who score high on the test are considered as action oriented and focus more on goal monitoring and putting their plan into action, and less on failure outcomes. The subscale can be calculated in a way to represent state orientation (SOF, SOD, SOP), the opposite of action orientation. Khul and Beckmann (1994) reported the Cronbach's alpha above .70 for all three subscales. Based on the result of previous studies (e.g., Blunt & Pychyl, 2005) only SOF and SOD were included in validation package. The internal consistency coefficients for these subscales were .78 and .75, respectively, in the current study.

PROMIS Measures (PROMIS, 2013). The PROMIS system of measurement includes various self-reported health measures designed to be used in research and counselling programs (Cella et al., 2007). The PROMISS global health items (10 items) were used. The response option was 5-point Likert-type scale. Items and their corresponding response scales are presented in Appendix H. The PROMIS scales are well-defined, had strong psychometric properties and based on validated items (PROMIS, 2013). Two subscales were calculated, global mental health and global physical health based on Hays, Bjorner, Revicki, Spritzer, Cella (2009). The internal consistency coefficient for the subscales was .81 and .54 respectively in the current study. The result only supported the reliability of global mental health. Various aspects of physical health may need to be used separately.

Time-management Questionnaire (TQ). The TQ (Britton & Tesser, 1991) measures various aspects of time management. It consists of 35 items and has 3 subscales: Short-term Planning (7 items), Time Attitudes (6 items), and Long-Rage Planning (5 items). The TQ uses a 5-point scale (anchored to the descriptors *always, frequently, sometimes, infrequently, and*

never). The TQ items are presented in Appendix H. The internal consistency coefficient (Cronbach's alpha) for the TQ's total score was .83 in the current study. The internal consistency coefficient (Cronbach's alpha) for Short-term Planning was .90. The Cronbach's alpha for Time Attitudes, and Long-Range Planning were lower than .50 indicating very poor reliability. The latter subscales were not used in the validation analyses.

Obsessive-Compulsive Inventory-Revised. The OCI-R (OCI-R; Foa et al., 2002) was used to measure obsessive-compulsive symptoms in six areas: (a) washing, (b) checking, (c) obsessions, (d) mental neutralizing, (e) ordering, and (f) hoarding. The inventory consists of 18 items, 3 items per subscale and asks participants to rate how much a particular experience bothered or disturbed them in the past month on a 5-point Likert-type scale ranging from 0 (*not at all*) to 4 (*extremely*). Items are presented in Appendix H. Foa and colleagues (2002) reported adequate internal consistency and test-retest reliability for the OCI-R total score and the 6 subscales. There is also a sufficient evidence of convergent and divergent validity (Foa et al., 2002). The Cronbach's alpha coefficients for the OCI-R total score was .93 and for the subscales ranged from .68 to .86.

Overall Hedonism. Three items of the Overall Hedonism subscale of the Hedonism and Concern Survey (HCS; Audebert, Deiss, & Rousset, 2006) were used. A 7-point Likert scale is used to measure the level of agreement with the HCS items (1, *completely disagree* to 7, *completely agree*). See Appendix H for a list of items. The internal consistency coefficient (Cronbach's alpha) for the three-item Hedonism subscale was .69.

Brief COPE. The COPE (Carver, 1997) was used to measure the following 14 coping strategies: self-distraction, denial, substance use, use of emotional support, use of instrumental

support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame. The measure consists of 28 items and each coping strategy is measured by two items. A 4-point scale ranging from 1 (*I haven't been doing this at all*) to 4 (*I've been doing this a lot*) was used in this study. The scale was found to have acceptable reliability and internal consistency (Carver, 1997). The items are presented in Appendix H.

Demographics and Background Information. Demographics and Background Information including sex, age, marital status, ethnicity, and GPA were measured (see Appendix H).

Validation Measures for Studies 6 and 8

Big Five Personality Traits. Neuroticism, Conscientiousness, Extraversion, Agreeableness and Openness was measured by the Big Five Personality Inventory (BFI; John & Srivastava, 1999; John, Donahue & Kentle, 1991, as cited in John, Naumann, & Soto, 2008). The BFI consists of 44 items and employs a 5-point Likert-type scale scored from 1 (*disagree strongly*) to 5 (*agree strongly*). Items can be found in Appendix B. The BFI has demonstrated an adequate level of internal consistency as well as convergent and divergent validity (John, Naumann, & Soto, 2008). In Study 6, the internal consistency (Cronbach's alpha) coefficients were: .76 for Conscientiousness, .81 for Neuroticism, .86 for Extraversion, .79 for Agreeableness and .73 for Openness. In Study 7, the internal consistency (Cronbach's alpha) coefficients were .80 for Conscientiousness, .81 for Neuroticism, .84 for Extraversion, .76 for Agreeableness and .74 for Openness.

Tuckman Procrastination Scale. The Tuckman Procrastination Scale (TPS; Tuckman, 1991) measures trait procrastination and can be used in both academic and everyday life settings.

The TPS contains 16 items and uses a 4-point Likert-type scale (see Appendix G). The scale was reported to have Cronbach's Alpha of .86. In Study 6, the Cronbach's Alpha coefficient was .91.

General Procrastination Scale. The most frequently cited measure of procrastination in everyday life is the General Procrastination Scale (GPS) developed by Lay (1986). This measure is very often used as a measure of trait or chronic procrastination. This scale contains 20 items (see Appendix A) and uses 5-point Likert-type scale ranging from 1 (*false of me*) to 5 (*true of me*). The scale was reported to have a Cronbach's Alpha of .89. In Study 8, the Cronbach's Alpha coefficient was .88.

Procrastination Assessment Scale-Students (PASS). The PASS is a well-known instrument to measure academic procrastination. The PASS is composed of 38 items and uses a five-point Likert-type scale format. The PASS contains two sections: academic procrastination and academic procrastination reason. In this study, eight items of the PASS from the first section were used to measure procrastination behaviours and procrastination as a problem in writing a term paper, studying for an exam, keeping up with weekly reading assignments, and performing academic tasks in general (see Appendix D). The PASS has demonstrated an adequate level of internal consistency, ranging from .70 to .80. Its test-retest reliability over a 6-week interval ranges from .65 to .74. In study 6 and 8, the Cronbach's Alpha coefficients were .86 and .89 for the total academic procrastination score, respectively.

Activities Questionnaires. This short questionnaire measures whether or not participants read an instruction that is presented before a list of regular activities such as watching movies or cooking (Ariely, 2010). It uses a multiple-choice format. It was included in the study to evaluate whether students read measurement instructions.

Survey Reader Questionnaire (SRQ). This was a set of items that I created for my doctoral dissertation research. It consists of 17 single-choice items that measure whether the participants read the items throughout the survey. These items direct participants to choose a particular answer, skip answering a question, or ask them about the frequency of or general attitude towards particular activities. Only a subset of the SRQ items was used in my research. The items were spread throughout the online survey package and were used to screen for meaningful engagement with the survey completion.

Perceived Academic Performance Scale (PAPS). The PAPS was a new measure that I created for my doctoral dissertation research (Haghbin, 2013). The PAPS measures academic performance based on perceived university standards. It consists of 7 items and uses a 7-point Likert scale format, 1 = *very good* to and 7 = *very poor* (see Appendix D). In Study 8, the internal consistency coefficient (Cronbach's alpha) for the PAPS was .97.

Self-Other Performance Evaluation (SOPE). The SOPE is a new self-report measure that I developed for my research (Haghbin, 2013). The SOPE measures the evaluation of academic performance based on self and perceived other's (e.g., partners, partners) standards and expectations, as well as the discrepancy between self and other's evaluations. It consists of 7 items and uses an 8-point Likert scale format where 0 = *not applicable* and the Likert scale was anchored as 1 = *strongly disagree* to 7 = *strongly agree* (see Appendix G). In Study 8, the internal consistency coefficients (Cronbach's alpha) for the self, parent and partner subscales were above .95, .98 and .97, respectively.

Validation Measures for Studies 7 and 9

In addition to the measures described above (i.e., BFI, TPS, Activities Questionnaire, SRQ, PAPS, and SOPE), for studies 7 and 9, I included the following.

Self-regulation. Self-regulation was measured with the Short Self-Regulation Questionnaire (SSRQ, Carey, Neal, & Collins, 2004). The SSRQ is a short version of the 63-item Self-regulation Questionnaire (SRQ, Brown, Miller, & Lawendowski, 1999) which was designed to assess self-regulation capacity across seven processes. The SSRQ provides one aggregated score for self-regulation and uses a 5-point Likert-type scale, ranging from *strongly disagree* to *strongly agree* (see Appendix H). Carey and colleagues (2004) provided support for the reliability and validity of the measure in a student sample. In Study 7, the internal consistency coefficient (Cronbach's alpha) for total self-regulation was .92.

Self-efficacy. The New General Self-Efficacy scale (NGSE; Ghen, Gully, & Eden, 2001). measures “one’s overall ability to perform successfully in a wide variety of achievement situations” (p. 79, Ghen, Gully, & Eden, 2001). It consists of 8 items and uses a 5-point Likert-type scale (1 = *strongly agree* to 5 = *strongly disagree*). The NGSE’s items are presented in Appendix G. The measure showed satisfactory psychometric properties including internal consistency (Alpha= .88), stability over time ($r = .62$ to $.66$) and content validity, as well as discriminant and predictive validity (Ghen et al., 2001). The internal consistency of the measure was .93 in Study 7.

Eysenck Impulsiveness Subscale. The EIS (Eysenck, Pearson, Easting, & Allsopp, 1985) was used to measure self-control problems. It uses a “yes/no” response format and consists

of 19 items. Items are presented in Appendix G. The internal consistency of EIS was .85 for males and .82 for females (Eysenck et al., 1985). In Study 7, the alpha coefficient was .80.

Perceived Competency Scale. The PCS (PCS; Williams, Freedman, Deci, 1998) is a 4-item scale that measures perceived competency at a given task or in a specific situation. It uses 7-item Likert scale ranging from *not at all true* to *very true* where the greater the score, the greater the perceived competency. Items are presented in Appendix G. The internal consistency of PCS exceeds .80 (Williams & Deci, 1996; Williams et al., 1998). The internal consistency of the PCS was .95 in the study 7.

Analyses

The main statistical analyses used to evaluate the validity hypotheses were correlational analysis, Multiple and Hierarchical Regression Analysis, and ANOVA as well as a “receiver operating characteristics” (ROC) analysis (Green & Swets, 1966; Hosmer & Lemeshow, 2000; van Erkel & Pattynama, 1998). Before each analysis, important assumptions were checked and adjustments were implemented when necessary.

Validity Argument: Propositions, Rationale, Results and Discussion

One of the major purposes of the MMAP was to quantify procrastination problems in order to be used in basic and applied research. For this type of usage, validity evidence based on relations to other variables is especially important. The evidence is also an important source of construct validity, given that clear conceptual and theoretical distinctions exist between components of the MMAP as well as among various prototypes of delay in the DQ. In this section, I present these aspects of validity evidence as part of the validity argument for supporting the interpretation and usage of the MMAP and DQ scores.

Validity evidence related to the internal structure of the MMAP obtained from factor analyses indicated and supported various scores to capture item variations. The scores proposed based on the refined and supported models in the CFA had different levels of data aggregation. At the highest level of aggregation, for all MMAP items, two overall scores could be calculated to measure the intensity and duration of procrastination problems. In the next level of data aggregation, four facets could be calculated to quantify various aspects of procrastination problems. At the lowest level of data aggregation, 11 dimensions could be used to quantify various aspects of the procrastination problem's facets.

Choosing a desired level of aggregation depends on the purpose of a research project. The validity evidence for selected scores was discussed in this section as explained in the introduction to this chapter. Given the appeal and simplicity of high-level aggregation, intensity and duration scores were chosen for detailed discussion of their relations with other variables. Moreover, two dimensions of procrastination behaviour, anxious procrastination and hedonistic delay, are discussed. In the first section below, the relations between procrastination intensity as well as the duration total score with important antecedents of procrastination are studied.

There are two versions of the MMAP, General-MMAP and Specific-MMAP. The differences between these two versions were discussed in the Method sections of the EFA and CFA chapters. There are several methods that can be used to calculate procrastination-intensity scores, including aggregating all items that contributed to the general procrastination score in the final MMAP model (see CFA section), aggregating scores on all of the dimensions in the model, aggregating the three facets (PBS, PNCS and TDNE) in the model, or estimating the factor score based on factor analysis or IRT model. The results of these different methods were similar, therefore the first method was used given its simplicity and broad usage.

Aggregation can be done either by summation or by calculating the average score. There is no difference between the results of averaged or summed total scores. However, the interpretation of average scores is easier since various scales consisted of different numbers of items; therefore averages were used to calculate all scores related to the newly developed measures¹⁹. For the validation scales used in the analyses, scores were calculated based on the test-developers' instructions.

The main purpose of calculating procrastination intensity scores is to quantify the intensity or severity of procrastination problems in academic settings, and the purpose of calculating total duration scores is to provide retrospective information regarding the onset of procrastination problems. In calculating intensity scores, all aspects of procrastination as a psychological problem were included, such as the frequency of procrastination behaviour, perceived negative consequences of the problems, and dissatisfaction and negative emotions related to delaying a task. In calculating duration scores, the start of procrastination behaviour and its subjective negative experiences were targeted. Given the components included in calculating intensity and duration scores, as well as their interrelations, the initial validity propositions listed in Table 13.3 were made. The table also shows propositions related to two dimensions of procrastination behaviour, anxious and hedonistic procrastination.

¹⁹ The averaging method may also protect from a common mistake in calculating aggregated scores in future studies. When missing values are not substituted, summing items to calculate total score is methodologically incorrect since the records with missing values would be artificially low due to missing values.

Studies 6 and 8:

Intensity and Duration Scores. The relation of procrastination intensity and duration with antecedents, other procrastination scales, and academic outcome variables were studied using bivariate zero-order correlations. A majority of the evidence-based validation hypotheses were about procrastination intensity; procrastination duration was a new construct and examining its relation with other variables was exploratory. However, since duration can be considered a complementary method for quantifying procrastination problems or even a proxy for the measure of how problematic procrastination is for participants, I expected the association of the duration scale with major antecedents and outcomes of procrastination to have a similar pattern (significance, direction, differentiation) to that found for intensity, but different magnitude when its relation with antecedents of procrastination was studied. Considered most generally, I assumed that the magnitude of association with duration should be small unless the antecedent factor explained the temporal aspect of procrastination in addition to or instead of frequency of procrastination. For example, self-regulation is fundamental and develops early in life so it can theoretically explain whether or not a person starts procrastinating or experiences negative consequences of procrastination earlier in life. Given these general validity propositions, I examined the relations between intensity and duration with the validation scales (see Table 13-3).

Table 13-3

Hypothesized Relations between Procrastination Intensity Scores and Duration Total Scores, Anxious Procrastination, and Hedonistic Procrastination Behaviours with the Validation Scales used in Study 6 and 8

	Intensity	Duration	AP/ID	HP/HD
Conscientiousness	MN to LN	SR (SN to MN)	MN to LN	MN
Neuroticism	SP to MP	EX (SR)	SP	NR/PZ
Extraversion	PZ to SN	EX (NR/PZ)	NR/PZ	NR/PZ
Agreeableness	PZ to SN	EX (NR/PZ)	NR/PZ	SP
Openness	NR/PZ	EX (NR/PZ)	NR/PZ	NR/PZ
Other Measure of Procrastination	LP	SR (SP to MP)	LP	MP
Self-regulation	MN to LN	MN	MN to LN	MN
Self-efficacy	MN	SN	SN	SN
Impulsivity	SP to MP	SR (SP to MP)	SP	MP
Social Desirability	SP	SP	SP	SP
Academic Achievement	SN	SR (SN)	SR (SN)	SN to MN
High-school Achievement	EX (N)	SR (SN)	EX	EX
Perceived Academic Performance	SN to MN	SR (SN)	SN to MN	SN to MN
Self-Evaluation of Performance	SN to MN	SR (SN)	SN to MN	SN to MN
Perceives Parents Evaluation of Performance	SN to MN	SR (SN)	SN to MN	SN to MN

Note. For abbreviation see Table 13-1.

No conceptually or empirically surprising results were found among the pairwise correlations between the new scales and three major antecedents of procrastination problems, conscientiousness, self-regulation, and self-efficacy (see Table 13-4). All of these associations had medium to large effect sizes, were in the expected direction, and were significant. The relations between the total intensity score and other important personality factors such as neuroticism and impulsivity were also significant and in the expected direction. For example,

given that the conceptualization of procrastination intensity included strong emotional components, the correlation of the total intensity scale with neuroticism was moderate. However the correlations between total duration and neuroticism had small effect sizes across academic task types. This supports the discriminatory value of the duration scale.

The relation between duration and conscientiousness particularly was in the predicted direction. Since higher scores on duration were coded to represent older procrastination behaviour and problems, duration's significant negative correlations with conscientiousness and self-regulation across studies and tasks indicates that people with longer-standing procrastination problems have been affected by low conscientiousness and self-regulation. This is in line with fundamental assumptions in personality psychology and self-regulation theories, which suggest early and enduring effects of major traits and self-regulation ability on behavioural and psychological problems. The correlations of intensity and duration scores with other personality factors were small or negligible as expected.

Table 13-4

The Relation of Intensity and Duration Total Scores from General and Specific MMAP with Personality, Self-regulation, Self-efficacy, Impulsivity and Other Procrastination Measures

	Study 6		Study 8					
	Gen	Gen	Wr	Wr	Re	Re	Ex	EX
	Intensity	Duration	Intensity	Duration	Intensity	Duration	Intensity	Duration
CON	-0.47 ^c	-0.24 ^c	-0.43 ^c	-0.37 ^c	-0.35 ^c	-0.35 ^c	-0.41 ^c	-0.33 ^c
NEU	0.30 ^c	0.08 ^a	0.30 ^c	0.14 ^c	0.35 ^c	0.13 ^c	0.39 ^c	0.16 ^c
EXT	-0.11 ^c	-0.03	-0.13 ^c	-0.08 ^a	-0.08 ^a	-0.07 ^a	-0.13 ^c	-0.08 ^a
AGR	-0.13 ^c	-0.05	-0.11 ^c	-0.09 ^b	-0.13 ^c	-0.11 ^c	-0.14 ^c	-0.10 ^b
OPN	0.03	-0.11 ^c	-0.05	-0.01	-0.06 ^a	-0.03	-0.08 ^a	0.02
TPS	0.63 ^c	0.29 ^c	0.64 ^c	0.53 ^c	0.55 ^c	0.45 ^c	0.62 ^c	0.50 ^c
PASS_T	0.61 ^c	0.25 ^c	0.65 ^c	0.48 ^c	0.62 ^c	0.46 ^c	0.67 ^c	0.50 ^c
PASS_F	0.54 ^c	0.23 ^c	0.59 ^c	0.46 ^c	0.54 ^c	0.43 ^c	0.60 ^c	0.49 ^c
PASS_P	0.59 ^c	0.24 ^c	0.62 ^c	0.43 ^c	0.62 ^c	0.42 ^c	0.64 ^c	0.45 ^c
SRQ	-0.54 ^c	-0.39 ^c	-0.46 ^c	-0.37 ^c	-0.41 ^c	-0.32 ^c	-0.46 ^c	-0.29 ^c
GSE	-0.29 ^c	-0.27 ^c	-0.22 ^b	-0.21 ^b	-0.23 ^c	-0.21 ^b	-0.20 ^b	-0.21 ^b
EIS	0.27 ^c	0.28 ^c	0.18 ^a	0.15 ^a	0.20 ^b	0.17 ^a	0.23 ^c	0.18 ^a
LPS			0.54 ^c	0.49 ^c	0.48 ^c	0.49 ^c	0.49 ^c	0.49 ^c
GPA	-0.23 ^c	-0.17 ^c	-0.23 ^c	-0.11 ^c	-0.24 ^c	-0.14 ^c	-0.26 ^c	-0.17 ^c
HGPA	-0.15 ^c	-0.10 ^b	-0.08 ^a	-0.18 ^c	-0.05	-0.16 ^c	-0.08 ^a	-0.22 ^c
PAP	-0.48 ^c	-0.31 ^c	-0.22 ^c	-0.12 ^c	-0.23 ^c	-0.14 ^c	-0.20 ^c	-0.07 ^a
SEP	-0.52 ^c	-0.29 ^c	-0.46 ^c	-0.30 ^c	-0.42 ^c	-0.25 ^c	-0.44 ^c	-0.28 ^c
PEP	-0.42 ^c	-0.28 ^c	-0.37 ^c	-0.24 ^c	-0.34 ^c	-0.22 ^c	-0.37 ^c	-0.25 ^c

Note. CON = BFI Conscientiousness; NEU = BFI Neuroticism; EXT = BFI Extraversion ; AGR = BFI Agreeableness ; OPE = BFI Openness; SRQ = Self-regulation total; GSE = General Self-Efficacy; EIS = Impulsiveness Subscale Total (Eysenck Impulsiveness Questionnaire); TPS = Tuckman Procrastination Scale Total Score; PASS_T = PASS Total Score; PASS_F = Total Frequency Items of the PASS; PASS_P = Total severity/problem items on the PASS ; LPS = Lay's Procrastination Scale Total Score; GPA = Current (university) GPA; HGPA = High school GPA; Perceived Academic Performance Scale total score; PAP = Perceived Academic Performance Scale total score; PEP = Perceived Parents' Evaluation of Academic Performance; SEP = Self Evaluation of Academic Performance . $N = 994$ for study 6; N was 252 for SRQ, GSE, and EIS in Study 6; N was 824 and 813 for GPA and HGPA in Study 6; N was 907 to 929 for the majority of Study 8 relations; N was 890 to 900 for GPA and 963 to 973 for HGPA in Study 8; N was between 200 and 255 for SRQ, GSE and EIS in study 8; $a \leq .05$; $b \leq .01$; $c \leq .001$ ²⁰.

²⁰ Given the presence of both directional and non-directional hypotheses, two-tailed tests were selected for evaluation of significance to reduce complications. This choice may have provided a more conservative criterion for rejecting the null hypothesis when the validity hypotheses were directional; however since sample size is large, conservative criteria can be desirable.

Procrastination intensity had large associations with other measures of procrastination. However the effect size for the relation of duration and other procrastination factors was medium in magnitude for specific tasks and small for the general version of the MMAP. This was expected because the duration scale is different from operationalizations of trait procrastination and procrastination behaviour that were used in older measures of procrastination.

In addition to antecedents of procrastination and other measures of procrastination, it was important to measure the relation between procrastination problems and academic performance at school. Although the relation between previous measures of procrastination and academic achievement has been inconclusive (e.g., Steel, 2007), I expected that this new measure of procrastination problems would have significant negative relations with academic achievement and performance, particularly for self-evaluation of academic achievement and for perceived performance. In Studies 6 to 9, several measures of academic achievement and performance were used, including GPA, perceived academic performance, perceived parents' evaluation of academic performance, and self-evaluation of academic performance. As expected, procrastination intensity had significant negative relations with all of the above variables.

The relation between procrastination intensity and GPA had a small but statistically significant effect on GPA in both studies and across various tasks. These associations had larger effect sizes (medium effect size) for perceived measures of academic achievement and performance. Interestingly, but expectedly, among academic achievement and performance factors, procrastination had a stronger association with the evaluation of academic performance according to one's own standards. The relation of academic and achievement factors with procrastination duration was also studied. Similar to intensity, duration had significant and negative relations with achievement and performance factors, and intensity scores had a stronger

relation with perceived academic achievement than with actual GPA. The magnitude of these relations with procrastination duration was smaller than the magnitude of the relations with intensity.

To evaluate the unique effect of personality factors in explaining the new total scores, I calculated semipartial correlations between intensity and duration factors and five personality factors using multiple regression analysis (see Table 13-5). Both conscientiousness and neuroticism traits had a unique significant relations with procrastination intensity across studies and tasks. The magnitudes of the relations with these personality traits were comparable for the task-specific version of the MMAP. In terms of duration, the unique association with conscientiousness was significant, but its association with neuroticism was not significant after removing the effect of other personality traits. The results were compatible with the general consensus among procrastination researchers, who see low conscientiousness as one of the major sources procrastination problems (e.g., Lay, 1997; Watson, 2001).

Table 13-5

Semipartial Correlations between Intensity and Duration Factors and Personality Factors

	Study 6		Study 8					
	Gen	Gen	Wr	Wr	Re	Re	Ex	EX
	Intensity	Duration	Intensity	Duration	Intensity	Duration	Intensity	Duration
CON	-0.41	-0.23	-0.37	-0.35	-0.28	-0.32	-0.33	-0.29
NEU	0.18	0.03	0.20	0.06	0.27	0.04	0.29	0.08
EXT	-0.02	0.02	-0.01	-0.01	0.04	0.00	0.01	-0.01
AGR	0.01	0.04	0.04	0.02	0.01	-0.01	0.02	-0.01
OPN	0.08	-0.10	0.01	0.03	-0.02	0.01	-0.02	0.06
R-Square	0.26	0.07	0.23	0.14	0.20	0.12	0.26	0.12

Note. CON = BFI Conscientiousness; NEU. = BFI Neuroticism; EXT = BFI Extraversion; AGR = BFI Agreeableness; OPE = BFI Openness; $a \leq .05$; $b \leq .01$.

Procrastination Behaviours. Table 13-6 presents the relation between procrastination behaviour scores in the MMAP and the set of personality, self-system, and academic outcome

variables presented above. There were no major differences between the two dimensions of procrastination behaviour when their relations with conscientiousness were examined. Conscientiousness had a moderate negative relation with both anxious and hedonistic procrastination. Lower levels of conscientiousness may not only lead to delaying tasks for irrational reasons but also to hedonistic postponement of tasks. However, the relation of procrastination behaviours to neuroticism and agreeableness differed, providing discriminant validity evidence for the dimensions. Across both studies and across tasks, neuroticism was significantly related to anxious procrastination but not hedonistic procrastination. Agreeableness was significantly associated with hedonistic procrastination in both studies and for all tasks, but was not consistently associated with anxious procrastination. It should be noted that all of these relations had small effect sizes regardless of sample and type of task.

Similar to conscientiousness, self-regulation had a moderate association with both dimensions (i.e., prototypes) of procrastination behaviours in both Study 6 and 8 and across tasks. The relations of self-efficacy and the procrastination behaviours were not uniform. Self-efficacy had a significant negative relation only with overall anxious procrastination and with anxious procrastination on studying for exams. However, the relation between self-efficacy and hedonistic delay was significant for overall academic tasks and for each specific task. The relation between self-efficacy and hedonistic delay was stronger for studying for exams than for writing and reading tasks. But the difference was only significant between exam and reading tasks based on Steiger's Z -test for correlated correlations ($Z = 2.51, p < .05$). The results may be considered as discriminant validation evidence related to anxious and hedonistic procrastination behaviour. The overall procrastination score, which sums the two procrastination behaviours, had significant relations with self-efficacy in both studies.

Table 13-6

The Relation of the Procrastination Behaviour Scales with Personality, Self-system and Academic Performance

	Study 6			Study 8								
	Gen	Gen	Gen	Wr.	Wr.	Wr.	Re	Re	Re	Ex	Ex	Ex
	PBS	ID	HD									
CON	-0.51 ^c	-0.50 ^c	-0.40 ^c	-0.48 ^c	-0.46 ^c	-0.39 ^c	-0.40 ^c	-0.35 ^c	-0.35 ^c	-0.46 ^c	-0.44 ^c	-0.38 ^c
NEU	0.06	0.13 ^c	-0.03	0.10 ^b	0.18 ^c	-0.03	0.12 ^c	0.23 ^c	-0.02	0.15 ^c	0.23 ^c	0.02
EXT	-0.04	-0.08 ^a	0.01	-0.09 ^b	-0.12 ^c	-0.03	-0.04	-0.07 ^a	0.00	-0.07 ^a	-0.10 ^b	-0.02
AGR	-0.17 ^c	-0.10 ^b	-0.21 ^c	-0.14 ^c	-0.08 ^b	-0.18 ^c	-0.12 ^c	-0.04	-0.15 ^c	-0.18 ^c	-0.10 ^b	-0.23 ^c
OPN	0.00	0.02	-0.02	-0.06	-0.05	-0.05	-0.04	-0.03	-0.05	-0.08 ^a	-0.07 ^a	-0.07 ^a
TPS	0.68 ^c	0.75 ^c	0.44 ^c	0.66 ^c	0.72 ^c	0.44 ^c	0.60 ^c	0.66 ^c	0.39 ^c	0.65 ^c	0.72 ^c	0.41 ^c
PASS_T	0.59 ^c	0.65 ^c	0.38 ^c	0.61 ^c	0.66 ^c	0.40 ^c	0.60 ^c	0.66 ^c	0.40 ^c	0.64 ^c	0.71 ^c	0.40 ^c
PASS_F	0.61 ^c	0.66 ^c	0.39 ^c	0.63 ^c	0.67 ^c	0.44 ^c	0.64 ^c	0.67 ^c	0.45 ^c	0.66 ^c	0.71 ^c	0.43 ^c
PASS_P	0.50 ^c	0.55 ^c	0.32 ^c	0.51 ^c	0.57 ^c	0.31 ^c	0.49 ^c	0.56 ^c	0.30 ^c	0.54 ^c	0.61 ^c	0.32 ^c
SRQ-T	-0.52 ^c	-0.47 ^c	-0.46 ^c	-0.46 ^c	-0.44 ^c	-0.40 ^c	-0.35 ^c	-0.34 ^c	-0.28 ^c	-0.45 ^c	-0.42 ^c	-0.39 ^c
GSE-T	-0.23 ^c	-0.24 ^c	-0.17 ^b	-0.17 ^a	-0.10	-0.21 ^b	-0.14	-0.08	-0.17 ^a	-0.30 ^c	-0.22 ^b	-0.32 ^c
EIS	0.33 ^c	0.23 ^c	0.37 ^c	0.25 ^c	0.18 ^a	0.29 ^c	0.24 ^c	0.09	0.33 ^c	0.28 ^c	0.17 ^a	0.36 ^c
LPS				0.62 ^c	0.65 ^c	0.42 ^c	0.57 ^c	0.62 ^c	0.39 ^c	0.56 ^c	0.62 ^c	0.33 ^c
GPA	-0.18 ^c	-0.16 ^c	-0.16 ^c	-0.23 ^c	-0.20 ^c	-0.22 ^c	-0.23 ^c	-0.20 ^c	-0.22 ^c	-0.22 ^c	-0.19 ^c	-0.20 ^c
HGPA	-0.15 ^c	-0.12 ^c	-0.14 ^c	-0.12 ^c	-0.10 ^c	-0.11 ^c	-0.07 ^a	-0.05	-0.06	-0.13 ^c	-0.09 ^b	-0.13 ^c
PAP	-0.39 ^c	-0.37 ^c	-0.33 ^c	-0.19 ^c	-0.18 ^c	-0.16 ^c	-0.22 ^c	-0.19 ^c	-0.20 ^c	-0.19 ^c	-0.17 ^c	-0.17 ^c
SEP	-0.36 ^c	-0.41 ^c	-0.21 ^c	-0.35 ^c	-0.37 ^c	-0.24 ^c	-0.35 ^c	-0.36 ^c	-0.26 ^c	-0.37 ^c	-0.38 ^c	-0.26 ^c
PEP	-0.32 ^c	-0.31 ^c	-0.26 ^c	-0.32 ^c	-0.29 ^c	-0.27 ^c	-0.30 ^c	-0.27 ^c	-0.26 ^c	-0.34 ^c	-0.31 ^c	-0.30 ^c

Note. CON = BFI Conscientiousness; NEU = BFI Neuroticism; EXT = BFI Extraversion ; AGR = BFI Agreeableness; OPE = BFI Openness; SRQ = Self-regulation total; GSE = General Self-Efficacy; EIS = Impulsiveness Subscale Total (Eysenck Impulsiveness Questionnaire); TPS = Tuckman Procrastination Scale Total Score; PASS_T = PASS Total Score; PASS_F = Total Frequency Items of the PASS; PASS_P = Total severity/problem items on the PASS ; LPS = Lay's Procrastination Scale Total Score; GPA = Current (university) GPA; HGPA = High school GPA; Perceived Academic Performance Scale total score; PAP = Perceived Academic Performance Scale total score; PEP = Perceived Parents' Evaluation of Academic Performance; SEP = Self Evaluation of Academic Performance. N = 994 for Study 6; N was 252 for SRQ, GSE, and EIS in Study 6; N was 824 and 813 for GPA and HGPA in Study 6; N was 900 to 917 for the majority of pairwise relations in Study 8; N was between 198 and 257 for SRQ, GSE and EIS in Study 8; N was 880 to 893 for GPA and 958 to 969 for HGPA in Study 8; a ≤ .05; b ≤ .01.

One of the important convergent-evidence hypotheses was about the relation between impulsivity and procrastination behaviours. As expected, the correlation analysis showed a stable pattern of significant positive associations between impulsivity and hedonistic procrastination in both studies and across tasks. The effect sizes for these relations were medium. The relation between impulsivity and anxious procrastination was also positive and significant, but the effect size was small. All of these results were in line with the definitions of anxious and hedonistic procrastination behaviours and the difference between them.

Overall, it seems that conscientiousness and self-regulation are the shared antecedents for anxious and hedonistic procrastination; neuroticism was more specifically related to anxious procrastination; whereas self-efficacy, impulsivity, and agreeableness were more specifically associated with hedonistic procrastination. It should be noted that procrastination behaviours total score was related to all of the above variables; however, the differentiations in correlates of the two procrastination behaviours could not be detected if only the total PBS score was used. These findings support the calculation and usage of specific procrastination behaviour scores in empirical research that is geared toward understanding the behaviours and developing a theoretical model that contains procrastination behaviour as a component.

The relation between the overall procrastination behaviour score and scores on other measures of procrastination was examined. Total procrastination behaviour had a large and significant relation with other measures of procrastination. In terms of specific procrastination behaviour scores, anxious procrastination, as expected, had large correlations with previous measures of procrastination across samples and on various tasks. As expected, the relation between hedonistic procrastination and previous measures of procrastination was moderate, supporting the uniqueness of the new measure. This result supports the usage of the 5-item

anxious procrastination scale as a substitute for measuring procrastination based on traditional conceptualizations of procrastination. To measure procrastination behaviour based on this new conceptualization, both anxious and hedonistic procrastination need to be measured and calculated.

Finally, the relations between procrastination behaviour total scores, anxious procrastination, and hedonistic procrastination and various measures of academic achievement and performance were significant and negative, the effect size was small. More specifically, the PBS, AP, and HP total scores had a stable pattern of relations with GPA. The magnitude of these associations in study 8 was very similar across tasks.

Studies 7 and 9

Prototypes of delay. Given the component similarities and conceptual overlap between the DQ and the MMAP, I used convergent and divergent validation constructs similar to the ones I had used in to validate the MMAP in the initial validation of the DQ. A detailed list of convergent and divergent validity propositions for the various prototypes of delay are presented in Table 13-7.

Table 13-7

Hypothesized Relations between DQ Subscales with the Validation Scales used in Studies 7 & 9

	IrD	HD	InD	PD	AD	DEP
Conscientiousness	MN to LN	MN	NR/PZ	MP	SR (SN)	SN
Neuroticism	SP to MP	PZ	PZ to SP	PZ to SN	PZ to SN	MP
Extraversion	NR/PZ	NR/PZ	EX	EX	PZ to SP	NR/PZ
Agreeableness	NR/PZ	SP	NR/PZ	NR/PZ	EX	NR/PZ
Openness	NR	NR	NR	NR	NR	NR
Other Measure of Procrastination	LP	MP	PZ to SP	MN	SP	SR(P)
Self-regulation	MN to LN	MN	NR/PZ	SP-MP	PZ to SN	SR(N)
Impulsivity	SP	MP	PZ	PZ to SN	SP to MP	SR(P)
Self-efficacy	SN	SN	PZ	SP	EX	SR (N)
Perceived Competency	SN to MN	SN to MN	PZ	SP to MP	EX	SR(N)
Social Desirability	SP	SP	PZ to SP	PZ to SN	PZ to SP	PZ to SP
Academic Achievement	SN	SN	EX	SP	EX	SN
High-school Achievement	EX(N)	EX(N)	EX	EX(P)	EX	EX
Perceived Academic Performance	SN to MN	SN to MN	EX (PZ)	SP to MP	EX	SN to MN
Self-Evaluation of Performance	SN to MN	SN to MN	EX	SP to MP	EX	SN to MN
Perceives Parents Evaluation of Performance	SN to MN	SN to MN	EX	EX(P)	EX	SN to MN

Note. IrD = Irrational Delay (Anxious Procrastination); HD = Hedonistic Delay (Hedonistic Procrastination); InD = Inevitable Delay; PD = Purposeful Delay; AD = Arousal Delay; DEP = Delay due to Emotional Problems.

The above propositions were tested in Study 7 and replicated in Study 9 using similar validation scales. Table 13-8 presents the correlations of the various validation measures with the DQ subscales including Irrational (IrD), Hedonistic (HD), Inevitable (InD), Purposeful (PD), and Arousal (AD) Delay and Delay due to Emotional Problems (DEP) in Studies 7 and 9. The hypotheses related to irrational and hedonistic delay were identical to the hypothesis presented for anxious and hedonistic procrastination measured by the MMAP-general in Study 6 and

MMAP-specific in Study 8. Comparing these relations using two methods of measurement provided strong construct validation information for the scores calculated by the DQ and MMAP. As expected, no practically important differences were found between the relations measured by the MMAP in Studies 6 and 8, and the same relations measured by the DQ in Studies 7 and 9. The correlations related to major validity relations (e.g., self-regulation, conscientiousness, impulsivity, GPA) were very similar. A minor difference was found in the magnitude of the correlations, particularly when the association under study had very weak relations (see Tables 13-6 and 13-8). These minor differences between studies were expected based on the differences in the method of measurement, sample size, and types of tasks.

Some of the important discriminant validity evidence was solidified when comparing the relations across the four studies. As expected, associations with agreeableness showed the same interesting patterns. Agreeableness had a stronger relation with hedonistic delay (hedonistic procrastination) than with irrational delay in all studies. In fact, this difference was more pronounced in the DQ than in the MMAP, and in Study 7 than in other studies. Overall the replication of results leaves little doubt about differentiation between procrastination behaviours with this major personality variable. Another interesting finding was that the relation between agreeableness and arousal delay was negative and similar in magnitude to its relation with hedonistic delay. This was a congruent finding given the conceptual and empirical overlap between hedonistic delay and arousal discussed and presented in Chapter 11 with the result of the confirmatory factor analysis. Once again, the direction of the relation was opposite to what I initially expected. However, it can be argued that both in both arousal and hedonistic delay, the agent consciously ignores the optimal/recommended timing for starting imposed tasks, and intentionally postpones tasks until the last minute. In both types of delay, the relation to lower

levels of agreeableness indicates that rebelliousness or disagreeableness may be involved in this decision to delay task engagement. Rebelliousness has been identified as one of the main underlying causes of procrastination since early attempts to understand procrastination (see Ferarri et al., 1995). In other words, my initial hypothesis about hedonistic delay drew a superficial link between being careless and easygoing in the hedonistic delayer and being agreeable. Instead, the correlational evidence implies a stronger theoretical link between the constructs.

Similar to agreeableness, I expected impulsivity to be associated with hedonistic delay differently than with irrational delay. In line with the definitions of these constructs and with previous findings, hedonistic delay had a moderate positive relation with impulsivity and irrational delay had a small positive relationship. The difference was significant in both Study 7 and Study 9 (Steiger's Z for differences was above 2.58 in both studies, $p < .01$). The differences in the correlations of impulsivity with hedonistic delay and irrational delay measured by the DQ in Studies 7 and 9 were similar to the ones found in Studies 6 and 8. Once again, the differentiation between hedonistic delay and irrational delay's correlation with impulsivity was stronger for the DQ (Studies 7 and 9, Hotteling's t and Steiger's Z were above 4) than for the MMAP (Studies 6 and 9, Hotteling's t and Steiger's Z were between 2.5 and 3). Furthermore, the association between impulsivity and arousal delay was very similar to the association found for hedonistic delay in Studies 7 and 9.

Table 13-8

The Relation of the Delay Questionnaire Subscales with Personality, Self-system and Academic Performance

	Study 7						Study 9					
	IrD	HD	Ind	PD	AD	DEP	IrD	HD	InD	PD	AD	DEP
CON	-0.52 ^c	-0.46 ^c	0.03 ^c	0.35 ^c	-0.31 ^c	-0.32 ^c	-0.42 ^c	-0.45 ^c	0.06	0.29 ^c	-0.35 ^c	-0.35 ^c
NEU	0.20 ^c	0.00	0.02	-0.18 ^c	-0.09 ^c	0.34 ^c	0.24 ^c	-0.07	0.06	-0.02	-0.08	0.30 ^c
EXT	-0.08	-0.03	0.14 ^b	0.13 ^b	0.04	-0.09 ^a	-0.10 ^a	0.02	0.13 ^b	0.15 ^c	0.07	-0.04
AGR	-0.10 ^a	-0.34 ^c	-0.08	0.02	-0.29 ^c	-0.30 ^c	-0.07	-0.26 ^c	0.03	0.10 ^a	-0.23 ^c	-0.23 ^c
OPN	-0.01	-0.10 ^a	-0.04	0.01	0.00	-0.01	-0.08	-0.16 ^c	-0.03	0.06	-0.02	-0.06
TPS	0.72 ^c	0.42 ^c	0.02	-0.41 ^c	0.29 ^c	0.21 ^c	0.68 ^c	0.32 ^c	-0.02	-0.40 ^c	0.29 ^c	0.31 ^c
SRQ	-0.50 ^c	-0.45 ^c	-0.03	0.34 ^c	-0.29 ^c	-0.34 ^c	-0.51 ^c	-0.42 ^c	0.00	0.28 ^c	-0.28 ^c	-0.32 ^c
EIS	0.26 ^c	0.40 ^c	0.10 ^a	-0.09 ^a	0.28 ^c	0.25 ^c	0.16 ^c	0.41 ^c	0.07	-0.12 ^a	0.36 ^c	0.29 ^c
GSE	-0.27 ^c	-0.25 ^c	0.02	0.27 ^c	-0.09	-0.28 ^c	-0.24 ^c	-0.22 ^c	-0.01	0.23 ^c	-0.10 ^a	-0.33 ^c
PCS	-0.41 ^c	-0.36 ^c	-0.04	0.30 ^c	-0.19 ^c	-0.31 ^c	-0.41 ^c	-0.31 ^c	-0.02	0.31 ^c	-0.14 ^b	-0.35 ^c
SD	0.26 ^c	0.22 ^c	0.02	-0.15 ^c	0.06	0.09 ^a	0.22 ^c	0.09 ^a	-0.05	-0.14 ^b	0.03	0.10 ^a
GPA	-0.22 ^c	-0.22 ^c	-0.12 ^a	0.07	-0.16 ^c	-0.16 ^c	-0.19 ^c	-0.22 ^c	-0.04	0.08	-0.05	-0.17 ^c
HGPA	-0.11 ^a	-0.14 ^b	0.06	0.14 ^b	-0.07	-0.07	-0.09	-0.12 ^a	0.07	0.07	0.03	-0.02
PAP	-0.37 ^c	-0.42 ^c	-0.09 ^a	0.24 ^c	-0.27 ^c	-0.34 ^c	-0.34 ^c	-0.40 ^c	-0.02	0.20 ^c	-0.15 ^c	-0.31 ^c
SEP	-0.41 ^c	-0.28 ^c	-0.05	0.28 ^c	-0.16 ^c	-0.27 ^c	-0.47 ^c	-0.29 ^c	-0.02	0.27 ^c	-0.12 ^b	-0.30 ^c
PEP	-0.31 ^c	-0.33 ^c	-0.03	0.23 ^c	-0.21 ^c	-0.31 ^c	-0.32 ^c	-0.34 ^c	0.02	0.20 ^c	-0.18 ^c	-0.28 ^c

Note. IrD = Irrational Delay (Anxious Procrastination); HD = Hedonistic Delay (Hedonistic Procrastination); InD = Inevitable Delay; PD = Purposeful Delay; AD = Arousal Delay; DEP = Delay due to Emotional Problems; CON. = BFI Conscientiousness; NEU = BFI Neuroticism; EXT = BFI Extraversion; AGR = BFI Agreeableness; OPE = BFI Openness; SRQ = Self-regulation total; GSE = General Self-Efficacy; EIS = Impulsiveness Subscale Total (Eysenck Impulsiveness Questionnaire); PCS = Perceived Competency Scale total score; SD = Marlowe-Crowne Social Desirability total score; GPA = Current (university) GPA; HGPA = High school GPA; Perceived Academic Performance Scale total score; PAP = Perceived Academic Performance Scale total score; PEP = Perceived Parents' Evaluation of Academic Performance; SEP = Self Evaluation of Academic Performance. a ≤ .05; b ≤ .01; N = 515 for Study 7; N was 504 and 515 for the majority of pairwise comparisons in Study 7; N was 421 and 437 for GPA and HGPA in Study 7. N = 476 for Study 9; N for GPA and HGPA was 437 and 408 respectively. N for pairwise relation with SRQ in Studies 7 and 9 were 515 and 146 respectively.

In contrast to irrational and hedonistic delay, purposeful delay was considered an adaptive form of delay by definition, therefore its relations with validity scales were generally expected to be in the opposite direction from the relations of the validity scales with irrational and hedonistic delay. For example, as expected, the signs of the relation between purposeful delay and antecedents of procrastination were opposite of the signs for irrational delay (anxious procrastination) relations with those antecedents. Specifically, the associations of purposeful delay with conscientiousness, self-regulation, self-efficacy, and perceived competency were positive, ranging from small to moderate. The magnitude of the relations was lower for purposeful delay than for irrational delay. Similarly, the correlation between purposeful delay and previous measures of procrastination was moderate and negative, whereas the relation between irrational delay and previous measures of procrastination was large and positive. As the difference in the magnitudes of correlations showed, the purposeful delay scale was not the exact opposite of the irrational delay scale, supporting the discriminant validity of their scores. Moreover, the correlations between purposeful delay and irrational delay were low (see Table 13-9).

Table 13-9
Correlations among DQ Subscales in Studies 7 and 9

	IrD	HD	InD	PD	AD	DEP
IrD	1.00	0.39	0.15	-0.23	0.23	0.3
HD	0.44	1.00	0.18	0.02	0.51	0.41
InD	0.15	0.21	1.00	0.42	0.14	0.34
PD	-0.24	-0.02	0.42	1.00	0.04	0.08
AD	0.28	0.59	0.22	0.08	1.00	0.34
DEP	0.28	0.43	0.32	0.16	0.32	1.00

Note. IrD = Irrational Delay; HD = Hedonistic Delay; InD = Inevitable Delay; PD = Purposeful Delay; AD = Arousal Delay; DEP = Delay due to Emotional Problems; Correlations greater than or equal to 0.08, 0.11, 0.14 were significant at 0.05, 0.01, 0.001 alpha level in Study 7 (N = 580; below the diagonal).

Correlations greater than or equal to 0.09, 0.11 and 0.14 were significant at 0.05, 0.01 and 0.001 in Study 9 (N = 528; above the diagonal).

The relation with self-regulation was very similar across studies despite the fact that the sample size for pairwise comparisons related to the SSRQ (i.e., measure of self-regulation) in Study 9 was much smaller than in Study 7. In line with theoretical assertions and empirical evidence that highlight the relation between procrastination and self-regulation (e.g., Senecal, Koestner, & Vallerand, 1995; Tice & Baumeister, 1997; van Eerde, 2000; Wolters, 2003), both anxious and hedonistic procrastination had significantly negative relations with self-regulation. However, as expected, inevitable delay did not have a significant relation with self-regulation. It was expected that the sign of the relation between self-regulation and purposeful delay would be the opposite of that for irrational delay. However, it was not expected to find a large effect size since self-regulation is not a proximal causal factor for purposeful delay. Logically and by definition, self-regulation could not result in purposeful delay, but it can be assumed that those with a high level of self-regulation engage more in purposeful delay than in other forms of delay when they have multiple competing projects in order to optimize their performance. The results support this argument. As expected, and in contrast with the results for irrational delay, purposeful delay had a positive association with self-regulation. As expected, the effect size was significantly lower for purposeful delay in comparison to irrational delay (see Table 13-8).

The relation between arousal delay and self-regulation was also explored. Despite the controversial suggestion that arousal delay is merely a result of sensation seeking and that these individuals have a conscious preference for the excitement of doing tasks at the last minute as opposed to delaying due to self-regulation failure (e.g., Ferrari, 1991; Simpson & Pychyl, 2009), the results indicated a significant negative relation between this type of delay and self-regulation. Generally, psychological and emotional problems are linked to self-regulation problems and low

conscientiousness; therefore, I expected a negative association between these factors and delay due to emotional problems (DEP). The results of both studies supported these propositions.

Overall, the prototypes of delay showed different patterns of relations with important personality factors and self-system causal processes. Personality and self-system mechanisms had relations with all prototypes of delay. However the level and nature of these associations was expected to be different given the definition of the prototypes. For irrational delay, hedonistic delay, delay due to emotional problems and arousal delay, personality and self-system mechanisms were suggested to be major causal factors, but for purposeful delay and inevitable delay, personality and self-system mechanisms could not be considered causal. For purposeful and inevitable delay, situational factors can be considered the major causal factors. Multiple projects, busy and demanding schedules, and unexpected/emergency events are some of the factors that might contribute to variation in prototype scores for purposeful and inevitable delay. This was why the correlations of these prototypes with major personality factors were not high. Despite the small correlations, it is important to differentiate between prototypes of delay and delay type and their correlations with external personality and psychological constructs. The effect sizes for the relations between psychological factors (including personality and self-system variables) and types of delay, particularly irrational delay and purposeful delay, could show higher level relations than the ones obtained based on prototype measures. In a prototype conceptualization, all prototypes of delay can be attributed to all individuals, whereas in a type conceptualization, only one type of delay is attributed to each test taker. In study 10, the differences between these two conceptualizations were studied and compared.

In addition to personality and self-system factors, it was important to examine the relation between various prototypes of dilatory behaviour and GPA (academic achievement), one of the

most important outcome variables in academic settings. There are a number of factors that influence academic achievement, including intelligence and cognitive abilities, specific personality traits, parents' academic socialization and socio-economic status, and so on. Even a small effect size related to GPA is practically and theoretically important. Given multiple influential factors on GPA, it was expected that irrational delay, hedonistic delay, and delay due to emotional problems (DEP) would have significant, negative, but small associations with actual GPA, and that purposeful delay would have very small but positive relations with GPA. Regarding arousal (AD) and inevitable delay (InD), no specific associations were predicted, as the nature of this relation is paradoxical. On the one hand, intentional delay at the last minute with justification that the person works better under pressure (i.e., AD) should not affect performance, particularly if the claim is true. On the other hand, we can question whether habitually doing tasks "with too little time" or "delaying tasks enough to create time pressure" may have significant and negative influence on GPA. These relations were explored in Studies 7 and 9.

In terms of inevitable delay, since the delay is due to rational reasons, one would not necessarily expect to find an association between such a delay and GPA in long run. The influence of such forms of delay was expected to be limited to certain tasks/courses and influence only immediate outcomes such as a course exam. The significance and direction of InD's effect on grades depends on whether it is a habitual delay or merely a temporary form of delay lasting for a short period of time. For those who report only inevitable delay and no other forms of delay (particularly irrational and hedonistic delay), the relation between InD and GPA and other positive outcomes could even be positive. The prototypes measure does not provide differentiation directly and therefore InD correlations may vary from a very small negative

association to a positive association. Given such a complex relation between InD and GPA, it was difficult to state clear validity propositions.

The findings indicated that IrD, HD, and DEP had small negative but practically²¹ and statistically significant relations with GPA. The results supported an interpretation of high levels of IrD, HD, and DEP as maladaptive/or negative forms of delay. The results also replicated the findings in Studies 6 and 8 where various procrastination scores had small negative associations with GPA.

The hypothesis for the purposeful procrastination prototype was not fully supported. The PD showed a positive association with GPA based on Study 9 but the association was very small. The correlation was not significant in Study 7. The correlation of AD and InD with GPA was not consistent across studies. There were small negative relations between these two types of delay and GPA in Study 7 but the relations were not significant in Study 9.

Theoretically, there is often a difference between an official or objective index of academic achievement and an internal or subjective index of academic achievement. In fact, I argue that self-perceived achievement can be clinically important as it has stronger and direct

²¹ An effect-size statistic can be interpreted in two ways. First we can use it to categorise an effect as negligible, small, moderate, or large. Second, we can use it to determine whether the effect is practically significant. This second interpretation is often the goal of applied research. However, there is no single standard or cut-off for determining practical significance. Determining the practical significance of an effect depends on many factors, including the area of research, the nature of relations between variables, and the number of causal or explanatory factors, the complexity of relations, as well as the theoretical proximity between the independent and dependent variable. It is important to select a conservative cut-off that could be accepted by many researchers in the field.

When the effect of a clinical or educational intervention is evaluated, its practical significance can be estimated based on a cost-benefit analysis. For academic achievement, even a small change in effect size (.10) can be considered practically significant. In this study, correlations equal to or above .20 were considered practically significant based on Franzblau (1958), Lipsey (1998), and Ferguson (2009). This magnitude is equal to Cohen's $d = .4$; it is a small-to-medium effect size based on Cohen's guidelines, and can be considered a conservative magnitude for relations between dilatory behaviours and educational and health outcomes. This magnitude was twice the statistically significant correlation in most studies in this dissertation.

theoretical link to psychological and health outcomes such as mental and physical health. Studying the relations between prototypes of delay and perceived evaluation of academic performance may differentiate negative/maladaptive forms of delay from adaptive ones. Given the theoretical and conceptual association between some of the new measures of academic delay and the perceived evaluation of academic performance, studying these relations was important for building a validation argument.

A perceived negative influence on academic achievement and performance was part of the definition of IrD, HD, and DEP. Therefore, I expected to find negative associations between these prototypes of delay and self-perceived measures of performance. In comparison to the relations of the prototypes with actual self-reported GPA, I also expected to see a stronger relation between the prototypes as “perceived measures” of delay and “perceived measures” of academic achievement or performance. Similarly it was expected to see an opposite direction with the PD, an optimal form of delay. Since neither positive nor negative effects on performance was part of the definition of purposeful delay, the magnitude of the association was not expected to be larger than the relation between irrational delay and perceived performance. The correlational findings supported all of the validity propositions. In fact, the association of IrD, HD, and DEP with measures of perceived academic performance and self-evaluation of performance was moderate and negative in both studies. These results, in addition to the findings related to the relation with GPA, supported that the IrD, HD and DEP scores captured the negative aspects of delay; therefore interpretation of these forms of delay as negative was supported.

