

HEALTHY EATING PRACTICES:
THE ROLE OF CONSIDERATION OF FUTURE CONSEQUENCES AND
CONSCIENTIOUSNESS

by

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Abstract

Individual differences in the extent to which people consider the future consequences of their behaviour (Consideration of Future Consequences; CFC) and those who are planful, self-disciplined, and achievement-oriented (Conscientiousness; C) have been shown to influence a number of health behaviours. In the present study, messages describing the positive and negative consequences of eating fruits and vegetables were manipulated among a sample of undergraduate students ($N = 147$). Participants were measured on their behavioural intentions, measures from the Theory of Planned Behaviour, a behavioural measure, thought listings towards messages, CFC, and C. Results revealed a significant three-way interaction between temporal frame, CFC, and C on intentions to consume fruits and vegetables, where significant differences between participants high and low in CFC were found only when C was low. This study offers novel insight into how personality variables interact in their effects on healthy eating behaviour.

Keywords: consideration of future consequences, conscientiousness, healthy eating, message framing

HEALTHY EATING PRACTICES

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Healthy Eating Practices: The Role of Consideration of Future Consequences and Conscientiousness

Unhealthy dietary behaviour greatly contributes to the prevalence of chronic disease. In particular, unhealthy diets are a major risk factor for the development of cardiovascular disease, type II diabetes, and certain types of cancer (WHO, 2005). The World Health Organization (2004) has reported that these diseases currently kill more people every year than any other cause of death. Poor diet is one of the major factors in the epidemiology of these diseases, which are of great importance to overall public health.

Fruit and vegetables are an essential component of a healthy diet. The health benefits to be gained from their consumption are numerous (i.e. protection against cardiovascular disease, cancer, oxidative damage, stroke, cataract formation, chronic obstructive pulmonary disease, diverticulosis; Bazzano, Serdula & Liu, 2003; Genkinger, Platz, Hoffman, Comstock & Helzlsouer, 2004; Law & Morris, 1998; Oude Griep, Geleijnse, Kromhout, Ocké, & Verschuren, 2010; Van Duyn & Pivonka, 2000. Indeed, according to The World Health Report (2002), low intake of fruit and vegetables has been estimated to cause about 31% of ischemic heart disease, 11% of stroke worldwide, and up to 2.7 million lives could be saved each year if consumption was adequately increased. Furthermore, low frequency of fruit and vegetable consumption is also associated with other negative health behaviours, particularly physical inactivity, smoking, obesity, and alcohol dependence that have deleterious consequences to health (Pérez, 2002).

Are people aware that fruit and vegetables are important to healthy eating and that their consumption leads to better health? In a review of numerous studies examining this question (Paquette, 2005), it was found that perceptions of healthy eating were relatively homogeneous despite the studies being conducted in different countries involving different age groups, sexes

and socio-economic status. Perceptions of healthy eating were generally based on people's assessments of different foods, where, specifically, fruits and vegetables were consistently identified as part of healthy eating. Moreover, it has been shown that even adolescents are aware of both the short-term benefits (e.g. increased energy) and long term benefits (e.g. prevention of heart attacks) associated with healthy eating, which they most commonly recognize with fruit and vegetable consumption (Croll, Neumark-Sztainer, & Story, 2001). However, despite people's knowledge of the health benefits associated with eating fruits and vegetables, many people do not engage in this behaviour (USDA, 2008).

Certain health promotion strategies have been used to improve healthy eating among the general public. For example, those following a public policy approach to improving the nutritional quality of people's diets have relied heavily on providing the public with information about why and how to make food choices that promote their health and prevent disease (USDA, 2006). Although these educational efforts have shown some success in affecting people's awareness of healthier food options, such as when grocery shopping (FMI, 2001, 2002), research shows that diseases that are highly correlated with poor nutrition and overeating (e.g. cancer, heart disease, diabetes, and stroke) are on the rise (USDA, 2008). Thus, an examination of the factors that influence health communication may be of value in determining more effective strategies.

Health Communication

Health behaviours and habits are complex, determined by the relationship among numerous factors, and can be difficult to change (Rodin & Salovey, 1989; Taylor, 2003). Thus, health behaviour change should be implemented through the use of theoretically-based principles, which help to inform and influence health decisions on both individual and

community levels (U.S. Department of Health and Human Services, 2000). Research has shown that tailored health messages, compared to general, non-tailored health messages, are more persuasive and effective in promoting behaviour change (Kreuter, Bull, Clark, & Oswald, 1999; Kreuter & Wray, 2003; Latimer, Katulak, Mowad, & Salovey, 2005).

Message Framing

One widely studied area of health communication has investigated the effects of message framing, a technique that involves manipulating how information in a message is framed. Kahneman and Tversky (1979) were the first to develop a theory that considered the effects of presenting information in different ways. Prospect theory states that presenting the same information about risk in different ways alters people's perspectives, preferences and actions. The theory describes how individuals tend to avoid risks when considering gains and prefer risks when considering losses. Rothman and Salovey (1997) have built upon prospect theory and have demonstrated that when trying to promote a particular behaviour, messages can be framed in terms of gains (benefits) or in terms of losses (costs). Gain-framed messages emphasize the benefits achieved by adopting a specific behaviour, whereas loss-framed messages emphasize the costs of not adopting a specific behaviour (Rothman & Salovey, 1997; Salovey, 2005). Research has found that gain- and loss-framed messages differ in their effects on behaviours that prevent the onset of disease versus those that detect the presence of disease (Rothman et al., 2006).

Several studies have demonstrated that gain-framed messages are more effective for prevention behaviours (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Jones, Sinclair, & Courneya, 2003; Linville, Fischer, & Fischhoff, 1993; McCaul, Johnson, & Rothman, 2002; Millar & Millar, 2000; Rothman et al., 1993). For example, in a study by Detweiler et al. (1999), gain and loss-framed brochures about skin cancer were distributed to beach-goers that offered

them an opportunity to get a free sample of sunscreen. It was found that beach-goers who had received the gain-framed brochure were significantly more likely to seek out the free sample of sunscreen.

On the other hand, a number of studies have found loss-framed messages to be more effective than gain-framed messages in promoting various detection behaviours. For example, loss-framed messages were found to be more effective than gain-framed messages in promoting interest in and use of screening mammography and breast self-examination (Banks et al., 1995; Cox & Cox, 2001; Finney & Iannotti, 2002; Meyerowitz & Chaiken, 1987; Schneider et al., 2001), as well as colorectal cancer screening (Myers et al. 1991; Edwards, Elwyn, Covey, Matthews, & Pill, 2001).

Mechanisms of Health Behaviour

An important issue for research in health communication is to understand how messages might influence intentions and behaviours. The Theory of Planned Behaviour (Ajzen, 1985) states that behaviour is driven by behavioural intentions that are a function of one's attitudes toward the behaviour, the subjective norms surrounding its performance, and one's perceived behavioural control in regards to performing the behaviour. Attitudes relate to the overall evaluations of a behavior by the individual, subjective norms consist of one's beliefs about whether significant others believe in the importance of engaging in the behaviour, and perceived behavioural control describes an individual's perception of the extent to which the behaviour is easy or difficult to perform. Together these constructs may influence an individual's behavioral intentions and can be investigated further to better understand how they can explain the mechanisms underlying the impact of health communication on behaviour.

Individual Differences

Consideration of Future Consequences

Numerous health problems (i.e. heart disease, AIDS, and some types of cancer) have been found to be the direct result of behaviours that may have occurred 10 or 20 years before the onset of symptoms (Strathman, Gleicher, Boninger, & Edwards, 1994). Thus, many health campaigns now stress the idea that engaging in behaviours such as smoking, drinking, and eating nutritionally unsound foods may carry serious future costs for those who engage in them. One variable that may influence one's health-related behaviour is the personality trait *consideration of future consequences* (CFC). This construct is defined as the extent to which individuals consider the potential future outcomes of their current behaviours and the extent to which they are influenced by these potential outcomes (Strathman et al., 1994). Research has indicated that people low on CFC typically focus more on their immediate needs and concerns and behave accordingly, while people high on CFC focus more on the future implications of their behaviour and base their decisions on these outcomes (Orbell & Kyriakaki, 2008). High CFC individuals believe certain behaviours are worthwhile because of future benefits, even if immediate outcomes are relatively undesirable or require a level of sacrifice. They are willing to forgo immediate benefits, such as pleasure or convenience, to achieve more desirable future states. Thus, CFC may play a role in various behaviours that have immediate and long-term positive or negative consequences.

A number of lines of research suggest that CFC may have particular implications for health-protective behaviours, as they typically involve delayed benefits and immediate costs (Chapman, 2005). Individuals should think about the future consequences of their current behaviour, as certain activities (e.g. unhealthy eating, lack of exercise, or binge drinking) may

have negative repercussions for future health. Those who ignore the future consequences of their behaviour consequently focus more on short-term needs instead, thus the likelihood of having them perform a health-related behaviour depends on their evaluation of the inconvenience, loss of pleasure, or psychological costs of immediate behaviour (Chapman, 2005).

Individuals who think ahead to the future consequences of their present behaviours are more inclined to act in ways that are protective of their future health and well-being. A number of studies have examined the relationship between CFC and different health behaviours. For example, Strathman and colleagues (1994) found that low scores on CFC were significantly related to greater number of cigarettes smoked and marginally related to greater amount of alcohol consumed, whereas higher CFC individuals reported lower frequencies of these behaviours. Additionally, results indicated that CFC scores were significantly related to participants' general concern for health. Similarly, in a study by Adams and Nettle (2009), low CFC scores were likewise associated with higher self-reports of smoking but also with higher self-reported Body Mass Index (BMI), a finding also reported by Adams and White (2009). This association still remained significant after socio-demographic factors and the five-factor personality domains were controlled for, indicating a strong relation of CFC to both smoking and BMI. Adams and Nettle also assessed other measures of time perspective, which evaluate how individuals conceptualize and value future events, and CFC was the only significant predictor of smoking and BMI compared to the other measures when socio-demographic and personality variables were taken into account.