The associations of the InD and AD with the perceived measures of academic performance were evaluated. Interestingly and consistently, the association of perceived

academic performance with InD was not significant, whereas its association with AD was significant and in a negative direction. Based on this finding, it is impossible to categorize or interpret either InD or AD as positive forms of delay. This was particularly important for the interpretation of AD scores. Based on the definition of the AD, those who endorse high levels of AD claimed that perform better by doing tasks at the last minute. However, the results reveal negative relations between the AD and GPA in study 7 and between AD and several measures of perceived performance in both Study 7 and Study 9. Overall, these results indicate that AD might need to be considered a negative form of delay; however, such an interpretation requires further study.

Study 10

In study 10, I administered both the MMAP and the DQ simultaneously. This allowed me to compare the associations of scores from the two new measures with a set of validity scales. However, before presenting the validity propositions and discussing the findings related to convergent and discriminant validity evidence, I present the pairwise associations between the main scores of the two new measures. I then present the prevalence of the each form of delay in a student population based on the data from Study 10. To have better estimation of the prevalence, I compare the endorsement of prototypes of delay in Study 10 with Study 7 and 9. In the next section that follows, I report the convergent and divergent validity evidence related to the overall intensity and duration of procrastination based on the MMAP. The DQ had two different measures (delay prototypes and delay types) of the same constructs in these studies. For each set of validation scales (e.g., Antecedents), convergent and divergent validity information related to prototypes of delay (i.e., continuous operationalization of forms of delay) in the DQ and the scores calculated for hedonistic and irrational delay using the MMAP were studied and

compared. Simultaneously, the mean differences between the categories of delay were studied to provide further information about the uniqueness of each type of delay. I used the results of measuring categorical and continuous versions of delay to provide validation arguments under each set of validation scales. Finally, I tried to provide initial cut offs for procrastination problems despite the lack of an established standard (i.e., “gold standard”).

Between and within scales relations. Table 13-10 presents the correlations of the selected MMAP total scores with the DQ’s prototypes. It was not surprising to see strong relations between procrastination intensity scores and the AP and HP as these behaviours were part of the calculation of the intensity scores. Therefore, high correlations between intensity score and IrD and HD from the DQ were expected. The results showed that the correlation between intensity and IrD was high, but only moderate between intensity and HD. Given the strong negative emotional components of intensity, a significant positive association between intensity and DEP and a negative association between intensity and PD was expected. The results supported this conceptual argument. Based on content overlap, duration of procrastination was expected to have positive and moderate-to-large correlations with AP, IrD and to a lesser degree with HP and HD. The results matched the prediction. Given the strong theoretical association of AD with HP and HD, a moderate association was expected. The results approve this proposition, supporting both the link between arousal and hedonistic delay. Despite the overlap, the correlations were moderate, showing the uniqueness of the scores and supporting the necessity of calculating AD and HD scores separately.

The results related to inevitable delay revealed a complex pattern in Studies 7 and 9, therefore it was important to explore the relation of inevitable delay to other prototypes. If we consider InD and PD measures to be two forms of rational delay, there should be significant

positive correlations between them. In fact, the largest correlation of InD was its correlation with purposeful delay. Inevitable delay also showed a considerable positive correlation with the DEP. This was evaluated further by looking at the relations with components of the DEP. The correlation with both factors was positive and significant. These relations are expected theoretically since it can be argued that those who delay due to temporary or enduring emotional problems, may inevitably postpone tasks despite their desire not to do so. Both groups stop postponing tasks when their problems are resolved.

Table 13-10
The MMAP and DQ Correlations

	INT	DUR	AP	HP	IrD	HD	InD	PD	AD	DEP	DEEP	DTEP
INT	1.00											
DUR	0.52	1.00										
AP	0.74	0.46	1.00									
HP	0.54	0.34	0.62	1.00								
IrD	0.61	0.50	0.64	0.35	1.00							
HD	0.34	0.26	0.31	0.61	0.23	1.00						
InD	0.20	0.12	0.05	0.03	0.10	0.15	1.00					
PD	-0.27	-0.25	-0.36	-0.17	-0.33	-0.01	0.41	1.00				
AD	0.07	0.05	0.21	0.39	0.02	0.45	0.03	0.08	1.00			
DEP	0.38	0.15	0.19	0.23	0.14	0.37	0.30	0.05	0.11	1.00		
DEEP	0.39	0.17	0.21	0.21	0.17	0.32	0.24	-0.01	0.07	0.93	1.00	
DTEP	0.17	0.04	0.03	0.15	0.02	0.31	0.27	0.14	0.14	0.69	0.38	1.00
Mean	3.38	3.66	3.70	2.87	4.13	2.17	3.07	3.18	2.33	2.33	2.39	2.23
SD	0.80	1.14	1.09	1.07	1.56	1.20	1.28	1.37	1.35	1.22	1.43	1.45

Note. INT=Intensity/severity of procrastination problems total score measured by the MMAP; DUR= duration of procrastination problems measured by the MMAP; AP= Anxious Procrastination measured by the MMAP; HP= Hedonistic Procrastination measured by the MMAP; IrD = Irrational Delay measure by the DQ; HD = Hedonistic Delay measure by the DQ; InD = Inevitable Delay measure by the DQ; PD =Purposeful Delay measure by the DQ; AD =Arousal Delay measure by the DQ; DEP = Delay due to Emotional Problems measure by the DQ; Correlations greater than or equal to 0.09, 0.12, 0.15 were significant at 0.05, 0.01, 0.001 alpha level (N = 490) for two-tailed tests and 0.07, 0.11, 0.14 for one-tailed tests.

Both HD and IrD were considered to be maladaptive forms of delay and two basic types of procrastination. Therefore, I expected to find a considerable (moderate to high) positive correlation between them. These propositions were supported partially by the data. The

correlation between AP and HP was high, the correlations between AP and HD and between HP and IrD were moderate, but the correlation between IrD and HD was small. This might be due to the effect of administration of categorical measures of delay before measuring prototypes. Those who were forced to choose only one category of delay may later rate the prototype in a way that replicates their choice and differentiates between prototypes. In fact, the result of Studies 7 and 9—where participants were not forced to choose only one category of delay before presenting the prototypes version of the DQ—supported this rationale. The correlations between IrD and HD in Study 7 was 0.44 and in Study 9 it was 0.39, almost twice the size of correlation in Study 10.

One interesting finding was the correlation between HD and DEP. The association had a moderate effect size and the direction was positive. This association was maintained even when the DEEP and DTEP sub-scores were used. It can be argued that individuals who exhibit both prototypes of delay may suffer from weak or no intentions to do tasks on time, and, therefore, these prototypes positively overlap with each other. Moreover, both prototypes are negative forms of delay which may be another source of their shared variance. It should be noted that the positive and significant association was found even when the association with HP (measure of hedonistic delay in MMAP) was studied. However, the association was smaller for the correlations between HP and DEP in comparison to the correlation between HD and DEP. The difference might be due to the fact that HP and DEP were from different measures while the HD and DEP were from the same measure and use the same method. Furthermore, the emotional content is stronger in HD than in HP.

In sum, the correlations among the MMAP and DQ subscales supported the uniqueness of the various subscales and provided initial support for categorizing and interpreting prototypes

of delay based on their overall connotation and valence (e.g., negative, rational). Given the format of the prototypes, participants were free to show or not show multiple dominant forms of delay. The correlations supported such a format and suggested theoretical links between the constructs.

I discussed many points of validity evidence regarding the match between correlational evidence and theoretical and conceptual properties of the various procrastination constructs so far. These correlations showed how well the scores reflected the construct, however these relations did not provide information regarding the importance of the constructs and prevalence of the phenomenon. Before looking at other external correlational evidence measured by the validation scales in Study 10, it is important to evaluate and compare the significance of the delays based on their prevalence in student population.

Importance and prevalence of forms of delay. Relevance and social importance of the prototypes of delay that occur in student populations are important aspects of validation for various reasons. Four of the prototypes of delay were relatively new constructs and most of the constructs were driven theoretically and later tested empirically. Although the acceptability and social validity of the scenarios were evaluated extensively in a content-validity study using a large student sample, it was still important to further evaluate the relevance of the refined versions of the DQ and compare the scope of endorsement of prototypes based on the data at hand. If a prototype was a relevant prototype in academic settings, then a considerable percentage of individuals should endorse the prototype at least moderately. Moreover, if the

prototype is a distinct prototype, it is important that a small but practically non-zero portion of the sample endorse the prototype highly²².

Another potentially important piece of information for the validation of scores could be obtained by comparing various forms of delay. A larger endorsement suggests a greater prevalence of the behaviour and may imply that the prototype is more theoretically important for understanding a student population than another form of delay with a smaller percentage of students endorsing it. However, it is important to note that the size of the endorsement is not necessarily equivalent to the clinical and practical importance of a prototype. The clinical importance of prototype depends on the consequences and effects of delay on various aspect of a person's life. A form of delay with devastating consequences, correlates, or causes, such as DEEP, can be clinically important regardless of the percentage of endorsement in the population or its relatively smaller size in comparisons to other forms of delay. In sum, the practical importance of a delay depends on the objective of an applied project or research hypothesis, and would also depend on both the clinical importance of the delay (maladaptive nature of the delay) and its prevalence.

Keeping all of these points in mind, what is important for the validation discussion is to see whether my prediction of prevalence matched what was found in the studies, whether the differences in percentages for various prototypes were relatively stables across samples, and

²² There is no specific cut-off to determine practical significance or non-zero percentage. A conservative cut-off might be "more than 10% of the population" as a practically important percentage in many projects in academic settings and "more than 2.5% of the population" as a cut-off for non-zero percentage. The latter cut-off can be justified based on the area under the normal curve that represents a very high score on the right side of a normal curve.

what the data suggest regarding the theoretical importance of the scores in comparison with each other.

Table 13-11 shows the percentage of participants who endorsed each prototype to a moderate (i.e., “moderately like me” to “almost 100% like me”) or high (i.e., “very like me” to “almost 100% like me”) level of endorsement. Despite these rather conservative criteria, the percentage of participants endorsing the prototypes at a moderate level were far above the cut-offs for practically important phenomenon in student population across studies. All of the percentages were more than 20% across all studies.

It can be argued that the percentages under moderate endorsement for types of delay with smaller percentage (e.g., HD) may not exactly come from the distinct prototype but from endorsement overlap between forms of delay with lower percentages and forms of delay with higher percentages. This is why conservative criteria were proposed and investigated. As Table 13-11 shows, the percentage of endorsement for various forms of delay passes a criterion for a practically non-zero percentage. Hedonistic delay was highly endorsed by 4.5 to 8.4 percent of the participants in the various samples, the AD was endorsed by 6.6 to 11.4 percent, and the DEP by 4.9 to 10.2 percent.

Note that the percentage of endorsements depends on the characteristics of a population and composition of the sample. The above percentages of endorsement came from samples of individuals who had been able to earn enough educational qualification in high-school to enter university and were willing to pursue higher education despite its intellectual and personal challenges. This is particularly important for hedonistic delay because its main defining elements are making no initial (or weak) intention to perform a task with optimal timing, and choosing fun activities over committed educational tasks. Such behavioural patterns have devastating effects

on performance and may be more prevalent among those who have not been able to enter to university or who have not committed to pursue higher education.

The only types of delay that have been broadly investigated are irrational delay or anxious procrastination. Kachgal and colleagues (2001) and Solomon and Rothblum (1984) reported the prevalence of procrastination behaviour and its severity measured by the PASS in academic settings. The percentages of students who highly endorsed writing, exam, and reading tasks were 59.2, 55.1 and 56.5 respectively in the study by Kachgal and colleagues, and 45.0, 27.6 and 30.1 respectively in Solomon and Rothblum’s study. The percentage of procrastination problems for the same tasks were smaller in both studies. The percentages were 36.1, 55.1 and 32 in the Kachgal study and 23.7, 21.2 and 23.7 in the Solomon and Rothblum study. Since negative emotions, dissatisfaction, and negative outcomes are defining elements of irrational delay in the DQ, the DQ subscale for irrational delay was expected to have percentages of endorsement between the above two sets of scores (problems and behaviour) but closer to the percentages reported for procrastination problems by previous studies. The findings were in line with the above proposition. Between 35 and 40 percent of students highly endorsed the behavioural pattern of irrational delay despite awareness about its negative consequences.

Table 13-11

Prevalence of Delay Prototypes and Types

Study		IrD		HD		InD		PD		AD		DEP	
		Mod.	High										
7	N	337	200	137	49	233	85	248	112	134	38	151	58
	%	58.1	34.5	23.6	8.4	40.2	14.7	42.8	19.3	23.1	6.6	26.0	10.0
9	N	315	197	126	40	188	70	209	77	142	60	153	54
	%	60.0	37.3	23.9	7.6	35.6	13.3	39.6	14.6	26.9	11.4	29.0	10.2
10	N	323	194	76	22	187	67	195	94	99	38	100	24
	%	65.9	39.6	15.5	4.5	38.2	13.7	39.8	19.2	20.2	7.8	20.4	4.9

Since Purposeful Delay can be considered one of the main adaptive forms of delay, I expected it to be endorsed by a larger number of participants than other prototypes of delay with the exception of irrational delay. This was supported; the PD did in fact have a larger percentage of participants endorsing it than other prototypes with the exception of IrD. The InD had the third highest percentage of endorsements. This was understandable, given that this prototype represents another adaptive or rational form of delay that includes multiple rational reasons for delay in a normal population like student population.

Previous studies indicated that only a small percentage of students reported types of procrastination behaviour that are associated with sensation seeking and rebelliousness in comparison to the percentage reporting anxious procrastination and non-procrastination (see Steel, 2007). It was expected that HD and AD would have conceptual overlap with the above types, respectively, with lower percentages of endorsements. Similarly, given that the sample was not a clinical sample, the level of endorsement for DEP should not be larger than for adaptive forms of delay. The lowest percentages were related to AD, HD, and DEP as expected (see Table 13-11). Given the negative relations of HD and DEP with educational performance and various aspects of well-being, the number should nonetheless be considered alarming.

The uniqueness of the various procrastination prototypes could also be evaluated by analysing categorical conceptualizations of the delay's form where participants were forced to choose only one of the five forms of delay. This provides the most conservative way to evaluate the relevance of the delay types. Participants who choose one form might not only indicate high levels of the behavioural pattern but also have to choose the type of delay over and above the other forms. Regardless of the criticism regarding categorization and typology conceptualization, this approach may help to identify those with very high scores for each pattern (i.e., form of

delay) or those with more a distinctive and pure behavioural pattern. Based on a rationale similar to that discussed for prototypes, it was expected that the percentage of endorsements would be larger for IrD, PD, and InD than for AD and HD. The results supported this proposition. The percentages were 47.0, 27.7, 11.7, 8.2, and 5.3 for IrD, PD, InD, AD, and HD, respectively. Theoretically, the comparison of DEP with other forms of delay was not important and therefore was not included among categories presented to participants in order to reduce the cognitive load of choosing one scenario over and above multiple scenarios. As explained in Chapters 8 and 10, the DEP can be used as a screening variable to eliminate participants whose postponement is due to emotional problems. In any case, the percentages were very similar after eliminating cases with high levels of the problems that are measured by the DEP.

It should be noted that the percentages related to the prototypes of delay in Study 7 were slightly different from the other two studies. This difference were particularly evident for HD, AD, and InD. One of the main reasons could be that in Study 10 both categorical and continuous measures of delay were used with the categorical measures presented before the prototype measures. It can be argued that forcing participants to choose one type may have reduced cross prototypes endorsing responses (i.e., enforce multiple prototypes simultaneously) resulting in a reduction in the percentage of endorsements for some of the competing prototypes in Study 10. Based on this rationale, the percentages in Studies 7 and 9 could be more reliable for reference in future studies. Overall, despite the differences, the percentage of endorsement of the prototypes, and percentage of the types of delay support the relevance of the constructs and their measure.

Relations with external variables. A set of validation relations was predicted and tested to further validate the MMAP and DQ scores. The empirical rationale for the majority of validity propositions was based on two major meta-analytic reviews (Steel, 2007; van Eerde, 2003). The

propositions are presented before presenting the results. Validation scales in Study 10 consisted of approximately 70 total or subscale scores. The validity propositions and results related to validation scale and subscale scores were organised in three groups: Antecedents, Conceptually Related Constructs (i.e., constructs with conceptual and/or empirical overlap, no causal relation), and Consequences (i.e., general or specific outcome variables).

Relations with antecedents. The major antecedents of procrastination and other forms of delay were evaluated in Studies 6 to 9. In Study 10, the less prominent, but well-known antecedents of procrastination such as fear of failure and potential antecedents for other forms of delay (e.g., time management) were studied. Furthermore, some of the important comparisons from previous studies (e.g., associations with self-regulation) were replicated using new validity scales. The associations between the scales under the antecedent category and forms of delay were studied using two methods: correlation of the scales with prototypes of delay, and mean differences in scale scores between groups representing types of delay.

Fear of Failure. Both clinical and empirical evidence suggests a positive association between fear of failure and procrastination behaviour. The clinical importance of fear of failure as a proximal cause of procrastination has been highlighted in previous studies (see Haghbin et al., 2012). The effect size related to this association in correlational studies seems to be small (Steel, 2007; van Eerde, 2003) when no moderating variable is used (Haghbin et al., 2012). In our previous study, we found that the correlation for a group of students with competency problems was moderate and positive. We discussed the fact that people who seek counselling and psychotherapy for procrastinations problems have a similar psychological profile and suffer from the negative effects of fear of failure.

It was expected that a result similar to correlational studies without moderation would be found when studying the relation between fear of failure and procrastination behavior, particularly for AP and HP. More specifically, I expected that AP and HP would have small positive correlations with fear of failure. Since procrastination intensity by definition measures procrastination problems and has stronger emotional components, it was expected that fear of failure would be more strongly correlated with procrastination intensity than with procrastination behaviour. In other words, because the measure of procrastination intensity was developed to be more clinically sensitive and to identify procrastinators who needed intervention, we would expect the correlation between intensity and fear of failure to be closer to that found in clinical observations and in the moderation study. The findings supported these validity arguments. Procrastination intensity had a moderate positive relation with overall fear of failure, measured by the Performance Failure Appraisal Inventory, and with total exam anxiety, measured by the Achievement Emotions Questionnaire.

Table 13-12

The Antecedents' Convergent and Divergent Validity Evidence for MMAP and DQ Scores (Correlations)

	INT	DUR	AP	HP	IrD	HD	InD	PD	AD	DEP	DEEP	DTEP
T-FoF	0.44	0.23	0.16	0.12	0.31	0.12	0.16	0.02	-0.06	0.30	0.33	0.11
FDOS	0.37	0.17	0.11	0.05	0.26	0.10	0.11	-0.01	-0.10	0.29	0.32	0.12
FHUF	0.31	0.15	0.06	0.01	0.22	0.05	0.14	0.06	-0.15	0.18	0.20	0.05
FIOLI	0.39	0.17	0.15	0.18	0.22	0.19	0.11	0.00	0.06	0.33	0.35	0.15
FUIO	0.32	0.17	0.16	0.14	0.27	0.11	0.10	0.01	0.00	0.18	0.18	0.08
FESE	0.33	0.22	0.14	0.10	0.26	0.07	0.15	0.00	-0.04	0.20	0.24	0.03
T-EA	0.41	0.24	0.17	0.09	0.31	0.11	0.15	-0.02	-0.08	0.27	0.28	0.14
SOF	0.30	0.13	0.08	-0.04	0.21	-0.05	0.14	0.03	-0.19	0.19	0.22	0.03
SOD	0.50	0.39	0.43	0.29	0.47	0.19	0.04	-0.24	-0.07	0.19	0.23	0.03
SCS	-0.54	-0.45	-0.49	-0.45	-0.50	-0.41	-0.05	0.29	-0.17	-0.25	-0.28	-0.08
T-TQ	-0.44	-0.36	-0.53	-0.45	-0.42	-0.31	0.07	0.46	-0.16	-0.20	-0.23	-0.07
ShRP	-0.24	-0.21	-0.37	-0.36	-0.23	-0.24	0.14	0.45	-0.15	-0.11	-0.12	-0.05
LRP	-0.34	-0.30	-0.42	-0.35	-0.40	-0.22	0.07	0.30	-0.09	-0.15	-0.21	0.04
TA	-0.60	-0.44	-0.53	-0.39	-0.51	-0.25	-0.13	0.26	-0.08	-0.26	-0.28	-0.10

Note. INT=Intensity/severity of procrastination problems total score measured by the MMAP; DUR= Duration of procrastination problems measured by the MMAP; AP= Anxious Procrastination measured by the MMAP; HP= Hedonistic Procrastination measured by the MMAP; IrD = Irrational Delay measure by the DQ; HD = Hedonistic Delay measure by the DQ; InD = Inevitable Delay measure by the DQ; PD =Purposeful Delay measure by the DQ; AD =Arousal Delay measure by the DQ; DEP = Delay due to Emotional Problems measure by the DQ; T-FoF = Fear of failure Total score measured by the Performance Failure Appraisal Inventory (PFAI); FDOS = Fear of Devaluing One's Self-Estimate (PFAI); FHUF = Fear of Having an Uncertain Future (PFAI); FIOI = Fear of Important Others Losing Interests (PFAI); FUIO = Fear of Upsetting Important Others (PFAI); FESE = Fear of Experiencing Shame and Embarrassment (PFAI); T-EA = Exam Anxiety Total (AEQT); SOF = Failure-related State orientation (SOF) Or State-Oriented preoccupation; SOD = Decision-related State orientation (SOD) Or State Oriented hesitation; SCS = Self-Control Scale (SCS); T-TQ = Total Time-management Questionnaire (TQ); ShRP = Short-Range Planning (TQ-Subscale); LRP = Long-Range Planning (TQ-Subscale); TA = Time Attitudes (TQ-Subscale); Correlations greater than or equal to 0.09, 0.12, 0.15, and 0.17 were significant at 0.05, 0.01, 0.001, and 0.0001 alpha levels for two-tailed tests and 0.07, .11 0.14, and 0.17 for one-tailed tests (N = 490).

Study 10 provided a unique set of comparisons regarding the correlations between validity scales and two distinct procrastination behaviours measured by the MMAP and the DQ. The direction and relative magnitude of the relation of irrational delay (anxious procrastination) and hedonistic delay with antecedents were similar across measures, supporting the strong relation between the two measures. As discussed earlier, in comparison to the MMAP subscales, Irrational Delay and Hedonistic Delay measured by the DQ had stronger emotional content given that they were based on scenarios with multiple elements. Therefore, I expected to see slightly stronger correlations when a validation scale contained strong emotional elements in its definition.

As expected, anxious procrastination behaviour (AP) measured by the MMAP had small positive correlations with fear of failure and test anxiety, whereas the correlation for anxious procrastination measured by the DQ (IrD) were in the same direction but larger in magnitude. Hedonistic procrastination, regardless of the measure, had small positive correlations with fear of failure and test anxiety. As discussed above, these results were in line with previous studies and validity propositions.

The results also indicated small differences between AP and IrD. The IrD measures procrastination with stronger emotional content and with a negative causal element. It can be speculated that the differences between AP and IrD might have been smaller if the categorical version of the DQ (which forces a participant to identify with only one prototype) were not being used before measuring procrastination prototypes. Further research may be needed to test this speculation. In comparison to IrD as measured by the DQ, AP measured by the MMAP had results that were more comparable to previous studies. This similarity might be due to the fact

that the format of the MMAP items was very similar to previous measures of procrastination, whereas the format of the DQ differs from previous measures.

In summary, having a slightly stronger relation with causal factors that had strong emotional components was not a negative characteristic. The difference in correlations reflected the differences between operational definitions of irrational delay as behaviour and prototype. The differences need to be considered when choosing the measures and/or comparing and interpreting the scores. It should also be noted that the correlations of the AP and IrD with other causal factors such as conscientiousness, and self-regulation and self-control are similar based on findings from Studies 6 to 10. This was expected since the factors do not have an explicit emotional component and therefore covary with the behavioural aspect of the constructs; the behavioural aspect of irrational delay as behaviour (measured by MMAP) and prototype (measured by DQ) are similar.

Another form of delay that may have a complex relation with fear of failure is Arousal Delay. By definition, those who postpone a task for the excitement of doing it at the last minute and those who report that they consciously intended to do a task at the last minute, should not have high levels of fear. If Arousal Delay scores represent such content, the relation of the AD prototype with fear of failure should not be positive. Similarly, those who identify arousal delay as their main form of delay should have lower levels of fear of failure in comparison to those who endorse irrational delay.

The correlational analysis showed that the relation between arousal delay and overall fear of failure or test anxiety was not significant or practically zero with a negative sign. Among the fear of failure subscales, there was one small and practically non-ignorable negative relation between fear of having an uncertain future and the AD. This correlation was not a surprise

conceptually if we assume that those who report high levels of AD (taking risks and seeking arousal), do not fear uncertainty.

The categorical version of the DQ was used to measure mean differences between delay types. Levene's test indicated unequal variances ($F = 3.56, p = .043$), therefore, the Welch F -ratio for overall test and Games-Howell *post hoc* test for pairwise comparisons were used. The overall main group difference was significant, $F(4,107.98) = 3.88, p = .005$. Table 13-13 presents the results of Games-Howell *post hoc* test as well as Cohen's d effect size for mean differences among DQ groups in fear of failure. The comparisons revealed that the average fear of failure in the AD group was practically lower than the fear of failure in the IrD, HD, and InD groups. The differences had medium effect sizes. Statistically, the fear of failure associated with irrational delay was higher than the fear of failure associated with purposeful delay and arousal delay. The findings related to AD clarify the role of fear of failure. Moreover the findings support the uniqueness of AD from HD given the medium effect size related to mean differences related these group. The findings related to the difference between IrD and PD (significant but small effect size) replicate correlational findings. Figure 13-1 shows the ups and downs in the overall fear of failure across group²³. The overall pattern of relations between fear of failure and various types of delay matched the pattern of relations between prototypes of delay and fear of failure and what were discussed in validity discussion. The results support an expected relation between

²³ In classical textbooks it has been recommended to not use line graphs in order to illustrate mean differences between distinct nominal categories/groups. However, the line graphs were used for the delay categories because of the following reasons: (1) the line graphs could not cause confusion here since there was no repeated measure testing or trend analysis and (2) the line graph here could enhance result interpretation. Categories/types of delay were ordered from hypothetically and conceptually more negative/maladaptive to more positive/adaptive. Therefore the change from the first to the last categories along X-axis was meaningful and important for the interpretation purposes.

two versions of the procrastination measure in terms of their relation with fear of failure. If researchers interested in more pure/unique representation of forms of delay (high level of the latent trait), categorical operationalization may be a more sensitive way to capture the underlying dynamic related to these groups. To provide a more natural picture, both type of measure can be used to provide complementary information.

Table 13-13

Delay Types Differences in Fear of Failure

G1	G2	Cd	ΔM	s.e.	t	df	q-crit	LB	UB	Sig	ES	P-Sig
IrD	HD	0.048	0.22	0.518	0.42	36.63	4.06	-1.88	2.32	No	Trivial	No
IrD	AD	0.585	2.83	0.685	4.13	48.10	4.01	0.09	5.57	Yes	Medium	Yes
IrD	InD	0.051	0.23	0.449	0.52	93.13	3.94	-1.54	2.00	No	Trivial	No
IrD	PD	0.343	1.65	0.379	4.37	260.67	3.86	0.19	3.11	Yes	Small	No
HD	AD	0.522	2.61	0.801	3.26	63.41	3.97	-0.57	5.79	No	Medium	Yes
HD	InD	0.004	0.01	0.613	0.02	59.35	3.98	-2.42	2.45	No	Small	No
HD	PD	0.295	1.44	0.563	2.55	49.77	4.00	-0.82	3.69	No	Small	No
AD	InD	-0.527	-2.60	0.759	-3.42	66.66	3.97	-5.61	0.41	No	Medium	Yes
AD	PD	-0.223	-1.18	0.720	-1.63	57.95	3.98	-4.04	1.69	No	Small	No
InD	PD	0.293	1.42	0.501	2.84	126.72	3.92	-0.54	3.38	No	Small	No

Note. Categories of the DQ IrD = Irrational Delay; HD = Hedonistic Delay; InD = Inevitable Delay; PD = Purposeful Delay; AD = Arousal Delay Cd= Cohen's d

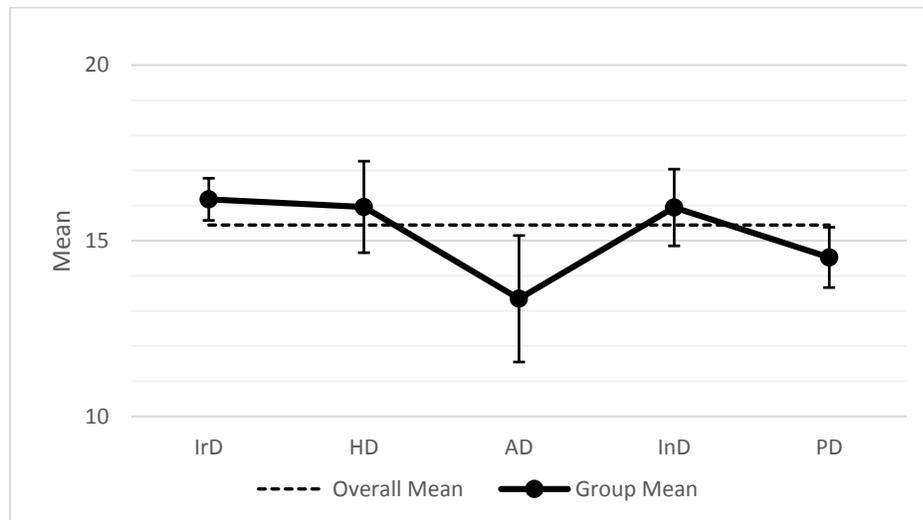


Figure 13-1. Mean plot of the fear of failure by delay type.

State and Action Orientation. Action Control Theory (Kuhl, 1985, 1994) tries to explain the processes underlying self-regulation to protect intentions and regulate enactment when multiple and competing sources of distraction and dysregulation such as negative or distracting thoughts and undesired emotions exist. The theory identifies a bipolar trait-like self-regulatory construct that affects the process of self-regulation known as state versus action orientation. Based on this theory, people can be categorised as having a state or action orientation based on their scores on three subscales. Previous studies (Blunt & Pychyl, 1998; Blunt & Pychyl, 2005) have highlighted the role of two of these subscales under this dichotomy, Decision-related State orientation (SOD) and Failure-related State orientation (SOF) or preoccupation with failure on procrastination. As expected and in line with these earlier studies, the Procrastination Intensity Score had significant and positive relations with both subscales of state orientation, Decision-related State orientation (SOD) and Failure-related State orientation (SOF). The correlations between anxious procrastination and state orientation factors in the whole sample were compatible with the hypotheses and findings from previous studies (Blunt & Pychyl, 1998; Blunt & Pychyl, 2005). The SOD had a large positive correlation with procrastination behaviour regardless of the measure used.

Previous studies found that the relation between SOF and procrastination is weak and not consistent across samples. Similarly, the current study found that SOF had a small positive correlation with Irrational Delay as measured by the DQ and a non-significant positive correlation with Irrational Delay (Anxious Procrastination) as measured by the MMAP.

To make a more accurate comparison with previous research, the relation between state orientation factors and the IrD were tested in male and female samples separately. Consistent with previous studies, the relation between SOD and procrastination was significant and

moderately strong in male and female samples. However, the correlations of SOF with irrational delay in male and female samples were the opposite of what was found in a previous study by Blunt & Pychyl (1998). In the current study, the relation was significant in the female sample, and not significant in the male sample. In contrast, the previous study found this relation was significant in the male sample but not the female sample. Given that the sample size in Blunt & Pychyl (1998) was small and the fact the SOF was not expected to have a moderate large effect size in relation to procrastination, the mismatch between the results should not be considered negative convergent evidence. Future research may test the differences by comparing the DQ and MMAP with and the measures used in Blunt & Pychyl (1998).

Given the positive connotation of purposeful delay and its convergent relation with self-regulation and moderate negative relation with procrastination, I expected to find a negative relation between PD and SOD. The findings supported this validity proposition.

The relation of other forms of delay with SOD (Decision-related State Orientation) and SOF (Failure-related State Orientation) were explored. An interesting association was found between SOF and Arousal Delay (AD). The relation between SOF and AD was negative. Given the conceptual similarities between preoccupation with failure and other negative emotions (SOF) and fear of failure, the relation between AD and SOF could be expected to be similar to the relation between AD and fear of failure. In both cases, the relation was negative. This finding once again implies that rebelliousness and risk taking are important aspects of AD (i.e., risk taking is in contrast with fear of failure a conceptual elements of AD). The findings supported that AD scores capture this aspect of sensation seeking that was also found when the AD association with fear of failure was studied. Based on this argument, I also expected to find that the mean of SOF in the AD group would be significantly lower than the means related to

procrastination, IrD and HD. This was discussed in detail after presenting the result of DQ categorical and SOF.

In line with the discussion at the beginning of this section, I expected that those who identify themselves as procrastinators would have the highest levels of decision-related state orientation and those who identify themselves as purposeful or rational delayers would have the lowest levels of decision-related state orientation. If the categorical version of variables capture such a differentiation and match with the main defining components of the dilatory types, we should not find significant relations between IrD and HD categories, but we should find significant relations between these two groups and the PD group. Based on the correlational results, I also expected that the AD and IrD group means would fall between these two extremes. Figure 13-2 presents the mean plot related to decision-related state orientation. The positions of the groups' means supported the above validity argument.

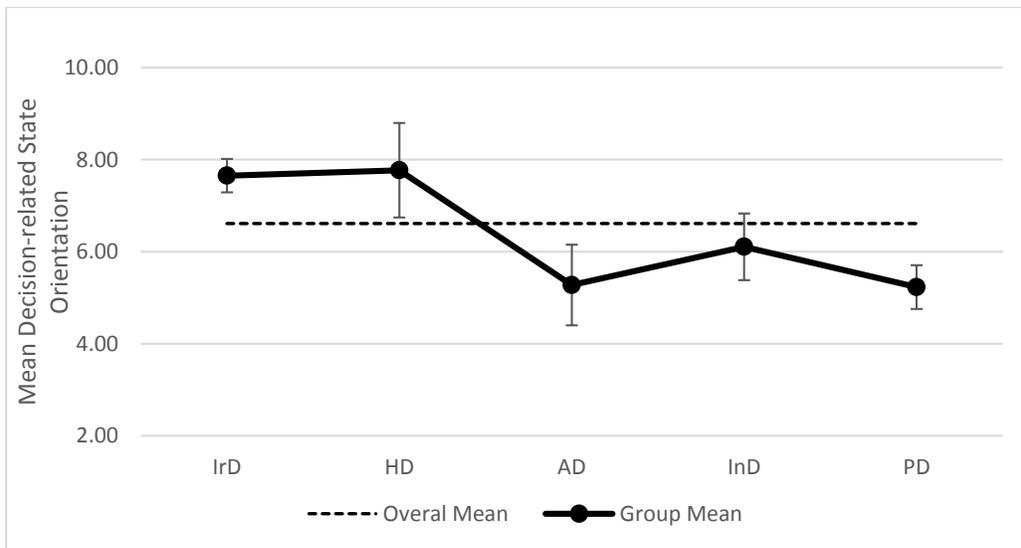


Figure 13-2. Mean plot of the decision-related orientation by delay type

The pairwise mean comparisons based on conservative adjustments for unequal sample size (Hochberg and Games-Howell) revealed that irrational and hedonistic delayers had

significantly higher levels of DOS than purposeful delayers (see Table 13-14). Similarly, the levels of DOS in irrational and hedonistic delayers were higher than in the AD group. Irrational delayers had the same level of decision related state orientation as hedonistic delayers. However, the level of decision related state orientation in the irrational delayer group, not the hedonistic group, was significantly larger than the one in the inevitable delayer group. There was a discrepancy between the result of AD prototype and types. The correlation between AD and SOD was practically zero, whereas the AD type, similar to the PD, had the lowest level of SOD. This might be because of an overlap between AD prototype and HD ($r = .45$). It is possible that some of those who endorsed AD prototypes may have high levels of HD while others do not, therefore they would partial out each other's effect.

Hierarchical regression was used to test this speculation. In the first stage, the relation between AD and SOD was tested. The relation was not significant ($\beta = -.074, p = .101$). In the second stage, HD was entered into the regression to remove the shared variance between HD and AD when studying their relations with SOD. The relation between AD and SOD became significant ($\beta = -.20, p = .000$); the association between HD and SOD was significant and in the opposite direction ($\beta = .27, p = .000$).²⁴ These findings imply that those who endorsed AD prototypes (high scores on AD) should not be considered a homogenous dilatory group. In particular, AD has moderate to high levels of overlap with HD. The prototype scores, by definition, cannot provide information regarding whether AD or HD is the main form of delay for participants who highly endorse both forms of delay. Therefore, it is important to use both measures of delay and if possible to obtain the unique association between the prototypes and

²⁴ The result indicated a suppression effect.

other factors by using multiple regression or other statistical models (e.g., SEM) to remove shared variance. This is particularly important when the relations with the AD and HD are in opposite directions.

Table 13-14

Delay Types Differences in Decision-Related State Orientation

G1	G2	Cd	ΔM	s.e.	t	df	q-crit	LB	UB	S-Sig	ES	P-Sig
IrD	HD	-0.043	-0.12	0.391	-0.30	31.57	4.09	-1.72	1.48	No	Trivial	No
IrD	AD	0.852	2.38	0.340	6.99	53.26	3.99	1.02	3.73	Yes	large	Yes
IrD	InD	0.555	1.55	0.291	5.32	86.25	3.94	0.40	2.69	Yes	Medium	Yes
IrD	PD	0.868	2.42	0.214	11.29	279.97	3.86	1.59	3.25	Yes	large	Yes
HD	AD	0.906	2.49	0.484	5.15	55.68	3.99	0.56	4.43	Yes	large	Yes
HD	InD	0.607	1.66	0.451	3.69	50.48	4.00	-0.14	3.47	No	Medium	Yes
HD	PD	0.914	2.54	0.406	6.25	36.51	4.06	0.89	4.19	Yes	large	Yes
AD	InD	-0.298	-0.83	0.408	-2.04	83.44	3.94	-2.44	0.78	No	Small	No
AD	PD	0.016	0.05	0.357	0.13	63.70	3.97	-1.37	1.46	No	Small	No
InD	PD	0.314	0.88	0.311	2.82	106.24	3.93	-0.34	2.10	No	Small	No

Note. Categories of the DQ IrD = Irrational Delay; HD = Hedonistic Delay; InD = Inevitable Delay; PD = Purposeful Delay; AD = Arousal Delay Cd = Cohen's d

Keeping in mind the overlap between SOF and fear of failure, the correlational results, as well as the fact that sensation seeking and fear are conceptually opposite, I expected that the mean of preoccupation with failure in the AD group would be lower than in the anxious procrastination (IrD) group. The results supported this proposition (see Figure 13-3 and Table 13-15). The effect size for the mean difference between IrD and AD were significant statistically and practically. At the descriptive level and in line with the definition of anxious procrastination, anxious procrastinators (IrD) had highest levels of preoccupation. The correlational analysis showed that the association between SOD and PD was not significant, and the relation between SOD and InD was small; similar to these findings the mean preoccupation with failure among those with high level of InD and PD was between the levels of SOC for the IrD and AD groups. The findings showed the compatibility of both prototypes and categorical factors.

In sum, the association between SOF and Delay is complex and requires further investigation. As for the interpretation of scores, the DQ and MMAP scores showed patterns of association with SOD and partially with SOF that were consistent with previous research and with conceptual and logical analyses of the constructs and their overlap. Future research may need to further clarify the relations between fear related constructs and various forms of delay and test the rationale that was used to explain the discrepancies.

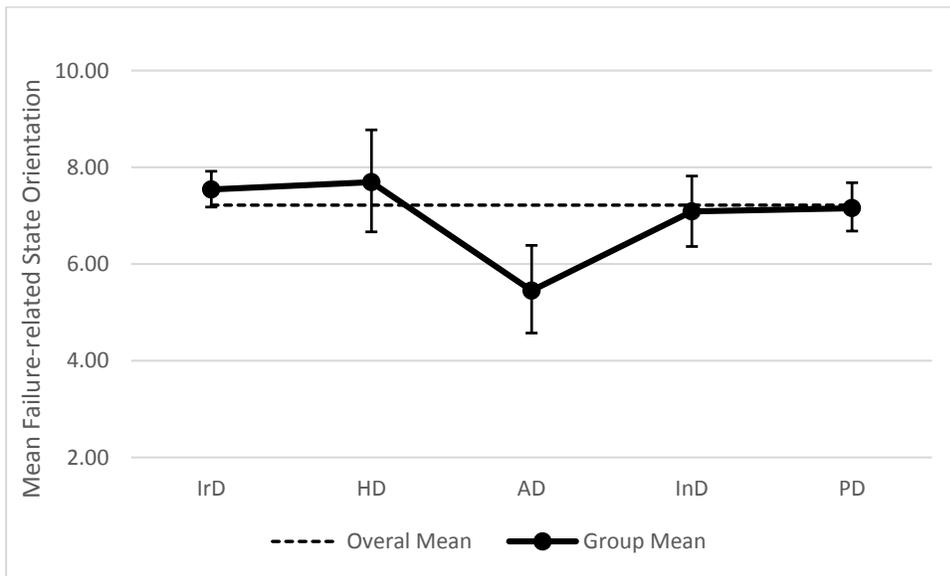


Figure 13-3. Mean plot of the failure related orientation by delay type.

Table 13-15

Delay Types Differences in Failure-Related State Orientation

G1	G2	Cd	ΔM	s.e.	t	df	q-crit	LB	UB	S-Sig	ES	P-Sig
IrD	HD	-0.052	-0.15	0.411	-0.37	31.44	4.09	-1.83	1.53	No	Trivial	No
IrD	AD	0.717	2.09	0.362	5.77	52.53	4.00	0.64	3.54	Yes	Medium	Yes
IrD	InD	0.157	0.45	0.296	1.53	88.17	3.94	-0.71	1.62	No	Trivial	No
IrD	PD	0.129	0.39	0.233	1.66	266.24	3.86	-0.51	1.28	No	Small	No
HD	AD	0.767	2.24	0.513	4.37	56.27	3.99	0.20	4.29	Yes	Medium	Yes
HD	InD	0.215	0.60	0.469	1.29	48.73	4.01	-1.27	2.48	No	Small	No
HD	PD	0.175	0.54	0.431	1.24	37.88	4.05	-1.21	2.28	No	Small	No
AD	InD	-0.566	-1.64	0.427	-3.84	80.50	3.95	-3.32	0.05	No	Medium	Yes
AD	PD	-0.553	-1.71	0.385	-4.43	65.68	3.97	-3.23	-0.18	Yes	Medium	Yes
InD	PD	-0.022	-0.07	0.324	-0.21	115.71	3.92	-1.34	1.20	No	Trivial	No

Note. Categories of the DQ IrD = Irrational Delay; HD = Hedonistic Delay; InD = Inevitable Delay; PD = Purposeful Delay; AD = Arousal Delay Cd = Cohen's d

Self-control. Defined as either a process or trait-like variable, self-control or self-regulation failure has been generally considered one of the most important causal factors that results in procrastination behaviour and therefore procrastination problems (e.g., Baumeister, Heatherton, & Tice, 1994; Tice & Baumeister, 1997; Senécal, Koestner, & Vallerand, 1995; Wolters, 2003). If self-control plays such a key role in both procrastination behaviour and problems, the correlation between self-control and procrastination problems and behaviour should be large and in a negative direction. Furthermore, theoretically, self-control, particularly dispositional self-control, starts and develops early in life (e.g., Fonagy & Target, 2002; Sroufe 1996, 1997, 2005), therefore it can be assumed that the negative effects of weak self-control and self-regulation failure should also start early. If the procrastination duration scale is capable of capturing the historical trajectory of procrastination problems, it would be expected to have a practically significant relation with a distal causal factor such as self-control.

All of the above propositions were supported. The correlation between procrastination intensity and a new measure of self-control (Tangney, Baumeister & Boone, 2004) was large and negative, replicating the findings related to self-regulation in Studies 6 and 8. Similar to Study 6,

procrastination duration had similar patterns of association with self-control, but to a substantially lesser degree in comparison to procrastination intensity. This is because the measure of self-control operationalizes the current level of self-control as opposed to the developmental trajectory of self-regulation. Despite the fact that the correlation was lower for duration than for intensity, the correlation between duration and self-control was higher than the correlation between duration and many other validity scales that were considered as antecedents of procrastination.

Looking at procrastination behaviour and prototypes, the factors had large to moderate correlations with self-control. In contrast with irrational and hedonistic delay, purposeful delay had a positive relation with self-control, replicating the findings from Studies 7 and 9. Low self-regulation and self-control is generally related to psychopathology (e.g., Dale, & Baumeister, 1999; Sroufe, 1997). If DEP captures delay due to psychological/emotional problems, it would be expected to have negative relations with self-control. The results of Study 10 supported these propositions. The correlation between DEP and self-control was statistically and practically significant. The relation between self-control and arousal delay (AD) was explored in Study 10. Similar to Studies 7 and 8, AD had a small, negative relation with self-control.

In sum, the pattern and magnitude of relations between self-control and total aspects of procrastination problems and prototypes of dilatory behaviours were in line with the validity propositions, previous research, as well as the conceptual and theoretical understandings of these constructs. The role of self-control and self-regulation is fundamental to the theoretical understanding of procrastination and to a conceptual differentiation of various forms of delay. It was expected that, in keeping with the correlational results, self-control would differ across groups of individuals who exhibited high levels of different forms of delay. More specifically,

self-control should be lower for people with negative forms of delay (IrD) and be higher for people with rational forms of delay (InD and PD).

If the defining components and features of irrational and purposeful delay are appropriately captured by the scenarios that were used to represent these delay types, we would expect to see the lowest and highest levels of self-control in these two groups. The second lowest and second highest levels of self-control should be related to hedonistic and inevitable delay, respectively.

ANOVA was used to evaluate these propositions. Levene's test of homogeneity of variance was not significant ($p = .06$), implying that the assumption of homogeneity of variance was held. However the ratio of largest variance (AD) over smallest variance (HD) was 3.66. This value implies a partial violation of the homogeneity assumptions. Therefore, Brown-Forsythe and Welch adjusted F values were used. Both statistics were significant [Welch $F(4, 111.01) = 2357, p = .000$; Brown-Forsythe $F(4, 214.10) = 25.54, p = .000$]. For the pairwise comparison both Hochberg's and Games-Howell's adjustment produced similar results.

Pairwise comparisons provided further support for the differences between interpretations of negative versus rational forms of delay (see Table 13-16). The levels of self-control associated with irrational, hedonistic, and arousal delay were practically and statistically significantly lower than the level associated with purposeful delay. Moreover, the irrational delay group had significantly lower levels of self-control than the inevitable delay group. The results indicated an increasing trend of self-control from irrational delay to purposeful delay based on the validity propositions (see Figure 13-4). The findings support the theoretical framework that was used to develop and differentiate the forms of delay. Based on this framework, self-control works as one of the important causal dimensions that may differentiate major forms of delay.

Table 13-16

Pairwise Comparison of Self-control among Delay Types Groups

G1	G2	Cd	ΔM	s.e.	t	df	q-crit	LB	UB	Sig	ES
IrD	HD	-0.197	-1.50	0.746	-2.01	43.22	4.03	-4.50	1.50	No	Trivial
IrD	AD	-0.287	-2.31	1.066	-2.17	50.12	4.00	-6.58	1.96	No	Small
IrD	InD	-0.649	-5.01	0.756	-6.63	94.03	3.94	-7.99	-2.04	Yes	Medium
IrD	PD	-1.003	-7.71	0.580	-13.30	296.70	3.86	-9.95	-5.47	Yes	large
HD	AD	-0.107	-0.81	1.192	-0.68	61.67	3.97	-5.55	3.93	No	Trivial
HD	InD	-0.548	-3.51	0.925	-3.80	70.07	3.96	-7.18	0.15	No	Medium
HD	PD	-0.887	-6.21	0.788	-7.88	52.31	4.00	-9.36	-3.06	Yes	large
AD	InD	-0.343	-2.70	1.198	-2.26	70.99	3.96	-7.45	2.04	No	Small
AD	PD	-0.697	-5.40	1.096	-4.93	55.55	3.99	-9.77	-1.03	Yes	Medium
InD	PD	-0.371	-2.70	0.798	-3.38	109.70	3.92	-5.83	0.43	No	Small

Note. cd = Cohen's d; G1 = Group 1; G2 = Group 2, ΔM = Mean Difference; s.e. = Standard Error; df = Games-Howell estimation of degrees of freedom; q-crit = Games-Howell estimation of critical value. LB = 95% Confidence Interval Lower Bound; UB = 95% Confidence Interval Upper Bound; ES = Effect Size interpretation; n (IrD) = 229; n (HD) = 26; n (AD) = 40; n (InD) = 57; n (PD) = 135; S-Sig = Statistical Significance at .05 level; ES = Effect Size interpretation (Cohen, 1988; P-Sig = Practical Significant ($d > .41$, Ferguson, 2009).

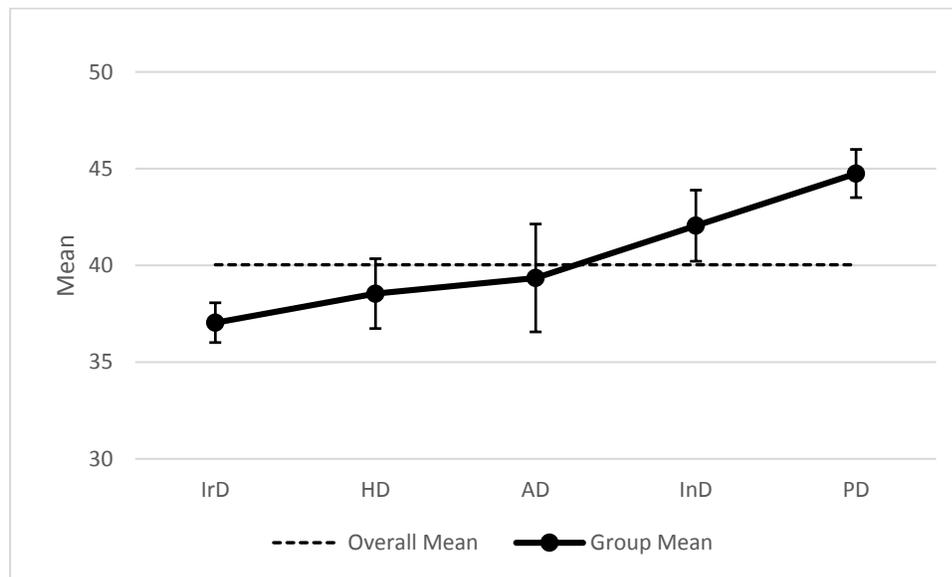


Figure 13-4. Mean plot of self-control by delay type

Time Management. One important element of discriminant validity concerns the relation between time-management and procrastination behaviour. As discussed, procrastination should not only be differentiated from other forms of delay but also from time-management. It is also important to show the extent to which lack of time management skills contributes to procrastination or other forms of delay and compare it with other casual factors. Problems in time-management and procrastination may have some sources of shared content and causal explanation such as self-regulation but are different by definition. It is important to look at the definition of time management and procrastination in order to provide a validity discussion regarding their relation.

Time management is heavily used and researched in popular psychology. As far as my research showed, there were neither well-developed measures of time management, nor strong theoretical efforts to conceptualize and define the construct and explain its differentiation from other factors. Whether time management is unidimensional or multidimensional, whether is a personality facet, an inherent capability, or a learned set of strategies and life skills, whether it includes only planning and scheduling or also includes action and performance, are important questions that have not been not been studied or coherently discussed.

The time management measure included in the validation package was one of the rare efforts to conceptualize and operationalize time management and provide a simple theoretical model in a peer-reviewed journal. Based on Britton and Tesser (1991), time-management is a set of time-related practices that enhance intellectual performance. The measure consists of time-management attitude and two major time-management skills: short-term planning and long-term planning. Despite the unique definitions, the two subscales of time-management, time-management attitude and long-term planning (and therefore the total time-management score that

sum all three factors), seemed problematic conceptually and statistically. Both subscales had extremely poor reliability.

Britton and Tesser suggest that the time-management attitude subscale had strong overlap with self-efficacy. Inspection of the items shows that the subscale may not only have strong self-efficacy content but also content that captures a self-control disposition as well as items that measure performance. The conceptualization and therefore operationalization of time management can be broadened to equate with self-control and self-regulation, but this was not the goal of the present research.

Looking at items under the long-term planning subscale revealed that the subscale consisted of a set of heterogeneous content, including tidiness, long-term goal-setting, working late on exam night, dividing works into various parts, and regular review of notes. Labelling such a diverse set of questions as long-term planning can be misleading. An exploratory factor analysis was conducted. The results revealed that the only replicated factor was short-term planning. The composition of the other factors as well as the number of underlying factors were noticeably different from what Britton and Tesser (1991) reported. Even when three factors were forced in the CFA, the marker item did not capture long-term planning. Only item (“Do you have a set of goals for the entire quarter?”) captured long-term planning at face value, and it had a cross-loading between the first factor that consisted of short-term planning items and the third factor that had low quality items. Because of low content and the structural quality of the factor, the comparison of long-term time management with types of delay was not analyzed further. In this study, despite reporting the correlational results related to problematic subscale scores (time management attitude and long-term planning) and total score (see Table-12), only short-term

planning as a key time-management component with a robust factor structure and good reliability was chosen to be a major focus of discussion.

By definition, an anxious procrastinator (high level of procrastination behaviour) has an initial short-term plan, but he or she does not follow this plan in a timely fashion. Conceptualization of short-term planning and time management does not include the final action while the conceptualization of needless and hedonistic postponement includes both action and inaction. Therefore, time-management and planning are not necessarily an exact opposite of procrastination behaviour as lay's person understanding of procrastination suggests. If procrastination-behaviour measures the partial conceptual link shared between the constructs, procrastination behaviours should not have a large to very large correlation with short-term planning. The findings were in line with this argument. Procrastination behaviours were moderately correlated with short-term planning. These relations were smaller for the DQ measures of procrastination. Overall, less effective short-term planning strategies were related to higher scores on anxious procrastination and hedonistic delay, however the shared variance between them was not as high as the variance shared with causal factors such as self-control. This is in line with the broad discussion in the field (e.g., Steel, 2007; Ferrari et al., 1995) suggesting that time-management is not the same as procrastination and it is not the main causal factor underlying procrastination. Even the total time-management score did not show a large effect size.

As expected and given that the majority of items in the time-management attitudes subscale were measuring important casual factors for procrastination (self-efficacy and self-control), the correlation between time attitude and duration was as high as the correlation between self-control and procrastination. This was reflected in time attitude's strong association

with procrastination behaviour ($r = -.53$), procrastination intensity ($r = -.60$) and self-control ($r = .53$). Including time attitude as part of the total time-management score, therefore, may result in an artificially large correlation with procrastination and confounding findings when its relation with other forms of delay are studied. These results indicate the need to study time-management subscales (short- and long-term planning) separately.