Research has also found that college students who consider the future consequences of their behaviour are more cautious about their sexual activity; they have fewer sexual partners, are more likely to use alternate methods of reducing exposure to HIV (e.g. inquiring about partner's

sexual history, delaying or abstaining from sex), and are more likely to seek out HIV-testing (Dorr, Krueckeburg, Stratham, & Wood, 1999; Rothspan & Read, 1996). Furthermore, Peters and colleagues (2001) surveyed a sample of college students about sleeping patterns and future goals using the Consideration of Future Consequences Scale. They found that higher CFC scores were associated with more regular sleep schedules and higher grade point averages. Overall, research indicates that individual differences in CFC appear to influence whether one will be more or less likely to engage in different health behaviours. These findings may have important implications within applied settings, where intervention strategies may be implemented.

CFC and health communication. The influence of CFC on various health behaviours has been clearly demonstrated; however, what implications do these findings have for the area of health communication and promotion? Several studies examining the impact of CFC on persuasive health communications have been conducted that demonstrate the importance and applied value of such research questions.

CFC and gain/loss message framing. One study has examined CFC and the influence of gain and loss-framed messages on the prevention of future health problems. O'Connor, Warttig, Conner, and Lawton (2009) examined the effectiveness of a web-based intervention aimed at raising awareness of the risks associated with hypertension. The researchers studied the role of CFC in determining the success of this intervention. High and low CFC participants were presented with either a gain-framed message or a loss-framed message. An example of a gain-framed message used in the study was presented as follows: "If you get regular blood pressure checks you can take advantage of a safe procedure to help prevent cardiovascular disease such as hypertension, angina and stroke" (O'Connor et al, 2009, p. 216). An example of a loss-framed message stated the following: "If you do not get regular blood pressure checks you will not be

able to take advantage of a safe procedure to help prevent cardiovascular disease such as hypertension, angina and stroke” (O’Connor et al, 2009, p. 216). Participants were measured on how long they spent reading additional information about hypertension that was provided to them after reading their presented message.

Results indicated a loss frame advantage for participants high in CFC and a gain frame advantage for those low in CFC. Furthermore, high CFC participants spent almost twice as long as low CFC participants in reading the provided additional health information related to hypertension. Based on these results, O’Connor et al. proposed that high CFC individuals respond better to loss-framed messages because when they are presented with information that indicates a potential risk to their future health, they feel that they must act on this information to preserve their current health. In contrast, they proposed that low CFC individuals do not respond as well to loss-framed messages because they are less hesitant to take risks than high CFC individuals.

CFC and temporal message framing. Three separate studies (Orbell & Hagger, 2006; Orbell & Kyriakaki, 2008; Orbell, Perugini, & Rakow, 2004) used a technique known as temporal framing to examine the impact of CFC on persuasive messages regarding sunscreen use, colorectal cancer screening, and type 2 diabetes screening. The temporal frame relates to temporal proximity, where the expected outcomes of a given behaviour (benefits and losses) are presented as occurring immediately (in the short-term) or distally (in the long-term). In all three studies, the researchers manipulated the temporal frame in which the positive and negative consequences of performing the specific behaviour were presented. In one time frame, the negative consequences were presented as short-term and the positive consequences were presented as long-term. In the opposite time frame, the positive consequences were presented as

short-term and the negative consequences as long-term. These framed messages were presented to both high and low CFC participants, who were defined according to a median split of their CFC scores. In addition, the Theory of Planned Behaviour variables of attitudes, subjective norms, and perceived behavioural control, which are proposed to influence behavioural intentions, were examined as potential mediators of the relationship between temporal frame and CFC on participant's intentions towards specific behaviours.

In the first study, Orbell et al. (2004) examined the relationship between CFC and responses to health information about colorectal cancer screening. It was predicted that a sample of middle-aged participants would be most responsive (i.e. show greater intention to engage in and show more positive attitudes toward screenings) when positive information about colorectal cancer screening was matched to each participant's corresponding level of CFC. Thus, it was predicted that high CFC participants would be more likely to engage in screenings when positive information was presented as occurring over the long-term and negative information was presented as occurring in the short-term. The opposite was predicted for low CFC participants in regards to their responsiveness to screening information.

In accordance with the researchers' hypotheses, results showed that CFC moderated both the generation of positive and negative thoughts and the persuasive impact of the different messages. High CFC participants exhibited more positive thoughts and were significantly more motivated to engage in screening (in terms of positive attitudes, perceived behavioural control, and greater intentions) when positive aspects of screening were linked to the future and negative aspects to the present, while participants low in CFC showed the opposite pattern. For example, low CFC participants exhibited more positive thoughts and greater intentions when presented with messages emphasizing the immediate peace of mind about bowel cancer as a positive short-

term consequence of screening and the negative long-term consequence of having to undergo unpleasant procedures for years into the future. There was no significant interaction effect for the theory of planned behaviour variable of subjective norms. Moreover, the interaction between CFC and temporal frame on intentions to engage in colorectal cancer screening was mediated by attitudes and perceived behavioural control. This showed that the more positive attitude toward the behaviour and the amount of perceived behavioural control one perceived to have toward getting screened both predicted one's intention to actually engage in getting screened. This may explain how the appropriate matching of temporal frame and CFC may lead to more positive attitudes and increased perceived behavioural control that, in turn, would lead to greater behavioural intentions as the Theory of Planned Behaviour suggests.

Another related study by Orbell and Hagger (2006) examined the role of CFC and temporally framed messages on type II diabetes screening. A sample of middle-aged men and women were asked about their views on a free screening program for type II diabetes. Results found that individual differences in CFC moderated the generation of positive and negative thoughts and the persuasive impact of the different messages. High CFC participants generated more positive thoughts and were significantly more motivated to engage in screening (in terms of positive attitudes, subjective norms, perceived behavioural control, and greater intentions) when positive consequences were framed as long-term and negative consequences were framed as short-term; the opposite was found among low CFC participants. In addition, the interaction between CFC and temporal frame on intentions to partake in type II diabetes screening was mediated by attitudes, subjective norms, and perceived behavioural control. It was also found that positive thoughts, generated by participants, mediated the effect of the CFC by temporal frame manipulations on behavioural intentions.

Orbell and Haggard also measured participants on their *fear of disease*, a form of threat appraisal assessing the degree of fear associated with getting diabetes. This measure is proposed to enhance the development of protection motivation towards preventing disease and asked participants to rate the following: “The thought of getting type II diabetes makes me feel (Very scared–not at all scared, very anxious–not at all anxious, very frightened–not at all frightened).” Results showed that fear of diabetes was significantly related to CFC, where high CFC participants were more fearful of the thought of developing the disease than low CFC participants.

Lastly, Orbell and Kyriakaki (2008) expanded previous work on CFC and disease screening by evaluating the role of temporal frame on sunscreen use, a form of preventive health behaviour, on a sample of college students. Sunscreen is used to prevent the longer term risks of sun exposure; thus it was hypothesized that high CFC participants would be more likely than low CFC participants to endorse arguments in favour of the long-term benefits of sunscreen use and hold more positive intentions to use sunscreen. In addition, sunscreen protects against sunburn, which is a short-term positive consequence; thus it was predicted that low CFC participants would be more likely to endorse such short-term benefits. Two experimental field studies were conducted whereby the researchers manipulated the temporal frame in which positive and negative consequences of using sunscreen were presented.

Results of the first experiment showed that individual differences in CFC once again moderated both the processing of long versus short-term consequences and the persuasive impact of the different temporal frames, where significant effects were found for the theory of planned behaviour variables of attitudes, perceived behavioural control, and intentions. Additionally, the CFC x temporal frame interaction was mediated by attitudes and perceived behavioural control.

In the second experiment, Orbell and Kyriakaki measured participants on a behavioural measure as opposed to their behavioural intentions. After completing the study questionnaire, participants were invited to detach a code-numbered voucher with the following words printed: “This voucher may be exchanged for one bottle of sunscreen lotion at either the Student Union shop or the Campus shop” (Orbell & Kyriakaki, 2008, p. 776). Results found that Low CFC participants presented with the short-term positive/long-term negative message redeemed the voucher significantly more than those given the long-term positive/short-term negative message. High CFC participants presented with the long-term positive/short-term negative message redeemed the voucher marginally more than those given the opposite message.

Overall, these three studies by Orbell and colleagues demonstrate how the processing of persuasive health information, in regards to a variety of health behaviours, is influenced by individual differences in people’s consideration of future consequences. However, two of these studies assessed detection behaviours (colon cancer screening and type II diabetes screening), while the other assessed a prevention behaviour (sunscreen use). I have found only one study that examined CFC within a diet-related domain. Kees (2011) examined differences in time orientation (CFC) and the perceived severity of health risks of fast food. Results showed that low CFC individuals were more strongly persuaded by messages that emphasized proximal rather than distal consequences of unhealthy food choices.

Conscientiousness

Another individual difference variable that may influence health behaviours and messages intended to target them is the personality variable of Conscientiousness (C). C describes individuals who are task and goal-directed, planful, able to control impulses, and able to delay gratification (John & Srivastava, 1999). Individuals who are low in C tend to be

disorganized, careless, inefficient, and unreliable (Costa & McCrae, 1992). One clear example of the effects of individual differences in C has been observed in Friedman et al.'s (1993) seminal study examining the relationship between childhood conscientiousness and longevity. Using data derived from the seven-decade long Terman Life-Cycle Study of children (Terman & Oden, 1947), Friedman et al. discovered that individuals observed as being high in C during childhood were more likely to outlive those low in C. Specifically, low-conscientious children were found to be at an increased risk of premature mortality throughout their adulthood.