Among the various prototypes of delay, purposeful delay (PD) had the largest magnitude correlation with short-term planning. The results indicate that higher levels of purposeful delay are linked to higher levels of effective time management, particularly short-term planning. This is in line with the definition of the PD and the content of the PD scenarios where students are able to resolve conflicts in their schedules and/or find an optimal time to perform all tasks at hand. As expected, this result was the opposite of what was found for irrational and hedonistic delay. Short-term planning includes strategies such as preparing a daily "to-do" list, setting priorities, scheduling tasks based on priorities and so on. Given that an individual characterized by AD has only one short plan (to do the tasks before the deadline), the relation between AD and short-term planning should be small and negative. The more a person makes a short-term plan based on priorities, the less the person does tasks based on preference for working under pressure or for the excitement of working at the last minute. The correlational analysis indicated a small negative correlation between arousal delay and short-term planning.

Short-term planning as defined by time management is different from making an initial intention or plan to do a task at a certain point in time. Short-term planning in time management refers to regular (daily and/or weekly) and systematic organization of one's time and schedule. Daily and weekly planning is not a defining component of most forms of delay. The correlation between planning and most forms of delay can be due to a causal factor that affects both

variables. Moderate to low levels of planning were expected for various forms of delay with the exception of purposeful delay. Setting up and acting upon priorities were key parts of the definition of purposeful delay, therefore it was expected that purposeful delay would have a practically and statistically significant association with short-term planning and that the overall level of short-term planning would be higher than in the other groups, particularly irrational, hedonistic, and arousal delayers. It was also expected that the irrational, hedonistic, and arousal delayers would show small levels of short-term planning.

Figure 13-5 presents plot for short-term planning means across various forms of delay. The dotted line indicates the mean of short-term planning in the whole student sample. The overall mean was 21, indicating participants who “sometimes” engaged in short-term planning. The group means for AD, IrD, and HD were close to the overall mean, indicating those individuals sometimes perform short-term planning. The pairwise mean differences indicated that people who engaged in purposeful delay had a significantly higher frequency of systematic short-term planning than irrational, arousal, and hedonistic delayers. This indicates that the categorical variable identified purposeful delayers appropriately and in line with the definition of the constructs. It should be noted that the frequency of short-term planning was above the mean for inevitable delayer and the group had significantly higher level of planning than irrational and arousal delayers (see Table 13-17).

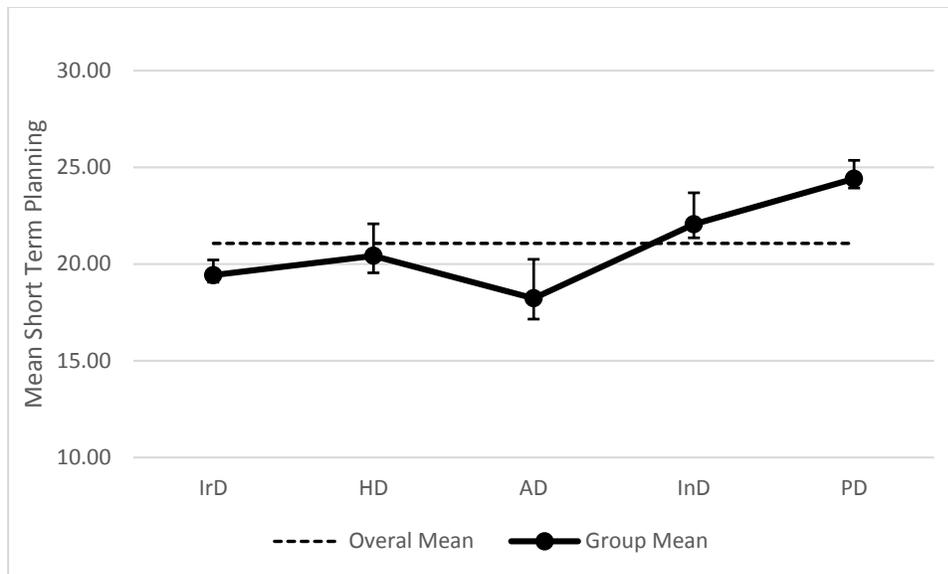


Figure 13-5. Mean plot of the short term planning by delay type

Table 13-17

Pairwise Comparison of Short-term Planning across Delay Types Groups

G1	G2	Cod	ΔM	s.e.	t	df	q-crit	LB	UB	S-Sig	ES	P-Sig
IrD	HD	-0.169	-1.00	0.658	-1.52	37.48	4.05	-3.67	1.67	No	T	No
IrD	AD	0.196	1.20	0.779	1.54	51.62	4.00	-1.91	4.31	No	T	No
IrD	InD	-0.431	-2.63	0.649	-4.05	84.34	3.94	-5.19	-0.07	Yes	S	No
IrD	PD	-0.846	-4.98	0.443	-11.26	299.78	3.86	-6.69	-3.28	Yes	L	No
HD	AD	0.384	2.20	0.937	2.35	63.97	3.97	-1.52	5.92	No	S	No
HD	InD	-0.286	-1.63	0.833	-1.96	68.24	3.96	-4.93	1.67	No	S	Yes
HD	PD	-0.737	-3.98	0.684	-5.82	43.22	4.03	-6.74	-1.23	Yes	M	Yes
AD	InD	-0.604	-3.83	0.931	-4.11	81.97	3.95	-7.50	-0.15	Yes	M	Yes
AD	PD	-1.065	-6.18	0.801	-7.72	57.23	3.98	-9.37	-2.99	Yes	L	Yes
InD	PD	-0.407	-2.35	0.676	-3.48	95.83	3.94	-5.01	0.30	No	S	Yes

Note. cd = Cohen's d; G1 = Group 1; G2 = Group 2, ΔM = Mean Difference; s.e. = Standard Error; df = Games-Howell estimation of degrees of freedom; q-crit = Games-Howell estimation of critical value. LB = 95% Confidence Interval Lower Bound; UB = 95% Confidence Interval Upper Bound; ES = Effect Size interpretation; T = Trivial; S = Small; M = Medium; L = large; n (IrD) = 229; n (HD) = 26; n (AD) = 40; n (InD) = 57; n (PD) = 135; S-Sig = Statistical Significance at .05 level; ES = Effect Size interpretation (Cohen, 1988; P-Sig = Practical Significant ($d > .41$, Ferguson, 2009).

Conceptually related constructs. I used a large number of validity scales and subscales that are conceptually and theoretically related to procrastination and other forms of delay in my research. The major difference between the variables in the conceptually related category and

those in the antecedents category is considerable theoretical and empirical doubt that the constructs are causally related to procrastination/delay. Nevertheless, there is consensus that these constructs at least have a considerable theoretical relation to procrastination/delay and shared causal factors (strong spurious relation) based on recent publications by leading researchers in the field (e.g., Steel, 2007; van Eerde, 2003; Ferrari et al., 1995)

The “conceptually related” category includes perfectionism (one total score and six subscale scores), self-esteem, spontaneity, self-sacrificing, overall hedonism, obsession and compulsion, and various coping strategies (14 subscales). The relation of the MMAP and DQ to this set of validation variables may provide information regarding how the scores obtained from the new measures of delay match the defining feature of constructs and therefore help validation of test score interpretations. The associations between most of the validation scales and selected MMAP scores and DQ prototypes are presented in Table 13-18. Most of the relations are not discussed in detail unless there is an unexpected or contradictory finding, and/or the construct has important theoretical or empirical connections to procrastination. Given the broad discussion in the field regarding the relation between perfectionism and procrastination, perfectionism is discussed in detail.

Perfectionism. One important construct related to procrastination is perfectionism. A set of validity propositions was built based on previous research that studied the relation between this construct and procrastination (Frost, Marten, Lahart, & Rosenblate, 1990; Voicu, 1993 as cited in Ferrari et al., 1995; Flett, Blankstein, Hewitt, & Koledin, 1992). Researchers have categorized perfectionism subscales of various measures into two major groups, those consisting of adaptive or positive features of perfectionism and those consisting of its more maladaptive or

negative aspects (Adkins & Parker, 1996; Dunkley, Zuroff, & Blankstein, 2003; Frost, Heimberg, Holt, Mattia, & Neubauer, 1993; Terry-Short, Owens, Slade, & Dewey, 1995)²⁵.

The differentiation between procrastination intensity and procrastination behaviour can be understood by looking at how these scores relate to perfectionism subscales and total scores. Among six subscales of perfectionism - personal standards, a positive and adaptive perfectionism, the doubting of actions, and concern over mistake - two maladaptive or negative forms of perfectionism are particularly important for our discussion. Similar to the findings of two key studies (Frost, Marten, Lahart, & Rosenblate, 1990; Voicu, 1993), the correlations between personal standards (i.e., personal component of perfectionism or adaptive perfectionism) and anxious procrastination behaviour (AP and IrD) were significant, whereas the correlations with procrastination intensity scores were not significant (see Table 13-18). Indeed, the magnitude of these associations was similar to those found in previous studies.

As for negative forms perfectionism, the doubting of actions and concern over mistakes had a significant, moderate, positive association with procrastination intensity, whereas their associations with AP and IrD were practically negligible and small. Since a majority of the subscales that constitutes total perfectionism score are maladaptive forms of perfectionism, similar differences between intensity and AP was found in their relation with total perfectionism. The same patterns of differences in magnitude of effect size and statistical significance were

²⁵ This categorisation of perfectionism has been criticized recently (see, Enns & Cox, 2002; Stoeber & Otto, 2006). Researchers proposed new categorisation of perfectionism such as dimensional conceptualization of perfectionistic strivings and perfectionistic concerns or typological conceptualisation of healthy perfectionists vs. unhealthy perfectionists (Stoeber & Damian, 2014; Stoeber & Otto, 2006). Regardless of the emerging research, the notion of positive and negative characteristics is still present.

found in Frost, Marten, Lahart, and Rosenblate (1990), who studied the relation between the same perfectionism factors with frequency and severity of academic procrastination.

These results highlight the distinction between procrastination intensity and procrastination behaviour. Given the pathological aspects captured by the procrastination intensity score and the fact that negative emotions were part of the intensity scores, an increase in procrastination intensity was conceptually linked to an increased level of negative perfectionism. These findings supported the interpretation of procrastination-intensity scores as a measure of procrastination problems.

The relation between perfectionism and other forms of delay has not been studied. Similar to its relation with procrastination, perfectionism could have a complex association with other forms of delay; the direction and importance of association of positive and negative perfectionism can differ from one form of delay to another. Because of the lack of clear information and empirical evidence regarding the nature of these associations, most of the correlational and mean differences analyses were conducted and reported for the purpose of exploration and supporting post-hoc validity arguments.

Despite the exploratory nature of these investigations of perfectionism and non-procrastinatory delay, logical analysis led me to expect that the direction of associations would match the overall positive or negative connotation of the constructs. For example, I expected that a negative form of delay such as hedonistic delay would be positively associated with a maladaptive type of perfectionism such as concern over mistakes (CM) but negatively associated relation with an adaptive form of perfectionism such as personal standards (PS). Similarly, I expected that positive forms of delay such as purposeful delay would be positively associated with adaptive perfectionism and negatively associated maladaptive perfectionism. Given the

theoretical and empirical relation between negative perfectionism and anxiety disorder, I expected a significant positive association between negative forms of perfectionism and DEP particularly DEEP.

It was difficult to predict the direction of relations between perfectionism and InD and AD based on the overall connotations or valences of these constructs. Inevitable delay is considered a rational form of delay, which can be seen as positive, yet because the delay is unwanted and inevitable, the delayer may experience negative emotions or other negative consequences. Similarly, arousal delay can be both a positive and a negative form of delay. It is positive because the arousal delayer intentionally plans to do the task at certain point in time later with a justification of working better under pressure, and he or she follows this initial plan. However, arousal delay is also negative because the person risks allocating insufficient time to complete the task, which may lower his/her achievement and performance as shown in Studies 7 and 9.

The correlational analysis revealed that similar to the relation with AP and IrD, scores on the personal standards subscale of perfectionism had a small negative association with HD scores. The relation between the personal standards (positive aspect of perfectionism) and the positive prototype of delay (PD) was positive and significant. Higher scores on CM were linked to higher scores on HD as expected. As expected, and in line with previous studies (Frost et al., 1993), delay due to enduring emotional problems had a significant negative association with negative aspects of perfectionism such as CM and DA. The magnitude of these associations was moderate.

Interestingly, inevitable delay had positive relations with both positive and negative perfectionism. Higher levels of personal standards as well as concern over mistakes and doubting

of actions were linked to higher levels of InD. There were no significant associations between changes in AD and positive and negative perfectionism scores.

In sum, the correlational findings with perfectionism were in line with the conceptual features and overall connotations of the delay prototypes. The findings support the positive versus negative interpretation of the scores and constructs for irrational delay, hedonistic delay, delay due to emotional problems and purposeful delay. The associations between the social aspects of perfectionism (parental criticism and parental expectation) and the organization subscale are presented in Table 13-18, but they are not discussed here. Overall, based on previous findings and conceptual analyses, there were no surprising relations. The relations between two social aspects of perfectionism (parental criticism and parental expectation) and intensity of procrastination problems were significant and could be justified based on previous research (e.g., Frost et al., 1990). Given the limitations of the Frost Multidimensional Perfectionism Scale (FMPS) in measuring the social aspects of perfectionism, future studies may need to explore the relations between these subscales and procrastination using other measures (e.g., Hewitt & Flett, 1991).

Table 13-18

Correlations between Conceptually Related Constructs and the MMAP and DQ Scores

	INT	DUR	AP	HP	IrD	HD	InD	PD	AD	DEP	DEEP	DTEP
FMPS	0.33	0.08	0.09	0.06	0.10	0.05	0.18	0.08	0.05	0.28	0.28	0.14
CM	0.38	0.13	0.13	0.13	0.15	0.10	0.17	0.03	0.02	0.31	0.34	0.12
Org	-0.16	-0.27	-0.23	-0.28	-0.20	-0.30	0.04	0.26	-0.14	-0.10	-0.10	-0.06
PS	0.01	-0.12	-0.16	-0.16	-0.14	-0.17	0.18	0.29	0.03	0.01	0.02	-0.01
PE	0.18	0.02	0.12	0.09	0.11	0.07	0.04	-0.03	0.12	0.14	0.13	0.10
PC	0.23	0.05	0.09	0.11	0.06	0.17	0.12	0.00	0.08	0.29	0.27	0.20
DA	0.40	0.22	0.14	0.07	0.20	0.03	0.17	-0.03	-0.07	0.28	0.28	0.13
RSES	-0.39	-0.19	-0.18	-0.17	-0.23	-0.18	-0.07	0.15	0.04	-0.41	-0.44	-0.15
SPON	0.47	0.22	0.23	0.16	0.25	0.22	0.17	-0.06	0.04	0.47	0.51	0.18
SACR	0.35	0.18	0.21	0.14	0.22	0.15	0.21	0.00	0.05	0.35	0.36	0.16
HCS	-0.16	-0.04	-0.05	0.06	-0.05	0.03	0.03	0.15	0.09	-0.20	-0.24	-0.04
OCIR	0.24	0.07	0.05	0.10	0.07	0.19	0.08	0.05	0.09	0.26	0.22	0.21
CHEC	0.16	0.04	-0.01	0.04	0.02	0.12	0.07	0.05	0.06	0.20	0.13	0.22
HOAR	0.31	0.16	0.16	0.20	0.19	0.22	0.11	0.02	0.09	0.21	0.18	0.16
NEUT	0.12	-0.01	-0.01	0.10	-0.03	0.18	0.02	0.08	0.13	0.15	0.10	0.17
OBSE	0.32	0.14	0.12	0.13	0.11	0.19	0.09	-0.01	0.03	0.38	0.39	0.19
ORDE	0.14	-0.02	0.01	0.01	0.05	0.05	0.06	0.06	0.04	0.10	0.08	0.08
WASH	0.06	0.01	-0.02	0.02	-0.04	0.12	0.06	0.06	0.10	0.21	0.17	0.19
COP1	0.18	0.10	0.20	0.13	0.22	0.03	0.13	0.07	0.03	0.03	0.02	0.04
COP2	-0.25	-0.21	-0.19	-0.18	-0.21	-0.18	0.05	0.24	0.08	-0.23	-0.24	-0.10
COP3	0.20	0.06	0.11	0.17	0.03	0.23	0.07	-0.01	0.10	0.31	0.26	0.25
COP4	0.19	0.17	0.12	0.20	0.03	0.26	0.04	-0.04	0.12	0.23	0.23	0.11
COP5	-0.06	-0.06	-0.10	-0.14	-0.01	-0.15	0.13	0.16	-0.12	-0.06	-0.05	-0.06
COP6	-0.07	-0.05	-0.08	-0.11	0.02	-0.10	0.11	0.18	-0.06	-0.07	-0.09	-0.02
COP7	0.34	0.16	0.22	0.23	0.19	0.31	0.09	-0.11	0.09	0.42	0.42	0.21
COP8	0.11	0.02	0.09	0.03	0.09	0.01	0.08	0.09	0.05	0.05	0.04	0.03
COP9	-0.15	-0.07	-0.11	-0.09	-0.09	-0.08	0.05	0.16	0.03	-0.14	-0.17	-0.01
COP10	-0.16	-0.10	-0.15	-0.15	-0.14	-0.18	0.07	0.26	0.03	-0.18	-0.18	-0.09
COP11	0.08	0.11	0.16	0.24	0.13	0.17	0.03	0.04	0.20	-0.01	0.00	-0.01

	INT	DUR	AP	HP	IrD	HD	InD	PD	AD	DEP	DEEP	DTEP
COP12	-0.07	-0.03	0.02	0.00	0.06	-0.03	-0.03	0.12	0.11	-0.09	-0.10	-0.04
COP13	0.01	-0.05	-0.04	-0.04	-0.05	-0.04	0.01	0.05	0.06	0.01	-0.06	0.13
COP14	0.41	0.20	0.19	0.11	0.26	0.11	0.19	-0.01	-0.03	0.30	0.34	0.08

Note. FMPS = Total perfectionism; CM = Concern over mistakes (FMPS subscale); ORG = Organization; PS = Personal Standards; PE = Parental expectations; PC = Parental criticism; DA = doubting of actions; RSES = Rosenberg Self-Esteem Scale Total; SPON = Spontaneity; SACR = Self-Sacrificing; HCS = Total Hedonism; OCIR = Obsessive-Compulsive Inventory-Revised total score; CHEC = Checking Subscale OCI-R; HORD = Hoarding Subscale OCI-R; NEUT = Neutralizing Subscale OCI-R; OBSE = Obsessing Subscale OCI-R; ORDE = Ordering Subscale OCI-R; WASH = Washing Subscale OCI-R; COP1 to COP14 = Self-distraction, Active coping, Denial coping, Substance use coping, Use of emotional support, Use of instrumental support, Behavioral disengagement, Venting, Positive reframing, Planning, Humor, Acceptance, Religion, Self-blame. Correlations greater than or equal to 0.09, 0.12, 0.15, and 0.17 were significant at 0.05, 0.01, 0.001, and 0.0001 alpha levels for two-tailed tests and 0.07, .11 0.14, and 0.17 for one-tailed tests (N = 490).

In addition to the correlational approach, average levels of perfectionism were then compared across types of delay. Analysis of variance showed significant differences for personal standards [$F(4, 482) = 3.69, p = .006$; Levene statistic $p = .40$], doubting of actions [$F(4, 482) = 6.97, p = .000$; Levene statistic $p = 0.08$], and parental expectation [$F(4, 482) = 2.58, p = .04$; Levene statistic $p = .60$]. A pairwise comparison using the Hochberg adjustment for multiple comparisons indicated that levels of personal standards were significantly lower in irrational delay than in other forms of delay, however the effect size was small. The level of personal standards was significantly lower in hedonistic delay in comparison to purposeful delay; this difference was only practically significant and the effect size was medium.

The doubting of actions (DA) was significantly higher in irrational delay in comparison to both purposeful delay and arousal delay. Similarly, levels of DA were higher in inevitable delay than in arousal delay. The DA findings were in line with the definition of the delay constructs. We would expect lower levels of DA among people who risk doing tasks at the last minute (Arousal Delay) than among people who intend to do tasks at an optimal (i.e., “perfect”) time, and who feel some level of emotional distress when they postpone tasks despite their initial intention (i.e., irrational and inevitable delayers).

Figures 13-6 to 13-8 presents the means plots for personal standards, concern over mistakes and parental expectations. Although many of the pairwise difference were not significant, the positions of the means in these plots were conceptually justifiable, supporting the constancy between scores and their conceptual definition.

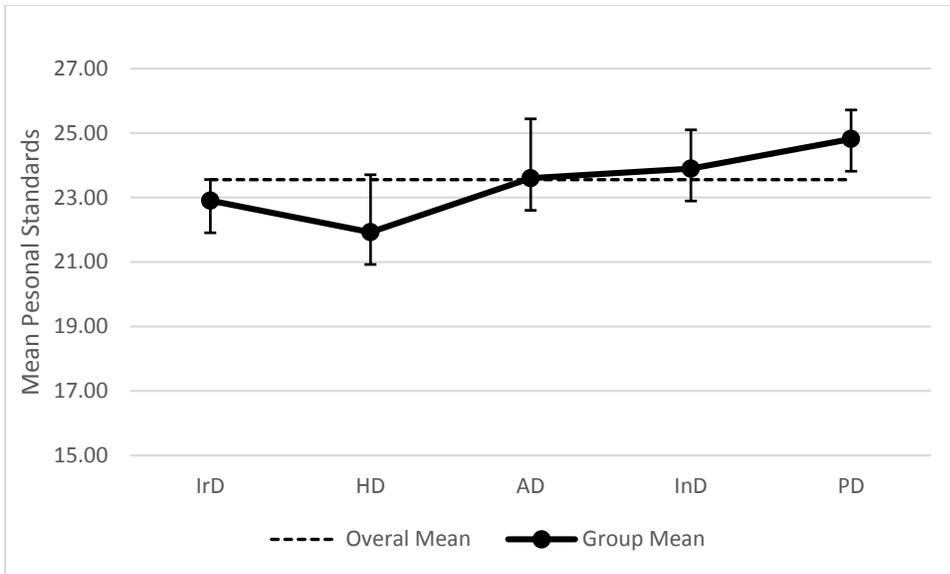


Figure 13-6. Mean personal standards by dilatory behaviour types.

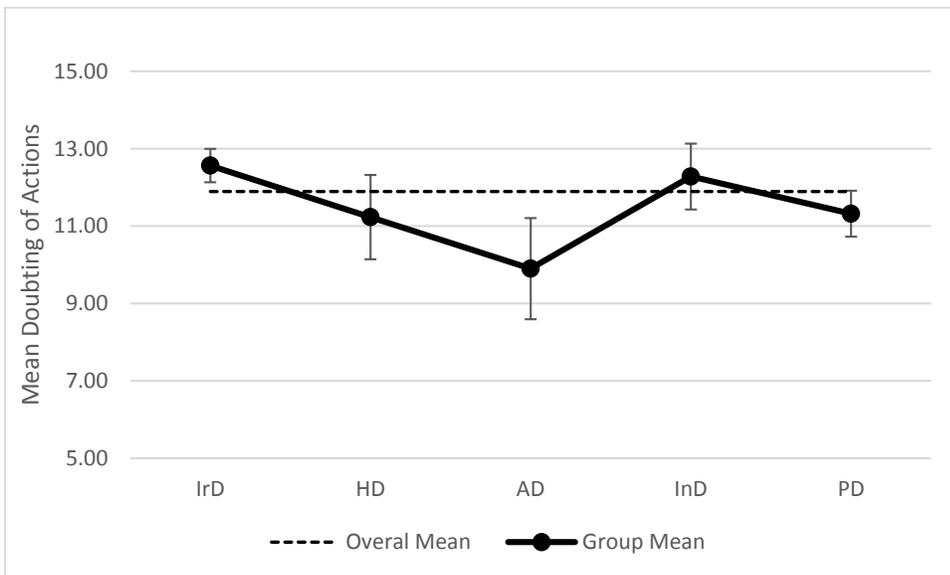


Figure 13-7. Mean doubting of actions by dilatory behaviour types.

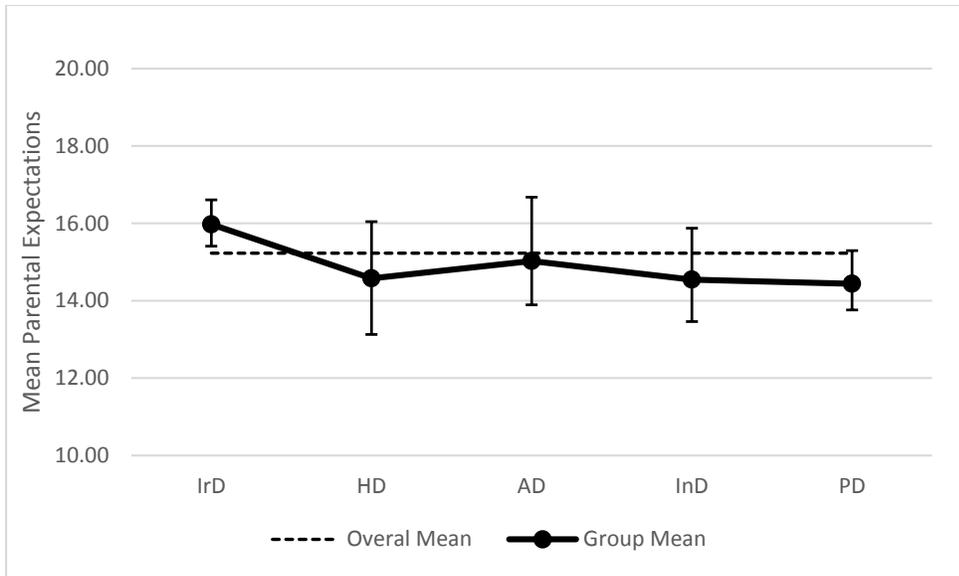


Figure 13-8. Mean parental expectations by dilatory behaviour types.

The correlations between procrastination/delay and other conceptually related measures (e.g., coping) are presented in Table 13-18. In the following section, I mention a few important propositions and/or findings in this table and highlight obvious discrepancies. Many of these relations were studied with an exploratory objective but can still contribute to the post hoc validity argument.

Given its emotional and perceptual components, intensity of procrastination (total score) had negative associations with those validity variables that are considered adaptive, and had negative associations with those that are considered not helpful or maladaptive. For example, if the construct of procrastination problems is measured by the new scale (MMAPI) appropriately, scores on this scale should have a negative relation with problem-focused coping (e.g., active coping, planning) and self-esteem and a positive relation with the theoretically relevant coping strategies that are generally less effective (particularly in the long run) such as self-distracting, behavioral disengagement, denial, and self-blame. Similarly, we might also expect to see a

negative association between total obsessive compulsiveness and intensity of procrastination scores.

The results related to procrastination intensity were overwhelmingly in line with the validity arguments, supporting the overall interpretation of the intensity score. Self-blame and behavioural disengagement had moderate effect sizes in their relations with procrastination-intensity scores.

Similar reasoning was used to develop the initial propositions for the validation arguments of various forms of delay and to evaluate and interpret the correlation between the validity scales and various prototypes of delay. For example, self-esteem is considered a key positive self-system variable. It had a moderate negative association with IrD, and HD (i.e., negative forms of delay) and a small positive association with PD (i.e., a positive form of delay).

The construct labeled spontaneous/borderline measures a personality style defined by an internal emotional lack, fluctuating self-esteem and feelings, and a self-harming impulse. The spontaneity/borderline construct can be linked to several personality disorders (Kuhl & Kazen, 2009), and it is theoretically and empirically linked to lower levels of regulation of negative affect (Heckhausen, 2000). Because some negative forms of delay (IrD, HD, DEP) were linked to problematic emotion regulation, I expected to find a positive correlation between dilatory behaviours and this manifestation of down-regulation of negative affect.

The results supported the above propositions. The spontaneous/borderline measure had a significant positive association with all forms of negative prototypes of delay. The effect sizes were small for IrD and HD, but moderate for DEEP. It should be noted the association between spontaneity/borderline construct and intensity total score was positive and medium to large.

In contrast to the relatively small association between spontaneous/borderline personality style and IrD and AP, which are measures of procrastination behaviour, its correlation with procrastination-intensity scores was considerable and of practical importance. Because the spontaneous/borderline variable measures a form of psychopathology, its differential correlations with procrastination intensity and procrastination behaviour is consistent with the conceptualizations and proposed usage and interpretations of these new measures of procrastination. Once again, procrastination-intensity scores highlight intensity of procrastination as a psychological problem. This interpretation and usage of the intensity score are discussed in greater details where the relation between intensity and mental health outcome are presented.

The only surprising result was related to the association between the overall hedonism scale and hedonistic delay. I expected to see a positive relation between these two constructs due to a shared conceptual link, however there was no significant zero-order correlation between hedonistic beliefs and the prototype of hedonistic delay. To explore this result further, I used two strategies. First, I used multiple regression to look at the unique relation between the two variables after the shared variance with the other prototypes of delay was statistically eliminated. Second, I studied mean differences in hedonism across various types of task.

Standardized regression coefficient and the semipartial correlation between HD and hedonism was significant [$\beta = .11, p = 0.04, r = .09$] in a positive direction. Purposeful delay also had significant positive relation with hedonism [$\beta = .16, p = 0.002, r = .14$]. Hedonistic delayers had the highest level of hedonism in comparison to other dilatory groups, particularly irrational delayers (see Figure 13-9).

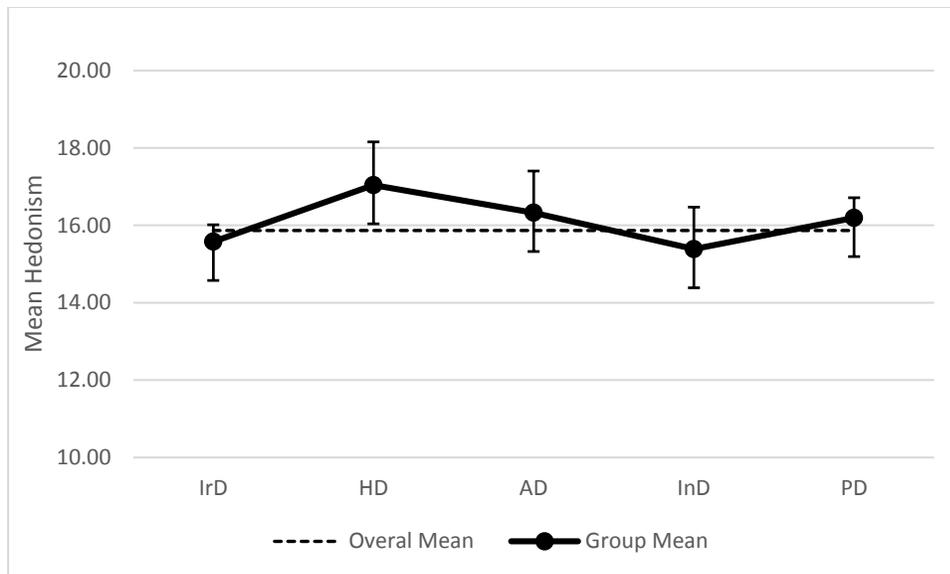


Figure 13-9. Mean of hedonism by dilatory behaviour types.

Cohen's d for pairwise mean differences showed a practically significant difference between IrD and HD groups in the level of hedonism beliefs ($d = -0.44$). However, ANOVA showed no overall significant differences in hedonism beliefs across dilatory types [$F(4, 482) = 2.00, p = 0.09$].

In line with the content of the hedonistic delay construct, those who endorsed the hedonistic delay prototype had relatively higher scores on a set of hedonistic beliefs such as “Life is made for pleasure,” “You must live for the present,” and “I make the most of life.” Regression analysis showed that hedonistic delay had a weak unique association with overall hedonistic beliefs. However, the change in the level of the hedonistic beliefs also had a significant association with purposeful delay, a form of delay with positive connotations.

Based on these results, it can be argued that overall hedonism was not a unique and strong reason behind hedonistic delay. Such beliefs were common among students and there were no significant differences between participants by type of delay. Furthermore, in some cases higher levels of hedonistic beliefs were associated with higher levels of positive forms of

delay. We might conclude that makes a person with high levels of hedonism show hedonistic delay and not purposeful delay is not hedonism alone, but a lack in the factors that can control the tendency towards purposeful and goal-directed behaviours. Such a conclusion is in line with my earlier theoretical discussion regarding the central role of self-regulation or self-control in defining both hedonistic and purposeful delay.

Outcome and consequences. In Study 10, a broad set of outcome variables were used, including psychological well-being, perceived mental and physical health, perceived stress, quality of life, satisfaction with one's social activities and relationships, common emotional problems in student populations (feeling anxious, depressed, and irritated), and fatigue. Also, to replicate the results related to academic achievement obtained in Studies 6 to 9, a new self-report measure of academic performance was used. All of the variables provided a rich amount of evidence for evaluating criterion (concurrent) validity.

The main reason for gathering a broad range of evidence about concurrent validity was to evaluate the validity of the interpretation of the intensity and duration of procrastination scores as measures of procrastination problems. To the extent that the scores captured the constructs appropriately and measured procrastination as a psychological problem, I expected to see statistically and practically significant relations with various indices of well-being, health, and social relations in addition to negative academic outcomes. Based on the same rationale, I expected the association of the intensity scores to be stronger than the association of the duration scores and procrastination behaviours (i.e., AP/IrD, HP/HD) with various outcome variables. Table 13-19 presents the specific propositions for procrastination intensity, duration, and behaviours as well as other forms of delay.

Table 13-19

Hypothesized Associations between the MMAP and DQ Subscales with the Outcome Validation Scales

	INT	DUR	AP	HP	IrD	HD	InD_	PD	AD	DEP	DEEP	DTEP
PWB	SN/MN	SR(N)	SR(N)	SR(N)	SR(N)	SR(N)	NR/PZ	SP	EX	SN/MN	SN/MN	SN/MN
GH	SN/MN	SN	SR(N)	SR(N)	SR(N)	SR(N)	NR/PZ	SP	EX	MN	MN/LN	NR/PZ
PMH	SN/MN	SN	SR(N)	SR(N)	SR(N)	SR(N)	NR/PZ	SP	EX	MN	MN/LN	NR/PZ
PPH	SN/MN	SN	SR(N)	SR(N)	SR(N)	SR(N)	NR/PZ	SP	EX	MN	MN/LN	NR/PZ
QL	SN/MN	SN	SR(N)	SR(N)	SR(N)	SR(N)	NR/PZ	SP	EX	MN	MN/LN	SR(N)
STER	MP/LP	SR(P)	SR(P)	SR(P)	SR(P)	SR(P)	SR(P)	SN	EX	MP/LP	MP/LP	SP
SSA	SN	EX	SN/MN	SN/MN	NR/PZ							
EP	MP/LP	SR(P)	SR(P)	SR(P)	SR(P)	PZ	EX	SN/PZ	EX	MP/LP	MP/LP	SP
FATI	SP/MP	SR(P)	SR(P)	EX	SR(P)	EX	SR(P)	SN/PZ	NR	MP/LP	MP/LP	SP/PZ
RGRD	SN	SN	SN	SN	SN	SN	PZ	SN	SP/PZ	SN	SN	SN

Note. PWB = Total Psychological Well Being; GH = General Health; PMH = Perceived Mental Health; PPH = Perceived Physical health; QL = Quality of life; PSTER = Perceived Stress; SSA = Satisfaction with Social Activities and Relationships; EP = Emotional Problems (feeling anxious, depressed or irritable); FATI = Average Fatigue; RGRD = Recent Grades.

The results of the correlational analyses are presented in Table 13-20. The magnitude and direction of correlations overwhelmingly support the validity propositions related to intensity scores. Given that the main purpose of MMAP is to measure procrastination as a psychological problem, intensity scores functioned well to provide such information. Intensity scores had practically significant associations with all of the important outcome variables used in this study. For example, procrastination intensity had a moderate negative correlation with total psychological well-being and mental health. In fact, procrastination intensity explained about 11 to 15 percent of the variance in these outcome variables. The association between intensity and stress, an important risk factor for many health issues, was large. Intensity scores explained 29 percent of the variance in stress. The magnitude of the direct association between procrastination intensity and all of the health factors used in this study was not only practically significant but also alarming. It should be noted that procrastination problems as measured by intensity scores showed a considerable effect size in relation to the outcome variables that have multiple causes

and in a young population who are assumed to have higher levels of positive health and mental health in comparison to general public. The results were theoretically predicted because school life and school tasks are so central in the lives of students; problematic procrastination relates not only how students engage with school tasks but also how they feel about themselves and how they perceive themselves in relation to others. Intensity scores reflected these theoretical predictions. Moreover, the correlations reflected the distinction between procrastination intensity and procrastination duration and behaviours. The only exception was related to the difference between intensity and hedonistic delay. Hedonistic delay (measured by the DQ) and intensity scores showed the same magnitude of association with overall psychological well-being. It was interesting but still conceptually justifiable that hedonistic delay had strong negative associations with purpose in life and sense of personal growth.

Table 13-20

The Correlations the MMAP and DQ Scales with Outcomes

	INT	DUR	AP	HP	IrD	HD	InD_	PD	AD	DEP	DEEP	DTEP
PWB	-0.33	-0.22	-0.17	-0.26	-0.15	-0.34	-0.07	0.15	-0.10	-0.37	-0.35	-0.23
AUPW	-0.22	-0.11	-0.08	-0.18	-0.11	-0.21	-0.12	0.02	0.02	-0.21	-0.19	-0.16
EMPW	-0.43	-0.31	-0.26	-0.22	-0.29	-0.25	-0.05	0.25	-0.03	-0.35	-0.37	-0.15
PGPW	-0.22	-0.13	-0.12	-0.21	-0.06	-0.33	-0.05	0.13	-0.15	-0.24	-0.22	-0.17
PRPW	-0.13	-0.10	-0.03	-0.18	0.04	-0.27	-0.08	0.01	-0.14	-0.27	-0.22	-0.24
PLPW	-0.27	-0.20	-0.22	-0.32	-0.15	-0.38	0.05	0.22	-0.17	-0.32	-0.32	-0.19
SAPW	-0.31	-0.21	-0.12	-0.15	-0.14	-0.18	-0.07	0.11	0.00	-0.36	-0.37	-0.17
GH	-0.25	-0.09	-0.18	-0.09	-0.15	-0.11	-0.06	0.18	0.04	-0.27	-0.30	-0.08
PMH	-0.39	-0.19	-0.25	-0.10	-0.27	-0.08	-0.07	0.22	0.10	-0.38	-0.47	-0.02
PPH	-0.29	-0.14	-0.20	-0.10	-0.22	-0.10	-0.03	0.20	0.02	-0.24	-0.27	-0.09
QL	-0.28	-0.14	-0.18	-0.12	-0.13	-0.15	-0.01	0.18	-0.01	-0.31	-0.33	-0.14
STER	0.54	0.25	0.28	0.16	0.32	0.15	0.16	-0.14	-0.08	0.43	0.45	0.18
SSA	-0.23	-0.08	-0.14	-0.06	-0.12	0.00	0.01	0.14	0.05	-0.28	-0.32	-0.06
EP	0.37	0.13	0.14	0.01	0.21	0.01	0.12	-0.09	-0.11	0.37	0.42	0.12
FATI	0.34	0.16	0.20	0.09	0.25	0.06	0.12	-0.06	-0.06	0.26	0.30	0.07
RGRD	-0.24	-0.11	-0.16	-0.11	-0.17	-0.17	0.05	0.25	0.02	-0.16	-0.13	-0.13

Note. PWB = Total Psychological Well Being; AUPW= Autonomy; EMPW = Environmental Mastery; PGPW = Personal Growth; PRPW = Positive Relations with Others; PLPW = Purpose in Life; SAPW = Self-Acceptance; GH = General Health; PMH = Perceived Mental Health; PPH = Perceived Physical health; QL = Quality of life; PSTER = Perceived Stress; SSA = Satisfaction with Social Activities and Relationships; EP = Emotional Problems (feeling anxious, depressed or irritable); FATI = Average Fatigue; RGRD = Recent Grades. Correlations greater than or equal to 0.09, 0.12, 0.15, and 0.17 were significant at 0.05, 0.01, 0.001, and 0.0001 alpha levels for two-tailed tests and 0.07, .11 0.14, and 0.17 for one-tailed tests (N = 490).

The direction of relations between procrastination duration and the validity scales were identical to the ones for intensity scores. Long-duration procrastination problems were associated with more negative physical and mental health outcomes. Among the validity scales, duration had practically considerable relations with psychological well-being and stress. The duration of procrastination problems by definition provides complementary information regarding the severity of problems. Having procrastination problems for a long time may not necessarily be related to higher levels of negative health outcomes for some participants; they may have been able to cope with the problem and reduce its negative effects. Duration information may provide

useful information for intervention studies and programs where the type and depth of interventions can be adjusted according to the duration of the problems. Such usage of duration scores has not been investigated in this study and requires further research.

As discussed and repeated in this dissertation, not all forms of delay should be considered procrastination and not all forms of delay should be considered negative. The study of correlations between prototypes of delay and outcome variables highlights this distinction. In line with what I have explained in previous sections of the dissertation, purposeful delay had positive and significant relations with health and well-being indices, including psychological well-being, mental, physical and general health, and even satisfaction in social activities. It also had a negative relation with stress. These findings support interpreting purposeful delay scores as a positive form of delay.

In contrast, irrational and hedonistic delay (both defined as forms of procrastination) had negative relations with positive outcomes and negative relations with positive outcomes, supporting labelling them as negative forms of delay or procrastination. Arousal delay and inevitable delay can be positioned between the negative and positive poles. AD and InD scores had complex patterns of relations and should not be considered as simply positive or negative forms of delay.

Severe procrastination problems. In addition to validating procrastination intensity as a continuous variable, it was important to provide a cut-off score that can be used to identify groups with high and low procrastination intensity. Converting a continuous variable to a categorical one can result in considerable loss of information and is not recommended statistically. This is particularly true in basic research and theoretical model testing. However, because the new measure is also intended for use in identifying/screening people with severe

procrastination problems in intervention research and treatment programs, it is important to provide such a cut-off. Using cut-offs is very common in psychological testing to screen for individuals with psychological problems/disorders (e.g., depression, anxiety) in order to further assess problems and provide appropriate referrals and treatment.

With respect to identifying cut-off scores, there was one major difference between common psychological tests and the MMAP. The development and validation of cut-offs for self-reports of psychological problems/disorders is based on established diagnostic standards (called “gold standards” in clinical and medical literature). This standard is often obtained through clinical interviewing and/or using a set of diagnostic criteria that is systematically established and widely accepted among clinicians. In these instances, various indices (e.g., sensitivity²⁶, specificity, positive and negative predictive value, and likelihood ratio) for potential cut-offs are calculated and compared. There is no gold standard for diagnosing procrastination as a psychological problem. If such a standard were available, we could assume that it would have significant and practically meaningful magnitudes of association with a set of mental health outcomes, particularly because we measured severe and problematic forms of dilatory behaviour on important tasks.

Two strategies could be employed in order to identify and/or evaluate a cut-off score. First, we could use a common method to transform a continuous variable into categorical variable²⁷ and then evaluate the differentiation between categories on various outcome variables

²⁶ Sensitivity is the percentage of true positive result (e.g., proportion of correct classification of problematic procrastinators); specificity is the percentage of true negative results (e.g., correct classification of non-problematic procrastinator).

²⁷ Methods that are used to transform a continuous variable to categorical one included using equal width interval, using equal percentiles, using equivalent of raw response options, and using mean and standard deviation.

using MANOVA tests and post hoc pairwise comparisons. Second, instead of transforming intensity into a categorical variable, we could choose and dichotomise a criterion variable and use a “receiver operating characteristics” (ROC) curve and indices such as sensitivity and specificity to find a cut off for intensity of procrastination (Green & Swets, 1966; Hosmer & Lemeshow, 2000; van Erkel & Pattynama, 1998). This process involves comparing possible cut-off values to determine the ones with the best accuracy and discriminatory power. To further validate the cut off, this process could be repeated using other important outcome variables. The final cut-off could then be selected based on the comparison of the ROCs, sensitivities, and specificities statistics related to optimal cut offs obtained from multiple criterion variables.

Both methods can potentially provide an artificial cut off in the absence of a direct gold standard and/or a well-developed clinical assessment. Until we have valid and well-accepted clinical research, the second method may provide a better cut off since it is more flexible and allows for comparisons of all possible magnitudes of the cut off. Different functions of cut-offs (ruling out vs. ruling in or screening vs. confirming) can be compared in order to choose an optimally functional cut off. Moreover, similar to the first method, the selected cut off can still be evaluated based on its association with other outcome variables. As well, a similar method of determining cut off scores has been used for other personality factors such as self-esteem (see Isommaa et al., 2012).

Given the purpose and negative psychological aspects of the procrastination-intensity score, a low level of mental health problems was used as one of the criteria in defining the cut-off for procrastination problems. To provide a broader and stronger measure, a global mental health (GMH) score was calculated using four items from the patient-reported outcomes measurement information system (PROMIS) and based on the recommendations and empirical

work of Hays and colleagues (2009). The GMH covers not only overall mental health status but also emotional problems, social and relational satisfaction, and quality of life. The global mental health score has shown promising predictive power in relation to multiple health and mental health variables (e.g., anxiety, depression, EQ-5D health index) across different studies (see Heys et al., 2009; Revicki, Kawata, Harnam, Chen, Hays, & Cella, 2009).

The mean for GMH in Study 10 ($M = 3.30$, $SD = 0.83$) was lower than the one in Heys et al. (2009; $M = 3.60$, $SD = 0.89$), indicating a lower level of mental health in my sample. Since the GMH may vary in different demographic groups, and given that specific normative information was not available, the sample statistic was used to define a dichotomy of low (1 SD below the sample mean; approximately 1.26 SD below Heys' sample mean) versus high mental health groups. In the next stage, a “receiver operating characteristics” (ROC) curve was obtained based on the intensity total score (see Figure 13-10). The area under the ROC curve was 0.73, indicating fair or acceptable discrimination or classification accuracy of the intensity test (Hosmer & Lemeshow, 2000).

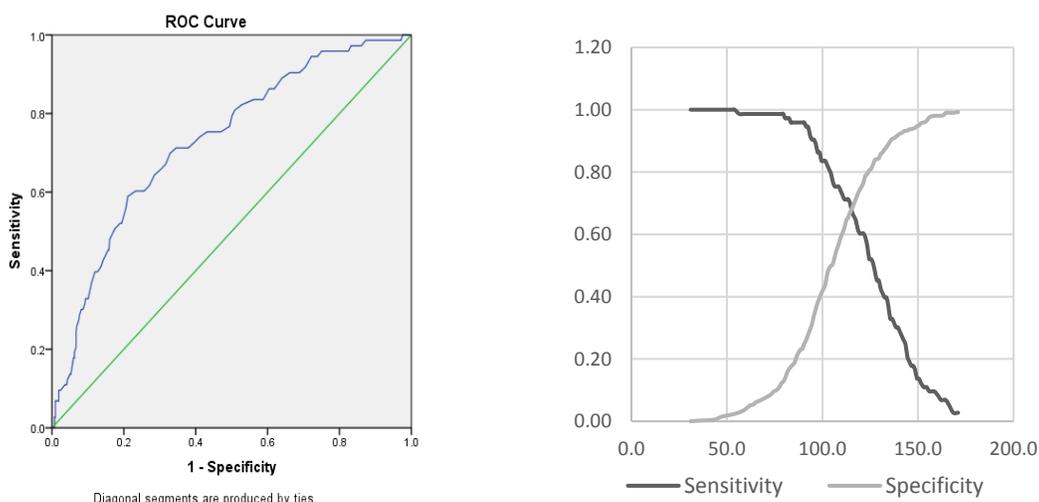


Figure 13-10. Sensitivity and specificity for intensity cut offs based on global mental health.

The ROC analysis produced the sensitivity and specificity for different potential cut-off points of the intensity total score. Sensitivity measured the percentage of participants with low global mental health who scored higher than a specific cut off, and specificity represented the proportion of individuals who did not have low scores on global mental health and were scored below the cut off for procrastination problems. There are different strategies to choose the cut off based on the magnitude of sensitivity and specificity. Because a balance between specificity and sensitivity provides maximum discrimination power, the point that represented this balance was identified and selected as an optimal cut-off. The detailed ROC results for potential cut-offs are presented in Table 13-21. Figure 13-10 shows the curve between sensitivity and specificity, which shows that the optimal point (cross point in the right plot in Figure 13-10) should be around an intensity score of 115.5. The corresponding sensitivity and specificity for this point was 67 and 68%, respectively; a modest magnitude, indicating a true positive (having a high level of severity) and negative test result (not having procrastination) usually obtained among those with and without low mental health scores. The positive predictive value (PPV), and negative predictive value (NPV) was 27% and 92%, respectively.

Table 13-21

Sensitivity, Specificity, PPV, and NPV for Different Cutoffs of Procrastination Problems Intensity in Relation to Global Mental Health and Psychological Stress

Criterion	PI-Total Cut Off	Sensitivity	Specificity	PI-Mean Cut Off	PPV	NPV
Global Mental Health	113.5	0.71	0.65	3.55		
	114.5	0.70	0.67	3.58	27.1	92.7
	115.5	0.67	0.68	3.61	27.1	92.2
	116.5	0.66	0.70	3.64		
Psychological Stress (Sample)	114.50	.756	.691	3.58		
	115.50	.732	.703	3.61		

	116.50	.695	.713	3.64	32.8	92.1
	117.50	.683	.730	3.67		
Psychological Stress (Normative)	112.50	0.68	0.69	3.52		
	113.50	0.68	0.70	3.55	43.9	86.4
	114.50	0.66	0.71	3.58	44.1	85.8
	115.50	0.64	0.73	3.61		

Stress has been an important risk factors for many physical and psychological problems including cardiovascular disease (Krantz & McCeney, 2002) and depression (Hammen, 2005; Kessler, 1997; Mazure, 1998; Monroe & Simons, 1991). The link between procrastination problems and stress and the role of stress in mediating the negative effect of procrastination on health outcomes is repeatedly highlighted in the literature (Sirois, Melia-Gordon, & Pychyl, 2003; Sirois, 2007). If self-regulation and conscientiousness are to be considered the most important causal factors underlying procrastination, psychological stress could be considered one of procrastination's most important consequences. Based on the empirical evidence as well as the theoretical link, it can be argued that if the gold standard for diagnosing procrastination problems existed and participants could be divided according to this standard, those with severe procrastination problems should have higher levels of psychological stress in comparison to those with no procrastination problems. This is why perceived stress was used as another important factor to estimate the cut-off for procrastination problems in the absence of a clinical evaluation.

It should be noted that perceived stress, similar to global mental health, was not a diagnostic test, therefore no standard cut-offs were available. However, normative data were available. The choice of using the sample mean and SD are justifiable because of the temporal nature of psychological stress. A high level of psychological stress was defined based on one standard deviation above the sample mean (19.68, $SD = 6.26$). This was equivalent to 1.34

standard deviations (normative *SD*) above the mean obtained from the latest normative data (Cohen & Janicki-Deverts, 2012). In other words, only participants with a practically significant higher level of stress than the mean population were selected. The initial optimal cut off could be slightly different if instead of sample statistics, the normative mean were used to dichotomize total stress variable (see Table 13-21). However, the final choice of intensity cut off score based on both GMH and stress results were similar, regardless of whether sample or reported mean and *SD* by other researchers were used.

Figure 13-11 shows the ROC and the curve that were used to identify the balance cut off (the maximum discrimination). The area under the curve was .79, with a confidence interval of .74 to .84, indicating good classification, discrimination, and accuracy. The curves showed that that the optimal cut off should be a total intensity score of around 116 (cross point in right plot). The sensitivity and specificity percentages were modest, 70% and 71%, respectively.

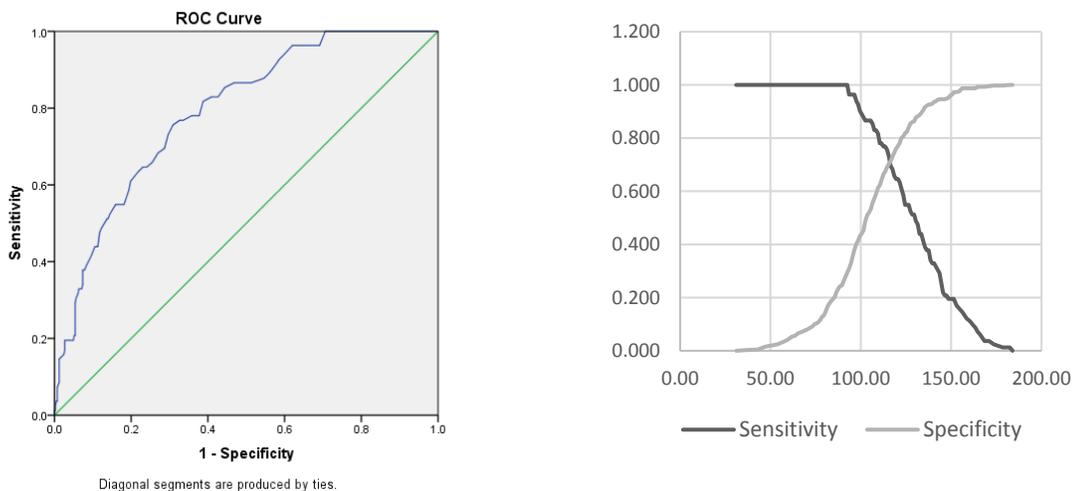


Figure 13-11. Sensitivity and specificity for intensity cut offs based on psychological stress. Note: The sample mean and SD were used to dichotomize psychological stress.

The potential range of optimal cut-offs was 113 to 117 based on the results related to mental health and stress. Accordingly, a total intensity score of 115.5 or a mean intensity score of 3.61 was considered the final cut off to identify cases with high level of problematic procrastination or a severe procrastination problem. Using the psychological stress as criterion, the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) related to the cut off were 70%, 71%, 33% and 92%, respectively. The findings support the use of this cut off for screening purposes.

It should be noted that the criteria used for establishing the cut-off were not a strong representation of all aspects of procrastination problems. Therefore, the cut off should be used with caution and needs to be further evaluated in different populations and with other criteria. However, despite this inherent conceptual drawback, the discrimination and accuracy of the intensity score for classifying participants were reasonable. The measure and obtained cut off seemed to perform very well for screening purposes (identifying potential cases with procrastination problems). Moreover, having very close and overlapping ranges of optimal cut off scores based on both criteria (i.e., mental health and stress) supported the validity of cut-off. In the next section, I report the validation of the cut-off by looking at how classification matches our prediction regarding the differences between those who have and do not have severe procrastination problems.

To validate the cut-off and its interpretation, mean differences between severe and not-severe groups were tested on the following causal and outcome variables: self-control, fear of failure, relevant dimensions psychological well-being, emotional problems/distress, global physical health, and a measure of academic achievement. In line with the validation hypotheses presented for the continuous score of procrastination severity, I expected to see both practically

and statistically significant differences between the severe and non-severe procrastination groups (see Table 13-22).