Research has also shown that the relationship between C and health behaviours has important implications for one's health (Roberts, Walton, & Bogg, 2005). In a meta-analysis conducted by Bogg and Roberts (2004) examining C and health-related behaviours, it was found that traits related to C were positively associated with all beneficial health behaviours assessed and negatively associated with all risky health behaviours included in the analysis. Behaviours found to be associated with high and low levels of C included physical activity, alcohol use, drug use, unhealthy eating, risky driving, risky sex, suicide, tobacco use, and violence. In regards to unhealthy eating, Bogg and Roberts coded this behaviour into two categories in their analysis: 1) obesity, weight, and mass, which accounted for the majority of the studies observed (79%), and 2) food selection which accounted for only 21% of the studies observed. Notably, food selection was represented by preferences for foods differing in their sodium content, amount of saturated fat, or complex carbohydrates, but not specifically by food group, such as fruits and vegetables. Additionally, only 14 studies examining unhealthy eating and C were accounted for while other behaviours were considerably more represented, ranging from 19-65 studies for each behaviour. Bogg and Roberts suggest that more research on C within an eating domain is necessary, as little has been conducted in relation to other health behaviours. Additionally, this study examined

unhealthy eating (a negative health behaviour), whereas I expanded on this research with the positive health behaviour of healthy eating.

Mechanisms of conscientiousness. Although it has been established that C is a predictor of health and longevity, the mechanisms by which C produces these effects are less known. One theoretical perspective, proposed by Clark and Watson (1999), describes the types of behaviours associated with the temperament factors of disinhibition and constraint. They suggest that disinhibited individuals are impulsive and oriented primarily toward feelings and sensations of the immediate moment, while constrained individuals plan carefully, avoid risk or danger, and are more controlled by the longer-term implications of their behaviour. Bogg and Roberts (2004) suggest that disinhibition and constraint overlap with facets of C and propose that the same links found between disinhibition, constraint and health behaviours exist between C and these behaviours. Individuals low in constraint should be more likely to engage in behaviours that are immediately satisfying or involve a disregard for future consequences (e.g. unhealthy eating). Conversely, individuals high in constraint should exhibit better future health outcomes as a result of being more careful, less risky, and more concerned with the implications of their behaviours.

An examination of C and its various facets may explain possible mechanisms by which individuals high in CFC effectively perform health behaviours. If a high CFC individual is more concerned with the future outcomes of their current behaviour, a higher level of C may enable them to perform health-protecting behaviours more successfully than an individual who is less conscientious. Thus, if an individual is high in CFC but lacks the ability to control their impulses or is less goal-oriented, they may be less likely to actually perform the desired behaviour. That is, it is possible that C and CFC may interact in their effects on health behaviour, thus examining the relationship between these two constructs may determine whether their combined effects lead

to a greater adherence to healthy behaviour. One goal of the present study is to examine the joint influence of these two constructs.

There is limited research on the relationship between the two constructs of C and CFC on health behaviours. C has been found to be significantly positively associated ($r = .35$) with future orientation as measured on the Consideration of Future Consequences Scale (Crockett, Weinman, Hankins & Marteau, 2009). Also, scores on the CFC Scale were moderately correlated ($r = .49$) to scores on the Big Five Conscientiousness dimension in Strathman et al.'s (1994) landmark study on CFC that included self-reported health behaviours of smoking and alcohol use, and general concern for health. Strathman et al. wished to show that CFC's influence was not subsumed by the personality variable of C and thus conducted hierarchical regressions that examined their relative contribution. C added to variance accounted for by CFC only for alcohol use. When the order of entry of the variables was reversed, CFC added to variance accounted for by C significantly for general health concern, marginally for smoking, and not for alcohol use. Notably, possible interactions between C and CFC were not examined by Strathman et al., nor were preventive behaviours such as healthy eating.

The Present Study

Research in health communication has focused primarily on differences between messages and different types of behaviours. Research on the individual differences between people and these corresponding associations on the effectiveness of health messages may be of value. For example, people differ in whether they consider the long-term consequences of their behaviour, therefore messages tailored to people's time orientation may be effective. As such, individual differences in the way people consider the future consequences of their behaviour may

influence their intentions and behaviours to adopt healthy eating patterns as well as the way they may respond to messages targeting these behaviours.

The primary goal of the present study was to examine CFC and healthy eating, an important health-preventive behaviour that has received little study. Past research has examined screening behaviours (e.g. colorectal cancer, type II diabetes) and one other preventive behaviour (sunscreen use), but healthy eating has received much less attention. In particular, this study focused on fruit and vegetable consumption as it has been shown to be an essential component of a healthy diet and has been associated with the prevention of major diseases such as cardiovascular disease and certain cancers. Although a general knowledge of the benefits of healthy eating is present among most individuals, not all people choose to engage in healthy eating habits. Thus, individual differences in whether people consider the future implications of their behaviour may influence behavioural outcomes.

An individual's level of CFC is proposed to influence their processing of information and formation of attitudes and intentions towards a given behaviour. Since time perspective plays a role in the CFC construct, temporal framing is proposed to be the appropriate framing method as it allows for messages to be framed according to the short-term and long-term consequences of behaviour. A suitable test of these effects may involve presenting individuals with information about both the beneficial and costly outcomes of fruit and vegetable consumption while manipulating the time frame in which those outcomes are proposed to occur. While gain and loss-framed messages describe either the costs or benefits of a given behaviour, temporally framed messages allow for these costs and benefits to be framed according to *when* their outcomes occur. Thus, manipulating the time frame in which the costs and benefits of a given behaviour occur allows for a more direct assessment of CFC's relation to the persuasiveness of

the health message. Moreover, the stable nature of the CFC construct over time, allows for these assessments to be conducted with greater confidence. However, it is important to note that the present study followed a one-time, cross-sectional approach; as a result, potentially informative follow up assessments regarding CFC and its effects were not obtained.

To understand the mechanisms underlying how messages might influence behavioural intentions, the Theory of Planned Behaviour variables of attitudes, subjective norms, and perceived behavioural control were investigated as potential mediators of the effects of CFC and temporally framed messages on behavioural intentions. This theory may explain how the appropriate matching of temporal frame and CFC (e.g. long-term positive, short-term negative for high CFC) may lead to more positive attitudes, increase perceptions of subjective norms, and strengthen one's level of perceived behaviour control, that in turn, would produce greater intentions to consume fruits and vegetables. These variables have been previously shown to significantly mediate the effects of other health behaviours (Orbell et al. 2004; Orbell & Hagger, 2006; Orbell & Kyriakaki, 2008), and may also underlie the behavioural mechanisms involved in healthy eating behaviour.

Furthermore, the present study investigated whether individual differences in C, in addition to those in CFC, also affect people's intentions and behaviours towards healthy eating and examined the relative contributions of C and CFC. Research has shown that highly conscientious and high CFC individuals typically engage in a variety of health behaviours (Bogg & Roberts, 2004; Strathman et al., 1994). Some limited research (Crockett et al. 2009, Strathman et al. 1994) has shown that C and CFC are somewhat related and appear to make independent contributions to some negative health behaviours and to a general concern for health. Less is known about factors underlying their effects, especially for positive, preventive health

behaviours such as healthy eating. Orbell and colleagues indicated that CFC's interactive effects with long-term consequences on intentions for screening and sunscreen use are mediated by attitudes, subjective norms, and perceived behavioural control. Some aspects of C (e.g. impulse control, goal-setting, delay of gratification, etc.) may similarly determine whether an individual will effectively perform health behaviours but have not been specifically examined in previous work.

One possibility is that CFC may predict intention to perform health protective behaviours but C may facilitate their effective adoption. Thus, C may moderate CFC in its effects through its associated facets such as those of achievement striving and/or self-discipline. Alternatively, C and CFC may both contribute to intentions and/or behaviours related to healthy eating. To the best of my knowledge, the only study that examined the relative contributions of C and CFC in health behaviours examined the behaviours of alcohol use and smoking (Strathman et al., 1994), neither of which are preventive behaviours.

Hypotheses

Hypothesis 1: The first study hypothesis concerned the interaction between CFC and temporal frame. It was predicted that high CFC individuals would show greater intentions to consume fruits and vegetables and would generate more positive relative to negative thoughts when presented with messages that emphasized the positive long-term and negative short-term consequences of this behaviour, while low CFC individuals would show greater intentions and thoughts when presented with messages that emphasized the positive short-term and negative long-term consequences. The same predictions were made in regards to a behavioural measure of whether participants would choose to complete a short questionnaire in order to receive a coupon for a healthy food item.

Hypothesis 2: The second hypothesis concerned the mediation of behavioural intentions. It was hypothesized that the Theory of Planned Behaviour variables of attitudes, subjective norms, and perceived behavioural control would mediate the effects of CFC and temporal frame on intention.

Hypothesis 3: To further replicate and extend Strathman et al.'s (1994) findings with behavioural intentions instead of behavioural reports, the independent contributions of CFC over C and vice versa were explored with the preventive behaviour of healthy eating.

Hypothesis 4: The fourth hypothesis concerned the possible interactive relationship between CFC and C. C was explored as a potential moderator of the effects of CFC, where high levels of C were proposed to increase the effects of high CFC in regards to greater intentions to consume fruits and vegetables.

Method

Participants

One hundred and fifty undergraduate students were recruited for study participation through Carleton University's online SONA system. From the initial sample, 147 participants (110 females, 36 males, 1 not specified) completed the full questionnaire. Participants ranged in age from 18-38 ($M = 20.27$, $SD = 3.54$) and the majority of the sample was Caucasian (71.4%), with the remaining identified as Asian (9.5%), Middle Eastern (6.8%), African (1.4%), Hispanic (1.4%), or Other (9.5%). Participants received partial course credit for participating in the study.

Materials

Questionnaire website. The study questionnaire was posted online at www.surveymonkey.com. Participants were provided with a link to the questionnaire website after they registered for the study on the online SONA system.