Table 13-22

Difference between Students with and without Severe Procrastination Problems

Variable	M	SD	Cohen's d	ES	P-Sig	F	S-Sig
Self-control	40.03	8.27	-0.922	large	Yes	97.01	.000
Fear of Failure	15.46	4.84	0.679	Medium	Yes	52.64	.000
Exam Anxiety	3.34	1.06	0.625	Medium	Yes	44.65	.000
Self-esteem	5.78	5.78	-0.610	Medium	Yes	42.47	.000
Decision Action Orientation	6.61	2.99	-0.850	large	Yes	82.56	.000
Doubting of Actions	11.90	3.50	0.586	Medium	Yes	39.17	.000
Concern over Mistakes	24.90	7.99	0.576	Medium	Yes	37.88	.000
Recent Grades at University	4.70	1.91	0.389	Small	No	16.35	.000
General Health	3.50	0.95	-0.545	Medium	Yes	33.88	.000
Global Physical Health	3.61	0.59	-0.622	Medium	Yes	44.11	.000
Environmental Mastery	32.29	6.44	-0.706	Medium	Yes	56.82	.000
Self-Acceptance	33.50	7.26	-0.516	Medium	Yes	30.35	.000

Note. $df_1 = 1$ $df_2 = 488$ for all variables except FGU; df_2 for FGU = 459; positive signs indicate larger mean in high severe group in comparison to no severe procrastination problem.

The results rejected the null hypothesis in favor of the main hypotheses mentioned above. The effect sizes for all of the variables with the exception of “recent grades” at university were medium or large, providing initial support for the utility and significance of the selected cut offs. The findings showed that students who score above the cut-off scored practically and statistically lower on positive constructs and considerably higher on negative characteristics or outcomes in comparison to those who scored below the cut-off point. These findings could be considered promising support for the utility of the cut off. However, it does not tell us whether relatively low or high levels of procrastination intensity are considered clinically abnormal. Future research will need to compare the results with clinically significant cut-offs for validity scales, where such cut-offs exist.

It should be noted that the non-severe procrastination group is heterogeneous and includes those who report low to moderate levels of procrastination behaviours and/or low to moderate negative subjective experience of procrastination, as well as those who do not report having procrastination problems. It is possible to divide these groups using the common method of categorizing a continuous variable. Future research may evaluate the subgroups by looking at their link with important validation scales such as self-regulation and relevant outcome variables.

As explained in Chapter 11, the notion of “procrastination problems” is a multidimensional construct that is defined and quantified based on four facets or 11 dimensions. Based on the results of confirmatory factor analysis, I recommended calculating facet and/or dimension scores to provide a comprehensive understanding of procrastination problems. However, the use of an overall procrastination-intensity score was emphasized and validated because a single, high-level aggregate variable is convenient and preferred for many research projects.

In addition, it was important to see how the cut off reflected the multidimensional conceptualization of procrastination. If the utility of the cut-off was valid, I expected that the procrastination problems group (high severity group) would have mean facet scores above four, a rough estimate for “frequent occurrence” (greater than or equal to “often”) of procrastination behaviour or state as measured by the facet average score. Using the same rationale, I expected that scores on most dimensions would be higher than four in the severe procrastination problems group. Given the results of confirmatory factor analyses of facets and overall models of the MMAP, some small fluctuation in magnitude of dimensions in the group was expected.

Facet means were calculated to validate the above arguments and are presented in Figure 13-12. Both plots support the expected pattern very well. The average facet scores of the high

intensity group were higher than the estimated line for frequent (rated “often or more”) occurrence of procrastination. Based on the findings, the high intensity group self-reported frequent procrastination, experiencing high levels of negative consequences, and feeling a high level of negative emotions. These findings not only support the validity of the selected cut-off score but also the use of a single aggregated score.

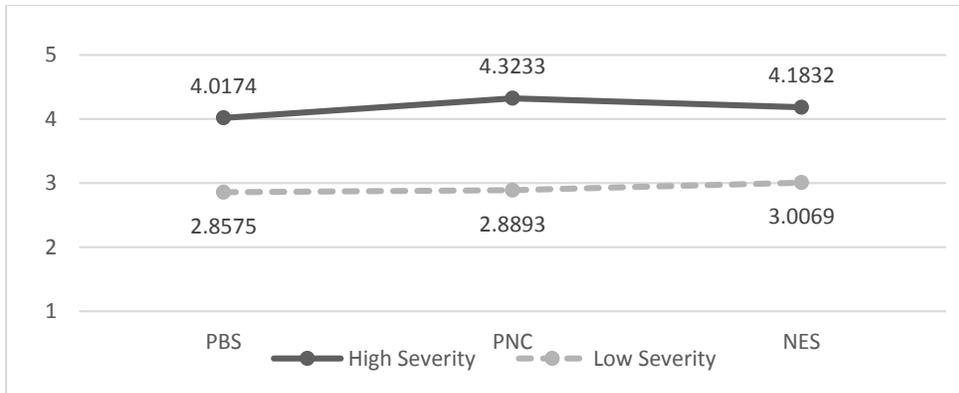


Figure 13-12. Mean plot of average facet scores by intensity group.

To further evaluate the internal characteristics of the intensity cut off score, I prepared a plot of the dimension means by procrastination intensity group (see Figure 13-13). Once again, the average dimension scores were above four (> 4) for anxious procrastination, dissatisfaction, academic and health negative consequences, and deactivating negative emotions. The mean scores for hedonistic delay and personal and social consequences were slightly lower than four. This fluctuation across tasks was conceptually justifiable. Moreover, the findings replicate the findings of the confirmatory factor analysis of the overall intensity model. Anxious procrastination, dissatisfaction, and academic consequences had relatively higher contributions in defining the latent trait based on confirmatory factor analysis. To the extent that the cut off performs its classification very well, I expected to see higher means on these dimensions and

lower means on hedonistic delay and personal consequences. This proposition was well-supported (see Figure 13-13).

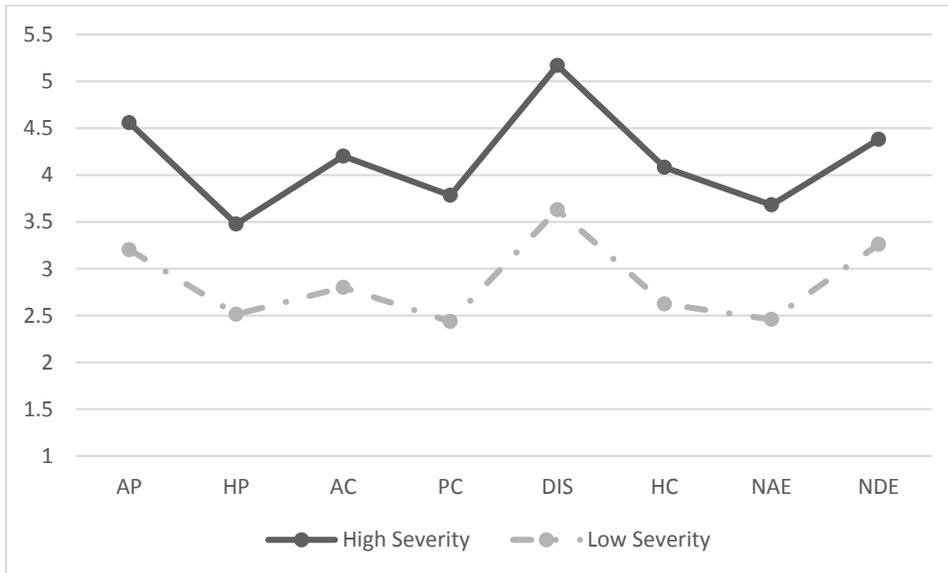


Figure 13-13. Mean plot of average dimension scores by intensity group.

Taken together, the results of these analyses indicate that a cut-off total score of 115.5 (a mean intensity score of 3.61) performs well in identifying those who have a high level of procrastination problem in multiple aspects (e.g., behavioural, emotional, academic) and as a result suffer from multiple negative outcomes. This cut off can be helpful in identifying individuals who might need clinical intervention and immediate support. However, it should be treated with caution and as a screening criterion, not as a diagnostic measure, until further investigation. These limitations will be discussed in greater details in the next chapter.

Summary. The findings of the exploratory and confirmatory analyses in previous chapters supported the structural integrity and robustness of the final measurement models; the multiple reliability analyses demonstrated the reliability of the measures. As well, the magnitude

of correlations among the factors supported the uniqueness of the factors. These findings provide important psychometric evidence that supports the construct validity of the new measures. In the current chapter, the focus was on other forms of validity evidence that support the construct validity of the measures. These sources of validity evidence included convergent and discriminant correlations, mean differences between severe and non-severe procrastination problems and between types of delay, and the prevalence or level of endorsement. As recommended by the new Standards (2014), the evidence is presented in the form of a validity argument supporting the usage and interpretation of various scores, including continuous and categorical scores for the severity or intensity of procrastination problems, continuous scores for the duration of procrastination problems, continuous scores for anxious and hedonistic procrastination behaviours measured by the Multifaceted Measures of Academic Procrastination, and continuous and categorical scores of various forms of delay measured by the Delay Questionnaire. I presented arguments for the relation of each specific score to a large number of external variables (personality, self-system, and outcome variables). I also compared the pattern of relations between various procrastination and delay scores in order to evaluate the uniqueness and usage of the constructs. External validation scales included more than 100 subscales that were gathered in five studies. Some of the key findings were as follows.

The intensity/severity of procrastination problems and procrastination-behaviour scores had similar relations with conscientiousness, self-regulation, and self-control. However, the relation between procrastination problems and a large number of outcome variables (e.g., mental health) were significantly higher than the ones related to procrastination behaviours. For example the relation between the intensity score and perceived stress was large; its relation with mental health, psychological wellbeing, emotional problems, and fatigue were moderate; but the relation

between procrastination behaviours and these variables had a small or negligible effect size. These results suggest the importance of using the measure of procrastination problems instead of procrastination behaviours in intervention research. In addition to the validation of the continuous score, preliminary validation evidence for a cut-off score for the severity of procrastination was presented. These results support the usage of the cut-offs for identifying those whose procrastination has become a psychological problem.

The uniqueness of each form of delay was clearly supported by studying the relations between large numbers of validation scales (i.e., antecedents, outcomes) and continuous and categorical versions of forms of delay measured by the Delay Questionnaire. For example, the results supported the notion that purposeful delay can be considered a positive form of delay as it has positive relations with positive outcomes (e.g., psychological wellbeing, mental health) or causal variables (e.g., measures of executive functioning). In contrast, irrational and hedonistic forms of delay had negative associations with these variables, supporting the notion that they can be considered negative forms of delay. The results also supported a differentiation between forms of delay that had large correlations with each other. Irrational and hedonistic delay were differentiated based on their relationship with agreeableness and neuroticism as well as psychological wellbeing. Arousal and hedonistic delay were differentiated based on their relations with negative emotions, GPA, psychological wellbeing, self-efficacy, and self-control. Finally, as expected, inevitable delay had small or negligible relations with a majority of the validation variables, particularly the personality and self-system variables. In sum, the validation findings supported the use of the Delay Questionnaire for screening and theoretical projects. In the next chapter, I highlight and discuss the implications and applications of the new measures in greater detail.

CHAPTER 14: DISCUSSION

The first purpose of this research was to evaluate procrastination measurement in order to find, synthesize or develop measures that capture procrastination behaviour and problems in academic settings that are theoretically and psychometrically sound. To provide a theoretical and conceptual foundation for this evaluation and possible measurement development, the defining elements of procrastination behaviour and problems were extracted from the conceptual and empirical literature on procrastination. My extensive literature review and subsequent content analyses of existing measures at the item level suggested that research on procrastination has suffered from a lack of a clear and well-developed conceptualization and operationalization (i.e., measurement) of the construct. Some of the overt measurement limitations found in this review have also been highlighted in many research projects including the two major meta-analyses in the field of procrastination research conducted in 2003 by van Eerde, and 2007 by Steel, as well as a recent literature review by Klingsieck (2013).

The *conceptual* limitations included lack of consensus on the definition of procrastination, disagreement on its defining elements (e.g., inclusion of emotional and motivational aspects), disagreement on the connotation of procrastination (positive vs. negative), lack of definition for procrastination problems, lack or confusion in the definition of procrastination behaviour in contrast to procrastination as a trait, limited conceptual effort in differentiating procrastination from other forms of delay, and the absence of a theoretical model that explains various forms of delay. The *measurement* limitations related to existing operationalizations of procrastination included no systematic validation efforts, use of outdated measurement development approaches, not enough psychometric evidence to support construct

validity, not including important defining elements of procrastination in item wording, using items that were not representative of the construct, not differentiating procrastination from delay at the item level, susceptibility to measurement errors related to item wording (e.g., difference in subjective understanding of the word procrastination), no systematic research to determine dimensionality, no theoretically and empirically sound instruments for procrastination behaviour and traits, no measure of procrastination problems, and no measures of various forms of delay. The review also showed that “procrastination as a psychological problem” is a multidimensional construct including behavioural and cognitive-emotional components.

To fill these gaps in procrastination measurement, I used a comprehensive approach to measurement development that included qualitative and quantitative analysis to develop a set of theoretically and psychometrically sound instruments. The first set of measures, the Multifaceted Measures of Academic Procrastination (MMAP), differentiated and measured procrastination behaviour from problematic procrastination, distinguished procrastination from other forms of delay, and were based on a rigorously tested multidimensional conceptualization and operationalization. Based on the measurement models examined using CFA, “procrastination as a psychological problem” was defined and measured as a multifaceted construct consisting of behavioural and emotional-cognitive aspects.

As noted, in addition to the gap in measuring procrastination in academic settings, there has been no systematic and empirical effort to define and measure various forms of delay in an academic setting. Consequently, there have also been no studies that explore how the correlates and consequences of procrastination are different from those associated with other forms of delay. This continued despite the fact that most researchers consensually defined procrastination as a specific form of delay and acknowledged the necessity of differentiating procrastination

from the other forms of delay (e.g., Aitken, 1982; Lay, 1986; McCown & Johnson, 2001; Steel, 2007; van Eerde, 2003).

I designed and conducted 10 studies to develop, refine and examine the MMAP and Delay Questionnaire (DQ). More specifically, the measures were developed through five stages: (1) item development, (2) content validity analysis, (3) structural exploration and item reduction (full-information factor analysis, item response techniques, differential item functioning, and extensive reliability analysis), (4) structural confirmation and evaluation (confirmatory factor analysis), and (5) multiple rounds of validation based on correlational data (convergent, divergent and concurrent validity evidence).

The final result of this lengthy project was a set of complementary self-report instruments to measure procrastination behaviour, procrastination problems, and various forms of delay. In sum, based on the results of multiple studies and replicate findings (see chapters 9-13), there was strong support for the final factor structure of the overall MMAP, each scale under the MMAP, and the Delay Questionnaire, as well as outstanding evidence in support of the reliability and validity of the scores.

In the following sections, I answer important questions about the new measures, such as how are they different from existing ones?; what are their theoretical, practical, and methodological contributions?; and what are their limitations and directions for future research? In the process of discussing the above topics, I also discuss some of the important and controversial topics in procrastination research such as what the different forms of procrastination are, how to measure chronic procrastination, and how to measure procrastination as a psychological problem. It should be noted that the MMAP and DQ had strong conceptual

overlap where they measured different forms of procrastination, therefore the theoretical and conceptual features related to overlapping parts are presented simultaneously.

Contribution of the New Measures: Uniqueness

Comparison of the MMAP measures with existing measures of procrastination is not fully possible because existing measures cover limited content and facets of procrastination (e.g., Solomon & Rothblum, 1984; Steel, 2010; Tuckman, 1991;). Existing measures of procrastination, even those published since I began the measurement development phase of my dissertation (Steel 2010), focus almost exclusively on the behavioural aspects of procrastination. In the MMAP, this content area is measured with a subscale of the Procrastination Behaviour Scale (PBS). That is, the equivalent of the existing/older measures of procrastination is the Anxious Procrastination/Irrational Delay subscale of the PBS and the Irrational Delay subscale of the DQ. There are no published equivalent measures to capture the other 11 dimensions, and four facets/scales of the MMAP.

In contrast to most of the existing measures of procrastination (see Chapter 4), in the development of the Procrastination Behaviour Scale, and other scales and subscales under the MMAP, specific care was taken in item wording and subsequent content analysis to ensure representativeness, relevance, and clarity in order to capture the constructs as defined based on an extensive literature review. The content analysis, refinement, and evaluation were done in multiple studies using both expert and large student samples and using both quantitative (factor analysis and item response theory) and qualitative methods (cognitive interviewing). In addition, instrument instructions, response options, and format of presentations were evaluated and selected based on participants' feedback. Such an extensive refinement and evaluation process is

not only unique in the field of procrastination research but also in measurement research in psychology more generally.

Similar care was used in the process of defining the content and items of the Delay Questionnaire. However, the DQ used different types of items than the MMAP and other self-report measures of procrastination. Specifically, different and stronger qualitative components were used to develop the initial measurement model and items of the DQ. This was because there was no systematic research to conceptualize various forms of delay apart from procrastination – the conceptual boundaries of delay were fuzzy and the causal processes and dimensions underlying delay had not been empirically investigated. The DQ, as the first instrument to measure many different forms of delay, had to incorporate multiple defining elements to differentiate various prototypes of delay. Given the fuzzy boundaries and lack of strong theoretical model, it was methodologically safer to assume that the various forms of delay are not mutually exclusive and that each person may engage in more than one form of delay in dealing with academic tasks²⁸. Therefore, I used a vignette approach in order to capture the various elements of delay simultaneously. In order to compensate for the scarcity of empirical effort on the subject of delay, I used both top-down and bottom-up methods to create items and vignettes. In other words, I created an initial set of items based on conceptual definitions obtained from my literature review (top-down) and in the next stage the students provided additional content based on their experience in university (bottom-up).

²⁸ Non-mutual categorization and conceptualization of forms of delay were referred to as prototypes of delay. The prototypes of delay refers to the use of rating scales where participants can endorse more than one form of delay. The word type was reserved for use where participants were forced to choose only one form of delay.

Another unique aspect of the measurement development in this dissertation was the use of both classic and modern psychometric techniques. Most existing procrastination measures fail to systematically explore and test dimensionality, item functioning, and possible biases. The refinement of the MMAP was guided by the latest advances in both classical psychometric techniques and item response theory. My goal was to use the most rigorous approach to develop reliable and short measures that could capture multiple facets of procrastination problems and provide a valid and unbiased interpretation of procrastination behaviour and problems in academic settings.

To explore the structure of the MMAP facets, I used a new method known as full-information factor analysis (Muraki & Carlson, 1995) or Multidimensional Item Response Theory (MIRT) that used multiple item-characteristic information as opposed to the more traditional method of using only the correlations between items. The results of the initial exploratory factor analyses were very good, showing a theoretically relevant structure and many items with large factor loadings under each factor. Since there was a large pool of good items at the end, I had to employ item response theory in addition to classical reduction methods to shorten some of the subscales.

This method also provided information about the functioning and reliability of the items and response options at both the test level and item level for different levels of the latent trait. The result was a set of short subscales with good reliability. For example, anxious procrastination behaviour (irrational delay) was measured by just five items. The anxious procrastination subscale (i.e., task-general version) was shorter than existing measures of procrastination (e.g., Schouwenburg, 1992, 1995; Solomon & Rothblum, 1984; Steel, 2010;

Tuckman, 1991). Moreover, the irrational delay subscale showed excellent levels of reliability for a broad range of the latent trait from low to high.

It should be noted that reliability evidence for most existing measures of procrastination has been limited to the report of Cronbach's alpha, a measure of internal consistency.

Psychometric studies related to these measures did not examine how the measures provide reliable information for those with low to high levels of irrational delay as a latent trait. In developing the MMAP, I conducted multiple studies that tested and supported reliability with multiple indices and methods, including Cronbach's alpha, Omega reliability coefficient, test-retest coefficient, and test and item information curves.

In contrast to previous unidimensional procrastination measures, at the end of factor refinement, the MMAP consisted of four main scales: the Procrastination Behaviour Scale (PBS), the Perceived Negative Consequences Scale (PNCS), the Negative Emotions Scale (NES), and the Procrastination Duration Scale (PDS). Based on testing of the bifactor model of procrastination problems, the intensity of procrastination was operationalized as the extent to which individuals procrastinate on academic tasks and the extent to which they experience negative emotions and negative consequences related to their procrastination behaviour. The combination of the first three scales (PBS, PNCS, NES) operationalizes the severity of procrastination problems, and the overall score on the fourth scale (PDS) determines the onset of procrastination problems. Together, the measures provide information regarding whether an individual's procrastination is acute or chronic, something that previous procrastination measures have been unable to capture.

Each of the above MMAP scales had a specific multidimensional measurement model that was explored, refined, and examined based on the results of the exploratory and

confirmatory factor analyses. The measurement model for the Procrastination Behaviour Scale (PBS) of the MMAP consisted of two types of dilatory behaviours: 1) “Irrational Delay” or “Anxious Procrastination,” and 2) “Hedonistic Delay” or “Hedonistic Procrastination.” The measurement model for the Perceived Negative Consequences Scale (PNCS) consisted of one general factor and four subscales including Personal, Academic, and Health consequences as well as Dissatisfaction. The Negative Emotion Scale (NES) consisted of separate measurement models, one measuring negative emotions related to task-initiation and the other measuring negative emotions related to procrastinating on a task. Each negative-emotion model consisted of one overall score and two subscales. The subscales (differentiated negative-emotion factors) included Task Initiation Negative Activating Emotions, Task Initiation Negative Deactivating Emotions, Procrastination-Related Negative Activating Emotions, and Procrastination-Related Negative Deactivating Emotions. The measurement model for the Procrastination Duration Scale was defined based on one overall factor that measures the duration of procrastination problems and three specific factors, labeled as Duration of Procrastination Behaviour, Duration of Negative Consequences and Duration of Procrastination-Related Negative Emotions.

The main evaluation methods that were used for refinement, the method of structural validation, and the collection of correlational evidence for construct validation of the DQ were identical to those used for the MMAP. Although the final model was designed to have only three items under each subscale of delay, the subscale scores had a good to acceptable level of reliability. The final DQ measurement model consisted of six correlated factors: Irrational Delay (IrD) or Anxious Procrastination (AP), Inevitable Delay (InD), Hedonistic Delay or Hedonistic Procrastination (HD or HP), Purposeful Delay (PD), Arousal Delay (AD), and Delay due to Emotional Problems (DEP).

Another unique feature of the MMAP is that it can be used to measure both general academic procrastination and task-specific academic procrastination. The task-specific version is a flexible instrument that provides information about overall academic procrastination and about procrastination on one or multiple academic tasks (e.g., writing essays, preparing for exams). The task-specific version allows researchers to make comparisons between procrastination on various academic tasks for each individual.

The task-general version of the MMAP is the shorter version and can be used when researchers are interested in overall academic procrastination. Two peripheral sets of questions (Task Priming and Task Reflection) can be used before and after the administration of the MMAP main scale(s). The Task-Priming section consists of two questions that are administered before the MMAP to stimulate students to think about specific and major tasks that they often procrastinate on while answering questions on the main scale(s). The Task-Reflection section consists of two questions that are administered after the MMAP to identify the tasks that participants had in mind when answering the main procrastination questionnaire. The task-general version with peripheral priming/reflection questions does not allow task-specific comparison for each individual but does allow researchers to compare tasks in the whole sample. However, one advantage of the task-general version with peripheral questions over the task-specific version of the MMAP and other task-specific procrastination measures (e.g., Milgram & Toubiana, 1999; Solomon & Rothblum, 1984) is that it allows participants to answer items based on the tasks that they feel are important. As my cognitive interview study showed, when a task is not important, the participants are more likely to rate the items in a way that reflects the value of the tasks as opposed to delay on the tasks. Answering based on important tasks can lead to more reliable (less error) and valid scores of procrastination behaviour and problems. By definition,

only procrastination on important tasks can lead to procrastination problems and participants subjectively consider delay on important tasks as procrastination (Schraw, Wadkins, & Olafson, 2007).

The MMAP allows researchers to adjust the measure based on their research needs by reducing or adding important tasks in the task-specific version or in the task-priming and task-reflection questions. The tasks can include major tasks such as exam preparation, writing assignments/term papers, assigned readings and specific tasks such as illustration projects or drawing, practical projects (e.g., software or game development; programming). The features also allow researchers to compare procrastination levels between individual and group projects. Overall, the MMAP's task-specific and task-general versions, along with its various customizations, allows procrastination researchers an unprecedented degree of flexibility.

Another unique feature of the development of the DQ and MMAP is their extensive validation. Conducting five validation studies in large samples allowed me to replicate important research findings such as the relation of the new scales with important personality and self-regulation variables as well as important outcome variables. This feature ensures the reliability and validity of the findings and enhances their generalisability. The results of multiple studies also allowed for comparisons between the MMAP's task-specific and task-general versions. The results indicated no major differences between the two versions in relation to important antecedents and academic outcome variables.

The previous section highlights some of the main and unique features of the measurement development studies and the developed measures. These include expansion from traditional, unidimensional measures to a multi-dimensional measure; extensive refinement and evaluation of item content and procedures; inclusion of many forms of delay; use of both classic and

modern psychometric techniques; multiple versions that can be customized according to researchers' needs; and finally extensive validation. These unique and important features have many implications which are discussed in the next section.

Contribution of the New Measures: Implications

The above unique features of the MMAP and DQ have clear theoretical and clinical implications. In general, the new conceptualization and measurement extend procrastination and delay research in at least two ways. First, the measures provide a more accurate and comprehensive assessment of procrastination problems. At the same time, they extend from a positive-versus-negative conceptualization with overemphasis on the negative side of delay (procrastination) to a positive-to-negative conceptualization with equal-emphasis on various forms of delay. In the following sections, theoretical and practical implications and contributions are summarized.

Theoretical Implications

The conceptualization of a psychological construct is a theoretical effort that integrates and uses existing theoretical explanations of the phenomena. These efforts may further enrich theoretical explanation, as they require conceptual arguments to reconcile competing theories and to choose the defining elements of the phenomenon of interests. The theoretical implications of my research are those related specifically to the improved measures and those related the multidimensional conceptualization of procrastination and delay.

A well-defined and validated measure has clear theoretical implications. The advancement and evaluation of theoretical explanations are difficult or impossible if the relevant constructs and phenomena are not defined and measured accurately and appropriately. A conceptually and psychometrically strong measure can resolve inconclusive findings regarding

the theoretically relevant factors. Along these lines, my validation studies provided multiple theoretical implications regarding the link between newly defined procrastination behaviours and forms of delay and various theoretically relevant variables. The final validation study demonstrated, for example, how a major inconclusive finding regarding the relation between procrastination, fear of failure, and perfectionism in clinical versus empirical research (e.g., see Steel, 2007; Ferrari et al., 1995; Haghbin et al., 2012) could be resolved by comparing the MMAP's procrastination behaviour and problem scores. The previous inconclusive findings occurred because correlational studies measured procrastination behaviour, whereas clinical evidence was based on procrastination problems (e.g., Steel, 2007).

In terms of the DQ, the validation studies demonstrate the unique position of each form of delay in relation to the big-five personality theory and self-regulation theories (e.g., Action Control Theory; Kuhl, 1985, 1992) as well as their relationship with other possible antecedents and causes of procrastination. Many interesting findings emerged. For example, agreeableness had a stronger association with hedonistic delay than with irrational delay. This finding was replicated in four studies using both the DQ and MMAP. In contrast to my initial hypothesis, agreeableness had similar negative association with both arousal and hedonistic delay, indicating a possible important causal link between rebelliousness or disagreeableness and these forms of delay. Such a causal link for hedonistic procrastination was in line with early theoretical explanations of procrastination particularly from a psychodynamic perspective (see Ferrari et al., 1995). This finding is also in line with studies that found sensation seeking and rebelliousness in a small percentage of students who report delay (see Steel, 2007).

Another contribution of the new conceptualization and the DQ was to define and measure delay with positive and negative connotations. The validation analysis of the relation between the

DQ prototypes and multiple outcome and process variables explicitly suggested that not all forms of delay are negative (e.g., purposeful delay) and some forms of delay (e.g., arousal delay) have a complex relation to outcomes, with different negative and positive outcomes in different domains. (For more theoretical clarifications and contributions see Chapter 13.)

In addition to these preliminary findings related to many possible micro-theoretical models, as well as positioning the forms of delay within macro theories (e.g., big-five personality theory; Costa & McCrae, 1985), the new conceptualizations and operationalization can be used to develop and test general models that can explain various forms of delay simultaneously. As an example, I present a theoretical model that explains possible dimensions underlying various forms of delay and offer a preliminary evaluation of the model based on validation data. This model is presented after the discussion related to multidimensionality.

Dimensions of Procrastination and Delay. Dimensionality is one of the most important topics in the theoretical and empirical stages of any measurement development project. One of the important features of this research was to approach dimensionality in a systematic way from conceptualization to operationalization. This was done based on a new set of items and multiple studies using large samples for multiple interrelated constructs – delay, procrastination behaviour, and procrastination problems. This was an important theoretical and practical contribution of my research as there was no consensus regarding the dimensionality of procrastination among procrastination researchers to this point in the literature.

A majority of researchers had defined and measured procrastination as a unidimensional behaviour or trait (e.g., Aitken, 1982; Lay, 1986; McCown & Johnson, 1989; Tuckman, 1991; Solomon & Rothblum, 1984). Only two groups of researchers had discussed various forms of

procrastination²⁹. First, Ferrari (1992) discussed two forms of procrastination behaviour, arousal and avoidant procrastination. Similarly, Chu and Choi (2005) and Choi and Moran (2009) argued that there were two forms of procrastination, passive and active. Given some of the similarities between labels or content domains in the above research and aspects of the MMAP and DQ, it is important to highlight some of the problems with that research and to discuss differences between their constructs and the ones defined and measured by the MMAP and the DQ.

The bi-dimensional model of avoidant versus arousal procrastination (Ferrari, 1992) has been criticized empirically by Simpson and Pynchyl (2009) and Steel (2010), and the conceptual definition of avoidant procrastination was questioned by Lay (2009, as cited in Steel 2010). Multiple problems in labelling, defining, and measuring active procrastination are discussed in Chapters 2 and 3. The major problem with research by Ferrari (1992), Chu and Choi (2005), and Choi and Moran (2009) that is relevant to our discussion is that they did not use comprehensive and systematic methods to develop and move from a strong theoretical measurement model to a robust and representative measure that could capture the proposed dimensions based on a set of

²⁹ Some researchers have implied that decisional procrastination is another dimension of procrastination in comparison to avoidant and arousal procrastination or traditional conceptualizations of procrastination behaviour (e.g., Ferrari, et al., 1995; Steel, 2010). This is conceptually questionable since procrastination behaviour and decisional procrastination may often have a hierarchical or chronological as opposed to a parallel conceptual relation. Postponing a decision can be considered part of the process of procrastinating on tasks. In other words, the two constructs measure procrastination problems from different angles as opposed to two dimensions or constructs. This argument is particularly relevant if decisional procrastination scales conceptualise and measure the postponement of decision making in general (e.g., Mann, 1982) without specifying the topic of decisional postponement. Even when the conceptualization and operationalization cover putting off decisions about specific minor or major matters (e.g., Milgram & Tenne, 2000), postponing decisions about many specific matters and action related to those matters are interrelated but at different conceptual levels (decision versus action) and/or psychological domains (thought versus behaviour).

items that had been evaluated and refined through content validation. These problems were not repeated in my dissertation, and my results call into question both their results and subsequent knowledge claims regarding procrastination types (e.g., active procrastination).

Ferrari (1992) did not develop any specific measure for his conceptualizations. Based on an exploratory factor analysis that was never confirmed in replicated efforts, he suggested that the Adult Inventory of Procrastination (AIP) developed by McCown and Johnson (1989) and the General Procrastination Scale (GPS) developed by Lay (1986) measure avoidant and arousal procrastination, respectively³⁰. The content of both measures actually covers only one dimension of procrastination; a traditional conceptualization that is measured by the anxious procrastination or irrational delay subscales of the MMAP and the DQ. Arousal procrastination was defined by the need to rush at the last minute (Ferrari, 1992) and/or a preference for multiple arousing sensations and states such as enjoyment, pleasure, and novelty seeking (Ferrari & Díaz-Morales, 2007). There is no measure to capture arousal procrastination based on the above definition. However, in the new conceptualization and operationalization of various forms of delay and based on the result of exploratory factor analysis and subsequent confirmatory factor analysis, the content domain consisted of two separate factors: one included sensation seeking and need to rush at the last minute and was labeled arousal “delay,” and the other included the pleasure seeking and need for fun content and was labeled hedonistic delay.

³⁰ Even if the two measures had loaded under two separate factors, the two-factor model could have emerged due to method effects (e.g., differences in test-developers’ style of writing and other features of the measures). The same criticism can be extended to the active-passive conceptualization. This is why it is crucial to use a systematic and comprehensive approach to test dimensionality and to control any irrelevant and/or undesired sources of covariance among items.

Chu and Choi (2005) and Choi and Moran (2009) developed a new measure of active/passive procrastination called the Active Procrastination Scale (APS: Choi & Moran, 2009). However, the scale's content does not effectively capture active or passive procrastination. First, the scale does not include any items about "passive" procrastination. Second, and more importantly, is the content of the intentional-decision factor. This is the only factor in the APS that may directly capture, at a behavioural level, what has been labeled as active procrastination. The content of items under this factor, however, is not homogenous. It consists of at least two distinct forms of dilatory behaviour: 1) strategically delaying tasks to optimize one's schedule ("To use my time more efficiently, I deliberately postpone some tasks."); and 2) delaying tasks to enhance one's arousal and get motivated ("I intentionally put off work to maximize my motivation").

Strategic delay and arousal delay are two content domains with different causes (etiology) and effects (consequences) as well as being linked to different subjective/emotional experiences. In strategic delay, there are no underlying internal or intrapsychic needs behind postponing a task. The delay is due to a situational factor and external necessity, and it is typically a result of rational decision making and setting priorities. The individual postpones a task only when doing so optimizes his/her schedule. The emotions associated with completing a *strategically delayed task* do not differ from the emotions associated with *an alternative task that is rationally prioritized* as well as with the same task had it not been delayed. In other words, by definition, the sequence and timing of task completion do not have any particular intrapsychic and emotional value (valence) for the person who strategically delays a task as a strategic and rational time-management strategy.

For the second form of dilatory behaviour, the one associated with seeking arousal/motivation, there is by definition an internal urge to delay tasks; the agent of dilatory behaviour postpones a task in order to reach an emotional and/or motivational objective. The urge to postpone tasks is constant and is not related to situational factors (circumstances and conflicts in scheduling). The agent, by definition, experiences a high level of arousal while completing the tasks at the last minute.

In the initial stage of item development for the DQ (top-down process), in line with Chu and Choi (2005) and Choi and Moran (2009), I considered both content domains to be part of one factor with heterogeneous content. The factor was labelled purposeful delay. A number of items for both content domains were created and included in the initial version of the DQ in the top down stage of content creation. In the bottom-up stage, student qualitative feedback and item generation suggested a need for additional stories to capture strategic delay. Moreover, the subsequent exploratory and confirmatory factor analyses left little doubt that the content domain discussed above indeed consisted of at least two separate factors. The new factors were relabelled as *purposeful delay* (i.e., strategic delay content domain) and *arousal delay* (i.e., sensation- and excitement-seeking).

In addition to the exploratory and confirmatory factor analyses, multiple validity studies strongly supported the differentiation between purposeful and arousal delay. The factors not only had different antecedents but also different relations with various educational and health outcome variables. For example, purposeful/strategic delay had positive relations with conscientiousness and self-control, whereas arousal procrastination had a negative relation with these variables. Purposeful delay had no significant association with GPA, whereas arousal procrastination had a significant negative correlation. Purposeful delay had a positive relation with psychological

wellbeing, whereas arousal delay had a negative association. The correlational results also called into question the conceptualization of active procrastination as a positive form of delay. In sum, it seems that in combining two forms of delay with many important opposite associations with other factors, active-procrastination research had covered some of the negative outcomes associated with postponing tasks to the last minute in order to experience excitement.

The question of whether procrastination is a multidimensional construct still exists. To address this issue, there are several points worthy of discussion. It is important to differentiate between multidimensionality of procrastination as a psychological problem and procrastination as forms of dilatory behaviour. Similarly, it is important to differentiate between multidimensionality of procrastination and other forms of delay. Third, one may need to be aware of the importance of and rationale for labeling a construct as procrastination or delay when studying the dimensionality of procrastination.

The findings of confirmatory factor analyses supported the multifaceted nature of procrastination problems. Almost all of the multidimensional models could be supported by the data. This was not a surprising finding given that almost all psychological problems consist of multiple components such as behavioural, emotional, personal/social, professional/educational, etc. A behaviour without negative internal and/or external negative consequences cannot be logically defined as a problem. There was little doubt about the multifaceted nature of procrastination as a psychological problem. The final measurement model for the severity of procrastination problems revealed that a mixed bifactor and hierarchical factor structures best reflected the structure of the construct. Given the bifactor nature of the supported multidimensional model, it was also justifiable to consider the severity of procrastination problems as a unidimensional construct for practical reasons, and, therefore, to calculate a single

score. (For details regarding the dual nature of bifactor models and their advantages when tested and supported see Chapter 9 under the “Analysis” headings in the Method section, as well as Chen et al. [2006] and Reise et al. [2013]).

In contrast to procrastination problems, the multidimensionality of procrastination behaviour was not clear based on rational and empirical evidence. As mentioned before, there was more support for the *unidimensionality* of procrastination behaviour, and all of the existing *multidimensional* conceptualizations of the construct (Ferrari, 1992; Choi & Moran, 2009) were problematic. The extensive empirical evidence obtained in this study may suggest that procrastination behaviour consists of two correlated dimensions, anxious and hedonistic procrastination. However, despite the strong and comprehensive methods used to test dimensionality, the conclusion regarding the 2-factor structure of procrastination behaviour can be invalidated easily. The empirical methods used in testing dimensionality are susceptible to errors related to the subjectivity of test developers who determine the initial set of items and choose the final model among competing models. Even in a strong and interconnected theoretical and empirical effort that compares multiple alternative models and uses multiple statistical criteria to select the number of items, such as the current study, factor analysis is affected directly by the initial set of items entered into the exploratory and confirmatory factor analyses equations. For example, if the construct of hedonistic delay had not been considered as a form of procrastination, or if, similar to Ferrari (1992) Choi and Moran (2009), the items related to the content domain of arousal or purposeful delay had been considered as “procrastination,” the dimensionality of the final procrastination behaviour model would have been different. Therefore, the only conclusion that can be made based on the factor analysis of the PBS where irrational and hedonistic delay items were entered in EFA and CFA, is that two distinctive

factors can be extracted and confirmed based on the data. Whether or not the factors are two dimensions of procrastination behaviour is a subject for conceptual and theoretical debate, which I have presented throughout my dissertation. In this regard, it is important to answer at least two issues: why hedonistic delay is considered as procrastination and why other forms of delay are not considered as procrastination. A consideration of these issues can be based on a semantic or conceptual debate regarding the usage and connotation of the terms procrastination and delay, as well as a theoretical model that explains the defining elements and psychological processes underlying each factor.

In Chapter 2, under evaluation of active procrastination, I mentioned the conceptual and semantic rationale for labeling a construct procrastination and, at the end of Chapter 5, I discussed the defining elements of dilatory behaviours and the psychological processes underlying hedonistic and irrational delay. However, given the importance of the topic, the rationale for considering the constructs procrastination are reviewed and discussed here.

Procrastination behaviour has historically and commonly had negative connotations (see Chapter 1). However, delay as a broader term has carried both positive and negative connotations (Schouwenburg, 2004; Ferrari et al., 1995). Therefore, the use of a descriptor such as “active” to imply that procrastination has positive forms is not only unnecessary, but may result in confusion. If delay can carry both positive and negative meaning, I argued that procrastination should be reserved, as widely accepted by researchers and authors in various fields, for negative forms of delay that are not due to well-established enduring psychological problems (i.e., psychological disorders) or temporary emotional problems caused by external factors (e.g., grief). Such usages can potentially reduce confusion and prevent unproductive semantic debates. These semantic choices do not preclude any efforts to study possible evolutionary and adaptive

features of dilatory behaviours that are labelled procrastination, but they do exclude relabelling constructs with noticeably positive meaning and labels (e.g., purposeful delay in this study; wise delay: Schouwenburg, 2004; sagacious delay: Ferrari et al., 1995; strategic delay: Klingsieck, 2013) as procrastination.

In addition to its semantic features and connotations, procrastination has been widely conceptualized and linked to a breakdown in executive functioning by philosophers and an overwhelmingly large number of procrastination researchers (e.g., Baumeister, Heatherton, & Tice, 1994; Blunt & Pychyl, 2005; Dewitte & Lens, 2000; Dewitte & Schouwenburg, 2002; Dietz, Hofer, & Fries, 2007; Klingsieck, 2013; Rabin, Fogel, & Nutter-Upham, 2011; Schouwenburg & Groenewoud, 2001; Senécal, Koestner, & Vallerand, 1995; Steel, 2007; Tice & Baumeister, 1997; van Eerde, 2000; Wolters, 2003). Given such broad support as well as the results of my studies, I argue that the word procrastination should be reserved for forms of delay that have a strong conceptual relation and practically noticeable empirical association (i.e., moderate to large effect size) with constructs related to executive functioning. Among the forms of delay, only irrational delay and hedonistic delay had such features. These forms of delay, regardless of method of measurement (i.e., use of short and regular items in the PBS and use of vignettes in the DQ), had negative, moderate-to-large relations with self-regulation and self-control in multiple studies. The factors also had negative associations with a wide range of outcome variables including GPA, academic performance, psychological well-being, mental health, and physical health. Arousal delay, as defined and measured by the DQ, did have a small effect size when its relations with various executive-function variables (e.g., self-regulation, self-control) were examined. These variables were positively associated with purposeful delay, and

there were no significant associations between inevitable delay and executive-functioning variables.

The anxious and hedonistic procrastination constructs at the behavioural level had strong relations with each other. The results of multiple studies indicated that a large number of participants reported both types of behaviours. In contrast, when the trait-like measures of these forms of delay (i.e., DQ) were used, the association between the constructs was considerably smaller. In both types of operationalizations – behavioural and trait-like – irrational and hedonistic delay seemed to be unique constructs based on factor analyses of the PBS and DQ, correlational analyses of the subscales, and examination of their relation with external factors in validity studies. For example, the relation of irrational and hedonistic procrastination behaviours to neuroticism and agreeableness differed. Neuroticism was significantly related to anxious procrastination as measured by the PBS, and to irrational delay as measured by the DQ. However, the relation between neuroticism and hedonistic procrastination/delay was not significant, as expected. In contrast, the association between hedonistic delay and agreeableness was significant, but the relation between agreeableness and irrational delay was not significant. These differentiations are just a glimpse of the new information that can be obtained when the new measures are used instead of existing measures.

Intention is a necessary component of procrastination constructs, one that captures an aspect of executive functioning such as self-regulation. A self-regulated action starts after a volitional agent makes an intention to start the act based on his or her free will. An action that is not intended or an action that is compelled by external forces does not require self-control or self-regulation. This is why, in addition to irrationality and negativity of postponement, an initial intention has been considered a necessary defining component of procrastination by a large

number of researchers in the field (for a review, see Chapters 1 to 5 or Klingsieck, 2013a).

Similar to this conceptualization, I consider initial intention a defining component of irrational delay or anxious procrastination, a construct identical to traditional definitions of procrastination. However, the role of intention in hedonistic delay or hedonistic procrastination is not similar to the traditional conceptualization of procrastination, therefore it can be considered debatable.

In the new conceptualization of procrastination behaviour, hedonistic delay is defined by no-to-weak intentions to do tasks ahead of their deadline. This may raise the question of whether or not hedonist delay should be considered a form of procrastination behaviour. Arguably, those who have no intention to perform a task at a certain time should not be considered to be experiencing a breakdown in executive functioning, and therefore procrastination. There are several reasons that the above argument is not applied to the conceptualization of hedonistic delay. First, empirical findings leave little doubt that hedonistic delay as conceptualized and measured in both the DQ and the MMAP have similar relations with major constructs related to executive functioning, such as self-regulation and self-control, while the factor analysis and its relation to external factors supported its uniqueness from irrational delay. Second, in hedonistic delay, even though individuals may tend not to make a specific decision to start and complete a task at certain time, they *should* have a general commitment or intention to start and finish a project on which they have embarked. In an academic setting, even if we assume that a student does not have even the weakest intention about a specific task (e.g., writing a term paper), his or her registration for the course implies the presence of a general intention or a plan (Bratman, 1999b) for starting and completing course-related tasks, which implies a commitment to action.

In sum, the ample conceptual and empirical evidence suggests that irrational and hedonistic delay, as two negative forms of delay with strong links to failure in executive

functioning, are two correlated dimensions of procrastination behaviour. Existing measures have failed to differentiate these types of procrastination behaviour. This failure might be due to missing content in the conceptualization. Previous research did not elaborate on the gradations of intention and commitment to do tasks and rarely considered hedonistic tendency (Ferrari, 1992) in their conceptualization. The failure to detect such forms of behaviour might also be because the number of students who purely endorsed hedonistic delay in academic settings is low, particularly in comparison to those endorsing irrational delay. Those whose hedonistic behaviour becomes an enduring and predominant method of task engagement will not be interested in accepting the challenge of pursuing higher education or may fail to earn admission to university.

It is also possible that individuals with hedonistic tendencies may not participate in many academic activities, including psychological experiments. In this research, several methods were employed to ensure that people prone to procrastination, including those with hedonistic tendencies, would participate. Multiple reminders were used to encourage students to participate. In addition, data collection for various studies was done from the beginning to the last moments of several semesters, and for a number of my studies, the data collection extended across more than one semester. Moreover, assuming that some of the procrastinating individuals may start tasks but not complete them, the new measures were put at the beginning of the study and the incomplete records were used in the analyses when it was possible.

In sum, my work offers a theoretical extension of procrastination research by approaching dimensionality systematically from its conceptualization to its measurement. The MMAP and DQ move the field beyond the flawed and limited unidimensional and bi-dimensional models of procrastination, revealing the complex association between procrastination behaviour, procrastination problems, and various antecedents and outcomes. The

theoretical implications of a dimensional approach extends even further when we apply it to different forms of delay.

Methodological Implications

There are many methodological implications of the current studies. In the process of the factor-structure exploration, item reduction and refinement, and structure evaluation, many advanced statistical methods were used. I have compared existing, and often parallel methods to arrive at the most suitable solution for my data, instead of blindly following the most commonly used or recommended methods. Since most of the recommendations are based on data simulation, the comparison of different methods using real data is quite rare and has important methodological implications.

Both statistical information and rational/conceptual evidence were used to evaluate methods recommended by methodologists or statisticians to deal with polytomous items and multivariate non-normality. My findings demonstrated the importance of comparing multiple recommended methods, and highlighted problems that can arise when one chooses a recommended method without testing the assumptions behind the recommendation or comparing the results of alternative methods. The findings suggested that evaluating and comparing methods is particularly important when one uses advanced analyses and/or new estimation methods.

Due to their overreliance on simulated data, most methodological research provides recommendations based on numerical features of the data (e.g., number of category response; sample size), ignoring the meaning behind the numeric codes in actual measurement settings. Moreover, the recommendations constantly change (see for example Brown, 2015; Flora & Curren, 2004; Rehmtulla, Brosseau-Liard, & Savali, 2012). The initial version of the MMAP

employed a 7-point Likert scale and used frequency adverbs as descriptors (anchors) under response option to measure procrastination. Based on multiple methodological references, it was recommended to use estimation methods that assumed items are ordered categorically (see Flora & Curren, 2004; Brown, 2015). However, the results of comparing various methods showed the superiority of methods that did not assume the interval level of measurement for my data, as opposed to the new methods that are recommended for ordered categorical data (see Flora & Curren, 2004; Brown, 2015). More specifically, comparison of the CFA methods supported the use of the robust maximum likelihood method, which assumes the items are continuous variables, over the recommended method for a Likert-type scale such as the robust weighted least squares (WLSMV; Muthen, 1984; Muthen & Muthen, 2009) or the use of asymptotic, distribution-free covariances and polychoric correlations (Flora et al., 2012).

My findings from comparing the above methods imply that, in addition to statistical features, it is important to consider the nature of the psychological phenomenon and the meaning of response options (i.e., descriptors) when choosing an appropriate methods of estimation in factor analysis. It can also be argued that many psychological processes and/or the conceptualizations of the processes, such as procrastination behaviour and problems, are matched with the features related to continuous level of measurement as opposed to categories or ordered categories. Based on the findings of this research, it is recommended to use estimation methods for close-to-interval scales for 7-point frequency scales. However, this does not mean a frequency response options with lesser categories (e.g., 4-point) have the same characteristics that a 7-point scale showed in my studies (Rehmtulla, et al., 2012).

There are many methods for a particular usage (e.g., analysis of data from a Likert-scale like response options, polytomous items) or problem (e.g. multivariate normality). My search

shows that with the exception of R to some degree, advanced statistical software (e.g., AMOS, Lisrel) can conduct analysis using only a *limited* number of advanced methods. The difficulty and cost of using advanced software programs does not allow researchers to use multiple software programs to overcome the limitations of each individual software package. Over time, a body of research has inherited the limitations of the statistical software. The recommendations—made by developers of the software and the community of researchers who use and teach the particular software—are potentially biased towards the available methods for the particular software. These possible sources of bias are particularly relevant to the use of advanced factor analysis and structural equation modeling (for example, see the difference between Lisrel, Mplus, SAS, and AMOS in advanced estimation methods and available indices of fit). In my study, multiple software programs (e.g., psych and MIRT statistical package in R, Mplus, Lisrel, and AMOS) were used to overcome the limitations and potential biases.

Another set of methodological implications of my studies was related to the multiple strategies developed and used to enhance integrity and quality of collected data. A set of items labeled the Survey Reader Questionnaire (SRQ) was developed for my research to determine whether the participants read the items throughout the survey; similarly a data quality strategy that I borrowed from Ariely (2010; Activities Questionnaire) was used to examine whether participants read measurement instructions. The results of the SRQ were utilized in the data cleaning process of my research. In addition to this particular usage, many interesting findings could be extracted from reanalysing SRQ data in future efforts, which in turn can have methodological and practical implications for online and survey research. For example, the analysis of the pattern of responses to SRQ items can potentially determine at which stages of a survey undergraduate participants are more likely to provide arbitrary responses, as well at which

point of time in the semester participants have the highest and lowest level of arbitrary response, and which demographic groups provide higher and lower level of the arbitrary responses. Similar questions can be answered in relation to reading instructions.

Another interesting finding with methodological implications can be obtained when the completion time of the survey is compared with total scores for the arbitrary responses obtained based on the SRQ data. Based on this comparison, an index (formula) can be defined that may potentially identify those who predominantly provide arbitrary responses. Given that the completion time is easily and often by default recorded in online survey systems, a formula that calculates a cut-off index for total completion time to identify arbitrary responses can be very helpful to control for errors related to the arbitrary responses.

The above methodological inquiries are particularly important because the preliminary analysis of the data was alarming. The frequency analysis on one of the datasets before data cleaning revealed that approximately 12% percent of participants read almost none of the items from beginning to the end of the survey and approximately 38% of participants failed to read almost half of items. As well, 20% did not read the instructions of the Activity Questionnaires. The initial findings indicated the importance of developing rigorous data cleaning strategies and understanding the factors that facilitate or decrease arbitrary and careless response in an online survey. These findings, however, required further validation by studying the patterns of responses to the SRQ in studies that have fewer items, and studies that did not contain repetitive items (non-measurement development studies and/or studies that contain constructs with more positive content). The initial findings, however, indicate the importance of developing rigorous data cleaning strategies and understanding the factors that facilitate or decrease arbitrary and careless response in an online survey.

Another important methodological implication of the current studies stem from my efforts in combining and integrating methods in measurement development (quantitative and qualitative methods in initial development of the DQ, use of classical and modern item refinement such as EFA, IRT, and DIF; use of multiple criteria to determine number of factors, combining bifactor and hierarchical models). The integration of these methods in psychology is rare and unique at the time of writing the dissertation. The by-product of these sequential and/or integrative methods was very promising and robust based on the results of multiple studies. The reports and discussions related to the methods in my dissertation can potentially works as an example for future usage of the integrated methods and in measurement development research.

Practical Implications

The MMAP and DQ have many implications for applied research and clinical/counseling programs. From an empirical point of view, instruments are the building block of any research. I discussed the fact that the many available procrastination measures confound procrastination with delay in general. Using ill-defined measures, without any doubt, affects the results of empirical enquiries. I provided an extensive theoretical and empirical review and discussion to highlight this problem. I developed a set of measures based on a more comprehensive conceptualization, with strong psychometric support, in order to target this fundamental problem in procrastination research. Using multifaceted measures such as the MMAP and the DQ can potentially resolve the problem of inconclusive findings in the literature and help to evaluate and develop effective interventions.

The MMAP has many features that make it a very flexible measure and therefore can be easily adapted to the needs of researchers, universities, and counsellors. It consists of four validated scales that can be used together or separately, therefore it can provide both specific

scores and overall scores for procrastination behaviours and problems. The MMAP's scales can be used as a task-specific and/or general measure of procrastination problems in academic settings; the tasks can easily be changed based on the needs of the user of the measures. Different methods of scoring and different levels of aggregation allow the usage of the measures in various research designs. For example, potential applications include: 1) the dimensions scores (continuous variable) can be used in structural and/or latent growth-curve models to define procrastination or aspects of procrastination problems as latent trait variables; 2) the scale/facet scores (continuous level) can be used in multiple regressions or in models to define procrastination problems; 3) the overall procrastination-intensity score (continuous level) can be used in many research and practical projects when one needs an overall measure of procrastination problems; and 4) the cut-off score (categorical) can be used in intervention studies or in experiments for participant-selection purposes as well as for screening in large-scale research to identify students with severe procrastination problems. In addition, the combination of categorical and continuous system of scoring allows researchers to use the same data for both selection of participants and pre-test evaluation.

The DQ has both categorical and prototype versions. The DQ is a short self-report measure that provides reliable scores for six behavioral patterns of delay. Given the trait-like nature of the measure, the DQ is more suitable for cross-sectional studies. The measure can be used to develop and test theoretical models that explain possible causes and effects of the various forms of delay. Moreover, the 3-item subscales of the measure (e.g., irrational delay) can be used for screening and participant selection purposes.

In sum, the above measures have been used and validated in online studies. Given their flexibility and strong psychometric properties, it is expected that they will be widely used in the

future in both small- and large-scale projects. The findings from these projects could have implication for individual students, counselling practice and services, and colleges and universities. The measures can be used to provide an accurate picture of procrastination behaviour and problems in national and international settings. This is particularly important since the previous research that provided the epidemiological information regarding chronic procrastination problems (e.g., Ferrari, et al., 2007) did not use theoretically and empirically defensible measures.