Temporal framing manipulations. Participants were randomly assigned to one of two framing conditions describing the consequences of fruit and vegetable consumption. Although the same consequences were presented in each passage, the temporal frame in which they were presented was manipulated. In one frame, the positive consequences were presented as long-term (e.g. “[Some people] find that they can prevent vitamin deficiency in the future, as the consumption of fruits and vegetables provides essential vitamins and nutrients over time”) and the negative consequences were presented as short-term (e.g. “Some people find that eating fruits and vegetables can be too time consuming to prepare on a daily basis”). In the second frame the positive consequences were presented as short-term (e.g. [Some people] find that they can immediately prevent vitamin deficiency, as the consumption of fruits and vegetables provides essential vitamins and nutrients on a daily basis”) and the negative consequences were presented as long-term (e.g. “Some people find that eating fruits and vegetables can be too time consuming to prepare throughout their lifetime”). All participants were presented with the same introductory passage describing general information regarding fruits and vegetables (See appendix A and B for complete message passages).

Thought listings. After reading the assigned message frame, participants were asked to complete a thought-listing task related to their assessment of the message content. Participants were provided with the following instructions, “Please write down the thoughts that came to mind as you read the passage above”. Individual thought listings were coded as positive, negative, or neutral/irrelevant. Positive thoughts were defined as any thought representing a positive evaluative orientation toward eating more fruits and vegetables and negative thoughts were defined as those representing a negative evaluative orientation.

Behavioural intention. Four items were used to measure behavioural intention: “I intend to consume more fruits and vegetables over the next month (strongly agree–strongly disagree)”, “How likely is it that you will consume more fruits and vegetables over the next month? (very likely–very unlikely)”, “I intend to consume more fruits and vegetables over the next month (definitely intend–definitely do not intend),” and “I plan to consume more fruits and vegetables over the next month (strongly agree–strongly disagree)”. This measure had excellent reliability ($\alpha = .97$). Mean scores were computed with higher scores indicating more positive intentions.

Theory of planned behaviour measures. Participants responded to a series of items to assess constructs specified by the Theory of Planned Behaviour (Ajzen, 1985). Six-point Likert-type scales were used to assess attitude, subjective norm, and perceived behavioural control. Attitude was assessed by the item, “For me to consume more fruits and vegetables in the next month would be . . .” followed by seven bipolar scales (necessary–unnecessary, good–bad, important–unimportant, pleasant–unpleasant, beneficial–harmful, desirable–undesirable, wise–foolish). This measure had high reliability ($\alpha = .87$). Subjective norm was measured with three items: “Most people who are important to me would think I should consume more fruits and vegetables over the next month” (strongly agree–strongly disagree), “Most people who are important to me would encourage/discourage me from consuming more fruits and vegetables over the next month (strongly encourage–strongly discourage),” and “Most people who are important to me would approve/disapprove of my increased consumption of fruit and vegetables over the next month (strongly approve–strongly disapprove). This measure had acceptable reliability ($\alpha = .75$). Perceived behavioural control was assessed by four items: “For me to consume more fruit and vegetables over the next month would be (very easy–very difficult),” “For me to consume more fruits and vegetables over the next month would be (totally under my

control—totally outside of my control),” “I am sure that I could consume more fruits and vegetables over the next month if I wanted to (very sure that I could—very unsure if I could),” and “I am confident I could consume more fruits and vegetables over the next month if I wished to (very confident—not at all confident)”. This measure had high reliability ($\alpha = .88$).

Consideration of future consequences. Participants were assessed on the 12-item Consideration of Future Consequences Scale (Strathman et al., 1994). Respondents were asked to indicate to what extent each item was characteristic of them on a 5-point Likert-type scale (ranging from extremely characteristic to extremely uncharacteristic). Example items are “I often consider how things might be in the future and try to influence those things with my day to day behaviour,” and “I only act to satisfy immediate concerns, figuring the future will take care of itself.” A high score indicates greater consideration of future consequences. The CFC scale has shown good internal consistency reliability across samples with coefficient alphas ranging from .80 to .93. Reliability was also acceptable with the current sample ($\alpha = .84$). (See Appendix C for complete scale).

Conscientiousness. Participants were measured on the 20-item Conscientiousness domain of the International Personality Item Pool (IPIP) representation of the NEO-PI-R Broad Domains (Costa & McCrae, 1992). Participants were asked to rate items using a 5-point Likert-type scale ranging from “very accurate” to “very inaccurate”. Examples of positively coded items are “Am always prepared”, “Carry out my plans”, and “Complete tasks successfully” and negatively coded items are “Waste my time”, “Find it difficult to get down to work”, and “Leave things unfinished”. The IPIP NEO-PI-R has excellent internal consistency reliability with a coefficient alpha of .90. Reliability was also high among the present sample ($\alpha = .93$). (See Appendix D for complete scale).

Behavioural measure. After completing the full questionnaire, participants were offered the choice to complete a short questionnaire in order to receive a health food coupon.