In addition to the implications related to the features of the measures and their usage in future research, my findings have other practical implications. I conducted multiple studies with an overall sample of 4400 undergraduate students even with rigorous elimination of low quality data. One of the implications of this research is that it can provide a more accurate picture regarding procrastination problems among university students at Carleton University. It can be assumed that the results can be generalised to other Canadian and/or North American universities with different degrees of caution, until national and international data are available. The results also provided information regarding the prevalence of other forms of delay including the positive one and the ones that are affected by environmental factors.

For example, based on the last validation study, approximately 35% of students suffer from severe procrastination problems, 28% of students had chronic procrastination problems, and for 8% procrastination was a more recent problem. Correlational and regression analyses showed that severe procrastination problems were significantly and meaningfully associated with lower academic achievement and lower perceived academic performance. It should be noted that there are a number of factors that influence academic achievement, including intelligence and cognitive abilities, specific personality traits, parents' academic socialization, socioeconomic

status, and so on. Given this variety of influences, even a small effect size related to GPA is practically and theoretically important. The intensity/severity of procrastination problems had a negative association with multiple outcome variables that were both statistically and practically significant.

Considering the results regarding both the prevalence of procrastination problems and its correlation with important academic variables, the findings are alarming and may have many practical implications for researchers, counsellors, university authorities, and policy makers as well as funders of research. Researchers and clinicians need to increase their effort to develop individual interventions that directly and effectively target various aspect of procrastination problems. Simultaneously, the efforts should be geared towards developing group and class interventions, and identifying positive and negative environmental factors that reduce or facilitate procrastination problems. Such interventions and recommendations can be implemented with the help of university authorities and policy makers. Moreover, particular attention needs to be focused on those for whom procrastination problems are more recent. Although the prevalence is smaller, this group requires more immediate intervention before the problems and its negative effects become solidified or lead to more negative mental and physical health problems (e.g., Sirois, 2007; Sirois, et al., 2003).

That said, the picture is not all negative. The results of the DQ showed that between 15 and 19% of students in the various studies highly endorsed purposeful delay, a positive form of delay, between 13 and 14% endorsed inevitable delay, and between 8 and 11% endorsed arousal delay. The relation between purposeful delay and various educational and health outcomes was opposite of procrastination. For example, purposeful delay was positively related to GPA and mental health, and was negatively related to perceived stress and negative emotions.

The relations of inevitable and arousal delay with positive and negative variables were complex and mixed. Inevitable delay might be particularly important for policy makers and those who aim to research contextual factors associated with delay. Eleven percent of participants selected inevitable delay as their main form of delay when asked to choose only one form of delay. In the context of student life, it is reasonable to expect that those who suffer from role conflict (e.g., worker and student, athlete and student, parent and student) inevitably have to delay tasks associated with one or more of their conflicting roles, and therefore experience stress (e.g., Buda & Lenaghan, 2005). The correlational analysis in my study showed that these individuals experience high levels of negative emotions and stress similar to those experienced with negative forms of delay, but significantly higher levels of self-control. These results depict a group of individuals in our community who have the inner resources to act in a timely fashion, but delay due to various external factors and therefore suffer from negative emotions and stress, which are important risk factors for health problems (Sirois, 2007). These results suggest that those with inevitable delay are more likely to respond favourably to supportive interventions that address the external factors associated with delay.

A fundamental hurdle for the above therapeutic or programmatic efforts is the need to use psychometrically and conceptually sound measures to screen for those who need assistance, measure various aspects of their problem, and evaluate its level of severity as well as change in response to interventions. Given all of the conceptual and empirical evidence presented, I strongly believe that the MMAP and DQ provide the tools required for these efforts. The multiple system of scoring and flexibility of the MMAP may serve the needs of researchers and organizations, but also the needs of clinicians in private practice or counselling centres where the measure can be used during the intake process as well as to potentially evaluate change. I also

hope that the findings in this research encourage researchers, university authorities, and research funders to invest in both intervening and preventative strategies to deal with the issues highlighted by this research. Finally, measuring more positive forms of delay opens up new opportunities to help students in particular understand that there are many forms of delay, that delay is often inevitable and that this is not detrimental to their wellbeing.

Despite many important implications of the new measures and strong methodological features of the measurement-development research, there are some limitations and, therefore, there remains a need for further investigations and development. However, before ending the discussion section by presenting the limitations and future directions, it is important to discuss how researchers should incorporate various forms of delay and the procrastination-problem construct into existing procrastination research literature. These discussions may facilitate appropriate use of the measures and interpretation of the scores which in turn may prevent confusion related to construct naming and overlapping constructs in future research.

Incorporating the New Forms of Delay into the Existing Procrastination Research Literature

The discussion regarding the dimensionality of procrastination highlighted the importance of labelling constructs. This is particularly important in the case of certain constructs whose mislabelling might lead to an unproductive debate and/or misinterpretation of their scores. Clarification regarding labels assigned to each form of delay (including procrastination) is also essential when future research tries to determine links between findings of previous studies and current research findings as well as their own results.

In my research, the main defining feature of marker items and conceptualizations were used as descriptors in naming the six forms of delay. Since all forms of delay (with the exception

of irrational delay) are rarely used in research, the naming should not be controversial. However, several points are worthy of attention for interpreting the new measures' scores and subscales.

Arousal delay in the DQ should not be equated to findings of the General Procrastination Scale (Lay, 1989). As mentioned earlier, Ferrari believes that the GP captures his conceptualization of arousal procrastination. Even at the conceptual level, arousal *procrastination* is not equal to arousal *delay* defined and measure by the DQ. The content domain of arousal procrastination proposed by Ferrari has overlap with both hedonistic and arousal delay in the DQ.

Similarly, the construct purposeful delay measured by the DQ is not the same as active procrastination; the behavioural aspect of active procrastination has overlaps with arousal and purposeful delay in the DQ. Strategic delay, the conceptualization discussed by Klingsieck (2013a), is similar to purposeful delay. However, in the DQ, strategic delay may also have some conceptual overlap with inevitable and arousal delay.

Irrational delay or anxious procrastination has been examined in multiple studies in the last 40 years. The majority of researchers used the term procrastination without any additional descriptors that explain the nature or connotation of the construct or its specific defining components (e.g., Aitken, 1982; Lay, 1986; McCown & Johnson, 1989; Pychyl, et al., 2000; Solomon & Rothblum, 1982; Sirois, & Pychyl, 2013; Steel, 2007; Tuckman, 1991; van Eerde, 2003), however they often used descriptors that explain the domain or context for the study (i.e., academic, general, everyday-life, health) or the level of conceptualization (decisional, behavioural, and trait). In the new reconceptualization of procrastination behaviours related to the Procrastination Behaviour Scale (PBS) and MMAP, I had to use descriptors that differentiate the two types of procrastination behaviours. The two procrastination behaviours by definition

could differ based on the emotional and experiential aspects that are theoretically related to the behaviour (e.g., stress, anxiety, and dissatisfaction). Since activating negative emotions (e.g., anxiety) are assumed to be one of the important causes and outcomes of irrational delay of an intended task, the factor with irrational delay items was labeled anxious procrastination. The word anxiety was chosen to be representative of activating negative emotions that are related to irrational delay and traditional conceptualizations of procrastination (e.g. Flett, Blankstein, & Martin, 1995; Spada, Hiou, & Nikcevic, 2006). Moreover, because I developed the MMAP for both basic and intervention research, including practical projects, the choice was made to imply its possible link to theoretically relevant constructs such as fear of failure and maladaptive perfectionism³¹ for the severe cases. However, it should be noted that the use of anxiety as a descriptor should not be interpreted to mean that anxiety is considered the most important negative emotion related to irrational delay in this new conceptualization. Anxious procrastinators may experience different forms of negative emotions (e.g., guilt, fear, anger). Moreover, the choice of anxiety or activating negative emotions should not be interpreted as though people engaging in other forms of procrastination do not feel negative emotions.

Negative emotions were not used in naming the second type of procrastination behaviour, hedonistic delay. As shown in the validity studies, both hedonistic and irrational delay are linked to negative emotions in general and to deactivating negative emotions specifically (boredom, sleepiness), and both are also correlated with activating emotions (e.g., Guilt). However, as it was expected, hedonistic delay as a form of delay, which is defined by components such as weak

³¹ Maladaptive perfectionism has been linked to anxiety and other negative emotions. It was also linked to several disorders that were formerly categorised under Anxiety Disorders in DSM (Antony, Purdon, Huta, & Swinson, 1998; Moser, Slane, Burt, & Klump, 2012).

initial intention and repeatedly choosing fun and pleasurable activities over intended tasks, had a weaker correlation with certain activating negative emotions (e.g., anxiety). Given the complex relations between hedonistic delay and various negative emotions, I chose not to refer to emotions in the descriptor. As explained previously, given that excessive pleasure seeking was the one unique defining component of the construct and the content of marker items in the factor analysis, the term hedonistic was chosen. However, future researchers should neither interpret the label “hedonistic” to mean that this group of delayers postpone their tasks only because of hedonistic values, nor that people who report other forms of procrastination (e.g., anxious procrastination) or delay (e.g., purposeful delay) do not have hedonistic tendencies. The term hedonistic here is only refers to the notion that the person chooses fun or pleasurable activities when he or she ought to work on his or her tasks. For those who report exclusively hedonistic delay, their delay can be due to other psychological process and constructs (self-regulation problems, maladaptive impulsivity, and rebelliousness) other than hedonism.

In sum, future research can compare the results of the Anxious Procrastination subscale of the PBS and the Irrational Delay subscale of the DQ with the results based on existing measures of behavioural and trait procrastination. All other measures are new despite some similarity in naming and content with the previous conceptualizations (e.g., Arousal delay) and measures (e.g., Active Procrastination Scale) and, therefore, should not be not be equated. Despite the care in labeling the constructs, descriptors of the forms of procrastination and delay are just a representative of an important feature of the construct. The constructs have other important features and other forms of delay may contain the same feature to a lesser degree. It is important to consider the definition or set of features related to the construct when interpreting the results as opposed to focusing exclusively on its descriptor.

In addition to forms of delay and procrastination behaviours, different terms and operationalizations (e.g., chronic procrastination, trait procrastination) have been used in discussing procrastination problems. This can be misleading. In the next section, I discuss such issues in a greater detail.

Incorporating the Construct of “Procrastination Problems” into the Existing Procrastination Research Literature

As found in my literature review and noted by other authors in the field (e.g., Kligsieck 2013), procrastination research has suffered from lack of a psychometrically strong measure of procrastination as a psychological *problem*. Very often, however, the term *chronic procrastination* has been used loosely to refer to procrastination problems without providing or using a robust definition or appropriate measurement (e.g., Ferrari, et al., 2007; McCown, Johnson & Petzel, 1989; Malatincová, 2015). The origin of such usage can be traced back to the medical and clinical literature. The terms chronic versus acute are widely used in medical science to classify health problems with specific diagnostic criteria based on the onset and course of the disease. In psychology the terms are used as descriptors rather than diagnoses or classifications, in order to refer to the course and/or onset of a problem (e.g., acute vs chronic stress), or a psychological disorder and its symptom (e.g., acute and chronic phases of psychosis).

In procrastination research, the instruments typically used to quantify chronic procrastination have not provided a clear definition or set of criteria for measuring the chronic nature of the construct (e.g., McCown & Johnson, 1989, cited in McCown & Johnson, 2001). The most important feature of any chronic problem, its onset or duration, is missing from the definition and the measurement of chronic procrastination. Instead, researchers have used a high frequency of procrastination behaviour (McCown, Johnson & Petzel, 1989; Ferrari et al., 2007)

or the presence of procrastination behaviour across multiple tasks (Dryden, 2000; Neenan, 2008) to define “chronic” procrastination. I believe that using the phrase chronic procrastination to define procrastination problems is very limited and can be problematic.

The MMAP overcomes this limitation, allowing users to quantify procrastination problems by differentiating the severity of procrastination problems from the onset or duration of procrastination problems. Moreover, both severity and duration/course of procrastination behaviours can be operationalized by different levels of aggregation or specification. At a high level of specification (low level of aggregation), there are 11 dimensions; at a medium level of specification, there are four facets; and at a low level of specification, two overall scores can be used to measure the severity and onset of procrastination problems.

This multilevel structure has been supported by confirmatory factor analysis. I believe that severity and onset of procrastination problems can provide a more accurate and less controversial operationalization of procrastination problems in comparison to chronic procrastination and its single-score operationalization. The multilevel specification of severity and duration in the MMAP is a unique feature that allows researchers and clinicians to choose the level of aggregation of scores based on their theoretical models and project needs. All of the dimensions and facets related to the severity of procrastination problems are measured as continuous variables. However, to facilitate research that needs to differentiate severe from non-severe procrastination problems, I have provided a cut-off for overall severity score based on a preliminary effort and conceptual link between procrastination problems and mental health outcomes (see Chapter 13).

In addition to severity and duration scores, the MMAP can also provide information regarding chronic procrastination. Using the MMAP, chronic procrastination at the highest level

of aggregation can be defined by two conditions: a high level of severity as defined by severity cut-off (see Chapter 13) and a duration of more than two years. A more conservative definition of chronic procrastination would use a higher level of specification and multiple criteria to identify “chronic” procrastinators: Specifically, this definition would require that chronic procrastinators in the academic domain meet four criteria. First, students should report a high level of procrastination behaviour on a majority of their important academic tasks including writing and reading assignments as well as preparing for exams³². Second, they should have high/extreme scores on more than one dimension of perceived negative consequences and negative emotions. These include: A) being highly dissatisfied about their tendency to procrastinate on tasks; B) repeatedly experiencing negative emotions (e.g., anxiety, guilt, boredom) in relation to their procrastination; and C) reporting that procrastination has had a moderate-to-high level of negative academic consequences and a low-to-moderate level of personal/social, and health consequences. Third, they should have suffered from procrastination and its consequences for a long time, during more than two distinct stages of academic life such as late high school and early university. Fourth, their procrastination should not be due to other psychological or psychiatric conditions such as depression, ADHD, PTSD, OCD, and so on.

The format of the above operationalization of chronic procrastination may resemble the operationalization of psychological disorders and diagnostic assessment. However, the MMAP should in no way be considered and/or used as a diagnostic test or to define and quantify procrastination as a psychological disorder similar to disorders in the Diagnostic and Statistical

³² When data related to other domains are available, they should reveal a high frequency of procrastination behaviour on several important educational/occupational, personal, and/or financial tasks or activities.

Manual of the APA (DSM). Engberding, Frings, Höcker, Wolf, and Rist (2011) provide a preliminary effort to operationalize procrastination as a psychological disorder similar to Axis-1-disorders in the DSM. However, despite its value as a starting point, Engberding et al.'s (2011) effort requires further development. Specifically, development and validation of a diagnostic test would require a panel of leading experts in procrastination research and intervention to identify the symptomology of a disorder and provide appropriate criteria for the classification is a necessary condition for development and validation of a diagnostic test.

Although obtaining such input from a panel of leading clinicians and experts would be beneficial for future research, it was not required for the development of the MMAP as it is not a diagnostic test and is not based on a disease model. All of the categorical scores and criteria were presented to facilitate intervention research where screening of participants is essential. For evaluating change in intervention research and developing and testing a theoretical model in basic research, continuous variables (dimensions and facets) obtained from the MMAP are recommended to be used. Another fundamental difference between the MMAP and measures based on a disease model (e.g., Engberding et al., 2011) is that the MMAP assumes that problematic academic procrastination is a psychological problem with limited effects on specific aspects of life and performance that are directly related to the procrastinated tasks (e.g., academic performance), rather than a psychological disorder with considerable impact on multiple aspects of life. Procrastination can be one of the behavioural consequences of a psychological disorder (e.g., mood disorder, ADHD, hoarding disorder), therefore accompanied by serious affects on social and general activities. However, the impairment should not be linked to procrastination problems in treatment formulation. This is why the fourth condition in the

operationalization of chronic procrastination is to exclude cases with established psychological disorders in the operationalization of chronic procrastination.

In line with the DSM, the classifications of procrastination *disorder* developed by Engberding and her colleagues (2011) has used 6 month as a diagnostic criterion. MMAP in line with procrastination *research*, assumes that chronic procrastination is an enduring problem (e.g., Schouwenburg, 2004b), therefore the minimum course of problem was chosen to be longer than 6 month. In the MMAP, the presence of procrastination problems before and after a transitional time (in two distinct stages of the educational history) or more than 2 years in one distinct stage was selected. The chosen criteria in the MMAP excludes the cases for whom their procrastination problems can be due to being in a transition period (e.g., the first semester of university); at the same time it allows to screen for sophomores who suffer from procrastination chronically since high school.

Chronic procrastination should not be equated to severe procrastination problems. People who meet all of the other conditions but whose procrastination problem is of shorter duration than the 2-year criterion for chronic procrastination, regardless of being or not being in transitional period, are still suffering from severe procrastination problems. In fact, such cases may need more immediate intervention than the chronic ones. As the validation findings indicate, those who have lived with their procrastination problems for a long time may have learned to cope with the psychological problem. Specifically, the correlations of the procrastination *duration* total scale with almost all of the outcome variables as well as factors with negative meanings were significantly and considerably lower than the correlation of procrastination *severity* in relation to these variables. Based on the MMAP research, severity of

procrastination problems is a better indicator of procrastination problems than procrastination duration.

The criteria used in the definition of chronic procrastination requires further clarification, testing and validation particularly by using and comparing non-clinical and clinical samples. In the absence of such effort, however, a high score on chronic procrastination can be defined as mean scores equivalent to “often” to “always” (equal to or greater than 4) and a moderate scores can be defined as mean scores from 3 to 4.

Future research on procrastination problems should also investigate the role of hedonistic delay. It could be argued that negative consequences and emotional experience of hedonistic procrastination may be different from those associated with anxious procrastination problems. For those with pure hedonistic procrastination, we might expect to see higher scores on deactivating negative emotions than with some of the activating negative emotions such as guilt. In terms of perceived negative consequences, it can be argued that based on the definition of hedonistic procrastination, the negative academic and relational consequences are the main area of problems as opposed to negative personal and health consequences as well as dissatisfaction. Although the above important factors are included in the present operationalization, future research may find it necessary to add, remove or modify criteria for severe and chronic hedonistic procrastination problems.

Limitations of the Present Research and Suggestion for Future Studies

The MMAP and DQ were developed to resolve limitations of existing measures of procrastination and to fill needs in procrastination research and intervention. However, regardless of the number of studies conducted and the amount of thought and care invested in the development the new measures, there are always some limitations and, therefore, a need for

further investigation. Given the number of measures and the diversity of their formats and applications, many possible limitations and recommendations for future research can be discussed. There are several specific limitations related to statistical methods and types of operationalizations that have been discussed throughout the dissertation. These include: (1) limitations related to the vignette approach and therefore its limited application (i.e., suitable for screening and basic research, not suitable for clinical settings or measuring therapeutic progress); (2) the use of multiple conditional elements in measuring procrastination and forms of delay with vignettes; (3) the possibility of finding new prototypes of delay (i.e., comprehensiveness of the set of prototypes defined); (4) limitations related to the statistical analyses used in the study (e.g., EFA, dimensionality); (5) the need for further evaluation of the CFA models (e.g., cross-validation); (6) the length of the dissertation and resulting omission of a discussion of the validity evidence related to facets and dimensions of the MMAP; (7) limitations related to the use of categorical measures of procrastination problems (severity and chronic); and (8) the necessity of validating the procrastination-severity cut-off in intervention and/or experimental research.

Given that the above issues have already been discussed where relevant in the preceding chapters, I focus here on: (1) the length of the surveys and their possible effects, (2) the use of online as opposed to pencil and paper questionnaires, (3) use of self-report for validation, (4) selection of validity scales and indices, (5) causality and interpretation, as well as (6) assumptions made throughout this process.

Timing

One of the important limitations of my studies was the length of the surveys. This occurred because validation was begun from the first administration of the measures. This

methodological choice, despite its advantages, resulted in lengthy surveys. Multiple strategies were used to overcome problems associated with long surveys, such as encouraging students to take a break during completion of the measures. This was indicated to students in the informed consent form as well as on the first page after the consent form and in the middle of survey. Breaks were facilitated by allowing and instructing participants to save the survey and return to it where they left off if they needed a long break. Analytically, I used multiple items to check the integrity of participants' responses.

Fatigue from long surveys was more likely to affect responses to the validation measures, because the main measures were always presented at the beginning of the survey before the validation measures. However, the order of the validation measures was randomized to control for order effects and to distribute the fatigue effect equally among the measures. Despite all of the above strategies, it would be beneficial to test the validity hypotheses as well as the structure of the model in a shorter study.

Online vs. Paper-pencil Responses

With the exception of the cognitive interview and pilot studies, all other studies were conducted online using undergraduate students. Given the trend toward the use of online research, this may not be considered a caveat for the current research. However, one of the important intended uses of the MMAP is intervention research and in clinical settings, where the instrument might potentially be administered in a paper-and-pencil format. Therefore, investigating possible differences in the results between paper-and-pencil and online versions would be beneficial and informative.

Use of undergraduate student participants is not a drawback for this research since both the DQ and the MMAP were specifically developed for this population. At this stage of

measurement development, the measures cannot be used for high school students for several reasons. First, the DQ would require major changes in most stories before being administered in younger populations. In addition, inevitable delay stories under the DQ is not applicable to a high-school population. The MMAP, with some minor changes in wording, could be administered in a younger student population, but only after investigating the structure, reliability of subscales, characteristics of items (e.g., difficulty), and convergent and discriminant validity of scores in the new population.

In this study, gender bias was only evaluated using parametric and non-parametric Differential Item Functioning (DIF) approaches. Since the constructs of procrastination and forms of delay can be affected by contextual factors (e.g., historical, cultural, and linguistic), it is very important to investigate possible biases and differences related to cultural and language background as well as age. In addition to DIF, the test of invariance in CFA framework can be used to investigate the possible biases and/or differences between these groups in the future research.

Self-Report

One limitation of this study was that it relied exclusively on self-report in the validation process of the newly developed instruments, which are themselves self-report measures. Similarity in measurement methods can potentially distort (inflate) correlations between new subscales and validity variables. This problem was particularly relevant in gathering convergent and divergent validity evidence related to the MMAP. Almost all of the validation scales consist of short items and Likert-scale response options. The DQ, although it is also a self-report measure, uses items that are stories. Comparisons between the results related to the MMAP and DQ were promising, but inflation due to use of self-report cannot be removed from the validity

correlations. Future research may need to use validation scales that do not rely on self-report, such as observation, behavioural measures, parental or peer report, interviews, and so on.

Operationalizing a behavioural measure of procrastination is very difficult if not impossible. This is mainly due to the complexity of procrastination, which requires multiple defining components. It is difficult to measure the intention-action gap and the irrationality or needlessness of delay as a behavioural measure. The difficulty arises because these components are not observable and require self-report. In addition, the behaviours may change and be revisited multiple times before individuals start and complete their tasks.

Despite these inherent limitations, it is possible to find some behavioural measures that are close to the conceptualization of procrastination or other forms of delay. Within the framework of the current study, a possible behavioural measure of general delay could be extracted by comparing the dates when participants registered for the study in the SONA system and the dates of their actual participation in the survey system. A behavioural measure closer to the conceptualization of procrastination might involve examining the timing in the test-retest dataset where participants committed to participate in a retest at a specific time, three to four weeks after receiving the link for the retest survey. The difference between the deadline for participating in the retest stage (intended/committed time) and the time that participants actually started the retest (action time) could be calculated. Moreover, it would be possible to calculate the time between receiving the invitation and completing the survey, as well as counting the number of reminders received before completing the retest stage. However, in addition to the general problems of behavioural measures, the task of completing an optional survey was assumed not to be an important one for many students; this reduces its value as a possible

measure of procrastination as opposed to strategic or intentional delay, or even the result of inevitable delay.

Given multiple conceptualization problems of the above variables and the cumbersome and time-consuming process of matching and calculating the time differences, it was not cost-effective to examine them in this dissertation research. The findings related to these variables, however, could be reported in future reports of the construct. It would also be valuable to measure behavioural delay on important tasks that are matched with the newly developed measures. Future research may benefit from studying the relation of the new measures of academic delay and procrastination behaviours with behavioural measures of academic delay in general and behavioural measures of delay that are closer to the conceptualization of academic procrastination.

Selection of the Validation Scales

The selection of instruments is often considered a limitation in the never-ending process of validating a new measure, and my research was no exception, despite the large number of validation measures I used. For example, I used only one measure of the Big Five personality traits, and because there are no validated measures of task-aversiveness, my validation package did not include a measure of task-aversiveness. Future studies may benefit from: using a different measure of the big five traits; developing a validated measure of task-aversiveness and testing its association with procrastination; finding and using well-developed measures of time-management, academic achievement, and multiple university- performance measures; collecting reports from parents and/or significant others regarding relational consequences, and so on. Investigation of any of these variables could be used to enhance the validity of the MMAP and DQ.

In my research, most of the correlational results related to inevitable delay were small. This may be because the causal factors behind inevitable delay prototypes are external as opposed to internal or psychological, and/or because the included psychological variables are not relevant. The relation between inevitable delay and variables with external components such as practical and emotional conflicts between work, school, and family might need to be tested in future research.

Causality

Another common limitation in validation research, including the present studies, is the use of a cross-sectional design, which does not allow researchers to determine causal relations among tested variables. Within a cross-sectional framework, I tested the hypothetical relations between the new measures and several validity measures (antecedents, theoretically-related, and outcome variables) by conducting pairwise correlations. Given the limitations of the cross-sectional method, it is not appropriate to conclude that the significant relations obtained are causal in nature. In future investigations, longitudinal methods could be used to study how procrastination behaviour and procrastination problems change over time, how problems in antecedent variables result in procrastination problems over time, how changes in procrastination problems relate to changes in health and mental health, as well as other outcomes. Future research could test the validity relations within a structural equation model with theoretically relevant variables to control for spurious effects and shared variance between factors. It is recommended that future research use experimental designs in order to investigate whether a reduction in procrastination problems results in increased positive outcomes (e.g., well-being) and/or decreased negative outcomes (e.g., depression, anxiety). The experimental and

intervention research can potentially provide valuable information regarding the sensitivity of the MMAP's various scores to change^{33,34}.

Assumptions

One of the important philosophical limitations of the project is that the conceptualization of procrastination problems is based on an individualistic point of view. Procrastination problems are considered explicitly an individual's problem that are caused by internal causes. I strongly believe in the importance of considering the interplay of individual and social components in causal explanations of procrastination problems. Even if we assume that procrastination is a trait-like phenomenon, a conflict between the individual and environment can facilitate development of a psychological problem. Even the formation of a procrastination tendency in the first place can be due to a conflict between internal and external components such as an emotional/relational conflict with parents (Haghbin, 2006a) or authoritarian parenting (Pychyl, Coplan, & Reid, 2002). It can be argued that the MMAP, as an accurate measure despite this philosophical bias, could reverse the drawback of individualistic focus if it were used in research that investigates the effects of environment or other external factors on academic procrastination problems. Without a doubt, the field of procrastination research suffers from the

³³ The test-retest study in the CFA phase showed the stability and reliability of the MMAP across time. Moreover, in a new intervention study conducted by Blouin-Hudon & Pychyl (2015), the new Procrastination Behaviour Scale of the MMAP was used to detect change across time and between various treatment groups. The findings supported the reliability of the measures and the sensitivity of the measures to detect the changes in procrastination.

³⁴ It should be noted that in such research projects, the task-specific version of the MMAP can be used, and therefore the types of tasks can be adapted based on the scope and content of interventions or experiments in order to make the measure more sensitive to change. In addition to adjusting types of tasks, the length of time that the behaviour and problems are measured can be shortened or extended in by altering the instructions, which would make the measure more sensitive to the changes related to the interventions.

lack of investigating environmental factors that contribute in procrastination problems. These studies need to be conducted in future.

The individualistic bias is more controversial when the measure is used in categorical format for labeling individuals. I strongly advise against using the measure as a “pathologizing” instrument and against defining procrastination problems as a mental disorder. The classification of chronic and severe procrastination should be approached with caution. It is recommended to avoid simplistic labels and to use multiple facets and dimensions in both consulting and research projects.

This individualistic assumption is less embedded in the conceptualization and operationalization of the various prototypes of delay. A prototype such as inevitable delay explicitly includes the effects of external factors in its conceptualization, and purposeful delay is a form that includes both internal and external forces. Previous research failed to differentiate and study the less individualistic and problematic forms of delay because of using procrastination measures that confound procrastination with other forms of delay and because of a lack of validated measures for the scores. Future research may need to focus on the newly measured forms of delay.

It is important to be aware of stigmatizing problems even if we are careful not to imply that procrastination is a disorder. The categorical system of scoring that I presented for the MMAP as well as the categorical version of the DQ may lead to stigmatizing problems if it were not used and reported wisely. When the use of such system of scoring and measurement is necessary, labels such as chronic procrastinator, arousal delayer, and so on are not appropriate ethically and not valid empirically.

From a psychological and ethical point of view, labels that overemphasize a typology are more likely to cause irreparable harm in how individuals perceive themselves and might affect how they are perceived in their social network (university and home) by others (teachers, family). Unfortunately, such labeling is common in published procrastination research, even among leading researchers. The simplicity and/or audience-appealing effect of types has resulted in typologizing constructs that have not been conceptualized and measured as types and are not categorical in nature. That is, in addition to ethical and psychological concerns, the use of terms such as chronic procrastinator or severe procrastinator is methodologically wrong. The use of chronic procrastinator conveys a typology of procrastination. The purpose and the methods used in developing the MMAP and DQ were intended to define the problematic aspects of procrastination as opposed to defining and identifying types of procrastinators. What makes a person with severe or chronic procrastination different from people not considered to have chronic or severe problems is not a difference in the underlying components of procrastination, but rather the intensity and the onset of procrastination problems.

In sum, the boundaries for classifications and the cut-offs for categorizations are artificial for many psychological processes with a continuous nature such as procrastination problems. This inherent limitation will be exacerbated if users of the MMAP and DQ ignore appropriate usages of the categorical system and its limitations. When researchers deem it necessary or beneficial to use a categorical system of scoring, I recommend the use of phrases such as *a person with chronic procrastination problems* instead of *chronic procrastinator*. Such a way of communication reduces the negative effects of labeling the person. Moreover, by shifting the focus from the person to the problem, it may result in a more proactive approach to dealing with

the issue, provide hope to seek a treatment, or tackle the factors (internal or external) that lead to the problem.

Conclusions

The field of procrastination research is growing in many different directions, including finding effective interventions, developing theoretical models, extending to various domains (e.g., health, organizational, internet, sleep), and studying theoretically relevant factors (see Fries & Grunschel, 2015; Klingsieck, 2013). The foundation for all of this research should be psychometrically and theoretically sound measures of the constructs of interest - delay and procrastination. However, as noted most recently by Klingsieck (2013), despite an increase in studies of procrastination, researchers often use measures that are outdated and conceptually and/or practically limited in scope. For example, current measures have failed to capture the multidimensional nature of procrastination problems and to differentiate procrastination from other forms of delay. As a result, discrepancies between the findings of correlational and clinical studies on the relation of procrastination to factors like neuroticism, rebelliousness, fear of failure, and perfectionism are not well-explained theoretically. More importantly, there is no systematic research regarding other forms of delay.

In my dissertation research, multiple studies were designed to address important gaps in measuring procrastination and forms of delay. First, a set of measures, the MMAP, was developed to capture the multifaceted nature of procrastination problems using a multiple-stage approach to measurement development. Second, using a similar approach but with a new set of studies, the Delay Questionnaire was developed to measure six forms of delay: irrational, hedonistic, arousal, inevitable, and purposeful delay as well as delay due to emotional and relational problems. The results of exploratory and subsequent confirmatory factor analysis

provide strong support for the validity and robustness of the factor structure as well as various latent variables (i.e., total scale and subscales). Reliability analyses provided strong support for the MMAP's scale and subscale scores. The reliability of the DQ subscales was acceptable, despite the small number of items per factor.

Based on the MMAP, procrastination problems can be operationalized using total continuous factor scores for the severity and duration of procrastination problems, or categorical criteria to measure severe and/or chronic procrastination. Similarly, the forms of delay can be operationalized based on continuous factors measuring prototypes of delay or one categorical variable. The evidence of convergent and divergent validity for these operationalizations was presented and discussed. Overall, extensive analysis of the content, structure, and relations of the new scales and subscales to theoretically relevant causal and outcome variables indicated that the MMAP and DQ were theoretically and psychometrically consistent with existing research. The MMAP uses multiple systems of scoring, is easily adaptable to different the types of tasks, and has a multifaceted and multilevel structure. Therefore, the scale(s) can be used in both basic and applied (e.g., intervention) research to measure and differentiate procrastination behaviours (irrational and hedonistic delay), severity of procrastination problems, onset of procrastination problems, and so on.

Complementing the MMAP, the brevity and simplicity of the DQ and its flexibility in measuring various forms of delay (i.e., using continuous and/or categorical operationalization) allows its use in basic research to enhance our theoretical understanding of various forms of delay as well as in applied projects to screen and select individuals with particular forms of delay. Similar to any other research projects, users of these new measures should attend to their limitations and follow my guidelines regarding interpretation of scores (see Chapter 13 and 14)

before using the measures. Finally, the MMAP and DQ have many potential implications for procrastination research, counselling and clinical practice, and for university policy makers and authorities. I hope that these new measures will be useful in advancing our knowledge related to various forms of delay and helping those who suffer psychologically from procrastination problems.

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APPENDICES

Appendix A:

Existing Procrastination Measures

The followings are the measures that their content were analysed in the first part of my Dissertation (see Chapter 4).

Aitken Procrastination Inventory (API: Aitken, 1982)

For each of the following items, on the blank space, please indicate the extent to which the statement is more or less False (1) or True (5) of you. Read each statement carefully; remember, there are no right or wrong answers.

1= False 2 =Mostly False 3=Sometimes True / Sometimes False 4 = Mostly True
5=True

- 1. I delay starting things until the last minute.
- 2. I'm careful to return library books on time.
- 3. Even when I know a job needs to be done, I never want to start it right away.
- 4. I keep my assignments up to date by doing my work regularly from day to day.
- 5. If there were a workshop offered that would help me learn not to put off starting my work, I would go.
- 6. I am often late for my appointments and meetings.
- 7. I use my vacant hours between class to get started on my evening's work.
- 8. I delay starting things so long, I don't get them done by the deadlines.
- 9. I am often frantically rushing to meet deadlines.
- 10. It often takes me a long time to get started on something.
- 11. I don't often delay when I know I really need to get the job done.
- 12. If I had an important project to do, I'd get started on it as soon as possible.
- 13. When I have a test scheduled soon, often I find myself working on other jobs when a deadline is near .
- 14. I often finish my work before it is due.
- 15. I get right to work at jobs that need to be done.

_ 16. If I have an important appointment, I make sure the clothes I want to wear are ready the day before.

_ 17. I arrive at college appointments with plenty of time to spare.

_ 18. I generally arrive on time to class.

_ 19. I overestimate the amount of work that I can do in a given time.

_ 20. My tendency to procrastinate is severely negatively affecting my school work.

14. To what degree is procrastination on this task a problem for you?

Not At All Almost Never Sometimes Nearly Always Always

a Problem

a Problem

a

b

c

d

e

15. To what extent do you want to decrease your tendency to procrastinate on this task?

Do Not Want

Somewhat

Definitely

to Decrease

Want to Decrease

a

b

c

d

e

VI. SCHOOL ACTIVITIES IN GENERAL

16. To what degree do you procrastinate on this task?

Never Almost Never Sometimes Nearly Always Always

a

b

c

d

e

17. To what degree is procrastination on this task a problem for you?

Not At All Almost Never Sometimes Nearly Always Always

a Problem

a Problem

a

b

c

d

e

18. To what extent do you want to decrease your tendency to procrastinate on this task?

Do Not Want

Somewhat

Definitely

to Decrease

Want to Decrease

a

b

c

d

e

Academic Procrastination State Inventory (APSI: Schouwenburg, 1992, 1995)

How frequently last week did you engage in the following behaviors or thoughts?
(1 = not; 2 = incidentally; 3 = sometimes; 4 = most of the time; 5 = always)

Factor 1: Procrastination

1. Drifted off into day dreams while studying.
2. Studied the subject matter that you had planned to do.
3. Had no energy to study.
4. Prepared to study at some point of time but did not get any further.
5. Gave up when studying was not going well.
6. Gave up studying early in order to do more pleasant things.
7. Put off the completion of a task.
8. Allowed yourself to be distracted from your work.
9. Experienced concentration problems when studying.
10. Interrupted studying for a while in order to do other things.
11. Forgot to prepare things for studying.
12. Did so many other things that there was insufficient time left for studying.
13. Thought that you had enough time left, so that there was really no need to start studying.

Factor 2: Fear of failure

14. Had panicky feelings while studying
15. Had doubts about your own ability.
16. Experienced fear of failure.
17. Wondered why you would study if this would mean so much trouble for you.
18. Felt tense when studying.
19. Gave up studying because you did not feel well.

Factor 3: Lack of motivation

20. Found the subject matter boring.
21. Felt that you really hated studying.
22. Doubted that you should have ever taken this course.
23. Felt, when studying, that you disliked the subject.

Procrastination Checklist Study Tasks (PCS: Schouwenburg, 1995)

Part A: At the start of the present or last academic year, you had to do a few administrative tasks. Please indicate how you did these tasks in comparison with your intention to do them.

1. a. Registered as a student ... b. Intended to do so ...

(upon receipt of forms; early August; late August; after September 1st)

2. a. Read through the study guide ... b. Intended to do so ...

(upon receipt; after a few days; after a few weeks; not yet)

3. a. Made a selection of courses ... b. Intended to do so ...

(amply before term began; just before term began; in the course of the term; at exam registration)

Part B: For the last term in which you attended lectures, please indicate how you did that in comparison with your intention to do so.

1. a. Present at lectures ... b. Intended to be . . .

(always; most of the time; half of the time; seldom)

2. a. Listened with concentration ... b. Intended to do so ...

(all of time; most of time; half of time; less than half of time)

3. a. Took notes b. Intended to do so ...

(all of time; most of time; half of time; less than half of time)

Part C: For the last three exams you intended to do, please indicate how (on the average) you performed the following actions in comparison with your intention to perform them.

1. a. Obtained books and papers ... b. Intended to do so ...

(before term began; as term began; in course of lectures; just before exam)

2. a. Registered for examination ... b. Intended to do so ...

(first day registration; after a while; last occasion possible; too late)

3. a. Started studying (homework).....b. Intended to do so . . .

(beginning of lectures; amply in time; just in time; too late)

4. a. Started making extracts . . . b. Intended to do so ...

(beginning of lectures; amply in time; just in time; too late; not at all)

5. a. Rehearsing materials . . . b. Intended to do so ...

(after first lectures; amply in time; just in time; too late)

Academic Procrastination Scale (APS: Milgram & Toubiana, 1999; Mailgram et al., 1998)

This scale deals with the phenomenon of procrastination that is, putting off until later things that we should do much earlier. Some people are procrastinators and others are very prompt. Many people delay doing some things they are supposed to do and do other things promptly. How do you handle things you have to do, and more particularly how do you handle academic assignments?

The following are a series of sentences describing students' behavior with respect to academic assignments. Three kinds of assignments are described: Preparing for tests, doing homework (doing assigned reading and reviewing lecture notes), and writing term papers (doing research on a specific topic and writing a paper of some length on it). Read each sentence and circle the number that most accurately describes how you handle these assignments. There are no right or wrong answers. Please, be forthcoming, answer every question, and if an assignment is not relevant, please, answer it as if it were one of your ongoing academic assignments.

1	2	3	4
Rarely	Sometimes	Much of the Time	Most of the Time

Preparing For Tests

1. It is hard for me to concentrate and I tend to daydream when I should be studying for an exam.
2. I do not delay preparing for an exam until the last minute. [R]
3. When I prepare for an exam, I concentrate on the task at hand and do not get distracted. [R]
4. I find it hard to organize the material before the test.

5. When I am informed of the date of a given test, I do not let the time pass, and immediately begin to prepare. [R]
6. When the date of an examination draws near, I find it hard to begin preparing for it.
7. When I postpone preparing for tests, I feel bad about it
8. I am interested in changing my habits of procrastination in preparing for tests

Preparing Homework

I do my homework from class to class (required reading exercises) [R]

10. When I sit down to do my homework, I find it hard to stick with it to the end and I permit other things to distract me.

I prefer to do my homework first and then to become free to do other things (games, friends, TV). [R]

12. I tend to put off my homework assignments until the last minute.
13. When it is time to get up and go to school, I get out of bed fairly promptly. [R]
14. I do not get to classes on time.
15. When I do not understand something in class, I make sure that I understand it as soon as possible (e.g., read a book that explains it, ask the lecturer or a friend to explain it). [R]
16. My assignments (summaries or reference lists) are ready well before the the allotted time. [R]
17. When I am supposed to review homework material, I put it off.
18. When I postpone doing homework, I feel bad about it
19. I am interested in changing my habits of procrastination in doing homework.

Preparing Term Papers

20. When I have to sit and prepare a term paper, I put it off again and again.

21. I start to prepare term papers soon after they are assigned and do not postpone the preparation. [R]
22. When I decide to work on the paper and the time comes to start writing it, I feel that I don't have the energy to do it.
23. When I schedule when to work on the paper, I stick to it to the dates and times. [R]
24. When I sit down to work on the paper, I can't concentrate and tend to daydream.
25. When I have to submit a term paper by a certain date, it is ready several days in advance. [R]
26. When I delay in writing term papers, I feel bad about it
27. I am interested in changing my habits of procrastinating in writing term papers.

General Procrastination Scale (GPS, Lay, 1986)

On a scale of 1 (False of me) to 5 (True of me) please indicate to what extent each of the items below describes you. No two statements are exactly alike, so please consider each statement carefully before responding. Answer as honestly as possible.

1 False of me	2 Not usually true for me	3 Sometimes true/false for me	4 Mostly true for me	5 True of me
---------------------	------------------------------------	-------------------------------------	----------------------------	--------------------

1. I often find myself performing tasks that I had intended to do days before.
2. I often miss concerts, sporting events, or the like, because I don't get around to buying tickets on time.
3. When planning a party, I make the necessary arrangements well in advance.
4. When it is time to get up in the morning, I often get right out of bed.
5. A letter may sit for days after I write it before I mail it.
6. I generally return phone calls promptly.
7. Even with jobs that require little else except sitting down and doing them, I find they seldom get done for days.
8. I usually make decisions as soon as possible.
9. I generally delay before starting on work I have to do.
10. When travelling, I usually have to rush in preparing to arrive at the airport or station at the appropriate time.
11. When preparing to go out, I am seldom caught having to do something at the last minute.
12. In preparing for some deadlines, I often waste time by doing other things.
13. If a bill for a small amount comes, I pay it right away.
14. I usually return an "R.S.V.P." request shortly after receiving it.
15. I often have a task finished sooner than necessary.
16. I always seem to end up shopping for birthday gifts at the last minute.
17. I usually buy even an essential item at the last minute.
18. I usually accomplish all things I plan to do in a day.
19. I am continually saying "I'll do it tomorrow".
20. I usually take care of all the tasks I have to do before I settle down and relax for the evening.

Adult Inventory of Procrastination (AIP, McCown & Johnson, 2001)

Revised 2001

1. Strongly Disagree
2. Moderately Disagree
3. Slightly Disagree
4. I am neutral
5. Slightly Agree
6. Moderately Agree
7. Strongly Agree

1. I usually pay my bills on time. (-)
2. I am prompt and on time for most appointments(-)
3. I lay out my clothes the night before an important early morning appointment so that I won't be late (-)
4. I often find myself running later than I would like to be
5. I often think that I don't get things done on time.
6. If someone were teaching a course on how to get things done on time I would want to attend.
7. My friends and family think I often wait until the last minute.
8. I get important things done with time to spare. (-)
9. I am not very good at meeting deadlines.
10. I find myself frequently running out of time.
11. I am as punctual as most people I know (-)
12. I do routine maintenance on things I own as often as I should. (-)
13. When I have to be somewhere at a certain time my friends can count on me being there (-)
14. Putting things off until the last minute has cost me money during the past year.
15. I usually meet major deadlines(-)

Tuckman Procrastination Scale (TPS: Tuckman, 1991)

4 = that's me for sure,
3 = that's my tendency,
2 = that's not my tendency,
5 = that's not me for sure

1. I needlessly delay finishing jobs, even when they're important.
2. I postpone starting in on things I don't like to do.
3. When I have a deadline, I wait till the last minute.
4. I delay making tough decisions.
5. I stall on initiating new activities.
6. I'm on time for appointments.
7. I keep putting off improving my work habits.
8. I get right to work, even on life's unpleasant chores.
9. I manage to find an excuse for not doing something.
10. I avoid doing those things which I expect to do poorly.
11. I put the necessary time into even boring tasks, like studying.
12. When I get tired of an unpleasant job, I stop.
13. I believe in "keeping my nose to the grindstone."
14. When something's not worth the trouble, I stop.
15. I believe that things I do not like doing should not exist.
16. I consider people who make me do unfair and difficult things to be rotten.
17. When it counts, I can manage to enjoy even studying.
18. I am an incurable time waster.
19. I feel that it's my absolute right to have other people treat me fairly.
20. I believe that other people don't have the right to give me deadlines.
21. Studying makes me feel entirely miserable.
22. I'm a time waster now but I can't seem to do anything about it.
23. When something's too tough to tackle, I believe in postponing it.
24. I promise myself I'll do something and then drag my feet.
25. Whenever I make a plan of action, I follow it.
26. I wish I could find an easy way to get myself moving.

27. When I have trouble with a task, it's usually my own fault.
28. Even though I hate myself if I don't get started, it doesn't get me going.
29. I always finish important jobs with time to spare.
30. When I'm done with my work, I check it over.
31. I look for a loophole or shortcut to get through a tough task.
32. I get stuck in neutral even though I know how important it is to get started.
33. I never met a job I couldn't "lick."
34. Putting something off until tomorrow is not the way I do it.
35. I feel that work bums me out.

Decisional Procrastination Scale (DPS: Mann, 1982)

People differ in how they go about making decisions. Please indicate how you make decisions by selecting the response from 1 (not true) to 5 (true) to each question that best fits your personal style. No two statements are exactly alike, so please consider each statement carefully before responding. Answer as honestly as possible. Remember, there are no right or wrong answers. This information, as mentioned in the informed consent is completely confidential.

- 1 . I waste a lot of time on trivial matters before getting to the final decision.
2. Even after I make a decision I delay acting upon it.
3. I don't make decisions unless I really have to.
4. I delay m a king decisions until it is too late.
5. I put off making decisions.

Active Procrastination Scale (APS: Choi and Moran, 2009)

Scale: 1 (not at all true) to 7 (very true).

1. Outcome Satisfaction

1. My performance tends to suffer when I have to race against deadlines(R).
2. I don't do well if I have to rush through a task (R).
3. If I put things off until the last moment, I'm not satisfied with their outcomes (R).
4. I achieve better results if I complete a task at a slower pace, well ahead of a deadline (R).

2. Preference for Pressure

5. It's really a pain for me to work under upcoming deadlines (R).
6. I'm upset and reluctant to act when I'm forced to work under pressure (R).
7. I feel tense and cannot concentrate when there's too much time pressure on me (R).
8. I'm frustrated when I have to rush to meet deadlines (R).

3. Intentional Decision

9. To use my time more efficiently, I deliberately postpone some tasks.
10. I intentionally put off work to maximize my motivation.
11. In order to make better use of my time, I intentionally put off some tasks.
12. I finish most of my assignments right before deadlines because I choose to do so.

4. Ability to meet deadline

13. I often start things at the last minute and find it difficult to complete them on time (R).
14. I often fail to accomplish goals that I set for myself (R).
15. I'm often running late when getting things done (R).
16. I have difficulty finishing activities once I start them (R).

Appendix B:

MMAP Content Analysis Material

Procrastination Behaviour

Component Description/Definition:

Procrastination behaviour in an academic setting is a needless delay of an assigned task, despite the initial intention to start or finish it at a particular point in time.

Based on this definition each item should capture the following two conditions in order to be rated as highly representative:

- it reflects a needless, irrational, or unnecessary delay on an academic task (e.g., writing assignment)
- it reflects delaying despite one's initial intention, or a gap between the time that one initially intended to work on the task and the time that one actually works on the task.

Some of the questions use the phrase “needless delay.” Needless means delaying without a rational reason. When it's needless delay you generally know that it isn't a good idea to delay the intended task. For example, if you intended to study for an exam at a particular time but instead engaged in “unnecessary activities” and then studied at the last minute, this would be needless delay.

Unnecessary activities typically are not urgent and are not part of one's initial plan. For example, you may watch TV, spend time on facebook, or clean your room instead of studying for your exam as you initially intended. In answering the questions below, use your honest judgment. Only you can determine if your delay was needless.

Intention can refer to a vague thought or decision (e.g., thinking about doing an assigned task ahead of time) or it can refer to a specific and concrete plan (e.g., doing the task at a specific time on a specific day).

Delay as it is used here means to avoid, postpone, put off, do near the deadline, etc.

Scale used in the participant version:

1= Never 2= Almost never 3= Occasionally 4= About half of the time 5= Often 6= Very often 7=Always

	Items measuring “procrastination”	Q1^a Representativeness	Q2^b Clarity	Q3^c Suggestion or alternative wording
1	There is a needless delay between when I want to do writing assignments and when I actually do them.	1 2 3	1 2 3	
2	As I am thinking now, I engage in some unnecessary activities instead of working on writing assignments based on my initial plan.	1 2 3	1 2 3	
3	Instead of working on writing assignments according to my intention, I involve myself in some activities that are not urgent.	1 2 3	1 2 3	
4	I intend to work on writing assignments at some point ahead of deadline, but when the time comes, I tend to postpone the tasks without any rational reason.	1 2 3	1 2 3	
5	Just before I am about to begin an intended writing tasks, I tend to avoid them by doing something else.	1 2 3	1 2 3	
6	Despite my intention to start and finish writing assignments on time, I engage in other unnecessary activities instead.	1 2 3	1 2 3	
7	According to my intention to start and finish writing assignments on time, I start and finish them on time	1 2 3	1 2 3	
8	When writing assignments are assigned, I tell myself that I will not start them late, but I end up delaying them without really a good reason.	1 2 3	1 2 3	

9	I plan to work on writing assignments ahead of time, but when the time comes I postpone the tasks.	1 2 3	1 2 3	
10	I don't like to postpone writing assignments, but I end up working on them near the deadline without any rational reason.	1 2 3	1 2 3	
11	I intend to work on writing assignments early, but I often engage in other activities.	1 2 3	1 2 3	
12	I plan to work on writing assignments ahead of time and follow my plans.(R)	1 2 3	1 2 3	
13	When I receive writing assignments, I plan to work on them ahead of time, but I needlessly delay starting them.	1 2 3	1 2 3	
14	I initially intend to not put off writing assignments, but I continuously find myself doing so.	1 2 3	1 2 3	
15	I keep putting off writing assignments until later without any rational reason.	1 2 3	1 2 3	
16	I postpone major writing assignments despite expecting to be worse off if I delay.	1 2 3	1 2 3	
17	I delay on major writing assignments despite the fact that I know I will not be happy about doing so later.	1 2 3	1 2 3	
18	I engage in unnecessary activities instead of working on major writing assignments despite the fact that I know I will feel dissatisfied about my delay later.	1 2 3	1 2 3	

Note:

^a **Q 1(Representativeness).** Please rate how well each item represents procrastination as defined above.
[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity).** Please rate each item's clarity.

[Rating Scale: **1= Low 2= Moderate 3=High**]

^c**Q3 (Suggestion).** If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Hedonistic delay on Assigned Tasks

Component Description/Definition:

Hedonistic Delay is a form of delaying assigned tasks where one volitionally (wilfully, intentionally) chooses to do fun, pleasurable, and/or exciting activities instead. In this type of delay, one does not perceive the assigned tasks as important or necessary in comparison to the other activities and does not form a clear initial intention to start or finish the assigned task on time.

Based on this definition, each item of Hedonistic Delay should represent the following conditions:

- it should reflect a delay on academic tasks
- it should reflect inclination for choosing fun, pleasurable, or exciting activities over academic tasks, reflect lack of interest in academic tasks, or/and reflect no clear intention or desire to do academic tasks on time

Scale used in the participant version:

1= Never 2= Almost never 3= Occasionally 4= About half of the time 5= Often 6= Very often 7=Always

	Items measuring “procrastination”	Q1 ^a Representativeness	Q2 ^b Clarity	Q3 ^c Suggestion or alternative wording
1	I am neither interested in making a plan for working on writing assignments nor interested in starting them ahead of time.	1 2 3	1 2 3	
2	I don’t intend to work on writing assignments, and I do other fun things instead.	1 2 3	1 2 3	
3	When writing assignments are assigned, I don’t give any thought to when I will start working on them.	1 2 3	1 2 3	
4	I don’t really care about starting writing assignments on time, and I try to do them at last minute.	1 2 3	1 2 3	
5	When I receive writing assignments, I don’t make even a vague plan to start them ahead of time.	1 2 3	1 2 3	

6	I do not care about writing assignments, and I do not plan to do them ahead of time when there are more fun activities	1 2 3	1 2 3	
7	I plan and do fun activities (e.g., partying, going out, sports) as opposed to plan and work on major writing assignments ahead of time.	1 2 3	1 2 3	
8	When I receive a major writing assignment, I don't give it any thought at all, and I do it at the last minute.	1 2 3	1 2 3	
9	I would rather do fun stuff instead of getting an early start on major writing assignments.	1 2 3	1 2 3	
10	When it comes to writing assignments, I personally don't intend to work too hard or to get started on time.	1 2 3	1 2 3	
11	I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on this type of school tasks on time.	1 2 3	1 2 3	
12	I do not really care if I get a bad grade due to working on a writing assignment at the last minute.	1 2 3	1 2 3	

Note:

^a **Q 1(Representativeness)**. Please rate how well each item represents Hedonistic Delay as defined above.

[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity)**. Please rate each item's clarity.

[Rating Scale: **1= Low 2= Moderate 3=High**]

^c**Q3 (Suggestion)**. If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Negative Emotions

Component Description/Definition:

Negative Emotions here refer to specific or general unpleasant feelings that arise from initiating a task or from delay. These feelings may arise at any time, including during delaying needlessly on a task and after finishing a task that has been delayed needlessly.

Since it is possible that one experiences positive emotions (e.g., happiness and/or relief at having finished the task) in the above situations, items containing positive emotions are included to increase the face validity of this section.

The following two conditions are necessary to rate an item as highly representative of Negative Emotions:

- The item measures an unpleasant (anxiety, anger, guilt, shame, hopelessness, boredom, and/or sleepiness) feelings.
- The emotional experience is related to initiating or delaying the tasks.

Scale used in the participant version:

1= Never 2= Almost never 3= Occasionally 4= About half of the time 5= Often 6= Very often 7=Always

	Items measuring “emotions”	Q1 ^a Representativeness	Q2 ^b Clarity	Q3 ^c Suggestion or alternative wording
1	Whenever I am about to start writing assignments, I feel anxious .	1 2 3	1 2 3	
2	Whenever I am about to start writing assignments, I feel angry .	1 2 3	1 2 3	
3	Whenever I am about to start writing assignments, I feel hopeless .	1 2 3	1 2 3	
4	Whenever I am about to start writing assignments, I feel bored .	1 2 3	1 2 3	
5	Whenever I am about to start writing assignments, I feel guilty .	1 2 3	1 2 3	
6	Whenever I am about to start writing assignments, I feel sluggish or sleepy .	1 2 3	1 2 3	
7	Whenever I am about to start writing assignments, I feel emotional distress .	1 2 3	1 2 3	
8	Whenever I am about to start writing assignments, I feel one or more of the	1 2 3	1 2 3	

	following emotions: relaxed, content or calm .			
9	Whenever I am about to start writing assignments, I feel one or more of the following emotions: attentive, active, joy, excited, hopeful or enthusiastic .	1 2 3	1 2 3	
10	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel anxious .	1 2 3	1 2 3	
11	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel angry .	1 2 3	1 2 3	
12	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel hopeless .	1 2 3	1 2 3	
13	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel bored .	1 2 3	1 2 3	
14	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel guilty .	1 2 3	1 2 3	
15	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel sluggish or sleepy .	1 2 3	1 2 3	
16	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel emotional distress .	1 2 3	1 2 3	
17	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel one or more of the following emotions: relaxed, content or calm .	1 2 3	1 2 3	
18	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel one or more of the following emotions: attentive, active, joy, excited, hopeful or enthusiastic .	1 2 3	1 2 3	
19	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel anxious .	1 2 3	1 2 3	

20	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel angry .	1 2 3	1 2 3	
21	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel ashamed of myself .	1 2 3	1 2 3	
22	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel guilty .	1 2 3	1 2 3	
23	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel relief .	1 2 3	1 2 3	
24	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel emotional distress .	1 2 3	1 2 3	
25	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel one or more of the following emotions: relaxed, content or calm .	1 2 3	1 2 3	
26	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel one or more of the following emotions: proud of myself, joy, hopeful, sharp, active, excited, or enthusiastic .	1 2 3	1 2 3	

Adequacy of Content Domain for “Delay Emotions” (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....

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.....

.....

Note:

^a **Q 1(Representativeness)**. Please rate how well each item represents negative/positive emotions as defined above.

[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity)**. Please rate how clear this item is.

[Rating Scale: **1= Low 2= Moderate 3=High**]

Q3 (Suggestion). If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Table 5: Undesired outcome

Component Description/Definition:

Undesired outcome refers to the extent to which postponing intended tasks leads to psychological, social, or academic outcomes that are suboptimal or not as good as one would like.

Based on the definition, the following two conditions are necessary to rate an item as highly representative of “Undesired Outcome”:

- The item refers to a negative or poor or undesired outcome such as: Low GPA or grade; poor self-reported academic performance; poor mental or physical health; negative emotional state, poor assignment quality, etc.
- The poor outcome/performance is mainly due to the needless delay on academic tasks.

Scale used in the participant version:

1= Not at all 4=Moderately 7= Very Strongly

	Items measuring “undesired outcome”	Q1^a Representativeness	Q2^b Clarity	Q3^c Suggestion or alternative wording
1	Putting off major writing assignments until the last minute is one of the factors that has negatively affected my performance in school.	1 2 3	1 2 3	
2	My needless delay on major writing assignments is one of the factors that has negatively affected my grades.	1 2 3	1 2 3	
3	The quality of my work has suffered from my delay on major writing assignments.	1 2 3	1 2 3	
4	My needless delay on major writing assignments has affected my personal life in a negative way.	1 2 3	1 2 3	
5	My needless delay on major writing assignments has bothered me emotionally and psychologically.	1 2 3	1 2 3	

6	My needless delay on major writing assignments has caused me to not enjoy my life.	1 2 3	1 2 3	
7	My needless delay on major writing assignments has caused me to not be able to appropriately plan for pleasurable activities.	1 2 3	1 2 3	
8	My delay on major writing assignments has resulted in some relationship problems.	1 2 3	1 2 3	
9	When I have delayed working on major writing assignments, it has leaded me to not be at my best in my personal relationships.	1 2 3	1 2 3	
10	My needless delay on major writing assignments has had a negative impact on my relationships with a significant others (e.g., family or partner).	1 2 3	1 2 3	
11	When I needlessly delay working on major writing assignments, significant others (e.g., parents, partner) complain about it.	1 2 3	1 2 3	
12	My failure to follow my plans to work on major writing assignments has bothered me.	1 2 3	1 2 3	
13	Delaying needlessly on major writing assignments has made me a less successful student.	1 2 3	1 2 3	
14	As a result of delaying major writing assignments, my professors are not satisfied with the quality of my work.	1 2 3	1 2 3	
15	As I think about it now, there are negative effects on my health when I delay working on major writing assignments.	1 2 3	1 2 3	
16	There are negative effects on my happiness when I delay working on major writing assignments.	1 2 3	1 2 3	
17	As I think about it now, there are negative effects on my well-being when I delay working on major writing assignments.	1 2 3	1 2 3	

18	My delay on writing assignments has negatively affected my wellness to some extent.	1 2 3	1 2 3	
19	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my health.	1 2 3	1 2 3	
20	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my happiness.	1 2 3	1 2 3	
21	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my school work.	1 2 3	1 2 3	
22	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my mood.	1 2 3	1 2 3	
23	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my enjoyment of school.	1 2 3	1 2 3	

Adequacy of Content Domain of Undesired Outcome (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):
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Note:
^a **Q 1(Representativeness).** Please rate how well each item represents “undesired outcome” as defined above.
[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]
^b **Q2 (Clarity).** Please rate how clear this item is.
[Rating Scale: **1= Low 2= Moderate 3=High**]
^c**Q3 (Suggestion).** If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Dissatisfaction

Component Description/Definition:

Dissatisfaction refers to the extent to which one experiences a general feeling of being displeased or discontent about his or her needless delay on school related tasks and/or about the consequences of the needless delay. Another way to think of this is that the needless delay makes us unhappy.

Scale used in the participant version: 1= Not at all 4=Moderately 7= Very Strongly

	Items measuring “personal dissatisfaction”	Q1 ^a Representativeness	Q2 ^b Clarity	Q3 ^c Suggestion or alternative wording
1	I am not satisfied with myself because of my needless delay on major writing assignments	1 2 3	1 2 3	
2	I don't like my habitual delay of major writing assignments.	1 2 3	1 2 3	
3	I blame myself for needlessly delaying writing assignments (postponing major writing assignment without any rational reason).	1 2 3	1 2 3	
4	I wish I could change my habitual procrastination when I should be writing my assignments.	1 2 3	1 2 3	
5	In general, my needless delay on major writing assignment bothers me.	1 2 3	1 2 3	
6	I really would like to learn how to avoid needless delay	1 2 3	1 2 3	
7	In general, my needless delay of writing assignments does not affect my satisfaction with myself .	1 2 3	1 2 3	
8	I am not satisfied with my performance at university because of my needless delay on writing assignments.	1 2 3	1 2 3	
9	I blame myself for the negative consequences of delay on my performance as a student	1 2 3	1 2 3	

10	I am not satisfied with myself for continuing to procrastinate on major writing assignments particularly when my procrastination results in sub-standard work.	1 2 3	1 2 3	
11	I do not like myself because of the negative consequences of postponing writing assignments until the last minute.	1 2 3	1 2 3	
12	I feel blameworthy when I delay working on major assignments without a rational reason.	1 2 3	1 2 3	
13	I am upset by the negative consequences of delaying writing assignments.	1 2 3	1 2 3	
14	In general, my delay of writing assignments does not affect my satisfaction with my performance at school. (R)	1 2 3	1 2 3	

Adequacy of Content Domain of Dissatisfaction (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....

.....

.....

.....

Note:

^a **Q 1(Representativeness).** Please rate how well each item represents “dissatisfaction” as defined above.
 [Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity).** Please rate how clear this item is.
 [Rating Scale: **1= Low 2= Moderate 3=High**]

^c**Q3 (Suggestion).** If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

DURATION

Component Description/Definition:

Duration here is a defining facet for of procrastination as a problem, and it refers to the period of time during which one habitually procrastinates on academic tasks and/or experiences negative emotions, negative consequences or some level of dissatisfaction related to his/her procrastinating behaviours.

Based on the definition, to rate an item as highly representative of “duration,” the item should reflect **at least one** of the following concepts.

1. It measures *when* one started habitually delaying on school-related tasks
2. It measures *when* one started experiencing negative consequences of delaying on school-related tasks

Scale used in the participant version:

1= elementary school 2= early high school 3= late high school
4= starting university 5= more recently 6=Not applicable

NOTE: Before answering the items on “Duration,” students will read the following instructions. Please give your expert opinion about this instruction.

SPECIFIC INSTRUCTIONS

In the following section, we ask about when you started habitually delaying on school-related tasks and when you started experiencing negative consequences of this delay. Please think of your past experiences since elementary school, as far as you can remember, and answer items by choosing one of the time frame options presented in front of the statement if applicable.

Expert Qc) Please rate how clear the above introduction and instruction would be for undergraduate participants?

Low
1

Moderate
2

High
3

Expert Qd) Please rate how appropriate the above introduction and instruction would be for undergraduate participants?

Low
1

Moderate
2

High
3

Comment or suggestion:

	Items measuring “Duration”	Q1^a Representativeness	Q2^b Clarity	Q3^c Suggestion or alternative wording
1	Now that I think about my past, I have habitually postponed working on writing assignments at the last minute since.....	1 2 3	1 2 3	
2	Putting off writing assignments to the last minute is something that I’ve often done since.....	1 2 3	1 2 3	
3	I have had a general tendency to keep putting off writing assignments until later since.....	1 2 3	1 2 3	
4	Starting writing assignments near the deadline despite planning to start earlier is something that I have typically done since.....	1 2 3	1 2 3	
5	Finishing writing assignments at the last minute is something that I have typically done since.....	1 2 3	1 2 3	
6	I have often delayed finishing <u>these types of tasks (writing)</u> in my life since.....	1 2 3	1 2 3	
7	Delay on school related tasks (e.g. writing assignments) has been part of who I am since.....	1 2 3	1 2 3	
8	I have not been good at meeting deadlines for writing assignments since.....	1 2 3	1 2 3	
9	Saying that I will start the writing assignment tomorrow is something that I have often done since.....	1 2 3	1 2 3	
10	Wasting time by doing other activities instead of working on writing	1 2 3	1 2 3	

	assignments is something I have done since.....			
11	Wasting a lot of time on trivial matters before starting writing assignments is something I have done since.....	1 2 3	1 2 3	
12	Delay on writing assignments has been a problem in my life since.....	1 2 3	1 2 3	
13	Putting off writing assignments to the last minute has bothered me since.....	1 2 3	1 2 3	
14	Habitually delaying on writing assignments has often led to emotional distress in my life since.....	1 2 3	1 2 3	
15	I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on writing assignments since.....	1 2 3	1 2 3	
16	Frequent delay on these types of tasks (writing) has often negatively influenced my school performance since.....	1 2 3	1 2 3	
17	Repeatedly postponing these types of tasks (writing) until the last minute has hurt my grades since.....	1 2 3	1 2 3	
18	I have not been satisfied with my habitual delay on these types of tasks (writing) since.....	1 2 3	1 2 3	
19	Now that I think about my past, the quality of my work has often suffered from my delay on these types of tasks (writing) since.....	1 2 3	1 2 3	

Adequacy of Content Domain for the Duration of Procrastination Problem (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....

.....

.....

Note:

^a **Q 1(Representativeness)**. Please rate how well each item represents “duration” component as defined above.

[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity)**. Please rate how clear each item item.

[Rating Scale: **1= Low 2= Moderate 3=High**]

^c**Q3 (Suggestion)**. If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Demographics (Study I)

The following questions include contact and background information. All information provided will be kept strictly confidential. The contact information will be used only for matching datasets and/or communication with you for a follow-up study if you agree to participate. The background information will be used only for data analyses (e.g., correlation) and group comparisons (e.g., gender differences). Your name or other identifying information will be coded in the final dataset and will not be associated with the data you provide on the questionnaires.

1. Are you a Carleton University student?

- Yes
- No

2. Please provide your name and email.

First Name: _____ Last Name: _____

Email: _____

(If Carleton student, please provide your connect email)

Student Number (Only Carleton students): _____

3. How did you hear about the study?

1. SONA system
2. In class announcement
3. My friends
4. My professors
5. Email
6. Procrastination.ca
7. Don't Delay weblog (Dr. Pychyl's weblog)
8. Internet (other websites)

Please specify: _____

4. What is your current registration status?

- B.A. or B.Sc. Student

- B.A. or B.Sc. Honours Student

- M.A. Student
- Ph.D. Student

5. How many years have you completed of post-secondary education?

- Less than 1 year
- 1 year
- 2 year
- 3 year
- 4 year
- 5 year
- 6 years or more

6. How long have you been a psychology student?

- Less than 1 year
- 1 year
- 2 year
- 3 year
- 4 year
- 5 year
- 6 years or more
- Not applicable

7. What is your gender?

- Male
- Female
- Transgendered

8. How old are you?

_____ years

9. What is your primary interest in psychology? (Choose all that apply).

- Developmental
 - Cognitive
 - Personality
 - Forensic
 - Social Psychology
 - Health
 - Clinical
 - Industrial/Organizational
 - Neuropsychology
 - Other: *(please specify)*
-

10. What is the primary field of your research? (Graduate students)

11. What is your current grade point average (GPA)? _____

12. What language do you speak most often at home? (choose one)

- English French Other: *(please specify)*

13. How would you rate your English reading comprehension?

- | | | | | |
|----------|--------------|----------|----------|--------|
| 1 | 2 | 3 | 4 | 5 |
| Beginner | Intermediate | Advanced | Superior | Native |

14. How would you rate your writing skills in English?

- | | | | | |
|----------|-----|--------|------|-----------|
| 1 | 2 | 3 | 4 | 5 |
| Very low | Low | Medium | High | Very high |

15. Please indicate which options best represent your ethnic background: (Select all that apply)

- White /European
- Aboriginal (North American Indian, Métis or Inuit)
- Arab (e.g., Saudi, Egyptian, Iraqi, Lebanese, Palestinian, Syrian etc.)
- Black (e.g., African, African American, African Canadian, Caribbean)
- East Asian (e.g., Chinese, Japanese, Korean, Polynesian)
- Latin American
- South Asian (e.g. Indian, Pakistani, Sri Lankan, Bangladeshi)
- Southeast Asian (e.g. Burmese, Cambodian, Filipino, Indonesian, Laotian, Malaysian, Thai, Vietnamese)
- West Asian (Afghan, Armenian, Iranian, Israeli, Turks etc.)
- Other:
- Prefer not to answer

16. Please indicate whether you would like to receive course credit for your participation or if you would like to be entered in the study's draw (one \$100 gift card or one of 4 procrastination self-help books, *The Procrastinator's Digest: A Concise Guide to Solving the Procrastination Puzzle*, signed by the author).

- Course credit
- Enter me in the draw

[The option "course credit will be shown only to undergraduate participants from Carleton University]

17. We do a lot of research in the Procrastination Research Group at Carleton University that might interest you or your family/friends. Are you interested in receiving information and/or invitation for future procrastination studies?

- Yes
- No

18. Are you interested in being invited to participate in other phases of this study?

[This question will be shown only to undergraduate participants]

- Yes
- No

19. You have answered yes in the questions related to participation in the future studies or chosen to receive an incentive (course credit or enter in a draw), please ensure that you provide your email.

[This question will be shown only to the participants who have not provided contact information but indicated their interest in participating in future studies or receiving incentives]

Email: _____
(If Carleton student, please provide your connect email)

MMAP Expert and Cognitive Interview (Study 2 and 3)

Sample of the Multidimensional Measure of Academic Procrastination, Expert Ver. 1

(MMAP; Expert Version 1.0; Oct., 2011) ©

This document is intended to elicit your expert opinion in order to establish the content validity of a multi-faceted measure of procrastination.

Purpose and Application of the Measure:

There is a lot of evidence that procrastination in some individuals should be considered a moderate psychological problem. The purpose of this instrument is to measure problematic procrastination. After development and validation of the instrument, all or some of the subscales

can be used in intervention research, correlational and experimental studies and counselling settings.

Procrastination as a Psychological Problem: Definition and Elements

Procrastination as a psychological problem is defined as a short-term or long-term needless and repeated delay of important tasks, despite the initial intention to start or finish them, which is accompanied by negative emotions and causes poor performance (i.e., undesired outcome) or personal dissatisfaction about the outcome. Two major elements for operationalizing procrastination as a psychological problem are having a moderate to high frequency of procrastination “behaviour” and experiencing that behaviour as “negative” or “having aversive consequences.” The first element, procrastination behaviour, is operationalized based on three concepts: delay, intention-action gap and perceived needlessness. The second element, the problematic nature of the behaviour, is operationalized based on five descriptive components: negative emotions, poor performance, personal dissatisfaction, irrationality and duration.

Overview of expert package

In the first section of this document, we ask you to evaluate the general introduction and instructions for the participant version of the questionnaire. In the second section, we ask you to evaluate how well our proposed items tap the constructs that measure various components of procrastination as a psychological problem.

The participant version of the questionnaire asks about three types of academic tasks. For the sake of brevity, we are requesting your feedback only on the items relating to one type of task, “major writing assignments.” The items for the other two tasks will be similar to those you will be evaluating.

SECTION I: Evaluation of general participant instructions

The following box is the general introduction and instructions that will be used in the participant version of the Multifaceted Measure of Procrastination (hereon referred to as the MMoP). Please read it and answer the questions below the box.

MMoP

This questionnaire asks about needless delay in your academic life. It may be very frequent, or you may almost never delay anything. We are interested in your thoughts and emotions when you do delay.

Please note the following before answering:

- The survey repeats a set of questions three times, once for writing assignments, once for readings and once for exam preparation.
- There are no right or wrong answers. We are only interested in how often you delay these tasks and how it affects you.
- Some questions may seem similar to each other. Your answers to all questions will help us to refine the survey for future research.
- In answering the questions, please consider what you have typically done in the recent past (current semester or last semester).

Some of the questions use the phrase “needless delay.” Needless means delaying without a rational reason. When it’s needless delay, you generally know that this isn’t a good idea to delay the intended task. For example, if you intended to study for an exam at a particular time but instead engaged in “unnecessary activities” and then studied at the last minute, this would be needless delay.

Unnecessary activities typically are not urgent and are not part of one’s initial plan. For example, you may watch TV, spend time on facebook, or clean your room instead of studying for your exam as you initially intended. In answering the questions below, use your honest judgment. Only you can determine if your delay was needless.

I1. Please rate *how appropriate* the above introduction and instruction would be for undergraduate participants?

Low	Moderate	High
1	2	3

I2. Please rate *how clear* the above introduction and instruction would be for undergraduate participants?

Low Moderate High
1 2 3

Microsoft word version:

If you have rated the above introduction and instruction low on appropriateness and/or clarity, please change the wording of the introduction and/or instruction to make it at least moderately clear and appropriate for undergraduate students.

.....
.....
.....
.....

Web version (adaptive):

You have rated the above introduction and instruction low on appropriateness and/or clarity. Please change the wording of the introduction and/or instruction to make it at least moderately clear and appropriate for undergraduate students.

SECTION II: Evaluation of initial item pool

In this section, the definition and the items related to procrastination behaviour and the descriptive components of problematic procrastination (i.e., negative emotions, undesired outcome, personal dissatisfaction, irrationality and duration) are presented in separate subsections/tables. In each subsection (table), we ask you to read the definition and description of the construct at the top of the table and then we ask you to answer the following questions for each item in the table:

Q 1(Representativeness). Please rate how well each item represents the construct as defined above.

1. Slightly representative 2. Moderately representative 3. Highly representative

Q2 (Clarity). Please rate each item's clarity.

1= Low 2= Moderate 3=High

Q3 (Suggestion). If you have rated the representativeness or clarity of an item low, please change the wording of the item to make it more clear and representative of the construct.

At the bottom of each table, we ask you to point out any aspects of the constructs that we have failed to include in our definition and/or items.

Procrastination Behaviour

Component Description/Definition:

Procrastination behaviour in an academic setting is a needless delay of an assigned task, despite the initial intention to start or finish it at some point in time. Procrastinating is a form of delaying on intended tasks where the delay is perceived as needless, irrational and/or unwanted.

“*Delaying one’s intended tasks*” refers to having a gap between the time that one is initially intends to start or finish the tasks and the time that one actually starts or finishes the tasks.

Intention can refer to a vague thought or decision (e.g., thinking about doing an assigned task ahead of time) or it can refer to a specific and concrete plan (e.g., doing the task at a specific time on a specific day).

Needless refers to perceiving one’s delay of an intended task as unnecessary, irrational or unreasonable. Needless delay often is due to engaging in activities considered as unnecessary or unimportant. Needless delay is typically accompanied with a general conscious awareness about the possible negativity of the delay and its consequences.

Delay as it is used here means to avoid, postpone, put off, do near the deadline, etc.

Scale used in the participant version:

1= Never 2= Almost never 3= Occasionally 4= About half of the time 5= Often 6= Very often 7=Always

	Items measuring “procrastination”	Q1 ^a Representativeness	Q2 ^b Clarity	Q3 ^c Suggestion or alternative wording
1	There is a needless delay between when I want to do writing assignments and when I actually do them.	1 2 3	1 2 3	
2	As I am thinking now, I engage in some unnecessary activities instead of working on writing assignments based on my initial plan.	1 2 3	1 2 3	
3	Instead of working on writing assignments according to my intention, I involve myself in some activities that are not urgent.	1 2 3	1 2 3	
4	I intend to work on writing assignments at some point ahead of deadline, but when the time comes, I tend to postpone the tasks without any rational reason.	1 2 3	1 2 3	

5	Just before I am about to begin an intended writing tasks, I tend to avoid them by doing something else.	1 2 3	1 2 3	
6	Despite my intention to start and finish writing assignments on time, I engage in other unnecessary activities instead.	1 2 3	1 2 3	
7	According to my intention to start and finish writing assignments on time, I start and finish them on time. (Reversed Item)	1 2 3	1 2 3	
8	When writing assignments are assigned, I tell myself that I will not start them late, but I end up delaying them without really a good reason.	1 2 3	1 2 3	
9	I plan to work on writing assignments ahead of time, but when the time comes I postpone the tasks.	1 2 3	1 2 3	
10	I don't like to postpone writing assignments, but I end up working on them near the deadline without any rational reason.	1 2 3	1 2 3	
11	I intend to work on writing assignments early, but I often engage in other activities.	1 2 3	1 2 3	
12	I plan to work on writing assignments ahead of time and follow my plans.(Reversed Item)	1 2 3	1 2 3	
13	When I receive writing assignments, I plan to work on them ahead of time, but I needlessly delay starting them.	1 2 3	1 2 3	
14	I initially intend to not put off writing assignments, but I continuously find myself doing so.	1 2 3	1 2 3	
15	I keep putting off writing assignments until later without any rational reason.	1 2 3	1 2 3	
16	I postpone major writing assignments despite expecting to be worse off if I delay.	1 2 3	1 2 3	
17	I delay on major writing assignments despite the fact that I know I will not be happy about doing so later.	1 2 3	1 2 3	
18	I engage in unnecessary activities instead of working on major writing assignments despite the fact that I know I will feel dissatisfied about my delay later.	1 2 3	1 2 3	

Adequacy of Content Domain specific to “Procrastination Behaviour” (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....

.....

.....

Note:

^a **Q 1(Representativeness)**. Please rate how well each item represents procrastination as defined above.

[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity)**. Please rate each item’s clarity.

[Rating Scale: **1= Low 2= Moderate 3=High**]

^c**Q3 (Suggestion)**. If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Hedonistic delay on Assigned Tasks

Component Description/Definition:

Hedonistic Delay is a form of delaying assigned tasks where one volitionally chooses to do fun and exciting activities instead of the tasks. In this type of procrastination, the person does not perceive the assigned tasks as important or necessary in comparison to the other activities and does not form a clear initial intention to start or finish the assigned task on time. This form of delay is very often labelled as procrastination based on external evaluation (e.g., Teacher, Parents), but may not feel like procrastination to the person who is choosing to delay an assigned task to have fun instead.

Scale used in the participant version:

1= Never 2= Almost never 3= Occasionally 4= About half of the time 5= Often 6= Very often 7=Always

	Items measuring “procrastination”	Q1^a Representativeness	Q2^b Clarity	Q3^c Suggestion or alternative wording
1	I am neither interested in making a plan for working on writing assignments nor interested in starting them ahead of time because I would rather do more enjoyable things instead.	1 2 3	1 2 3	
2	I don’t intend to work on writing assignments, and I do other fun things instead.	1 2 3	1 2 3	
3	When writing assignments are assigned, I don’t give any thought to when I will start	1 2 3	1 2 3	

	working on them because I am focused on more enjoyable activities.			
4	I don't really care about starting writing assignments on time, and I intentionally do the assignments at last minute.	1 2 3	1 2 3	
5	When I receive writing assignments, I don't make even a vague plan to start them ahead of time and would rather do fun leisure activities instead.	1 2 3	1 2 3	
6	I do not care about writing assignments, and I do not plan to do them ahead of time when there are more fun activities.	1 2 3	1 2 3	
7	I plan and do fun activities (e.g., partying, going out, sports) as opposed to plan and work on major writing assignments ahead of time.	1 2 3	1 2 3	
8	When I receive a major writing assignment, I don't bother myself to think about it and instead concentrate on pleasurable activities.	1 2 3	1 2 3	
9	I would rather do fun stuff instead of getting an early start on major writing assignments.	1 2 3	1 2 3	
10	When it comes to writing assignments, I wilfully don't intend to work too hard or to get started on time.	1 2 3	1 2 3	
11	I naturally fill my time with a lot of fun and exciting activities as opposed to planning and working on school tasks on time.	1 2 3	1 2 3	
12	I wilfully postpone starting my assignments due to my exciting social life, and do not care if I receive bad grades for them.	1 2 3	1 2 3	

Adequacy of Content Domain for “Hedonistic Delay” (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....

.....

.....

.....

Note:

^a **Q 1(Representativeness).** Please rate how well each item represents Hedonistic Delay as defined above. [Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity).** Please rate each item's clarity. [Rating Scale: **1= Low 2= Moderate 3=High**]

Q3 (Suggestion). If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Negative Emotions

Component Description/Definition:

Negative emotions here refer to specific or general unpleasant feelings that arise from even thinking about initiating a task, initiating action on a task or from delaying the task. These feelings may arise at any time, including during delaying needlessly on a task and after finishing a task that has been delayed needlessly.

Since it is possible that one experiences positive emotions (e.g., happiness and/or relief at having finished the task) in the above situations, items containing positive emotions are included to increase the face validity of this section.

The following scale will be used in the participant version:

1= Never 2= Almost never 3= Occasionally 4= About half of the time 5= Often 6= Very often 7=Always

	Items measuring “emotions”	Q1 ^a Representativeness	Q2 ^b Clarity	Q3 ^c Suggestion or alternative wording
1	Whenever I am about to start writing assignments, I feel anxious .	1 2 3	1 2 3	
2	Whenever I am about to start writing assignments, I feel angry .	1 2 3	1 2 3	
3	Whenever I am about to start writing assignments, I feel hopeless .	1 2 3	1 2 3	
4	Whenever I am about to start writing assignments, I feel bored .	1 2 3	1 2 3	
5	Whenever I am about to start writing assignments, I feel guilty .	1 2 3	1 2 3	
6	Whenever I am about to start writing assignments, I feel sluggish or sleepy .	1 2 3	1 2 3	
7	Whenever I am about to start writing assignments, I feel emotional distress .	1 2 3	1 2 3	

8	Whenever I am about to start writing assignments, I feel one or more of the following emotions: relaxed, content or calm.	1 2 3	1 2 3	
9	Whenever I am about to start writing assignments, I feel one or more of the following emotions: attentive, active, joyful, excited, hopeful or enthusiastic.	1 2 3	1 2 3	
10	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel anxious.	1 2 3	1 2 3	
11	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel angry.	1 2 3	1 2 3	
12	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel hopeless.	1 2 3	1 2 3	
13	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel bored.	1 2 3	1 2 3	
14	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel guilty.	1 2 3	1 2 3	
15	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel sluggish or sleepy.	1 2 3	1 2 3	
16	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel emotional distress.	1 2 3	1 2 3	
17	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel one or more of the following emotions: relaxed, content or calm.	1 2 3	1 2 3	
18	While I am needlessly delaying on a major writing assignment despite my initial plan, I feel one or more of the following emotions: attentive, active, joy, excited, hopeful or enthusiastic.	1 2 3	1 2 3	

19	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel anxious .	1 2 3	1 2 3	
20	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel angry .	1 2 3	1 2 3	
21	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel ashamed of myself .	1 2 3	1 2 3	
22	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel guilty .	1 2 3	1 2 3	
23	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel relief .	1 2 3	1 2 3	
24	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel emotional distress .	1 2 3	1 2 3	
25	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel one or more of the following emotions: relaxed, content or calm .	1 2 3	1 2 3	
26	After I finish a major writing assignment that I have needlessly delayed for awhile, I feel one or more of the following emotions: proud of myself, joy, hopeful, sharp, active, excited, or enthusiastic .	1 2 3	1 2 3	

Adequacy of Content Domain for “Delay Emotions” (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):
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.
.
.

Note:
^a **Q 1(Representativeness)**. Please rate how well each item represents negative/positive emotions as defined above.
[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]

^b **Q2 (Clarity).** Please rate how clear this item is.

[Rating Scale: 1= Low 2= Moderate 3=High]

^c**Q3 (Suggestion).** If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Undesired outcome

Component Description/Definition:

Undesired outcomes refer to the extent to which postponing intended tasks leads to psychological, social, or academic outcomes that are suboptimal or not as good as one would like.

The following scale will be used in the participant version:

1= Never 2= Almost never 3= Occasionally 4= About half of the time 5= Often 6= Very often 7=Always

	Items measuring “undesired outcome”	Q1 ^a Representativeness	Q2 ^b Clarity	Q3 ^c Suggestion or alternative wording
1	Putting off major writing assignments until the last minute is one of the factors that has negatively affected my performance in school.	1 2 3	1 2 3	
2	My needless delay on major writing assignments is one of the factors that has negatively affected my grades.	1 2 3	1 2 3	
3	The quality of my work has suffered from my delay on major writing assignments.	1 2 3	1 2 3	
4	My needless delay on major writing assignments has affected my personal life in a negative way.	1 2 3	1 2 3	
5	My needless delay on major writing assignments has bothered me emotionally and psychologically.	1 2 3	1 2 3	

6	My needless delay on major writing assignments has caused me not to enjoy my life.	1 2 3	1 2 3	
7	My needless delay on major writing assignments does not allow me to appropriately plan for pleasurable activities.	1 2 3	1 2 3	
8	My delay on major writing assignments has resulted in some relationship problems.	1 2 3	1 2 3	
9	When I have delayed working on major writing assignments, it has led me to not be at my best in my personal relationships.	1 2 3	1 2 3	
10	My needless delay on major writing assignments has had a negative impact on my relationships with significant others (e.g., family or partner).	1 2 3	1 2 3	
11	When I needlessly delay working on major writing assignments, significant others (e.g., parents, partner) complain about it.	1 2 3	1 2 3	
12	My failure to follow my plans to work on major writing assignments has bothered me.	1 2 3	1 2 3	
13	Delaying needlessly on major writing assignments has made me a less successful student.	1 2 3	1 2 3	
14	As a result of delaying major writing assignments, my professors are not satisfied with the quality of my work.	1 2 3	1 2 3	
18	As I think about it now, there are negative effects on my health when I delay working on major writing assignments.	1 2 3	1 2 3	
19	There are negative effects on my happiness when I delay working on major writing assignments.	1 2 3	1 2 3	
20	As I think about it now, there are negative effects on my well-being when I delay working on major writing assignments.	1 2 3	1 2 3	
21	My delay on writing assignments has negatively affected my wellness to some extent.	1 2 3	1 2 3	

22	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my health.	1 2 3	1 2 3	
23	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my happiness.	1 2 3	1 2 3	
24	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my school work.	1 2 3	1 2 3	
25	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my mood.	1 2 3	1 2 3	
26	Repeatedly postponing major writing assignments until the last minute has had a negative impact on my enjoyment of school.	1 2 3	1 2 3	
	My needless delay on major writing assignments does not allow me to fully enjoy social activities.	1 2 3	1 2 3	

Adequacy of Content Domain of “Undesired Outcome” (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....
.....
.....
.....

Note:
^a **Q 1(Representativeness).** Please rate how well each item represents **undesired outcome** as defined above.
[Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]
^b **Q2 (Clarity).** Please rate how clear this item is.
[Rating Scale: **1= Low 2= Moderate 3=High**]
^c**Q3 (Suggestion).** If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Dissatisfaction

Component Description/Definition:

Dissatisfaction refers to the extent to which one experiences a general feeling of being displeased or discontent about his or her needless delay on school related tasks and/or about the consequences of the needless delay. Another way to think of this is that the needless delay makes us unhappy.

Scale used in the participant version: 1= Not at all 4=Moderately 7= Very Strongly

	Items measuring “dissatisfaction”	Q1^a Representativeness	Q2^b Clarity	Q3^c Suggestion or alternative wording
1	I am not satisfied with myself because of my needless delay on major writing assignments	1 2 3	1 2 3	
2	I don't like my habitual delay of major writing assignments.	1 2 3	1 2 3	
3	I blame myself for needlessly delaying writing assignments.	1 2 3	1 2 3	
4	I wish I could change my habitual procrastination when I should be writing my assignments.	1 2 3	1 2 3	
5	In general, my needless delay on major writing assignment bothers me.	1 2 3	1 2 3	
6	I really would like to learn how to avoid needless delay	1 2 3	1 2 3	
7	In general, my needless delay of writing assignments negatively affects my satisfaction with myself.	1 2 3	1 2 3	
8	I am not satisfied with my performance at university because of my needless delay on writing assignments.	1 2 3	1 2 3	
9	I blame myself for the negative consequences of delay on my performance as a student	1 2 3	1 2 3	

10	I am not satisfied with myself for continuing to procrastinate on major writing assignments particularly when my procrastination results in sub-standard work.	1 2 3	1 2 3	
11	I do not like myself because of the negative consequences of postponing writing assignments until the last minute.	1 2 3	1 2 3	
12	I feel blameworthy when I delay working on major assignments without a rational reason.	1 2 3	1 2 3	
13	I am upset by the negative consequences of delaying writing assignments.	1 2 3	1 2 3	
14	In general, my delay of writing assignments does negatively affect my satisfaction with my performance at school.	1 2 3	1 2 3	

Adequacy of Content Domain of Dissatisfaction (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....

.....

.....

.....

Note:

^a **Q 1(Representativeness).** Please rate how well each item represents dissatisfaction as defined above.
 [Rating Scale: 1. Slightly representative 2. Moderately representative 3. Highly representative]

^b **Q2 (Clarity).** Please rate how clear this item is.
 [Rating Scale: 1= Low 2= Moderate 3=High]

^c**Q3 (Suggestion).** If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

DURATION

Component Description/Definition:

The purpose of measuring this construct is to understand whether procrastination is an acute or chronic problem in the person’s life. Duration here is a defining facet of procrastination as a problem, and it refers to the period of time during which one habitually procrastinates on academic tasks and/or experiences negative emotions, negative consequences or some level of dissatisfaction related to his/her procrastinating behaviours.

1 elementary school	2 early high school	3 late high school	4 starting university	5 more recently	6 Not applicable
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NOTE: Before answering the items on “Duration,” students will read the following instructions. Please give your expert opinion about this instruction.

SPECIFIC INSTRUCTIONS

In the following section, we ask about when you started habitually delaying on school-related tasks and when you started experiencing negative consequences of this delay. Please think of your past experiences since elementary school, as far as you can remember, and answer items by choosing one of the time frame options presented in front of the statement if applicable.

Expert Qc) Please rate how clear the above introduction and instruction would be for undergraduate participants?

Low Moderate High
1 2 3

Expert Qd) Please rate how appropriate the above introduction and instruction would be for undergraduate participants?

Low Moderate High
1 2 3

Comment or suggestion:

	Items measuring “Duration”	Q1^a Representativeness	Q2^b Clarity	Q3^c Suggestion or alternative wording
--	-----------------------------------	--	-----------------------------------	---

1	Now that I think about my past, I have habitually postponed working on writing assignments at the last minute since.....	1 2 3	1 2 3	
2	Putting off writing assignments to the last minute is something that I've often done since.....	1 2 3	1 2 3	
3	I have had a general tendency to keep putting off writing assignments until later since.....	1 2 3	1 2 3	
4	Starting writing assignments near the deadline despite planning to start earlier is something that I have typically done since.....	1 2 3	1 2 3	
5	Finishing writing assignments at the last minute is something that I have typically done since.....	1 2 3	1 2 3	
6	I have often delayed finishing these types of tasks (writing) in my life since.....	1 2 3	1 2 3	
7	Delay on school related tasks (e.g. writing assignments) has been part of who I am since.....	1 2 3	1 2 3	
8	I have not been good at meeting deadlines for writing assignments since.....	1 2 3	1 2 3	
9	Saying that I will start the writing assignment tomorrow is something that I have often done since.....	1 2 3	1 2 3	
10	Wasting time by doing other activities instead of working on writing assignments is something I have done since.....	1 2 3	1 2 3	
11	Wasting a lot of time on trivial matters before starting writing assignments is something I have done since.....	1 2 3	1 2 3	
12	Delay on writing assignments has been a problem in my life since.....	1 2 3	1 2 3	
13	Putting off writing assignments to the last minute has bothered me since.....	1 2 3	1 2 3	
14	Habitually delaying on writing assignments has often led to emotional distress in my life since.....	1 2 3	1 2 3	
15	I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on writing assignments since.....	1 2 3	1 2 3	

16	Frequent delay on these types of tasks (writing) has often negatively influenced my school performance since.....	1 2 3	1 2 3	
17	Repeatedly postponing these types of tasks (writing) until the last minute has hurt my grades since.....	1 2 3	1 2 3	
18	I have not been satisfied with my habitual delay on these types of tasks (writing) since.....	1 2 3	1 2 3	
19	Now that I think about my past, the quality of my work has often suffered from my delay on these types of tasks (writing) since.....	1 2 3	1 2 3	

Adequacy of Content Domain for the Duration of Procrastination Problem (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

.....

Note:
^a **Q 1(Representativeness).** Please rate how well each item represents Duration component as defined above. [Rating Scale: **1. Slightly representative 2. Moderately representative 3. Highly representative**]
^b **Q2 (Clarity).** Please rate how clear each item item. [Rating Scale: **1= Low 2= Moderate 3=High**]
^c**Q3 (Suggestion).** If you have rated the representativeness or clarity of item low, please change the wording of the item to make it more clear and representative of the construct.

Demographics (Study 2: Researchers /Professors)

1. What is your gender?
 Male Female Transgendered
2. How old are you?
 _____ years
3. What is the highest academic degree that you have obtained?
 B.A. degree or equivalent

- Masters degree
- PhD, JD, MD, EdD, or any other doctoral degree

4. What is your main area of expertise?

5. How many years of experience do you have in psychological research including graduate school?

_____ years

6. How many years of experience do you have in personality research including graduate school?

_____ years

7. How many years of experience do you have in procrastination research including graduate school?

_____ years

8. Have you done research in procrastination?

- Yes No

9. If yes, have you published any research on procrastination or related constructs (e.g., perfectionism, self-regulation, etc.)?

- Yes No

10. If yes, how many?

- 1) 1-2
- 2) 3-10
- 3) more than 10 articles

11. How would you rate your level of expertise in personality research?

- 1 2 3 4 5
Very low Low Medium High Very high

12. How would you rate your level of expertise in measurement development?

1	2	3	4	5
Very low	Low	Medium	High	Very high

13. How familiar are you with procrastination research?

1	2	3	4	5
Not at all	A little	Moderately	Very	Extremely

Sample Interview Questions

- As you were reading this item, please tell me what you were thinking. OR
- I would like to hear how were you thinking as you chose your answer for this question.
- Tell me about any thoughts, questions, ideas that came to your mind
 - during the administration of the questionnaire?
 - during answering this question
 - after reading this instruction

Probing or substituting questions (get information for incomplete parts):

- How did you understand it? Please repeat the question in your words.
- How would you paraphrase it? Or “How would you state this question in your own words?”
- How did you interpret it (this item/ phrase...)?
- What did you remember as you were answering? Did any specific memory come to your mind?
- How did you choose this option among other options?
- How did you decide on this answer?
- Why did you answer this way? Why didn't you answer.....(that way)?
- Why was your answer to this question different from your answer to that question?
- If I change this word or phrase tohow would you answer this question?
- If the rating was how you would have answered this question?
- How did you decide that this answer is the most appropriate answer that reflects your experience?
- Does this answer reflect you past or your current experience?
- Is your answer is based on your past experience, current experience or both?

- Can you tell me where the confusing part is?
- Can you tell me where you think it is most confusing?

Difficulty and Confidence:

1. On a scale of 1 to 7, how difficult is it to answer this question?
2. On a scale of 1 to 7, how sure are you that your answer is? or How confident are you in choosing this answer?

Demographics

1. How many years have you completed of post-secondary education?
2. How long have you been a psychology student?
3. How old are you? _____ years

4. What is your primary interest in psychology?

5. What is your current grade point average (GPA)? _____

6. What language do you speak most often at home? (choose one)

- English

 French

 Other: *(please specify)* _____

7. How would you rate your English reading comprehension?

1	2	3	4	5
Beginner	Intermediate	Advanced	Superior	Native

8. How would you rate your writing skills in English?

1	2	3	4	5
Very low	Low	Medium	High	Very high

9. Please tell me which options best represent your ethnic background: (You can select all that apply)

- White /European
- Aboriginal (North American Indian, Métis or Inuit)
- Arab (e.g., Saudi, Egyptian, Iraqi, Lebanese, Palestinian, Syrian etc.)
- Black (e.g., African, African American, African Canadian, Caribbean)
- East Asian (e.g., Chinese, Japanese, Korean, Polynesian)

- Latin American
- South Asian (e.g. Indian, Pakistani, Sri Lankan, Bangladeshi)
- Southeast Asian (e.g. Burmese, Cambodian, Filipino, Indonesian, Laotian, Malaysian, Thai, Vietnamese)
- West Asian (Afghan, Armenian, Iranian, Israeli, Turks etc.)
- Other:
- Prefer not to answer

Appendix C:

DQ Content Analyses Materials

Delay Questionnaire (Expert Version)

General Instruction [Participants see the following after the consent form]

Thank you for agreeing to participate in this project. You will shortly be presented with the survey items. Your honest answers to all of the questions ensure the success of this study. After answering all questions on a given page you need to click NEXT at the bottom of the page to save your answers and move to the next page. On the last page of the survey, you will see a “submit” button instead of the “next” button. You need to click the submit button to finalize your participation.

To go to the next page and start the survey please click the NEXT button

Have a great testing session!

Delay Questionnaire

(DQ; Expert Version 1.0; July, 2012) ©

This study is intended to elicit your expert opinion in order to establish the content validity of a new measure, the Delay Questionnaire (hereon referred to as the DQ).

Purpose and Application of the Measure

The purpose of this measure is to identify various forms of delay. After validation, the Delay Questionnaire can be used as a short screening tool for identifying students with various form of delay. The measure can also be used in basic research for deepening our understanding about various forms of delay.

Overview of Expert Package

In the first section of this survey, we ask you to evaluate the general introduction and instructions for the participant version of the questionnaire. In the second section, we ask you to evaluate the representativeness and clarity of proposed vignettes.

SECTION I: Evaluation of General Participant Instructions

The following box is the general introduction and instructions that will be used in the participant version of the Delay Questionnaire. Please read it and answer the questions below the box.

DQ

Delay is an inevitable part of life. In this questionnaire, we ask you about delay in your life.

There are different forms of delay, and people may delay for various reasons. For example, sometimes we see the delay as necessary or even wise; at other times, we might engage in needless delay.

Below are descriptions of different forms of delay that people often report. **Please read each description and then rate it according to the extent to which you think it describes you or is close to the way you generally act in school.**

There are **no right or wrong answers**. Some of the descriptions might seem similar, but please answer all of them.

Please rate how appropriate the above introduction and instructions would be for undergraduate participants?

- High
- Moderate
- Low

Please rate how clear the above introduction and instructions would be for undergraduate participants?

- High
- Moderate
- Low

SECTION II: Evaluation of initial item pool

This section includes 4 pages. In each page, we present the definition of a construct (e.g., form of delay) in a separate box and then present a set of vignettes (stories/items) for each form of delay in a subsequent box/table. After reading the definition of the construct, we ask that you answer the following questions for each vignette developed to measure the construct:

Q 1(Representativeness). Please rate how well each vignette (story) represents the construct as defined above.

1. Slightly representative 2. Moderately representative 3. Highly representative

Q2 (Clarity). Please rate each item's clarity.

1. Low clarity 2. Moderate clarity 3. High clarity

For the vignettes that are rated as low in representativeness and/or clarity, you will be asked to change the wording to make them more clear or representative of the construct. Finally, at the bottom of each table, we ask you to point out any aspects of the constructs that we have failed to include in our definition and/or items.

Definition: Procrastination

Procrastination is a form of delay where individuals needlessly and repeatedly delay important tasks, despite their initial intention to start or finish the tasks. Delay of an intended task is considered *needless* when the individual perceives it as unnecessary, irrational or unreasonable. Needless delay often is due to engaging in activities that individuals themselves consider unnecessary or unimportant. This form of delay is accompanied by negative emotions and causes poor performance or personal dissatisfaction with the outcome.

 The following scale will be used in the participant version:

1= Not like me at all 2= A little bit like me 3= Somewhat like me 4= Moderately like me 5= Very like me
6= Very much like me 7=Almost 100% like me

Procrastination Vignettes

After reading carefully the definition of *procrastination* presented above, please answer the following questions for each item/story:

1. Please rate how well each item represents procrastination as defined above.
2. Please rate each item's clarity.

John often delays doing school work such as studying for exams, doing his assigned readings, and working on projects. He always intends to start well ahead of the deadline and work steadily, but very rarely does so. He feels bad about this – anxious, guilty or otherwise distressed, depending on the task.

Andrea is about to start studying for her exam, but she tells herself she will start after she checks her email. But after she checks her email, she finds herself checking the news, then facebook, then taking a break for lunch, and before she knows it, the day is over and she hasn't studied at all. Another time, before her last assignment, she found herself cleaning the house, calling her friends, and organizing her desk. She keeps postponing her school work until the last minute. She feels stressed about having to rush and believes her work is not as good as it could be if she could get started earlier or put more time into it.

Lorenzo doesn't know why he always avoids doing his school work until it's too late to produce his best work. He often tells himself he won't do this again, but it seems like whenever he has school work he should be doing, he does all sorts of other things instead, like watching TV, text messaging, surfing the Internet, etc. Lorenzo is generally not happy about his habitual delay and would like to find a way to change it.

Although Maria intends to start writing her assignment with plenty of time to spare, when the time comes to actually start writing, she starts to feel anxious and uncomfortable and puts it off to do something else instead. She keeps putting off her writing assignment until later and later, and the deadline for submitting the assignment is fast approaching. She doesn't like working this way, but she can't seem to help it.

When Sarah has to prepare for an exam or do something for school, she often doesn't follow her initial plan. Instead of starting tasks on time, she often engages in non-urgent activities despite the fact that she knows she will not be happy about doing so. This way of dealing with school tasks has had a negative effect on Sarah's performance in school.

Although Alex usually intends to get his school work done ahead of time, he ends up wasting time on things he knows are less important. He ends up having to rush to finish his school work at the last minute, which causes him to be stressed out. He thinks he would do better in school if he could break this habit.

Adrian's final exam is in a week. He needs to review two chapters a day, giving him time to study all the material. He starts on Monday. At the beginning, Adrian tries to be thorough, ending up spending longer than he intended and only finishes one chapter. On Tuesday, he starts the next chapter, but again finds himself spending too much time on it. He even looks up the suggested readings at the end of the chapter, which he knows won't be on the exam. By

1. Please rate how well each item represents procrastination as defined above.
2. Please rate each item's clarity.

Wednesday, Adrian knows he's running out of time to study all the chapters, but can't seem to stop attending to unnecessary details that he knows are not really important. He ends up barely skimming the last 4 chapters the night before the exam, feeling anxious and upset with himself for not sticking with his study plan.

It's four days before the deadline for one of Sam's main assignments, and he hasn't started working on it yet. He had planned to start Monday afternoon, but when Monday came, he put it off, despite the fact that deep down he knew there might not be enough time to produce a quality assignment like he wanted. Sam tells himself that he can always pull off a miracle under pressure, and that he will definitely start it tomorrow. On Tuesday morning, he finds himself spending time on facebook and chatting with his girlfriend and postpones the major assignment again. In the afternoon, his good friend Mike calls, insisting they go to an important hockey game together. Sam finds that he can't resist the invitation. On Wednesday morning, Sam feels anxious and guilty about losing Monday and Tuesday. He finally starts working on the assignment. He works nonstop and submits the paper at the last minute on Thursday.

Professor Johnson assigns a term paper that is due in two weeks. Jack tells himself that he will work on it as soon as possible. However, Jack ends up writing the paper just before the deadline, like his other assignments. His delay is not because he wants the thrill of writing at the last minute, not because he is too busy with other commitments, and not because he does not care about his grades. In fact, he would genuinely like to do it earlier but he always ends up avoiding writing tasks by doing unnecessary activities (e.g., watching TV or browsing the internet). He postpones the tasks, despite the fact that he knows he will not be happy about doing so later. Jack calls himself a procrastinator and feels hopeless about his delay.

Adequacy of Content Domain: Are there any aspects of the construct (Procrastination) that we have possibly failed to include in our definition and/or presented items? (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

Continuation of Section II: Evaluation of initial item pool

Definition: Hedonistic Delay

Hedonistic delay is a form of delaying assigned tasks where one volitionally (wilfully) chooses to do fun or exciting activities instead of the tasks. In this type of procrastination, one does not perceive the assigned tasks as important or necessary in comparison to other activities and does not form a clear initial intention to start or finish the assigned task on time. Hedonistic delay often leads to poor school performance; however, individuals do not experience negative emotions (e.g., guilt, anxiety) or dissatisfaction about the delay and its consequences, at least not early in the school year.

 The following scale will be used in the participant version:

1= Not like me at all 2= A little bit like me 3=Somewhat like me 4=Moderately like me 5=Very like me 6=Very much like me 7=Almost 100% like me

Element 2 Items: Hedonistic Delay

After reading carefully the definition of *hedonistic delay* presented above, please answer the following questions for each item:

1. Please rate how well each item represents hedonistic delay as defined above.
2. Please rate each item's clarity.

Others (Professors or parents) say that Tina should put more time and effort into her school work. But the truth is, she simply prefers to hang out with her friends, download music, and generally do things that are fun and interesting, and school work doesn't qualify. As a result, she often works on her school work near the deadline and does not get very good grades. Tina does not see her behaviour or grades as a problem.

Colin admits that he's kind of lazy when it comes to doing school work. He often doesn't have any intention or desire to start a school task on time. He enjoys having time to relax and doesn't see the point of pushing himself to get an early start on studying and assignments.

Dimitri has been postponing doing his assigned readings and lab reports for awhile now. It seems like something more fun always comes up. He knows his grades are not as good as they could be, but he's having a good time and that's what he really cares about right now.

Eric doesn't give any thought to when he will start working on his school tasks. He admits that he often doesn't care to keep up with the weekly readings and/or assignments for his courses. Others (e.g., parents, professors) sometimes criticize Eric for delaying his school work. This doesn't really bother him, he would just rather put his time and energy into other things he's more interested in.

Krista often doesn't have any intention of following the timelines that professors set for getting school work done. She tends to do what interests her first and do school work at the last minute, without feeling bad about it.

Professor Johnson assigns a class term paper that is due in two weeks. Alicia makes no plans to work on it, not because she is lazy or too busy with other courses or her job, but because she is in university mainly to have fun. She puts off all of her school work, because there is always more fun to be had first. When it comes to her school work, Alicia often pulls something together at the very last minute. It is never anywhere near the quality that it could be, but Alicia isn't bothered by this.

Sebastian almost never starts his assignments as early as professors recommend. He always has something else he'd rather be doing. Other people might think Sebastian is a slacker when it comes to school, but he doesn't stress about it. He feels he just isn't the type to spend tons of time on school work, since he's not that motivated by it. Right now, he's more interested in having a good time and does not care about the grades he gets on his assignments. As far as Sebastian is concerned, it's all fine just as long as he's still passing the courses.

Adequacy of Content Domain for "Purposeful Delay" (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

Definition: Purposeful Delay

Purposeful delay is a form of delaying tasks where one purposefully chooses to do tasks near the deadline. Individuals may purposely delay tasks because they prefer to work under pressure, because they want to get more information, or in order to optimize their schedule. These individuals usually complete tasks on time and are not dissatisfied with doing tasks near the deadline, nor with the consequences of their actions.

The following scale will be used in the participant version:

1= Not like me at all 2= A little bit like me 3=Somewhat like me 4=Moderately like me 5=Very like me 6=Very much like me 7=Almost 100% like me

Vignettes: Purposeful Delay

After reading carefully the definition of *hedonistic delay* presented above, please answer the following questions for each item/story:

3. Please rate how well each item represents Purposeful Delay as defined above.
4. Please rate each item's clarity.

Devon gets a kick out of working under pressure, so he intentionally puts off writing papers and studying for exams. Last semester, he wrote two essays and a lab report in three days on very little sleep, then had less than a week to catch up on his readings and study for his exams. He doesn't think this affected his grades and he found it exciting to rush at the last minute.

Sabrina intentionally postpones working on her school assignments. She finds it kind of exciting to come face to face with a deadline. Some of her friends get all stressed out when they have to do work at the last minute, but Sabrina is satisfied with her work and doesn't feel any negative effects from postponing her assignments.

Edwin deliberately puts off working on assignments and/or studying until the last minute, so he can gather as much information as possible. Depending on the assignment, he might email the TA, ask how his friends are approaching it, or wait for the professor to give more details about it in class. Edwin's performance hasn't suffered because of this approach, and it doesn't cause him any distress.

Anna does most of her assignments right before the deadline, sometimes staying up all night to get something handed in on time. This is a pretty intense experience, but she doesn't mind working under pressure. In fact, Anna felt she actually achieved better results when she did her assignments and papers right before they were due.

Professor Johnson assigns a writing assignment that is due in two weeks. Joe looks at his calendar and realizes that the best time—or maybe the only time—for him to work on the assignment is the two days before it's due. It's not that he puts off working on the paper until the last minute for unnecessary reasons or activities; but because he has to travel for his sport team on the weekend and he has two other assignments due before this paper. He knows that the optimal time for him to focus on that assignment is 2 days before it's due, and he knows that's enough time for him to do a good job. This is how Joe organizes his time and activities. He has a reasonable number of commitments and tasks and generally makes good use of his time. He schedules some tasks well ahead of the deadline and others close to the deadline. He is usually able to stick to his schedule.

3. Please rate how well each item represents Purposeful Delay as defined above.
4. Please rate each item's clarity.

Professor Johnson assigns a term paper that is due in two weeks. Peter looks at his schedule, which is already quite full with ongoing commitments and deadlines, to find an optimal time to write the first draft and a revision. Most of the time, Peter can schedule time to work on his assignments ahead of deadline, but sometimes he has to choose a time that's quite close to the deadline to make the best use of his time and/or to be able to fulfill his other commitments. Everything in Peter's life is planned and gets done according to his schedule.

Adequacy of Content Domain for "Purposeful Delay" (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

Continuation of Section II: Evaluation of initial item pool

Definition: Inevitable Delay

Inevitable delay is a form of delaying tasks where individuals intend to do tasks earlier but often encounter inevitable obstacles or changes that require them to delay. This form of delay is thought to affect a diverse group of people. For some individuals, their own tendency to accept too many commitments leads to them being overscheduled and overwhelmed and having to delay on personal and/or academic tasks. Others delay because difficulties managing their time lead to unavoidable scheduling overloads or conflicts. For a third group, delay is truly inevitable – they may have too many unavoidable responsibilities, disruptions or emergencies. All three groups are dissatisfied with their delay and its consequences, and they may feel negative emotions (anxiety, guilt).

The following scale will be used in the participant version:

1= Not like me at all 2= A little bit like me 3=Somewhat like me 4=Moderately like me 5=Very like me 6=Very much like me 7=Almost 100% like me

Vignettes: Inevitable Delay

After reading carefully the definition of *hedonistic delay* presented above, please answer the following questions for each item:

1. Please rate how well each item represents Inevitable delay as defined above.
2. Please rate each item's clarity.

Nick often intends to do tasks ahead of time and tries to not waste any time. He works non-stop but there always seems to be so much to do in his schedule that he can't seem to organize his time effectively and realistically to get some of his school-related tasks done on time.

Adam tends to have lots of demands on his time from work, school, family and friends. For example, Adam has a lot going on this semester; he is taking a full course load, has a part-time job, is involved in extracurricular activities and also has to put some time aside for his family and friends. Adam wants to work on his school tasks ahead of the deadline, but he often has to put them off to fulfill other commitments. Adam sometimes feels emotional distress when has to postpone academic tasks and is generally not happy about his delay.

Even though Lisa makes plans and works hard, she gets to the end of the day with lots of things (e.g., school work) left to do. In addition to school, she has two part-time jobs and is doing

1. Please rate how well each item represents Inevitable delay as defined above.
2. Please rate each item's clarity.

volunteer work to improve her resume. She also has to help care for her older brother, who has special needs. She feels bad about putting off school work, but it seems like important demands that she can't control always come up to get in the way of her plans.

Heather always has the best of intentions about doing her readings and papers on time. With everything else she accepts to do, however, she often has no choice but to put them off. Last week, for example, she planned to catch up on her seminar readings as well as start the research for her film essay. She had set aside time for everything, but ended up staying at the mall after work to help a co-worker shop for a gift, and then a friend was stuck on a History assignment and Heather offered to help. Now she's even further behind, and she's stressed out and overwhelmed by everything she has to do.

Martha is the type of student who is a busy "doer," working non-stop with no time to waste. Her schedule is crazy busy with no room for anything extra, but she still tries to find time if someone important to her asks for something. In terms of school work, she sometimes changes her initial plans again and again to meet other important commitments, and therefore postpones some of her school work until near the deadline. She is generally not satisfied with the way she does her school tasks and her busy lifestyle.

Professor Meier assigns a term paper that is due in two weeks. Frank tells himself that he will work on it as soon as possible and far ahead of the deadline. However, Frank ends up writing the paper just before the deadline, like his other assignments. His delay is not because he intentionally waits until the last minute for the thrill of working under pressure, not because he avoids writing tasks by doing unnecessary activities (e.g., watching TV or browsing the internet), and not because he does not care about his grades. In fact, he would genuinely like to do it earlier, but he is always too busy with everything. With five courses, agreeing to work extra shifts, and offering to help many people (friends and coworkers), everything in Jack's life gets done at the last minute. He manages to get everything done to the best of his ability but always feels stressed out at the end of day.

Jordan always seems to be juggling too many responsibilities. He has to work in his family's store every weekend, as well as helping his elderly grandmother with her household chores. On top of that, he has a chronic medical condition that requires time-consuming weekly treatments. He often has no choice but to put off his school work until the last minute, causing him a fair bit of stress and pressure.

Laura has a hectic schedule. She tries to do everything well, but often ends up delaying her school work. She has so much going on that sometimes she forgets to write down an appointment or deadline and then has to scramble to readjust her schedule to do everything she planned. Laura is dissatisfied with this stressful pattern in her life but she can't seem to get everything organized to prevent it.

Adequacy of Content Domain for "Inevitable Delay" (Please take a moment to point out any aspects of the construct that we have possibly failed to include in our definition and/or presented items):

Appendix D:

MMAP-General Factor Analysis Version

Q1) Below is a list of important and common tasks in school setting. What major academic tasks do you typically do in your courses? (Choose ALL that apply)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project
- Other:

Q2) On which task do you delay more? (Only choose ONE TASK even if you delay many)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project
- Other:

Multidimensional Measure of Procrastination

This questionnaire asks about needless delay in your academic life. It may be very frequent, or you may almost never delay anything. We are interested in your thoughts and emotions when you do delay on academic tasks such as studying for exams, writing assignments (e.g., essays, reports, thesis), or assigned readings.

Please note the following before answering:

- There are no right or wrong answers. We are only interested in how often you delay academic tasks and how it affects you.
- Some questions may seem similar to each other. Your answers to all questions will help us to refine the survey for future research.
- In answering the questions, **please consider the major academic tasks and what you have typically done in the recent past (current semester or last semester).**

Some of the questions use the phrase “**needless delay**.” Needless means delaying without a rational reason. When it’s needless delay, you generally know that this isn’t a good idea to delay the intended task. For example, if you intended to work on an academic task (e.g., study for an exam) at a particular time but instead engaged in “unnecessary activities” and then studied at the last minute, this would be needless delay.

Unnecessary activities typically are not urgent and are not part of one’s initial plan. For example, you may watch TV, spend time on facebook, or clean your room instead of studying for your exam as you initially intended. In answering the questions below, use your honest judgment. Only you can determine if your delay was needless.

Response options:

- 1=Never
- 2= Almost never
- 3=Occasionally
- 4=About half of the time
- 5=Often
- 6=Very often
- 7=Always

Items:

1. I initially intend to not put off academic tasks, but I continuously find myself doing so.
2. When academic tasks are assigned, I tell myself that I will not start them late, but I end up delaying them without a good reason.
3. There is a needless delay between when I want to do academic tasks and when I actually do them.
4. I postpone academic tasks despite expecting to be worse off if I delay.
5. I plan to work on academic tasks ahead of time, but when the time comes, I needlessly postpone the tasks.
6. Instead of working on academic tasks according to my intention, I involve myself in some activities that are not urgent.
7. I keep putting off academic tasks until later without any rational reason.
8. I intend to work on academic tasks well before the deadline, but instead of working on them I often engage in other activities without a good reason.

9. Just before I am about to begin an intended academic task, I tend to avoid it by doing something else.
10. I delay on academic tasks despite the fact that I know I will feel guilty about my delay later.
11. I initially intend to not put off academic tasks, but I continuously find myself doing so.
12. I needlessly delay working on academic tasks despite the fact that I know I will not be happy about doing so later.
13. I plan to work on academic tasks ahead of time, but when the time comes I postpone the tasks.
14. Despite my intention to start and finish academic tasks on time, I engage in other unnecessary activities instead.
15. When I receive academic tasks, I plan to work on them ahead of time, but I needlessly delay starting them.
16. I engage in some unnecessary activities instead of working on academic tasks based on my initial plan.
17. I engage in unnecessary activities instead of working on academic tasks despite the fact that I know I will feel dissatisfied with the result of my delay later.
18. I don't like to postpone academic tasks, but I find myself working on them near the deadline without a good reason.

Undesired outcome:

Please choose the appropriate response for each item:

1. I feel down about myself when I delay working on academic tasks without a rational reason.
2. Repeatedly postponing academic tasks until the last minute has had a negative impact on my enjoyment of school.
3. My needless delay on academic tasks has bothered me emotionally and psychologically.
4. My needless delay on academic tasks has had a negative impact on my relationships with a significant others (e.g., family or partner).
5. I wish I could change my habitual procrastination when I should be working on academic tasks.
6. I am not satisfied with my performance at university because of my needless delay on academic tasks.
7. There are negative effects on my health when I delay working on academic tasks.
8. When I needlessly delay working on academic tasks, significant others (e.g., parents, partner) complain about it.
9. Putting off academic tasks until the last minute is one of the factors that has negatively affected my performance in school.

10. My needless delay on academic tasks does not allow me to appropriately plan for pleasurable activities.
11. Repeatedly postponing academic tasks until the last minute has had a negative impact on my mood.
12. I am not satisfied with myself because of my needless delay on academic tasks.
13. I blame myself for the negative consequences of postponing academic tasks on my performance as a student.
14. Repeatedly postponing academic tasks until the last minute has had a negative impact on my health.
15. Delaying needlessly on academic tasks has made me a less successful student.
16. I am critical of myself for needlessly postponing academic tasks.
17. I am not satisfied with myself because my procrastination on academic tasks has resulted in work that is not my best.
18. There are negative effects on my well-being when I delay working on academic tasks.
19. My needless delay on academic tasks is one of the factors that has negatively affected my grades.
20. In general, my needless delay of academic tasks "negatively" affects how I feel about myself.
21. I am upset by the negative consequences of delaying academic tasks.
22. Repeatedly postponing academic tasks until the last minute has had a negative impact on my school work.
23. There are negative effects on my happiness when I delay working on academic tasks.
24. I don't like my habitual delay of academic tasks.
25. Repeatedly postponing academic tasks until the last minute has had a negative impact on my happiness.
26. As a result of delaying academic tasks, my professors are not satisfied with the quality of my work.
27. I really would like to learn how to avoid needless delay on academic tasks.
28. I am not happy with my needless delay on academic tasks.
29. My delay on academic tasks has had a problematic effect on my relationships.
30. My failure to follow my plans to work on academic tasks has bothered me.
31. I do not like myself because of the negative consequences of postponing academic tasks until the last minute.
32. The quality of my work has suffered from my delay on academic tasks.

33. When I have delayed working on academic tasks, it has led me to not be at my best in my personal relationships.
34. In general, my needless delay on academic tasks bothers me.
35. My needless delay on academic tasks has affected my personal life in a negative way.
36. In general, my delay of academic tasks negatively affects my satisfaction with my performance at school.
37. My needless delay on academic tasks has caused me to not enjoy my life.
38. My needless delay on academic tasks does not allow me to fully enjoy social activities.
39. Repeated postponing academic tasks until the last minute has had a negative effect on my general life satisfaction.
40. I think if I didn't needlessly postpone academic tasks, my work could be much better.

Negative Emotion

The following questions are about the feelings that one may experience at different stage of dealing with specific academic tasks. It is important that you answer these questions **based on what you have actually felt or experienced** at similar situations in recent semesters, NOT what you believe that you should ideally feel in the future

1. Whenever I am about to start working on academic tasks, I feel anxious.
2. Whenever I am about to start working on academic tasks, I feel angry.
3. Whenever I am about to start working on academic tasks, I feel hopeless.
4. Whenever I am about to start working on academic tasks, I feel bored.
5. Whenever I am about to start working on academic tasks, I feel guilty.
6. Whenever I am about to start working on academic tasks, I feel sluggish or sleepy.
7. Whenever I am about to start working on academic tasks, I feel emotional distress.

8. While I am needlessly delaying on an academic task despite my initial plan, I feel anxious.
9. While I am needlessly delaying on an academic task despite my initial plan, I feel angry.

10. While I am needlessly delaying on an academic task despite my initial plan, I feel hopeless.
11. While I am needlessly delaying on an academic task despite my initial plan, I feel bored.
12. While I am needlessly delaying on an academic task despite my initial plan, I feel guilty.
13. While I am needlessly delaying on an academic task despite my initial plan, I feel sluggish or sleepy.
14. While I am needlessly delaying on an academic task despite my initial plan, I feel emotional distress.

15. After I finish an academic task that I have needlessly delayed for awhile, I feel anxious.
16. After I finish an academic task that I have needlessly delayed for awhile, I feel angry.
17. After I finish an academic task that I have needlessly delayed for awhile, ashamed of myself.
18. After I finish an academic task that I have needlessly delayed for awhile, I feel guilty.
19. After I finish an academic task that I have needlessly delayed for awhile, I feel relief.
20. After I finish an academic task that I have needlessly delayed for awhile, I feel emotional distress.

Irrationality

The following questions are about the thought processes that one may have when needlessly delaying on academic tasks. It is important that you answer these questions **based on what you have actually thought or experienced**, NOT what you believe that you should ideally think in the future

1. When I needlessly postpone working on an academic task, I underestimate the time needed to complete the task.
2. When I needlessly postpone working on academic tasks, I think I will be worse off if I delay, but I keep postponing the task.
3. Whenever I am about to start working on an academic task, I keep putting it off for a few minutes, until I have to rush to do it at the last minute.

4. When I needlessly delay working on academic tasks, I overestimate the importance of other, less urgent activities that I do instead of working on the assignments.
5. When I needlessly delay working on academic tasks, I overestimate my capacity to complete the tasks.
6. When I needlessly delay major writing assignment, I am thinking that it is more valuable for me to do other activities.
7. When I needlessly delay working on academic tasks, I know I will not be happy about doing so.
8. When I needlessly delay working on academic tasks, I keep ignoring the negative consequences of putting them off until later.
9. Even once I have started an academic task, I repeatedly take breaks to do other things that end up taking longer than I planned.
10. When I needlessly delay working on academic tasks, I ignore the fact that later I will feel dissatisfied about my delay.
11. When I needlessly delay working on an academic task, I have difficulty to realistically assess the time needed to complete the task.
12. When I put off an academic task, it seems like I'm not considering the long-term benefits of doing it in a timely fashion.
13. When I needlessly postpone an academic task, I do not pay attention to the real value of working on the tasks based on my initial plan.
14. I repeatedly put off starting academic tasks to do something else that takes just a few minutes, wasting a lot of my time before I finally start doing the assignments.
15. When I needlessly delay working on an academic task, I unrealistically think that the assignment is easy.
16. When I needlessly delay working on an academic task, I unrealistically think that I will be able to complete it in a short period of time.
17. When I needlessly delay an academic task, I avoid thinking about what could happen if I don't finish it.
18. When I put off academic tasks, I'm thinking more about the short-term benefits of doing another activity.
19. When I needlessly delay working on academic tasks, I usually think I will feel more like doing it tomorrow.

Duration

In the following questions, we ask about when you started habitually delaying on this type of school-related tasks and when you started experiencing negative consequences of this delay. Please think of your past experiences since elementary school, as far as you can

remember, and answer items by choosing one of the time frame options presented in front of the statement if applicable.

1. Now that I think about my past, I have habitually been postponing working on school tasks until the last minute since.....
2. Starting school tasks near the deadline despite planning to start earlier is something that I have typically done since.....
3. Wasting time by doing other activities instead of working on school tasks is something I have done since.....
4. Wasting time by doing other activities instead of working on school tasks is something I have done since.....
5. Needlessly putting off school tasks to the last minute has bothered me since.....
6. Delaying on school tasks has been part of who I am since.....
7. Finishing school tasks at the last minute is something that I have typically done since.....
8. I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on school tasks since.....
9. Repeatedly postponing these types of tasks (writing) until the last minute has hurt my grades since.....
10. I have not been good at meeting deadlines for school tasks since.....
11. Saying that I will start working on the school task tomorrow is something that I have often done since.....
12. Now that I think about my past, the quality of my work has often suffered from my delay on school tasks since....
13. Delay on school tasks has been a problem in my life since.....
14. Putting off school tasks to the last minute is something that I've often done since.....
15. Frequent delay on school tasks has often negatively influenced my school performance since.....
16. I have had a general tendency to keep putting off school tasks until later since.....
17. Wasting a lot of time on trivial matters before starting school tasks is something I have done since.....
18. I have often delayed finishing school tasks in my life since.....
19. Habitually delaying on school tasks has often led to emotional distress in my life since.....

Q1) When you were answering the questions related to needless delay, which academic task(s) did you have in mind? (Choose all that apply)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project
- Other:-----

Q1) When you were answering the questions related to needless delay, which academic task were you thinking about the most? (Only choose ONE TASK)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project

MMAP Initial Task Specific Version:

The following is the first section of the MMAP-Specific, procrastination behaviour scale. The items are very similar to the general version of the MMAP presented above. In the general version, the phrase “academic tasks” was used in the wording of the items. In the task-specific version, the same items were presented but instead of “academic tasks,” specific academic tasks such as writing, reading and studying for exams were used in the wording of items.

MMAP (Task-Specific)

Instructions

The questionnaire following pages asks about needless delay in your academic life. It may be very frequent, or you may almost never delay anything. We are interested in your thoughts and emotions when you do delay.

Please note the following before answering:

- The survey repeats a set of questions three times, once for **major assignments (Task I)**, once for **exam preparation (Task II)**, and once for **readings (Task III)**.
- Since answering questions with subtle differences may be tiring, **we present the questions for Task I at the beginning, Task II in the middle and Task III at the end of survey**. Other questionnaires are presented between the three tasks.
- There are no right or wrong answers. We are only interested in how often you delay these tasks and how it affects you.
- Some questions may seem similar to each other. Your answers to all questions will help us to refine the survey for future research.
- In answering the questions, **please consider what you have typically done in the recent past (current semester or last semester)**.

Some of the questions use the phrase “**needless delay**.” Needless means delaying without a rational reason. When it’s needless delay, you generally know that this isn’t a good idea to delay the intended task. For example, if you intended to study for an exam at a particular time but instead engaged in “unnecessary activities” and then studied at the last minute, this would be needless delay.

Unnecessary activities typically are not urgent and are not part of one’s initial plan. For example, you may watch TV, spend time on facebook, or clean your room instead of studying for your exam as you initially intended. In answering the questions below, use your honest judgment. Only you can determine if your delay was needless.

MMAP-PBS

Task I: Major Writing assignments (e.g., term paper, essays, or thesis):

MPwp_P_1 I initially intend to not put off major writing assignments, but I continuously find myself doing so.
MPwp_H_2 I don't intend or plan to work on major writing assignments, and I do other fun things instead.
MPwp_P_3 When major writing assignments are assigned, I tell myself that I will not start them late, but I end up delaying them without a good reason.
MPwp_H_4 I intentionally choose to do fun stuff instead of doing major writing assignments ahead of the deadline.
MPwp_P_5 There is a needless delay between when I want to do major writing assignments and when I actually do them.
MPwp_H_6 I do not really care if I get a bad grade due to working on a major writing assignment at the last minute.
MPwp_H_7 I choose to do fun activities instead of getting an early start on major writing assignments and I do NOT feel bad about it.
MPwp_P_8 I postpone major writing assignments despite expecting to be worse off if I delay.
MPwp_H_9 When I receive a major writing assignment, I don't give it any thought at all, and I do it at the last minute.
MPwp_P_10 I plan to work on major writing assignments ahead of time but when the time comes I needlessly postpone the tasks.
MPwp_P_11 Instead of working on major writing assignments according to my intention, I engage in some activities that are not urgent.
MPwp_P_12 I keep putting off major writing assignments until later without any rational reason.
MPwp_H_13 I am focused on fun and enjoyable activities and do not bother myself with major writing assignment until the last minute.
MPwp_P_14 I intend to work on major writing assignments well before the deadline, but instead of working on them I often engage in other activities without a good reason
MPwp_H_15 I am not interested in starting major writing assignments ahead of time because I would rather do more enjoyable things instead.
MPwp_P_16 Just before I am about to begin an intended writing task, I tend to avoid them by doing something else.
MPwp_H_17 When major writing assignments are assigned, I don't give any thought to when I will start working on them.
MPwp_P_18 I delay on major writing assignments despite the fact that I know I will feel guilty about my delay later.
MPwp_P_19 I initially intend to not put off major writing assignments, but I continuously find myself doing so.
MPwp_H_20 When I receive major writing assignments, I don't make even a vague plan to start them ahead of time.
MPwp_P_21 I needlessly delay working on major writing assignments despite the fact that I know I will not be happy about doing so later.

MPwp_H_22	Having fun is my main priority, so I am not afraid to deliberately postpone doing my assignment until the last minute.
MPwp_P_23	I plan to work on major writing assignments ahead of time, but when the time comes I postpone the tasks.
MPwp_H_24	I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on this type of school task on time.
MPwp_P_25	Despite my intention to start and finish major writing assignments on time, I engage in other unnecessary activities instead.
MPwp_H_26	When it comes to major writing assignments, I don't intend to work too hard or to get started on time.
MPwp_P_27	When I receive major writing assignments, I plan to work on them ahead of time, but I needlessly delay starting them.
MPwp_H_28	I choose to do major writing assignments at the last minute so I leave more time for fun stuff instead.
MPwp_P_29	I engage in some unnecessary activities instead of working on writing assignments based on my initial plan.
MPwp_H_30	I plan and do fun activities (e.g., partying, going out, sports) as opposed to plan and work on major writing assignments ahead of time.
MPwp_H_31	I don't really care about starting major writing assignments on time, and I intentionally do the assignments at the last minute.
MPwp_P_32	I engage in unnecessary activities instead of working on major writing assignments despite the fact that I know I will feel dissatisfied with the result of my delay later.
MPwp_H_33	I do not care about major writing assignments, and I do not plan to do them ahead of time since I have more exciting activities to do.
MPwp_H_34	I choose to do writing assignments at the last minute without feeling guilty about it.
MPwp_P_35	I don't like to postpone major writing assignments, but I find myself working on them near the deadline without a good reason.

Task II: Assigned readings (e.g., textbook, chapter, articles, novels, or other assigned reading)

MPr_P_1	I initially intend to not put off assigned readings, but I continuously find myself doing so.
MPr_H_2	I don't intend or plan to work on assigned readings, and I do other fun things instead.
MPr_P_3	When readings are assigned, I tell myself that I will not start them late, but I end up delaying them without a good reason.
MPr_H_4	I intentionally choose to do fun stuff instead of doing assigned readings ahead of the deadline.

MPr_P_5 There is a needless delay between when I want to do my assigned readings and when I actually do them.
MPr_H_6 I do not really care if I get a bad grade due to working on an assigned reading at the last minute.
MPr_H_7 I choose to do fun activities instead of getting an early start on assigned readings and I do not feel bad about it.
MPr_P_8 I postpone assigned readings despite expecting to be worse off if I delay.
MPr_H_9 When I receive an assigned reading, I don't give it any thought at all, and I do it at the last minute.
MPr_P_10 I plan to work on assigned readings ahead of time, but when the time comes, I needlessly postpone the task.
MPr_P_11 Instead of working on an assigned reading according to my intention, I engage in some activities that are not urgent.
MPr_P_12 I keep putting off assigned readings until later without any rational reason.
MPr_H_13 I am focused on fun and enjoyable activities and do not bother myself with assigned readings until the last minute.
MPr_P_14 I intend to work on assigned readings well before the deadline, but instead of working on them I often engage in early in other activities without a good reason.
MPr_H_15 I am not interested in starting assigned readings ahead of time because I would rather do more enjoyable things instead.
MPr_P_16 Just before I am about to begin an intended reading task, I tend to avoid them by doing something else.
MPr_H_17 When readings are assigned, I don't give any thought to when I will start working on them.
MPr_P_18 I delay on assigned readings despite the fact that I know I will feel guilty about my delay later.
MPr_P_19 I intend to not put off assigned readings, but I continuously find myself doing so.
MPr_H_20 When I receive assigned readings, I don't make even a vague plan to start them ahead of time.
MPr_P_21 I needlessly delay working on assigned readings despite the fact that I know I will not be happy about doing so later.
MPr_H_22 Having fun is my main priority, so I am not afraid to deliberately postpone doing my assigned readings until the last minute.
MPr_P_23 I plan to work on assigned readings ahead of time, but when the time comes I postpone the tasks.
MPr_H_24 I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on this type of school task on time.
MPr_P_25 Despite my intention to start and finish assigned readings on time, I engage in other unnecessary activities instead.

MPr_H_26	When it comes to assigned readings, I don't intend to work too hard or get started on time.
MPr_P_27	When readings are assigned, I plan to work on them ahead of time, but I needlessly delay starting them.
MPr_H_28	I choose to do assigned readings at the last minute so I leave more time for fun stuff instead.
MPr_P_29	I engage in some unnecessary activities instead of working on assigned readings based on my initial plan.
MPr_H_30	I plan and do fun activities (e.g., partying, going out, sports) as opposed to plan and work on assigned readings ahead of time.
MPr_H_31	I don't really care about starting assigned readings on time, and I intentionally do the readings at the last minute.
MPr_P_32	I engage in unnecessary activities instead of working on assigned readings despite the fact that I know I will feel dissatisfied with the result of my delay later.
MPr_H_33	I do not care about assigned readings, and I do not plan to do them ahead of time since I have more exciting activities to do
MPr_H_34	I choose to do assigned readings at the last minute without feeling guilty about it.
MPr_P_35	I don't like to postpone assigned readings, but I find myself working on them near the deadline without a good reason

Task III: Exam preparation

MPe_P_1	I initially intend to not put off exam preparation, but I continuously find myself doing so.
MPe_H_2	I don't intend or plan to prepare for exams, and I do other fun things instead.
MPe_P_3	When exams are announced, I tell myself that I will not start them late, but I end up delaying them without a good reason.
MPe_H_4	I intentionally choose to do fun stuff instead of preparing for exams ahead of the deadline.
MPe_P_5	There is a needless delay between when I want to start preparing for exams and when I actually do.
MPe_H_6	I do not really care if I get a bad grade due to preparing for an exam at the last minute.
MPe_H_7	I choose to do fun activities instead of getting an early start on exams preparation and I do NOT feel bad about it.
MPe_P_8	I postpone exam preparation despite expecting to be worse off if I delay.

MPe_H_9	When the date of an exam is determined, I don't give it any thought at all, and I do it at the last minute.
MPe_P_10	I plan to work on exam preparation ahead of time, but when the time comes, I needlessly postpone the task.
MPe_P_11	Instead of preparing for exams according to my intention, I engage in some activities that are not urgent.
MPe_P_12	I keep putting off exam preparation until later without any rational reason.
MPe_H_13	I am focused on fun and enjoyable activities and do not bother myself with exam preparation until the last minute.
MPe_P_14	I intend to work on exam preparations well before the deadline, but instead of working on them, I often engage in other activities without a good reason.
MPe_H_15	I am not interested in preparing for exams ahead of time because I would rather do more enjoyable things instead.
MPe_P_16	Just before I am about to begin intended exam preparations, I tend to avoid it by doing something else.
MPe_H_17	When exams are announced, I don't give any thought to when I will start preparing for them.
MPe_P_18	I delay on exam preparation despite the fact that I know I will feel guilty about my delay later.
MPe_P_19	I intend not to put off exam preparation, but continuously find myself doing so.
MPe_H_20	When I receive exam dates, I don't make even a vague plan to start preparing ahead of time.
MPe_P_21	I needlessly delay preparing for exams despite the fact that I know I will not be happy about doing so later.
MPe_H_22	Having fun is my main priority, so I am not afraid to deliberately postpone preparing for exams until the last minute.
MPe_P_23	I plan to prepare for exams ahead of time, but when the time comes I postpone the task.
MPe_H_24	I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on this type of school task on time.
MPe_P_25	Despite my intention to start and finish preparing for exams on time, I engage in other unnecessary activities instead.
MPe_H_26	When it comes to preparing for an exam, I don't intend to work too hard or to get started on time.
MPe_P_27	When I receive exam dates, I plan to prepare for them ahead of time, but I needlessly delay starting them.
MPe_H_28	I choose to prepare for exams at the last minute so I leave more time for fun stuff instead.
MPe_P_29	I engage in some unnecessary activities instead of preparing for exams based on my initial plan.

MPe_H_30 I plan and do fun activities (e.g., partying, going out, sports) as opposed to plan and to prepare for exams ahead of time.

MPe_H_31 I don't really care about starting exam preparation on time, and I intentionally start preparing at the last minute.

MPe_P_32 I engage in unnecessary activities instead of preparing for exams despite the fact that I know I will feel dissatisfied with the result of my delay later.

MPe_H_33 I do not care about exams, and I do not plan to prepare for them ahead of time since I have more exciting activities to do

MPe_H_34 I choose to do exam preparations at the last minute without feeling guilty about it.

MPe_P_35 I don't like to postpone exam preparation, but I find myself working on it near the deadline without a good reason.

Appendix E:

DQ Factor Analysis Version

Delay is an inevitable part of life. In this questionnaire, we ask you about delay in your life. There are different forms of delay, and people may delay for various reasons. For example, sometimes we see the delay as necessary or even wise; at other times, we might engage in needless delay. Below are descriptions of different forms of delay that people often report. Please read each description and then rate it according to the extent to which you think it describes you or is close to the way you generally act in school. There are no right or wrong answers. Some of the descriptions might seem similar, but please answer all of them.

1 Not at all	2 A little bit like me	3 Somew hat like me	4 Modera tely like me	5 Ve ry like me	6 Ve ry much like me	7 Alm ost 100% like me
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1. John often delays doing school work such as studying for exams, doing his assigned readings, and working on projects. He always intends to start well ahead of the deadline and work steadily, but very rarely does so. Instead, he tends to engage in other non-important activities such as texting/tweeting friends, checking Facebook, playing video games or watching TV, doing laundry, etc. He knows he is just delaying his school work, however, the little tasks always seem important to complete at the time. He experiences negative emotions (e.g., anxiety, guilt, or distress) due to this.
2. Others (e.g., Professors or parents) say that Tina should put more time and effort into her school work. But the truth is, she prefers to hang out with her friends and download music. Generally she likes to do things that are fun and interesting, and schoolwork doesn't qualify. As a result, she often works on her school work near the deadline and does not get very good grades. Tina does not see her behaviour or grades as a problem.
3. Devon gets a kick out of working under pressure, so he intentionally puts off writing papers and studying for exams. Last semester, he wrote two essays and a lab report in three days on very little sleep, then had less than a week to catch up on his readings and study for his exams. He doesn't think this affected his grades and he found it exciting to rush at the last minute.
4. Nick often intends to do tasks ahead of time and tries to not waste any time. He works non-stop but there always seems to be so much to do in his schedule that he can't seem to

organize his time effectively and realistically to get some of his school-related tasks done on time.

5. Paige most often will start her assignments well before the dead line because she does not do well under stress. She always leaves plans for extra time before the deadline just in case she needs to fix something in a paper, etc. However, sometimes it is hard for Paige to start her assignments right away or get them done quickly, although she gets them done on time. Paige is very busy. She attends dance class three nights a week and is a full-time student. Also, she tries to make time for her family as well. Paige sometimes feels overwhelmed with her activities, but always manages to make time for everything and gets everything done on time.
 6. James has a midterm exam and an assignment due in 2 weeks. He knows that he needs to do the work to pass the course but he has a difficult time to focusing on his work due to his mental health condition. He has suffered from this condition for some time. This has affected his performance in school and often led him to delay his work. James generally does not postpone his tasks when the symptoms of his mental illness are under control.
7. Jessica always plans to do her assignments ahead of the deadline. However, she procrastinates on tasks or assignments that she has no interest in or finds them too vague. For example, this semester she is enrolled in a compulsory class that she has no interest in. She has postponed taking this course but now needs it to graduate. She finds the teacher and the material dull and has no motivation to complete any of the assignments. She puts off her work until right before the deadline and then rushes to complete the assignment. This course has caused her a great deal of stress and she wants it to be over as soon as possible.
8. Andrea is about to start studying for her exam, but she tells herself she will start after she checks her email. But after she checks her email, she finds herself checking the news, then Facebook, then taking a break for lunch, and before she knows it, the day is over and she hasn't studied at all. Another time, before her last assignment, she found herself cleaning the house, calling her friends, and organizing her desk. She keeps postponing her school work until the last minute. She feels stressed about having to rush and believes her work is not as good as it could be if she could get started earlier or put more time into it.
9. Colin says that he doesn't care about school work as much as the more enjoyable aspects of campus life. He often doesn't have any intention or desire to start school tasks on time. Colin enjoys having time to relax and doesn't see the point of pushing himself to get an early start on studying and assignments.
10. Sabrina intentionally postpones working on her school assignments. She finds it kind of exciting to come face to face with a deadline. Some of her friends get all stressed out when they have to do work at the last minute, but Sabrina is satisfied with her work and doesn't feel any negative effects from postponing her assignments.
11. Adam tends to have lots of demands on his time from work, school, family and friends. For example, Adam has a lot going on this semester; he is taking a full course load, has a part-time job, is involved in extracurricular activities and also has to put some time aside

for his family and friends. Adam wants to work on his school tasks ahead of the deadline, but he often has to put them off to fulfill other commitments. Adam sometimes feels emotional distress when he has to postpone academic tasks and is generally not happy about his delay.

12. Lorenzo keeps putting off working on his schoolwork until later and later until it's too late to produce his best work. He often tells himself he won't do this again, but it seems like whenever he has schoolwork he should be doing, he does all sorts of other things instead, like watching TV, text messaging, surfing the Internet, etc. Lorenzo is generally not happy about his study habits and would like to find a way to change it.
13. Dimitri has been postponing doing his assigned readings and lab reports for awhile now. It seems like something more fun always comes up. He knows his grades are not as good as they could be, but he's having a good time and that's what he really cares about right now.
14. Edwin deliberately puts off working on assignments and/or studying until the last minute, so he can gather as much information as possible. Depending on the assignment, he might email the TA, ask how his friends are approaching it, or wait for the professor to give more details about it in class. Edwin's performance hasn't suffered because of this approach, and it doesn't cause him any distress.
15. Even though Lisa makes plans and works hard, she gets to the end of the day with lots of things (e.g., school work) left to do. In addition to school, she has two part-time jobs and is doing volunteer work to improve her resume. She also has to help care for her older brother, who has special needs. She feels bad about putting off school work, but it seems like important demands that she can't control always come up to get in the way of her plans.
16. Kevin was generally able to focus on his school tasks and complete his work in a timely fashion. However, at this point of his life, Kevin is feeling sad and depressed and feels he may need help to overcome his depression and other negative emotions. Due to his emotions he is having trouble staying focused on the tasks at hand for school, and finds it hard to get motivation to work on assignments. He knows that putting off his school work will hurt his grades, but he has difficulty to bring himself to get any work done.
17. Jo knows she has a large assignment due. She tells herself she will start ahead of time and finish the assignment with time to spare. However, every time she goes to work on the assignment, she feels unmotivated. Working on assignments is not fun and feels very isolating. The work is stressful and difficult, even tedious at times. Jo postpones writing her assignment because it is something unpleasant she rather not go through. Eventually, time runs out and she accepts that the assignment must be done. She hastily works on it and ends up causing herself extra stress and misery. She knows the assignment wouldn't have been so bad had she started sooner and vows to never work like this again, even though she knows that's not true.
18. Although Maria intends to start writing her assignment with plenty of time to spare, when the time comes to actually start writing, she starts to feel anxious and uncomfortable and puts it off to do something else instead. She keeps putting off her writing assignment until

later and later, and the deadline for submitting the assignment is fast approaching. She doesn't like working this way, but she can't seem to help it.

19. Eric doesn't worry about when he will start working on his school tasks. He tells his friends that he doesn't care to keep up with the weekly readings and/or assignments for his courses. Others (e.g., parents, professors) sometimes criticize Eric for delaying his school work. This doesn't bother him too much, he would just rather put his time and energy into other things he's more interested in.
20. Anna does most of her assignments right before the deadline, sometimes staying up all night to get something handed in on time. This is a pretty intense experience, but she doesn't mind working under pressure. In fact, Anna felt she actually achieved better results when she did her assignments and papers right before they were due.
21. When Sarah has to prepare for an exam or do something for school, she often doesn't follow her initial plan. Instead of starting tasks on time, she often engages in non-urgent activities despite the fact that she knows she will not be happy about doing so. This way of dealing with school tasks has had a negative effect on Sarah's performance in school.
22. Krista often doesn't have any intention of creating a plan to work on school tasks ahead of time or of following the timelines that her professors recommend. She tends to do what interests her first and do school work at the last minute, without feeling bad about it.
23. Professor Johnson assigns a writing assignment that is due in two weeks. Joe looks at his calendar and realizes that the best time—or maybe the only time—for him to work on the assignment is the two days before it's due. It's not that he puts off working on the paper until the last minute for unnecessary reasons or activities; but because he has to travel for his sport team on the weekend and he has two other assignments due before this paper. He knows that the optimal time for him to focus on that assignment is 2 days before it's due, and he knows that's enough time for him to do a good job. This is how Joe organizes his time and activities. He has a reasonable number of commitments and tasks and generally makes good use of his time. He schedules some tasks well ahead of the deadline and others close to the deadline. He is usually able to stick to his schedule.
24. Martha is the type of student who is a busy “doer,” working non-stop with no time to waste. Her schedule is crazy busy with no room for anything extra, but she still tries to find time if someone important to her asks for something. In terms of school work, she sometimes changes her initial plans again and again to meet other important commitments, and therefore postpones some of her school work until near the deadline. She is generally not satisfied with the way she does her school tasks and her busy lifestyle.
25. Although Alex usually intends to get his school work done ahead of time, he ends up wasting time on things he knows are less important. He ends up having to rush to finish his school work at the last minute, which causes him to be stressed out. He thinks he would do better in school if he could break this habit.
26. Professor Johnson assigns a class term paper that is due in two weeks. Alicia makes no plans to work on it, not because she is too busy with other courses or her job, but because she is always invited to different parties and going out with her friends. When it comes to

her school work, Alicia often pulls something together at the very last minute. It may not be near the quality that it could be, but Alicia isn't bothered by this.

27. Professor Johnson assigns a term paper that is due in two weeks. Peter looks at his schedule, which is already quite full with ongoing commitments and deadlines, to find an optimal time to write the first draft and a revision. Most of the time, Peter can schedule time to work on his assignments ahead of deadline, but sometimes he has to choose a time that's quite close to the deadline to make the best use of his time and/or to be able to fulfill his other commitments. Everything in Peter's life is planned and gets done according to his schedule.
28. Professor Meier assigns a term paper that is due in two weeks. Frank tells himself that he will work on it as soon as possible and far ahead of the deadline. However, Frank ends up rushing to write the paper just before the deadline, like his other assignments. He would genuinely like to do it earlier, but he is too busy with everything. With five courses, agreeing to work extra shifts, and offering to help many people (friends and coworkers), everything in Frank's life is very chaotic and he has difficulty keeping track of all of his commitments. He tries to do everything to the best of his ability but always feels stressed out at the end of day and wishes he had fewer commitments and more time for schoolwork.
29. Katie intends to work on her assignment before the deadline. However she is not able to divide her time optimally among various tasks. When she has multiple tasks to complete, she often spends all of her time on the tasks that she is interested in and is unmotivated to work on the other tasks. She finds herself rushing to finish the uninteresting tasks before the deadline. As a result, she experiences a lot of stress when doing those tasks and she is not satisfied with her quality of work or her time management.
30. Sebastian almost never starts his assignments as early as professors recommend. He always has something else he'd rather be doing. Other people might think Sebastian is a slacker when it comes to school, but he doesn't stress about it. He feels he just isn't the type to spend tons of time on school work, since he's not that motivated by it. Right now, he's more interested in having a good time and does not care about the grades he gets on his assignments. As far as Sebastian is concerned, it's all fine just as long as he's still passing the courses.
31. Jordan always seems to be juggling too many responsibilities. He has to work in his family's store every weekend, as well as helping his elderly grandmother with her household chores. On top of that, he has a chronic medical condition that requires time-consuming weekly treatments. He often has no choice but to put off his school work until the last minute, causing him a fair bit of stress and pressure.
32. It's four days before the deadline for one of Sam's main assignments, and he hasn't started working on it yet. He had planned to start Monday afternoon, but when Monday came, he put it off, despite the fact that deep down he knew there might not be enough time to produce a quality assignment like he wanted. Sam tells himself that he will definitely start it tomorrow. On Tuesday morning, he finds himself spending time on Facebook and chatting with his girlfriend, causing him to postpone the major assignment again. In the afternoon, his good friend Mike calls, insisting they go to an important

hockey game together. Sam finds that he can't resist the invitation. On Wednesday morning, Sam feels anxious and guilty about losing Monday and Tuesday. He finally starts working on the assignment. He works nonstop and submits the paper at the last minute on Thursday.

33. Claire always makes plans and is good at prioritizing various tasks. Even though she is very busy and has a full schedule of activities, she always manages to get things done. This semester, she has 4 midterms and a lab report due all in one week as well as her usual part-time job and other commitments. She chose some tasks to begin working on early while leaving the rest to start right before the deadline. This sometimes causes her some stress but she generally manages to follow her initial plan and complete all of her assignments on time.
34. Kevin knows that he needs to attend his classes and start working on his assignments but he prefers going out and having fun. Kevin is pretty popular and gets many invitations to parties. He stays out late with his friends having fun rather than attending his 8:30 a.m. class or starting his assignments. This lifestyle has affected his grades but this does not change his tendency to put pleasure before work.
35. Laura has a hectic schedule. She tries to do everything well, but often ends up delaying her school work. She has so much going on that sometimes she lose track of time and then has to scramble to readjust her schedule to do everything she planned. Laura is dissatisfied with this stressful pattern in her life but she can't seem to get everything organized to prevent it.
36. Marta usually plans to work on her school tasks ahead of time and is able to accomplish most of her tasks on time, according to her plan. However, recently she suffered a loss of someone very close and has a hard time concentrating on anything. She is grieving and therefore cannot focus on her school work. She knows that the delay will likely have a negative effect on her academic performance, considering she will need to catch up on a lot of stuff.
37. Professor Johnson assigns a term paper that is due in two weeks. Jack tells himself that he will work on it as soon as possible. However, Jack ends up writing the paper just before the deadline, like his other assignments. His delay is not because he wants the thrill of writing at the last minute, not because he is too busy with other commitments. Jack would like to start working on his term paper earlier but he always ends up avoiding writing tasks by doing unnecessary activities (e.g., watching TV or browsing the internet). He postpones the tasks, despite the fact that he knows he will not be happy about doing so later. Jack calls himself a procrastinator and feels hopeless about his delay. Jack would like to correct his procrastination problem.

Appendix F:

MMAP and DQ Final versions

MMAP-General Final Version

General Instruction:

This questionnaire asks about delay in your academic life. It may be very frequent, or you may almost never delay anything. We are interested in your thoughts and emotions when you do delay on academic tasks such as studying for exams, writing assignments (e.g., essays, reports, thesis), or assigned readings.

Please note the following before answering:

- There are no right or wrong answers. We are only interested in how often you delay academic tasks and how it affects you.
- Some questions may seem similar to each other. **Your answers to all questions are important for our study.**
- In answering the questions, **please consider the major academic tasks and what you have typically done in the recent past (current semester or last semester).**

MMAP-PBS

Instructions: Please choose the appropriate response for each item:

Response options:

- 1=Never
- 2= Almost never
- 3=Occasionally
- 4=Often
- 5=Very often
- 6=Always

Items:

1. When academic tasks are assigned, I tell myself that I will not start them late, but I end up delaying them without a good reason.
2. I don't intend or plan to work on academic tasks, and I do other fun things instead.
3. I keep putting off academic tasks until later without any rational reason.
4. I am not interested in starting academic tasks ahead of time because I would rather do more enjoyable things instead.
5. I needlessly delay working on academic tasks despite the fact that I know I will not be happy about doing so later.
6. I intentionally fill my time with a lot of fun and exciting activities as opposed to planning and working on school tasks on time.
7. Despite my intention to start and finish academic tasks on time, I engage in other unnecessary activities instead.
8. I choose to do academic tasks at the last minute so I leave more time for fun stuff instead.
9. When I receive academic tasks, I plan to work on them ahead of time, but I needlessly delay starting them.
10. I am focused on fun and enjoyable activities and do not bother myself with academic tasks until the last minute.

MMAP-PNCS

Instructions:

Please choose the appropriate response for each item:

Response options:

- 1=Never
- 2= Almost never
- 3=Occasionally
- 4=Often
- 5=Very often
- 6=Always

1. Delaying needlessly on academic tasks has made me a less successful student.
2. My needless delay on academic tasks has caused me to not enjoy my life.
3. I don't like my habitual delay of academic tasks.
4. There are negative effects on my health when I delay working on academic tasks.
5. My needless delay on academic tasks is one of the factors that has negatively affected my grades.
6. My needless delay on academic tasks does not allow me to fully enjoy social activities.
7. I am not happy with my needless delay on academic tasks.
8. Repeatedly postponing academic tasks until the last minute has had a negative impact on my health.
9. The quality of my work has suffered from my delay on academic tasks.
10. My needless delay on academic tasks has affected my personal life in a negative way.
11. I really would like to learn how to avoid needless delay on academic tasks.
12. There are negative effects on my well-being when I delay working on academic tasks.
13. As a result of delaying academic tasks, my professors are not satisfied with the quality of my work.
14. When I have delayed working on academic tasks, it has led me to not be at my best in my personal relationships.
15. In general, my needless delay on academic tasks bothers me.

MMAP-NES

Instructions:

The following questions are about the feelings that one may experience at different stage of dealing with academic tasks. It is important that you answer these questions **based on what you have actually felt or experienced** at similar situations in recent semesters, NOT what you believe that you should ideally feel in the future

Response options:

- 1=Never
- 2= Almost never
- 3=Occasionally
- 4=Often
- 5=Very often
- 6=Always

1. Whenever I am about to start working on academic tasks, I feel **anxious**.
2. Whenever I am about to start working on academic tasks, I feel **hopeless**.
3. Whenever I am about to start working on academic tasks, I feel **bored**.
4. Whenever I am about to start working on academic tasks, I feel **guilty**.
5. Whenever I am about to start working on academic tasks, I feel **sluggish** or **sleepy**.
6. Whenever I am about to start working on academic tasks, I feel **emotional distress**.
7. Whenever I am about to start working on academic tasks, I feel one or more of the following emotions: **relaxed, content or calm**.
8. Whenever I am about to start working on academic tasks, I feel one or more of the following emotions: **attentive, active, joy, excited, hopeful or enthusiastic**.
9. While I am needlessly delaying on an academic task despite my initial plan, I feel **anxious**.
10. While I am needlessly delaying on an academic task despite my initial plan, I feel **angry**.
11. While I am needlessly delaying on an academic task despite my initial plan, I feel **hopeless**.
12. While I am needlessly delaying on an academic task despite my initial plan, I feel **bored**.
13. While I am needlessly delaying on an academic task despite my initial plan, I feel **guilty**.
14. While I am needlessly delaying on an academic task despite my initial plan, I feel **sluggish** or **sleepy**.

15. While I am needlessly delaying on an academic task despite my initial plan, I feel **emotional distress**.
16. While I am needlessly delaying on an academic task despite my initial plan, I feel one or more of the following emotions: **relaxed, content or calm**.
17. While I am needlessly delaying on an academic task despite my initial plan, I feel one or more of the following emotions: **attentive, active, joy, excited, hopeful or enthusiastic**.

MMAP-PDS

Instructions:

In the following questions, we ask about when you started habitually delaying on school-related tasks and when you started experiencing negative consequences of this delay. Please think of your past experiences since elementary school, as far as you can remember, and answer items by choosing one of the time frame options presented in front of the statement if applicable.

Response Options

1. Elementary School
 2. Early High School
 3. Late High School
 4. Starting University
 5. More Recently
 6. Not Applicable
-
7. Starting school tasks near the deadline despite planning to start earlier is something that I have typically done since.....
 8. Repeatedly postponing school tasks until the last minute has hurt my grades since.....
 9. Needlessly putting off school tasks to the last minute has bothered me since.....
 10. Saying that I will start working on the school task tomorrow is something that I have often done since.....
 11. Now that I think about my past, the quality of my work has often suffered from my delay on school tasks since....
 12. I have often felt some negative emotions (e.g., anxious, angry at myself, guilty, ashamed or irritable) during my habitual delay on school tasks since.....
 13. Putting off school tasks to the last minute is something that I've often done since.....

14. I have not been good at meeting deadlines for school tasks since.....
15. Habitually delaying on school tasks has often led to emotional distress in my life since.....
16. I have had a general tendency to keep putting off school tasks until later since.....
17. Frequent delay on school tasks has often negatively influenced my school performance since.....
18. Wasting a lot of time on trivial matters before starting school tasks is something I have done since.....

MMAP-Peripheral Sections:

MMAP-TPQ

TP_Q1) Below is a list of important and common tasks in school setting. What major academic tasks do you typically do in your courses? (Choose ALL that apply)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project
- Other:

TP_Q2) On which task do you delay more? (Only choose ONE TASK even if you delay many)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project
- Other:

MMAP-TRQ

TR-Q1) When you were answering the questions related to delaying on academic task(s), which task(s) did you have in mind? (Choose all that apply)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project
- Other:-----

TR-Q1) When you were answering the questions related to delaying on academic task(s), which task were you thinking about the most? (Only choose ONE TASK)

- Exam preparation (studying for exams)
- Writing assignment
- Assigned readings
- Writing Term paper
- Writing Essay
- Writing Thesis
- Lab report
- Illustration projects or drawing
- Problem sets
- Questions on readings or discussions
- Presentation
- Practical projects (e.g., software or game development; programming)
- Group project
- Other:-----

DQ Final Version

Delay is an inevitable part of life. In this questionnaire, we ask you about delay in your life. There are different forms of delay, and people may delay for various reasons. For example, sometimes we see delay as necessary or even wise; at other times, we might engage in needless delay. The Delay Questionnaire has two parts:

Part 1: Below are descriptions of 5 different forms of delay that students often report. Please read each description and then choose the one that you think best describes you or is closest to the way you generally act in school.

- Lorenzo keeps putting off working on his schoolwork until later and later, until it's too late to produce his best work. He often tells himself he won't do this again, but it seems like whenever he has schoolwork he should be doing, he does all sorts of other things instead, like watching TV, text messaging, surfing the Internet, etc. Lorenzo is generally not happy about his study habits and would like to find a way to change it.
- Even though Lisa makes plans and works hard, she gets to the end of the day with lots of things (e.g., school work) left to do. In addition to school, she has two parttime jobs and is doing volunteer work to improve her resume. She also has to help care for her older brother, who has special needs. She feels bad about putting off school work, but it seems like important demands that she can't control always come up to get in the way of her plans.
- Dimitri has been postponing doing his assigned readings and lab reports for a while now. It seems like something more fun always comes up. He knows his grades are not as good as they could be, but he's having a good time and that's what he really cares about right now.
- Professor Johnson assigns a term paper that is due in two weeks. Peter looks at his schedule, which is already quite full with ongoing commitments and deadlines, to find an optimal time to write the first draft and a revision. Most of the time, Peter can schedule time to work on his assignments ahead of deadline, but sometimes he has to choose a time that's quite close to the deadline to make the best use of his time and/or to be able to fulfill his other commitments. Everything in Peter's life is planned and gets done according to his schedule.
- Sabrina intentionally postpones working on her school assignments. She finds it kind of exciting to come face to face with a deadline. Some of her friends get all stressed out when they have to do work at the last minute, but Sabrina is satisfied with her work and doesn't feel any negative effects from postponing her assignments.

Part 2: Eighteen students' stories that describe various forms of delay are presented in this section of the Delay Questionnaire. Please rate each story/description according to the extent to which you think it describes you or is close to the way you generally act in school. There are no right or wrong answers. Some of the descriptions might seem similar, but please answer all of them.

1 Not like me at all	2 A little bit like me	3 Somewhat like me	4 Moderately like me	5 Very like me	6 Very much like me	7 Almost 100% like me
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1. Lorenzo keeps putting off working on his schoolwork until later and later until it's too late to produce his best work. He often tells himself he won't do this again, but it seems like whenever he has schoolwork he should be doing, he does all sorts of other things instead, like watching TV, text messaging, surfing the Internet, etc. Lorenzo is generally not happy about his study habits and would like to find a way to change it.
2. Even though Lisa makes plans and works hard, she gets to the end of the day with lots of things (e.g., school work) left to do. In addition to school, she has two part-time jobs and is doing volunteer work to improve her resume. She also has to help care for her older brother, who has special needs. She feels bad about putting off school work, but it seems like important demands that she can't control always come up to get in the way of her plans.
3. Colin says that he doesn't care about school work as much as the more enjoyable aspects of campus life. He often doesn't have any intention or desire to start school tasks on time. Colin enjoys having time to relax and doesn't see the point of pushing himself to get an early start on studying and assignments.
4. Kevin was generally able to focus on his school tasks and complete his work in a timely fashion. However, at this point of his life, Kevin is feeling sad and depressed and feels he may need help to overcome his depression and other negative emotions. Due to his emotions he is having trouble staying focused on the tasks at hand for school, and finds it hard to get motivation to work on assignments. He knows that putting off his school work will hurt his grades, but he has difficulty to bring himself to get any work done.

5. Professor Johnson assigns a term paper that is due in two weeks. Peter looks at his schedule, which is already quite full with ongoing commitments and deadlines, to find an optimal time to write the first draft and a revision. Most of the time, Peter can schedule time to work on his assignments ahead of deadline, but sometimes he has to choose a time that's quite close to the deadline to make the best use of his time and/or to be able to fulfill his other commitments. Everything in Peter's life is planned and gets done according to his schedule.
6. Sabrina intentionally postpones working on her school assignments. She finds it kind of exciting to come face to face with a deadline. Some of her friends get all stressed out when they have to do work at the last minute, but Sabrina is satisfied with her work and doesn't feel any negative effects from postponing her assignments.
7. Andrea is about to start studying for her exam, but she tells herself she will start after she checks her email. But after she checks her email, she finds herself checking the news, then Facebook, then taking a break for lunch, and before she knows it, the day is over and she hasn't studied at all. Another time, before her last assignment, she found herself cleaning the house, calling her friends, and organizing her desk. She keeps postponing her school work until the last minute. She feels stressed about having to rush and believes her work is not as good as it could be if she could get started earlier or put more time into it.
8. Martha is the type of student who is a busy "doer," working non-stop with no time to waste. Her schedule is crazy busy with no room for anything extra, but she still tries to find time if someone important to her asks for something. In terms of school work, she sometimes changes her initial plans again and again to meet other important commitments, and therefore postpones some of her school work until near the deadline. She is generally not satisfied with the way she does her school tasks and her busy lifestyle.
9. Dimitri has been postponing doing his assigned readings and lab reports for awhile now. It seems like something more fun always comes up. He knows his grades are not as good as they could be, but he's having a good time and that's what he really cares about right now.

10. James has a midterm exam and an assignment due in 2 weeks. He knows that he needs to do the work to pass the course but he has a difficult time to focusing on his work due to his mental health condition. He has suffered from this condition for some time. This has affected his performance in school and often led him to delay his work. James generally does not postpone his tasks when the symptoms of his mental illness are under control.
11. Professor Johnson assigns a writing assignment that is due in two weeks. Joe looks at his calendar and realizes that the best time—or maybe the only time—for him to work on the assignment is the two days before it's due. It's not that he puts off working on the paper until the last minute for unnecessary reasons or activities; but because he has to travel for his sport team on the weekend and he has two other assignments due before this paper. He knows that the optimal time for him to focus on that assignment is 2 days before it's due, and he knows that's enough time for him to do a good job. This is how Joe organizes his time and activities. He has a reasonable number of commitments and tasks and generally makes good use of his time. He schedules some tasks well ahead of the deadline and others close to the deadline. He is usually able to stick to his schedule.
12. Devon gets a kick out of working under pressure, so he intentionally puts off writing papers and studying for exams. Last semester, he wrote two essays and a lab report in three days on very little sleep, then had less than a week to catch up on his readings and study for his exams. He doesn't think this affected his grades and he found it exciting to rush at the last minute.
13. Although Alex usually intends to get his school work done ahead of time, he ends up wasting time on things he knows are less important. He ends up having to rush to finish his school work at the last minute, which causes him to be stressed out. He thinks he would do better in school if he could break this habit.
14. Adam tends to have lots of demands on his time from work, school, family and friends. For example, Adam has a lot going on this semester; he is taking a full course load, has a part-time job, is involved in extracurricular activities and also has to put some time aside for his family and friends. Adam wants to work on his school tasks ahead of the deadline, but he often has to put them off to fulfill other commitments. Adam sometimes feels

emotional distress when has to postpone academic tasks and is generally not happy about his delay.

15. Others (e.g., Professors or parents) say that Tina should put more time and effort into her school work. But the truth is, she prefers to hang out with her friends and download music. Generally she likes to do things that are fun and interesting, and schoolwork doesn't qualify. As a result, she often works on her school work near the deadline and does not get very good grades. Tina does not see her behaviour or grades as a problem.
16. Marta usually plans to work on her school tasks ahead of time and is able to accomplish most of her tasks on time, according to her plan. However, recently she suffered a loss of someone very close and has a hard time concentrating on anything. She is grieving and therefore cannot focus on her school work. She knows that the delay will likely have a negative effect on her academic performance, considering she will need to catch up on a lot of stuff.
17. Claire always makes plans and is good at prioritizing various tasks. Even though she is very busy and has a full schedule of activities, she always manages to get things done. This semester, she has 4 midterms and a lab report due all in one week as well as her usual part-time job and other commitments. She chose some tasks to begin working on early while leaving the rest to start right before the deadline. This sometimes causes her some stress but she generally manages to follow her initial plan and complete all of her assignments on time.
18. Anna does most of her assignments right before the deadline, sometimes staying up all night to get something handed in on time. This is a pretty intense experience, but she doesn't mind working under pressure. In fact, Anna felt she actually achieved better results when she did her assignments and papers right before they were due.

Short List of Academic Tasks

- Writing assignments (e.g., essays, term papers, reports, or thesis)

- Assigned readings (e.g., textbook, chapter, articles, or other assigned readings)
- Exam Preparation (studying for exams)
- Other Major Academic Tasks:.....

Appendix G:

Validation Instruments Study 6 to 9

Marlowe-Crowne Social Desirability Scale (MCSD; Crowne & Marlowe, 1960)

Personal Reaction Inventory

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you personally.

1. Before voting I thoroughly investigate the qualifications of all the candidates. (T)
2. I never hesitate to go out of my way to help someone in trouble. (T)
3. It is sometimes hard for me to go on with my work if I am not encouraged. (F)
4. I have never intensely disliked anyone. (T)
5. On occasion I have had doubts about my ability to succeed in life. (F)
6. I sometimes feel resentful when I don't get my way. (F)
7. I am always careful about my manner of dress. (T)
8. My table manners at home are as good as when I eat out in a restaurant. (T)
9. If I could get into a movie without paying and be sure I was not seen I would probably do it. (F) ,
10. On a few occasions, I have given up doing something because I thought too little of my ability. (F)
11. I like to gossip at times. (F)
12. There have been times when I felt like rebelling against people in authority even though I knew they were right. (F)
13. No matter who I'm talking to, I'm always a good listener. (T)
14. I can remember "playing sick" to get out of something. (F)
15. There have been occasions when I took advantage of someone. (F)
16. I'm always willing to admit it when I make a mistake. (T)
17. I always try to practice what I preach. (T)

- 18. I don't find it particularly difficult to get along with loud mouthed, obnoxious people. (T)
- 19. I sometimes try to get even rather than forgive and forget. (F)
- 20. When I don't know something I don't at all mind admitting it. (T)
- 21. I am always courteous, even to people who are disagreeable. (T)
- 22. At times I have really insisted on having things my own way. (F)
- 23. There have been occasions when I felt like smashing things. (F)
- 24. I would never think of letting someone else be punished for my wrongdoings. (T)
- 25. I never resent being asked to return a favour. (T)
- 26. I have never been irked when people expressed ideas very different from my own. (T)
- 27. I never make a long trip without checking the safety of my car. (T)
- 28. There have been times when I was quite jealous of the good fortune of others. (F)
- 29. I have almost never felt the urge to tell someone off. (T)
- 30. I am sometimes irritated by people who ask favours of me. (F)
- 31. I have never felt that I was punished without cause. (T)
- 32. I sometimes think when people have a misfortune they only got what they deserved. (F)
- 33. I have never deliberately said something that hurt someone's feelings. (T)

Big Five Personality Inventory (BFI; John & Srivastava, 1999)

Questions:

For each of the 44 characteristics listed below, rate how descriptive each characteristic is of you using the scale from 1 (disagree strongly) to 5 (agree strongly). I see myself as someone who...

1	2	3	4	5
Strongly disagree	Disagree a little	Neither agree nor disagree	Agree a little	Strongly agree

- 1. Is talkative
- 2. Tends to find fault with others

3. Does a thorough job
4. Is depressed, blue
5. Is original, comes up with new ideas
6. Is reserved
7. Is helpful and unselfish to others
8. Can be somewhat careless
9. Is relaxed, handles stress well
10. Is curious about many different things
11. Is full of energy
12. Starts quarrels with others
13. Is a reliable worker
14. Can be tense
15. Is ingenious, a deep thinker
16. Generates a lot of enthusiasm
17. Has a forgiving nature
18. Tends to be disorganized
19. Worries a lot
20. Has an active imagination
21. Tends to be quiet
22. Is generally trusting
23. Tends to be lazy

24. Is emotionally stable, not easily upset
25. Is inventive
26. Has an assertive personality
27. Can be cold and aloof
28. Perseveres until the task is finished
29. Can be moody
30. Values artistic, aesthetic experiences
31. Is sometimes shy and inhibited
32. Is considerate and kind to almost all
33. Does things efficiently
34. Remains calm in tense situations
35. Prefers work that is routine
36. Is outgoing, sociable
37. Is sometimes rude to others
38. Makes plans and follows through
39. Gets nervous
40. Likes to reflect, play with ideas
41. Has few artistic interests
42. Likes to co-operate with others
43. Is easily distracted
44. Is sophisticated in art, music, literature

Procrastination Scale (Lay, 1986)

See Appendix A

Tuckman Procrastination Scale (TPS: Tuckman, 1991)

See Appendix A

Procrastination Assessment Scale – Students (PASS; Solomon & Rothblum, 1984)

See Appendix A

Activities Questionnaire

Activities. Recent research on decision making shows that choices are affected by context. Differences in how people feel, their previous knowledge and experience, and their environment can affect choices. To help us understand how people make decisions, we are interested in information about you. Specifically, we are interested in whether you actually take the time to read the directions; if not, some results may not tell us very much about decision making in the real world. To show that you have read the instructions, please ignore the question below about activities and instead write "I read the instructions" in the "other" space. Thank you.

- Watching Athletics
- Participating in Athletics
- Reading Outside of Work or School
- Watching Movies
- Cooking
- Electronic Games
- Board or Card Games
- Attending Cultural Events
- Religious Activities
- Travel
- Needlework
- Gardening
- Hiking
- Other

Survey Readers Questionnaire (Ver. 1)

A) Skip Items

- Reading outside of work or school is something that I have often done. Please choose not at all for this item since this is a fake item.

- This is a skip item that determines if one has read items carefully. To show that you have read the item, please choose always for this item.
- To show that you have read the items so far, please ignore this item/row and move to the next item.
- I am human and reading this item. To show this fact, please choose.....
- I just want to thank you for reading items and ask you to choose the second option (....) for this row/item.
- I just want to appreciate again that you are reading items carefully and ask you to choose the second option (....) for this row/item.

B) Repeated items

- I am human and need to drink and eat food to survive
- I often do needlework and watch movies early in the morning.
- I do often gardening in the middle of the night while eating ice-cream.
- I like to participate in athletics
- I prefer electronic games over participating in sport
- I play electronic games
- I play card games
- I watch movies.
- I participate in religious activities
- I like cooking
- I attend cultural events

Perceived Academic Performance (PAP)

Based on your understanding of the common standards for satisfactory performance in your department and university, please COMPLETE the following statements according to your overall experience and results during this academic year.

1	2	3	4	5	6	7
Very Good	Good	Somewhat Good	Fair	Somewhat Poor	Poor	Very Poor

1. So far in this academic year, my grades have been.....
2. So far in this academic year, my overall performance in school has been.....
3. My GPA/ course grades are....
4. So far in this academic year, the quality of my academic work has been.....
5. So far in this academic year, the progress in my studies has been.....
6. So far in this academic year, my understanding of course concept or content generally has been-----
7. So far in this academic year, my understanding of course subjects generally has been.....

Self-Other Performance Evaluation (SOPE)

Please indicate how much you agree or disagree with the following statement which are about your satisfaction and current academic performance.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	slightly agree	Agree	Strongly agree

1. I am satisfied with the quality of my current academic work.
2. I am satisfied with my current academic performance.
3. My father (or father-like figure) is satisfied with my current academic performance.
4. My mother (or mother-like figure) is satisfied with my current academic performance.
5. My partner is satisfied with my current academic performance.
6. I am happy with my GPA.
7. My father (or father-like figure) is happy with my GPA.
8. My mother (or mother-like figure) is happy with my GPA.
9. My significant other is satisfied with my GPA.
10. Academically, I am performing up to my own standards.
11. Academically, I am performing up to the standards of my father (or father-like figure).
12. Academically, I am performing up to the standards of my mother (or mother-like figure)
13. Academically, I am performing up to the standards of my partner.
14. Based on my definition of success, I am a successful student.
15. Based on my father's definition of success, I am a successful student.
16. Based on my mother's definition of success, I am a successful student.
17. Based on my significant other's definition of success, I am a successful student.
18. I am performing as well as I would like in my studies.
19. Based on my father's expectations, I am performing well.
20. Based on my mother's expectations, I am performing well.
21. Based on my significant others' expectations, I am performing well.

SSRQ (31-item) – For student populations

Instructions:

Please answer the following questions by choosing the response that best describes how you are. If you

STRONGLY DISAGREE with a statement, select 1. If you DISAGREE select 2. If you are UNCERTAIN or UNSURE select 3. If you AGREE select 4, and if you STRONGLY AGREE select 5. There are no right or wrong answers. Work quickly and don't think too long about your answers.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1	2	3	4	5

- 1) I usually keep track of my progress toward my goals
- 2) **I have trouble making up my mind about things**
- 3) **I get easily distracted from my plans**
- 4) **I don't notice the effects of my actions until it's too late**
- 5) I'm able to accomplish goals I set for myself
- 6) **I put off making decisions**
- 7) **It's hard for me to notice when I've had enough (alcohol, food, sweets)**
- 8) If I wanted to change, I am confident that I could do it
- 9) **When it comes to deciding about a change, I feel overwhelmed by the choices**
- 10) **I have trouble following through with things once I've made up my mind to do something**
- 11) **I don't seem to learn from my mistakes**
- 12) I can stick to a plan that is working well
- 13) I usually only have to make a mistake one time in order to learn from it
- 14) I have personal standards, and try to live up to them
- 15) As soon as I see a problem or challenge, I start looking for possible solutions
- 16) **I have a hard time setting goals for myself**
- 17) I have a lot of willpower
- 18) When I'm trying to change something, I pay attention to how I'm doing
- 19) **I have trouble making plans to help me reach goals**
- 20) I am able to resist temptation
- 21) I set goals for myself and keep track of my progress
- 22) **Most of the time I don't pay attention to what I'm doing**
- 23) **I tend to keep doing the same thing, even when it doesn't work**
- 24) I can usually find several different possibilities when I want to change something
- 25) Once I have a goal, I can usually plan how to reach it
- 26) If I make a resolution to change something, I pay a lot of attention to how I'm doing
- 27) **Often I don't notice what I'm doing until someone calls it to my attention**
- 28) I usually think before I act
- 29) I learn from my mistakes
- 30) I know how I want to be
- 31) **I give up quickly**

Eysenck Impulsivity Scale

Answer yes/ no to the following questions

1. Do you often buy things on impulse?
2. Do you generally do and say things without stopping to think?
3. Do you often get into a jam because you do things without thinking?
4. Are you an impulsive person?
5. Do you usually think carefully before doing anything? (R)
6. Do you often do things on the spur of the moment?
7. Do you mostly speak before thinking things out?
8. Do you often get involved in things you later wish you could get out of?
9. Do you get so "carried away" by new and exciting ideas, that you never think of possible snags?
10. Do you need to use a lot of self-control to keep out of trouble?
11. Would you agree that almost everything enjoyable is illegal or immoral?
12. Are you often surprised at people's reactions to what you do or say?
13. Do you think an evening out is more successful if it is unplanned or arranged at the last moment?
14. Do you usually work quickly, without bothering to check?
15. Do you often change your interests?
16. Before making up your mind, do you consider all the advantages and disadvantages? (R)
17. Do you prefer to 'sleep on it' before making decisions? (R)
18. When people shout at you, do you shout back?
19. Do you usually make up your mind quickly?

Perceived Academic Performance (PAP, Haghbin 2015)

Based on your understanding of the common standards for satisfactory performance in your department and university, please COMPLETE the following statements according to your overall experience and results during this academic year.

1	2	3	4	5	6	7
Very Good	Good	Somewhat Good	Fair	Somewhat Poor	Poor	Very Poor

8. So far in this academic year, my grades have been.....

9. So far in this academic year, my overall performance in school has been.....
10. My GPA/ course grades are....
11. So far in this academic year, the quality of my academic work has been.....
12. So far in this academic year, the progress in my studies has been.....
13. So far in this academic year, my understanding of course concept or content generally has been-----
14. So far in this academic year, my understanding of course subjects generally has been.....

Self-Other Performance Evaluation (SOPE)

Please indicate how much you agree or disagree with the following statement which are about your satisfaction and current academic performance.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	slightly agree	Agree	Strongly agree

22. I am satisfied with the quality of my current academic work.
23. I am satisfied with my current academic performance.
24. My father (or father-like figure) is satisfied with my current academic performance.
25. My mother (or mother-like figure) is satisfied with my current academic performance.
26. My partner is satisfied with my current academic performance.
27. I am happy with my GPA.
28. My father (or father-like figure) is happy with my GPA.
29. My mother (or mother-like figure) is happy with my GPA.
30. My significant other is satisfied with my GPA.
31. Academically, I am performing up to my own standards.
32. Academically, I am performing up to the standards of my father (or father-like figure).
33. Academically, I am performing up to the standards of my mother (or mother-like figure)
34. Academically, I am performing up to the standards of my partner.
35. Based on my definition of success, I am a successful student.
36. Based on my father's definition of success, I am a successful student.
37. Based on my mother's definition of success, I am a successful student.
38. Based on my significant other's definition of success, I am a successful student.
39. I am performing as well as I would like in my studies.
40. Based on my father's expectations, I am performing well.
41. Based on my mother's expectations, I am performing well.
42. Based on my significant others' expectations, I am performing well.

Please respond to each of the following items in terms of how true it is for you with respect to dealing with your course work (academic tasks).

1. I feel confident in my ability to manage my course work
2. I am capable of handling my coursework now.
3. I am able to handle my coursework schedule.
4. I feel able to meet the challenge of completing my coursework on schedule.

Demographics (Study II-A)

The following questions include background information. All information provided will be kept strictly confidential. The background information will be used only for data analyses (e.g., correlation) and group comparisons (e.g., gender differences).

What is your gender? (Choose one of the following answers)

Female Male

How old are you?

_____ (years old)

What is your current grade point average (GPA)?

If you graduated from high school, what was your high school grade point average (GPA)? For example (3 out of 4 or 9 out of 12)

What is your major field of study?

How many years have you completed of post-secondary education?

1. Less than 1 yr
2. 1 year
3. 2 years
4. 3 years
5. 4 years
6. 5 years
7. 6 yrs or more
9. Not applicable

If answer 0 to 2:

How many semesters have you registered in your program?

Open ended

Have you taken this survey before? Yes/no

What is your current registration status?

- B.A. Student
- B.Sc. Student
- B.A. Honours Student
- B.Sc. Honours Students
- M.A. student
- Ph.D. Student

How many university classes are you enrolled in this semester?

1 2 3 4 5 More than 5

How many university classes were you enrolled in last semester?

1 2 3 4 5 More than 5 Not Applicable

Are you a full-time student?

Yes / No

What language do you speak most often at home? (Choose one)

1. English
2. French
3. Spanish
4. Aboriginal Language
3. Other please specify: _____

How would you rate your English reading comprehension?

Beginner Intermediate Advanced Superior Native

How would you rate your writing skills in English?

Very Low Low Medium High Very High

Please indicate which options best represent your ethnic background: Select all that apply.

White/European

Aboriginal (North American Indian, Métis, Inuit)

Arab (e.g. Saudi, Egyptian, Iraqi, Lebanese, Palestinian, Syrian)

Black (e.g. African, African American, African Canadian, Caribbean)

East Asian (e.g. Chinese, Japanese, Korean, Polynesian)

Latin American

South Asian (e.g. Indian, Pakistani, Sri Lanka, Bangladesh)

Southeast Asian (e.g. Burmese, Filipino, Indonesian, Malaysian, Thai, Vietnamese)

West Asian (e.g. Afghan, Armenian, Iranian, Israeli, Turks, etc.)

Prefer not to answer

Other (please specify)

What is your place of birth?

- Born in Canada. Please specify province or territory _____
- Born outside Canada. Please specify country: _____

What is your present citizenship status?

- Canadian citizen by birth
- Canadian citizen by naturalization (“*Canadian citizen by naturalization*” refers to the process by which an immigrant is granted citizenship of Canada, under the Citizenship Act.)
- Canadian Permanent Resident
- Temporary Resident Visa (Student visa or other non-immigrant visa.)
- No status in Canada

Note: Canadian citizen by naturalization refers to the process by which an immigrant is granted citizenship of Canada, under the Citizenship Act

Will you recommend participating in this study to other students?

Yes No

Please use the space below to make any additional comments you may have about this survey.

Appendix H:

Validation Instrument Study 10

PWB

The following set of questions deals with how you feel about yourself and your life.

Please remember that there are no right or wrong answers.

1. Most people see me as loving and affectionate.
2. I am not afraid to voice my opinion, even when they are in opposition to the opinions of most people.
3. In general, I feel I am in charge of the situation in which I live.
4. I am not interested in activities that will expand my horizons.
5. I live life one day at a time and don't really think about the future.
6. When I look at the story of my life, I am pleased with how things have turned out.
7. Maintaining close relationships has been difficult and frustrating for me.
8. My decisions are not usually influenced by what everyone else is doing.
9. The demands of everyday life often get me down.
10. I don't want to try new ways of doing things—my life is fine the way it is.
11. I tend to focus on the present, because the future always brings me problems.
12. In general, I feel confident and positive about myself.
13. I often feel lonely because I have few close friends with whom to share my concerns.
14. I tend to worry about what other people think of me.
15. I do not fit very well with the people and the community around me.
16. I think it is important to have new experiences that challenge how you think about yourself and the world.
17. My daily activities often seem trivial and unimportant to me.
18. I feel like many of the people I know have gotten more out of life than I have.
19. I enjoy personal and mutual conversations with family members or friends.
20. Being happy with myself is more important to me than having others approve of me.
21. I am quite good at managing the many responsibilities of my daily life.
22. When I think about it, I haven't really improved much as a person over the years.
23. I don't have a good sense of what it is I'm trying to accomplish in my life.
24. I like most aspects of my personality.
25. I don't have many people who want to listen when I need to talk.
26. I tend to be influenced by people with strong opinions.
27. I often feel overwhelmed by my responsibilities.
28. I have a sense that I have developed a lot as a person over time.
29. I used to set goals for myself, but that now seems a waste of time.
30. I made some mistakes in the past, but I feel that all in all everything has worked out for the best.
31. It seems to me that most other people have more friends than I do.

32. I have confidence in my opinions, even if they are contrary to the general consensus.
33. I generally do a good job of taking care of my personal finances and affairs.
34. I do not enjoy being in new situations that require me to change my old familiar ways of doing things.
35. I enjoy making plans for the future and working to make them a reality.
36. In many ways, I feel disappointed about my achievements in my life.
37. People would describe me as a giving person, willing to share my time with others.
38. It's difficult for me to voice my own opinions on controversial matters.
39. I am good at juggling my time so that I can fit everything in that needs to be done.
40. For me, life has been a continuous process of learning, changing, and growth.
41. I am an active person in carrying out the plans I set for myself.
42. My attitude about myself is probably not as positive as most people feel about themselves.
43. I have not experienced many warm and trusting relationships with others.
44. I often change my mind about decisions if my friends or family disagree.
45. I have difficulty arranging my life in a way that is satisfying to me.
46. I gave up trying to make big improvements or change in my life a long time ago.
47. Some people wander aimlessly through life, but I am not one of them.
48. The past has its ups and downs, but in general, I wouldn't want to change it.
49. I know that I can trust my friends, and they know they can trust me.
50. I judge myself by what I think is important, not by the values of what others think is important.
51. I have been able to build a home and a lifestyle for myself that is much to my liking.
52. There is truth to the saying that you can't teach an old dog new tricks.
53. I sometimes feel as if I've done all there is to do in life.
54. When I compare myself to friends and acquaintances, it makes me feel good about who I am.

AEQ Test Anxiety(AEQTA)

Tests and exams can induce different feelings. This part of the questionnaire refers to emotions you may experience when taking tests or exams at university. Before answering the questions on the following pages, please recall some typical situations of testtaking or exams which you have experienced during the course of your studies. Read each item carefully and RESPOND USING THE SCALE PROVIDED.

[]BEFORE TAKING THE TEST / EXAM The following questions pertain to feelings you may experience BEFORE taking a test or an exam. Please indicate how you feel, typically, before taking a test or an exam.

Please choose the appropriate response for each item:

	1 Strongly disagree	2	3	4	5 Strongly agree
I worry whether I have studied enough.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel sick to my stomach.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Before the exam I feel nervous and uneasy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get so nervous I wish I could just skip the exam.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I worry whether the test will be too difficult.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[]DURING TAKING THE TEST / EXAM The following questions pertain to feelings you may experience DURING taking a test or an exam. Please indicate how you feel, typically, during taking a test or an exam.

Please choose the appropriate response for each item:

	1 Strongly disagree	2	3	4	5 Strongly agree
I worry whether I will pass the exam.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At the beginning of the test, my heart starts pounding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am very nervous.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My hands get shaky.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get so nervous I can't wait for the exam to be over.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel panicky when writing the exam.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am so anxious that I'd rather be anywhere else.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ACS-24 Sample Items:

Action Control Scale (ACS-90)

Choose the one of the possible answers (A or B) that is most like you and give an answer for every question on the supplied answer sheet. Please don't make any marks on this questionnaire.

1. When I have lost something valuable and can't find it anywhere:
A) I have a hard time concentrating on anything else.
B) I don't dwell on it.
2. When I know I must finish something soon:
A) I have to push myself to get started.
B) I find it easy to get it done and over with.
3. When I have learned a new and interesting game:
() A) I quickly get tired of it and do something else.
B) I can really get into it for a long time.

PROMIS Measures:

[] Please respond to each item.					
Please choose the appropriate response for each item:					
	1	2	3	4	5
	Poor	Fair	Good	Very Good	Excellent
In general, would you say your health is:	<input type="radio"/>				
In general, would you say your quality of life is:	<input type="radio"/>				
In general, how would you rate your physical health?	<input type="radio"/>				
In general, how would you rate your mental health, including your mood and your ability to think?	<input type="radio"/>				
In general, how would you rate your satisfaction with your social activities and relationships?	<input type="radio"/>				
In general, please rate how well you carry out your usual social activities and roles. (This includes activities at home, at work and in your community, and responsibilities as a parent, child, spouse, employee, friend, etc.).	<input type="radio"/>				

[]

Please choose the appropriate response for each item:

	1	2	3	4	5
	Not at all	A little	Moderately	Mostly	Completely
To what extent are you able to carry out your everyday physical activities such as walking, climbing stairs, carrying groceries, or moving a chair?	<input type="radio"/>				

[] In the past 7 days...

Please choose the appropriate response for each item:

	1	2	3	4	5
	Always	Often	Sometimes	Rarely	Never
How often have you been bothered by emotional problems such as feeling anxious, depressed or irritable?	<input type="radio"/>				
How would you rate your fatigue on average?	<input type="radio"/>				

[]

Please choose the appropriate response for each item:

	1	2	3	4	5	6	7	8	9	10
	No pain									Worst imaginable pain
How would you rate your pain on average?	<input type="radio"/>									

Perceived Stress Scale

Instructions: The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please indicate with a check how often you felt or thought a certain way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

3. In the last month, how often have you felt nervous and "stressed"?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

5. In the last month, how often have you felt that things were going your way?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

7. In the last month, how often have you been able to control irritations in your life?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

8. In the last month, how often have you felt that you were on top of things?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

9. In the last month, how often have you been angered because of things that were outside of your control?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

Please rate the degree of stress that you have experienced in the past two weeks:

1= a little.....10=extremely

Please rate the degree of stress that you have experienced in the past 6 months:

1= a little.....10=extremely

Self Esteem

SES

Instructions: Below is a list of statements dealing with your general feelings about yourself. Please use the scale to indicate to what extent you agree or disagree with the statement.

scale: 1 = Strongly disagree 2=Disagree 3=Agree 4 = Strongly agree

1. On the whole, I am satisfied with myself.
2. At times, I think I am no good at all.
3. I feel that I have a number of good qualities.

4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel that I'm a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude toward myself.

PCS

Please respond to each of the following items in terms of how true it is for you with respect to dealing with your course work (academic tasks).

1. I feel confident in my ability to manage my course work
2. I am capable of handling my coursework now.
3. I am able to handle my coursework schedule.
4. I feel able to meet the challenge of completing my coursework on schedule.

Self-Control Scale (SCS)

Instructions:

Using the scale provided, please indicate how much each of the following statements reflects how you typically are.

Long version

1. I am good at resisting temptation.
2. I have a hard time breaking bad habits. (R)
3. I am lazy. (R)
4. I say inappropriate things. (R)
5. I never allow myself to lose control.
6. I do certain things that are bad for me, if they are fun. (R)
7. People can count on me to keep on schedule.
8. Getting up in the morning is hard for me. (R)
9. I have trouble saying no. (R)
10. I change my mind fairly often. (R)
11. I blurt out whatever is on my mind. (R)
12. People would describe me as impulsive. (R)
13. I refuse things that are bad for me.
14. I spend too much money. (R)
15. I keep everything neat.
16. I am self-indulgent at times. (R)
17. I wish I had more self-discipline. (R)
18. I am reliable.

19. I get carried away by my feelings. (R)
20. I do many things on the spur of the moment. (R)
21. I don't keep secrets very well. (R)
22. People would say that I have iron self- discipline.
23. I have worked or studied all night at the last minute. (R)
24. I'm not easily discouraged.
25. I'd be better off if I stopped to think before acting. (R)
26. I engage in healthy practices.
27. I eat healthy foods.
28. Pleasure and fun sometimes keep me from getting work done. (R)
29. I have trouble concentrating.(R)
30. I am able to work effectively toward long-term goals.
31. Sometimes I can't stop myself from doing something, even if I know it is wrong. (R)
32. I often act without thinking through all the alternatives. (R)
33. I lose my temper too easily. (R)
34. I often interrupt people. (R)
35. I sometimes drink or use drugs to excess.(R)
36. I am always on time.

Time-management Questionnaire (TQ)

Response options: always, frequently, sometimes, infrequently, and never

Short-Range Planning

1. Do you make a list of the things you have to do each day?
2. Do you plan your day before you start it?
3. Do you make a schedule of the activities you have to do on work days?
4. Do you write a set of goals for yourself for each day?
5. Do you spend time each day planning?
6. Do you have a clear idea of what you want to accomplish during the next week?
7. Do you set and honor priorities?

Time Attitudes

1. Do you often find yourself doing things which interfere with your schoolwork simply because you hate to say "No" to people? ®
2. Do you feel you are in charge of your own time, by and large?
3. On an average class day do you spend more time with personal grooming than doing schoolwork? ®
4. Do you believe that there is room for improvement in the way you manage your time? ®
5. Do you make constructive use of your time?
6. Do you continue unprofitable routines or activities? ®

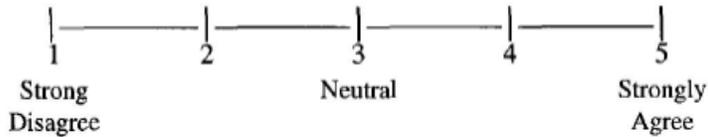
Long-Range Planning

1. Do you usually keep you desk clear of everything other than what you are currently working on?
2. Do you have a set of goals for the entire quarter?

3. The night before a major assignment is due, are you usually still working on it? ®
4. When you have several things to do, do you think it is best to do a little bit of work on each one?
5. Do you regularly review your class notes, even when a test is not imminent?

Frost Multidimensional Perfectionism Scale (FMPS)

Please write in the space provided beside each item the number that best corresponds to your agreement with each statement below. Use the scale provided.



1. My parents set very high standards for me.
2. Organization is very important to me.
3. As a child, I was punished for doing things less than perfectly.
4. If I do not set the highest standards for myself, I am likely to end up a second rate person.
5. My parents never tried to understand my mistakes.
6. It is important to me that I be thoroughly competent in everything that I do.
7. I am a neat person.
8. I try to be an organized person.
9. If I fail at work/school, I am a failure as a person.
10. I should be upset if I make a mistake.
11. My parents wanted me to be the best at everything.
12. I set higher goals than most people.
13. If someone does a task at work/school better than I, then I feel like I failed the whole task.
14. If I fail partly, it is as bad as being a complete failure.
15. Only outstanding performance is good enough for my family.
16. I am very good at focusing my efforts on attaining a goal.
17. Even when I do something very carefully, I often feel that it is not quite right.
18. I hate being less than the best at things.
19. I have extremely high goals.
20. My parents have expected excellence from me.
21. People will probably think less of me if I make a mistake.
22. I never felt like I could meet my parents' expectations.
23. If I do not do as well as other people, it means that I am an inferior human being.
24. Other people seem to accept lower standards from themselves than I do.
25. If I do not do well all the time, people will not respect me.
26. My parents have always had higher expectations for my future than I have.
27. I try to be a neat person.
28. I usually have doubts about the simple everyday things I do.
29. Neatness is very important to me.
30. I expect higher performance in my daily tasks than most people.
31. I am an organized person.

32. I tend to get behind in my work because I repeat things over and over.
33. It takes me a long time to do something “right.”
34. The fewer mistakes I make, the more people will like me.
35. I never felt like I could meet my parents’ standards.

Spontaneous and Self-sacrificing Personality style (PSSI)

Please rate the degree to which each statement applies to you or your current situation, using the given scale:

1. I often feel an emotional void inside of me.
2. People easily take advantage of me.
3. My self-esteem at times fluctuates rapidly between very positive and very negative feelings.
4. It's easier for me to consider the needs of others than my own needs.
5. My feelings about something or someone frequently change very abruptly.
6. I sometimes feel bad because I empathize so strongly with the suffering of others.
7. I have sometimes had an impulse to harm myself.
8. The problems of other people preoccupy me more than my own needs.

OCI-R Questionnaire

The following statements refer to experiences that many people have in their everyday lives. Circle the number that best describes **HOW MUCH** that experience has **DISTRESSED or BOTHERED you during the PAST MONTH**. The numbers refer to the following verbal labels:

0	1	2	3	4
Not at all	A little	Moderately	A lot	Extremely

1. I have saved up so many things that they get in the way.
2. I check things more often than necessary.
3. I get upset if objects are not arranged properly.
4. I feel compelled to count while I am doing things.
5. I find it difficult to touch an object when I know it has been touched by strangers or certain people.

6. I find it difficult to control my own thoughts.
7. I collect things I don't need.
8. I repeatedly check doors, windows, drawers, etc.
9. I get upset if others change the way I have arranged things.
10. I feel I have to repeat certain numbers.
11. I sometimes have to wash or clean myself simply because I feel contaminated.
12. I am upset by unpleasant thoughts that come into my mind against my will.
13. I avoid throwing things away because I am afraid I might need them later.
14. I repeatedly check gas and water taps, and light switches after turning them off.
15. I need things arranged in a particular order.
16. I feel that there are good and bad numbers.
17. I wash my hands more often and longer than necessary.
18. I frequently get nasty thoughts and have difficulty in getting rid of them.

Brief Cope

We are interested in how people respond when they confront difficult or stressful events in their lives. There are lots of ways to try to deal with stress. This questionnaire asks you to indicate what you generally do and feel, when you experience stressful events. Obviously, different events bring out somewhat different responses, but think about what you usually do when you are under a lot of stress.

Then respond to each of the following items by blackening one number on your answer sheet for each, using the response choices listed just below. Please try to respond to each item separately in your mind from each other item. Choose your answers thoughtfully, and make your answers as true FOR YOU as you can. Please answer every item. There are no "right" or "wrong" answers, so choose the most accurate answer for YOU--not what you think "most people" would say or do. Indicate what YOU usually do when YOU experience a stressful event.

- 1 = I usually don't do this at all
- 2 = I usually do this a little bit

3 = I usually do this a medium amount

4 = I usually do this a lot

1. I turn to work or other activities to take my mind off things.
2. I concentrate my efforts on doing something about the situation I'm in.
3. I say to myself "this isn't real."
4. I use alcohol or other drugs to make myself feel better.
5. I get emotional support from others.
6. I give up trying to deal with it.
7. I take action to try to make the situation better.
8. I refuse to believe that it has happened.
9. I say things to let my unpleasant feelings escape.
10. I get help and advice from other people.
11. I use alcohol or other drugs to help me get through it.
12. I try to see it in a different light, to make it seem more positive.
13. I criticize myself.
14. I try to come up with a strategy about what to do.
15. I get comfort and understanding from someone.
16. I give up the attempt to cope.
17. I look for something good in what is happening.
18. I make jokes about it.
19. I do something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.
20. I accept the reality of the fact that it has happened.
21. I express my negative feelings.
22. I try to find comfort in my religion or spiritual beliefs.
23. I try to get advice or help from other people about what to do.
24. I learn to live with it.
25. I think hard about what steps to take.
26. I blame myself for things that happened.
27. I pray or meditating.
28. I make fun of the situation.

Demographic Information

The following questions include background information. It will be used only for data analyses (e.g., correlation) and group comparisons (e.g., gender differences).

What is your gender? (Choose one of the following answers)

Female Male Other (please specify)

What is your year of birth? 19 __

Height : _____ feet _____ inches or _____ cm

Weight: _____ lbs. Or _____ Kg.

What is your marital status?

- Married
- Living common-law
- Widowed
- Separated
- Divorced
- Single, never married

Please indicate the highest level of education you have completed.

- Some elementary school
- Some middle school
- Some high school
- High school diploma
- Some college or university
- B.A. degree
- Some graduate school

- Masters degree
- PhD, JD, MD, EdD, or any other doctoral degree

What have most of your grades been up to now at Carleton University?

- A
- A
- B+
- B
- B
- C+
- C
- C- or lower

Please indicate which options best represent your ethnic background: Select all that apply.

- White /European
- Aboriginal (North American Indian, Métis or Inuit)
- Arab (e.g., Saudi, Egyptian, Iraqi, Lebanese, Palestinian, Syrian etc.)
- Black (e.g., African, African American, African Canadian, Caribbean)
- East Asian (e.g., Chinese, Japanese, Korean, Polynesian)
- Latin American
- South Asian (e.g. Indian, Pakistani, Sri Lankan, Bangladeshi)
- Southeast Asian (e.g. Burmese, Cambodian, Filipino, Indonesian, Laotian, Malaysian, Thai, Vietnamese)
- West Asian (e.g., Afghan, Armenian, Iranian, Israeli, Turks, etc.)
- Other:
- Prefer not to answer

Are you an international student or foreign national?

Yes No

Please use the space below to make any additional comments you may have about this survey.

Appendix I: Other Research Materials

Informed Consent (Study I: Graduate and Undergraduate Students)

Study title: Procrastination Study: Multidimensional Measure of Procrastination (MMoP I-B)

This study has received clearance by the Carleton University Psychology Research Ethics Board (10-).

The purpose of an informed consent is to ensure that you understand the true purpose of the study and that you agree to allow your data to be used for research and teaching purposes.

Research Personnel:

Dr. Timothy A. Pychyl (Faculty Sponsor, Carleton University, tpychyl@connect.carleton.ca, 613-520-2600 x1403)

Mohsen Haghbin (Principle Investigator, Carleton University, mohaghbin@gmail.com, 613-520-2600 x1676)

Should you have any ethical concerns about this research, please contact Dr. Monique Sénéchal (Chair of Carleton University Ethics Committee for Psychological Research, 613-520-2600 x1155, monique_senechal@carleton.ca). For any other concerns, please contact, Dr. Anne Bowker (Chair, Department of Psychology, 613-520-2600x8218, psychchair@carleton.ca).

Purpose: This purpose of this survey is to refine the initial item pool and establish the face and content validity of a new procrastination measure in academic settings known as the Multidimensional Measure of Procrastination (MMoP).

Task requirements and duration: We are asking you to rate the representativeness and clarity of a number of items related to problematic procrastination in academic settings. It will take about 60 minutes to complete the survey.

[NOTE: The following paragraph will be used for undergraduate students in PSYC 2001 or 2002 , registered in the study through SONA system:]

You will receive a 1% increase in your final grade of PSYC 2001 or PSYC 2002 for participating in this study. Alternatively, you can choose at the end of the survey to enter your name in a draw for \$100 gift card and 4 procrastination self-help books (The Procrastinator's Digest: A Concise Guide to Solving the Procrastination Puzzle) signed by Dr. Pychyl.

[The following paragraph will be used for graduate students and other undergraduate students who recruited using other method than SONA announcement:]

At the end of this survey, you can enter your name in a draw for \$100 gift card and 4 procrastination self-help books (The Procrastinator's Digest: A Concise Guide to Solving the Procrastination Puzzle) signed by Dr. Pychyl.

Potential risk/discomfort: There are no known and anticipated psychological or physical risks in this study. However, if you experience some anxiety or discomfort for any unanticipated reason, you may stop participating in the study.

Anonymity/confidentiality: The information you provide during this study will be kept strictly confidential. Access to the data you provide will be limited to the researchers listed above. Your name will not be revealed in any report regarding this research. All of the personal information (e.g., email and name) will be deleted after three years from the completion of the study. To assure the security and confidentiality of online communication in the study, the online study is equipped with encrypted communication features and a security certificate used for secure e-commerce.

Copyright ©: This survey includes copyrighted materials. It may not be translated, stored, recorded, used, transmitted, or reproduced in whole or in part without prior permission in writing from the principal researchers or the developers of the instruments and questionnaires.

Right to Withdraw: Participation in this online research is completely voluntary. You have the right to refuse to answer any question and to withdraw from the study at any time, for any reason, without explanation or penalty.

Clicking yes indicates that you have read the above description and agree to participate in this study. You must answer "yes" if you wish to continue.

Informed Consent (Study II)

Study title: Procrastination Study : Multidimensional Measure of Procrastination (MMoP I-A)

This study has received clearance by the Carleton University Psychology Research Ethics Board (10-).

The purpose of an informed consent is to ensure that you understand the true purpose of the study and that you agree to allow your data to be used for research and teaching purposes.

Research Personnel:

Dr. Timothy A. Pychyl (Faculty Sponsor, Carleton University, tpychyl@connect.carleton.ca, 613-520-2600 x1403)

Mohsen Haghbin (Principle Investigator, Carleton University, mohaghbin@gmail.com, 613-520-2600 x1676)

Should you have any ethical concerns about this research, please contact Dr. Monique Sénéchal (Chair of Carleton University Ethics Committee for Psychological Research, 613-520-2600 x1155, monique_senechal@carleton.ca). For any other concerns, please contact, Dr. Anne Bowker (Chair, Department of Psychology, 613-520-2600x8218, psychchair@carleton.ca).

Purpose: The purpose of this survey is to refine the initial item pool and establish the face and content validity of a new procrastination measure in academic settings known as the Multidimensional Measure of Procrastination (MMoP).

Task requirements and duration: We are asking you to rate the representativeness and clarity of a number of items related to problematic procrastination in academic settings as well as a brief demographic questionnaire (e.g., gender, experience). It will take about 45 minutes to complete the survey and you will be entered in a draw for \$100.

Potential risk/discomfort: There are no known and anticipated psychological or physical risks in this study. However, if you experience some anxiety or discomfort for any unanticipated reason, you may stop participating in the study.

Anonymity/confidentiality: The information you provide during this study will be kept strictly confidential and anonymous. Access to the data you provide will be limited to the researchers listed above. Your name will not be revealed in any report regarding this research. To ensure the security and confidentiality of online communication in the study, the online study is equipped with encrypted communication features and a security certificate used for secure e-commerce.

Copyright ©: This survey includes copyrighted materials. It may not be translated, stored, recorded, used, transmitted, or reproduced in whole or in part without prior permission in writing from the principal researchers.

Right to Withdraw: Participation in this online research is completely voluntary. You have the right to refuse to answer any question and to withdraw from the study at any time, for any reason, without explanation or penalty.

Clicking yes indicates that you have read the above description and agree to participate in this study. You must answer "yes" if you wish to continue.

Informed Consent (Study III)

Study title: Procrastination Study: Multidimensional Measure of Procrastination (MMoP, I-C).

This study has received clearance by the Carleton University Psychology Research Ethics Board (10-).

The purpose of informed consent is to ensure that you understand the purpose of the study and that you agree to allow your data to be used for research and teaching purposes.

Research Personnel:

Dr. Timothy A. Pychyl (Faculty Sponsor, Carleton University, tpychyl@connect.carleton.ca, 613-520-2600 x1403)

Mohsen Haghbin (Principle Investigator, Carleton University, mohaghbin@gmail.com, 613-520-2600 x1676)

Should you have any ethical concerns about this research, please contact Dr. Monique Sénéchal (Chair of Carleton University Ethics Committee for Psychological Research, 613-520-2600 x1155, monique_senechal@carleton.ca). For any other concerns, please contact, Dr. Anne Bowker (Chair, Department of Psychology, 613-520-2600x8218, psychchair@carleton.ca).

Purpose: The purpose of this study is to develop and refine a questionnaire that measures needless delay on academic tasks. In this questionnaire, we are interested in your thoughts and emotions when you delay on academic tasks.

Task requirements: We are asking you to respond to a number of items related to delay on three main academic tasks (writing, reading, studying for exam). As you are reading and rating items, the principal researcher will ask you several open-ended questions about your thoughts and/or how you formulate your answers and rate items. After completing the questionnaires, you will receive a debriefing form. With your permission, the interview will be tape-recorded.

Duration, Location and Remuneration: This study will take about 110 minutes and take place at Loeb Building, Room A812, Carleton University. You will receive a 2% increase in your final grade of PSYC 1001, PSYC 1002, PSYC 2001 or PSYC 2002 for participating in this study.

Potential risk/discomfort: There are no known or anticipated psychological or physical risks in this study. However, if you experience anxiety or discomfort for any unanticipated reason, you may stop participating in the study. You may wish to speak to a counsellor at Carleton Health and Counselling Services, 613-520-6674 or the Distress Centre of Ottawa and Region, 613- 238-3311.

Anonymity/confidentiality: The information you provide during this study will be kept strictly confidential. Your name or other identifying information will not be associated with your interview and will be removed during transcription (note-taking). All materials (e.g., notes, interview files) in this study will be kept in a secure location in Dr. Pychyl's research office for up to 5 years and will then be destroyed.

Right to Withdraw: Participation in this study is completely voluntary. You have the right to refuse to answer any question and to withdraw from the study at any time, for any reason, without explanation or penalty.

Clicking yes indicates that you have read the above description and agree to participate in this study. You must answer "yes" if you wish to continue.

Informed Consent (Study 6)

Study title: Procrastination Study: Multidimensional Measure of Procrastination (MMoP, II-AB).

This study has received clearance by the Carleton University Psychology Research Ethics Board (10-).

The purpose of an informed consent is to ensure that you now understand the true purpose of the study and that you agree to allow your data to be used for research and teaching purposes.

Research Personnel:

Dr. Timothy A. Pychyl (Faculty Sponsor, Carleton University, tpychyl@connect.carleton.ca, 613-520-2600 x1403)

Mohsen Haghbin (Principle Investigator, Carleton University, mohaghbin@gmail.com, 613-520-2600 x1676)

Should you have any ethical concerns about this research, please contact Dr. Monique Sénéchal (Chair of Carleton University Ethics Committee for Psychological Research, 613-520-2600 x1155, monique_senechal@carleton.ca). For any other concerns, please contact, Dr. Anne Bowker (Chair, Department of Psychology, 613-520-2600x8218, psychchair@carleton.ca).

What is the goal of this project? The purpose of this study is to develop and refine a questionnaire that measures needless delay or procrastination on academic tasks as well as to evaluate the reliability and validity of the measure. In this questionnaire, we are interested in your thoughts and emotions when you delay on academic tasks.

What will be asked of me? You will be asked to complete a demographic survey and a set of questions related to delay on three main academic tasks (the new procrastination questionnaire), your personal characteristics, and your experience as a student in the university. Because this study requires some follow-up, we also require your permission for the researcher to access your university grades in the Carleton University database.

There are two stages in this study. You may choose to participate in stage one alone or in both stages.

- **Stage one** will take approximately 100 minutes of your time. This stage will involve completing the new procrastination self-report and several measures that mentioned above.
- **Stage two** will take place three to five weeks after stage one and will take approximately 60 minutes. This stage will involve only completing the procrastination questionnaire for the second time.

What is in it for me? In addition to our appreciation, you will receive a 2% increase in your final grade of PSYC 1001, PSYC 1002, PSYC 2001 or PSYC 2002 for participating in Stage 1 and an additional 1% increase for participating in Stage 2. Alternatively, your name can be entered in a draw for \$100 Amazon gift card for participating in Stage 1 only or \$200 Amazon gift card for participating in both stages. As well, you'll be able to win one of the four available procrastination self-help books, *The Procrastinator's Digest: A Concise Guide to Solving the Procrastination Puzzle*, signed by Dr. Pychyl. The likelihood of winning a prize for participating in Stage 1 only is approximately 1/100 and for participating in both Stages 1 and 2 is approximately 1/20.

What are the potential risks or sources of discomfort? There are no known or anticipated psychological or physical risks in this study. However, if you experience some anxiety or discomfort for any unanticipated reason, you may stop participating in the study without penalty. You may also wish to speak to a counsellor at Carleton Health and Counselling Services, 613-520-6674 or the Distress Centre of Ottawa and Region, 613- 238-3311.

Can I be assured of confidentiality and/or anonymity? The information you provide during this study will be strictly kept confidential. However, we ask you to provide some identifying information such as your email address and your name. Access to the information you provide will be limited to the two principal researchers listed above. The identifying information will only be used for registering in the study, signing the consent form, being invited to participate in the study, assuring the quality of data collection, and matching between different phases of the study. Your name or other identifying information will be coded in the final main dataset and will not be revealed in any report regarding this research. The file containing personal information will be deleted after three years from the completion of the study.

To ensure the security and confidentiality of online communication in the study, the online study is equipped by encrypted communication feature and a security certificate used for secure e-commerce.

Copyright ©: This survey includes copyrighted materials. It may not to be translated, stored, recorded, used, transmitted, or reproduced in whole or in part without prior permission in writing from the principal researchers or the developers of the instruments and questionnaires.

What are my rights? Participation in this online research is completely voluntary. You have the right to refuse to answer any question and to withdraw from the study at any time, for any reason, without explanation or penalty.

What are my options? Below, please indicate that you have read the above description of the study and understand the conditions of your participation. You must select one of the three options and then click next to continue.

I read the above description and agree to participate in both stages 1 and 2

I read the above description and agree to participate in stage 1 ONLY

I decline to participate

Informed Consent Form (Study 10)

The purpose of an informed consent is to ensure that all participants fully understand and are aware of the nature of their involvement in the present study. The informed consent form must provide sufficient information such that each participant may have the opportunity to determine whether or not they wish to participate.

Study title: Online Procrastination Study: Measurement Validation

Contact information:

Research personnel:

Dr. Timothy A. Pychyl (Faculty Sponsor, Carleton University, tpychyl@connect.carleton.ca, 613-520-2600 x1403)

Mohsen Haghbin (Principle Investigator, Carleton U., mohsen_haghbin@carleton.ca, 613-520-2600 x1676).

Ethical concerns: Should you have any ethical concerns about this questionnaire please contact Dr. Shelley Brown Chair, Carleton University Ethics Committee for Psychological Research (shelley.brown@carleton.ca; 613-520-2600 x 1505). For any other concerns, please contact the department chair, Dr. Anne Bowker, (anne_bowker@carleton.ca, 613-520-2600, Ext. 8218).

Purpose: The purpose of this study is to test the validity of a measure of procrastination and a measure of delay in an academic setting.

Task requirements and Duration:

You will be asked to complete a set of questionnaires online. More specifically, you are asked to rate a selection of items that measure various dimension of academic procrastination, various forms of delay in academic setting, personality characteristics or traits, various self-related concepts (e.g. self-esteem, self-regulation), screening measures of psychological problems (e.g., anxiety, depression, ADHD), negative emotions in academic setting, relationship with parents, wellbeing, physical and psychological health, and academic satisfaction and experience. You will be also asked to answer a short demographic questionnaire (e.g., age, gender, ethnic background, GPA, and highest level of education). At the end of survey, you will be navigated to a separate form to submit your request for the compensation and finally you will receive the debriefing form where the purpose of study will be explained in more details.

Completion of selected items takes approximately **70 minutes of your time**.

Compensation:

[NOTE: The following paragraph will be used for undergraduate students registered in the study through SONA system:]

In addition to our appreciation, you will receive a .75% increase in your final grade of PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR 2002.

[The following paragraph will be used for participants who recruited using other method than SONA system:]

In addition to our appreciation, we would like to enter your name in a draw for \$100 Amazon gift card or 1 procrastination self-help book signed by Dr. Pychyl.

Potential risk/discomfort: Almost all of the measures used in this study have frequently been administered in student samples and/or general public and there has not been any report of psychological or physical risks related to completing them. However, it should be noted that some of the questionnaires are about emotional experience and/or possible symptoms of psychological problems such as depression and anxiety. If you feel any distress or discomfort, you may choose not to respond to any item or to withdraw from the study at any time, without penalty.

If you feel any distress related to this study and need emotional support, please don't hesitate to contact Carleton University Health and Counseling Services at: 613-520-6674 or contact the Distress Centre of Ottawa and Region at 613-238-3311 (<http://www.dcottawa.on.ca>) or the Crisis Line at 613-722-6914 in Ottawa or 1866996-0991 outside of Ottawa (<http://www.crisisline.ca>).

Anonymity/Confidentiality:

[NOTE: The following paragraph will be used for undergraduate students registered in the study through SONA system:]

No name, email or other identifying information such as ip address will be collected in the main survey where you asked to rate the items. However, after completing the survey, you will receive a link that will navigate you to a separate webpage / form (compensation request form) where you can enter your name/email and send your request for receiving .75% course credit. There will be no way for us to link your identifying information in the compensation-request-form or SONA system with the collected data in the main survey. Therefore **your responses to the main survey are completely anonymous**

[The following paragraph will be used for participants who recruited using other method than SONA system:]

No name, email or other identifying information such as ip address will be collected in the main survey where you asked to rate the items based on your personal experience. After completing the survey, you will receive a link that will navigate you to a separate webpage/form where you can enter your name/email and send your request for entering into the draw. There will be no way for us to link your identifying information in the compensation request form or SONA system with the collected data in the main survey. Therefore **your responses to the main survey are completely anonymous.**

Collected data will only be used for research and teaching purposes. All of the identifying information provided in the compensation request form will be erased/destroyed after 2 years.

To assure the security of online communication in the study, the online study is equipped with encrypted communication features and a security certificate used for secure e-commerce.

Right to withdraw: Your participation is entirely voluntary. At any point while filling out this questionnaire, you have the right to decline to respond to any questionnaire item or to stop responding to the questionnaire entirely.

Copyright ©: This survey includes copyrighted materials. It may not be translated, stored, recorded, used, transmitted, or reproduced in whole or in part without prior permission in writing from the principal researchers or the developers of the instruments and questionnaires.

This study has received clearance by the Carleton University Ethics Committee for Psychological Research (13-XXX).

Please indicate that you have read the above description of the study and understand the conditions of your participation.

If you would not like to participate at this point, you may close this window. You must click the following options and then click next if you wish to continue.

- **I read the above description and agree to participate in this study.**

Recruitment Notice

Study Name: Online Procrastination Study: Measurement Validation (MP, III-A).

Description:

This **online research** is about how individuals might postpone working on academic tasks. You will read and then rate a number of statements based on your experience as a student. The statements are about delaying various tasks, personality characteristics, self-related concepts (e.g., self-confidence), mental health and problems, and your experience in university.

Eligibility Requirements: No requirements

Duration and Compensation:

It takes **approximately 70 minutes** of your time to complete the survey. You will receive a **.75% increase in your final grade** of PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR 2002.

Researchers: Mohsen Haghbin (mohsen_haghbin@carleton.ca; 520-2600 ext. 1676), or Dr. Timothy A. Pychyl, (tpychyl@connect.carleton.ca; 520-2600 x1403).

This study has received clearance by the Carleton University Psychology Research Ethics Board

Contact Information:

To obtain the latest versions of the MMAP and DQ as well as their Manuals, please send your inquires to Mohsen Haghbin at mohaghbin@gmail.com