Participants who chose to fill out the short questionnaire were provided with a link to a website that allowed them to receive a coupon in the mail. Participants' decisions to accept or decline this offer was recorded by the survey engine and later reviewed by the researcher. (See Appendix E for screenshot of coupon website).

Demographic variables. Participants were measured on a variety of demographic variables including gender, ethnicity, age, height, weight, whether they had any dietary medical conditions (e.g. diabetes), whether they were vegetarian or vegan, or if they were on a food restricting diet (see Appendix F). Body mass index (BMI) scores were calculated from participants' height and weight responses.

Procedure

Students were invited to participate in an online study on people's evaluations of health information regarding healthy eating (see Appendix G for recruitment notice). Upon arrival at the questionnaire website, participants were informed of the experimental procedure and were asked to complete an informed consent form (see Appendix H). After consent was given, participants completed a series of demographic questions and were asked to click one of two buttons prior to proceeding to the next page; each button was linked to a different message frame, which allowed for random assignment of each condition. Next, participants were presented with their assigned message in the form of a short passage regarding the consequences of fruit and vegetable consumption. Immediately after reading the message passage, participants were asked to write down their thoughts about the presented message. After completing their thought listings, participants were asked a series of questions regarding attitudes, subjective

norms, perceived behavioural control, and their intentions to consume more fruits and vegetables. Next, participants were asked to fill out the Consideration of Future Consequences Scale and the IPIP NEO-PI-R for Conscientiousness. Lastly, participants were given the option to complete a short questionnaire if they wished to obtain a coupon for a healthy food item. Those who chose this option were asked to answer a series of questions regarding their shopping habits and where they most often eat their meals (this questionnaire was solely a measure of participant behaviour, thus the data were not analyzed). Participants who completed the short questionnaire were provided with a link to a website where they had to provide mailing information to receive a coupon. Following completion of the online questionnaire, participants were provided with a debriefing page (see Appendix I) that further explained the purpose of the study, the researcher's intentions, and provided further information and resources for participants with question or concerns about their eating practices.

Analyses

In order to be consistent with previous work conducted by Orbell and Kyriakaki (2008), the temporal frame x CFC interactions on all of the Theory of Planned Behaviour variables of intentions, attitudes, subjective norms, and perceived behavioural control were analyzed using a multivariate analysis of variance (MANOVA). However, multiple regression analyses were also conducted to account for the loss of power attained from the use of dichotomous variables required for performing the MANOVA. All continuous variables were mean centered prior to the computation of cross products in the regression analyses. Simple slopes were analyzed using Preacher's online simple slope calculator (Preacher, Curran, & Bauer, 2006).

Results

Preliminary Analyses

Data were screened for potential outliers, missing values, and data entry errors. Frequencies and histograms were observed and it was determined that appropriate assumptions of normality and homogeneity of variance were not violated. Correlations among the primary variables were also calculated (see Table 1). As was previously reported by Strathman and colleagues (1994), CFC and C were moderately correlated. The Theory of Planned Behaviour variables were also significantly correlated with each other, except for subjective norms and perceived behavioural control, however this is expected as these variables have been shown to vary across behaviours and situations (Ajzen, 1991).

Table 1
Correlations Among CFC, C, and TPB Variables

Scale	2	3	4	5	6
1. CFC	.47***	.08	-.01	-.03	.25**
2. C	–	.16	.08	-.10	.30***
3. Intentions	–	–	.66***	.33***	.52***
4. Attitudes	–	–	–	.46***	.38***
5. Subnorms	–	–	–	–	.12
6. PBC	–	–	–	–	–

Note. CFC = Consideration of Future Consequences, C = Conscientiousness, TPB = Theory of Planned Behaviour, Subnorms = Subjective Norms, PBC = Perceived Behavioural Control, ** $p < .01$, *** $p < .001$

To detect potential multicollinearity among the data, linear regressions were run and the tolerance values were examined. The lowest tolerance value was .48, which was within acceptable limits (Tabachnik & Fidell, 2007) and indicated that there were no issues with multicollinearity among the data.

A median split of CFC scores was performed to establish participants as either high or low CFC (required for MANOVA analyses discussed later). To ensure that participants were

randomized across temporal frame conditions, tests were conducted to determine whether participants significantly differed between conditions in levels of CFC, C and various demographic variables (See Table 2). Results showed that there were no significant differences between conditions for any variables. In addition, associations were examined between demographic variables and the various dependent measures (see Tables 3 and 4), in order to determine potential covariates to control for in the main analyses. Analyses with and without covariates yielded similar results; all subsequent reported analyses are with covariates excluded.¹

Table 2

Descriptive Statistics and Frequencies of Variables in each Frame Condition

Variable	Temporal Frame Condition			
	ST-, LT+		ST+, LT-	
Continuous	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CFC	3.44	.62	3.44	.63
C	74.54	14.01	73.81	11.70
Age	20.28	3.35	20.36	3.89
BMI	22.76	3.78	23.61	4.94
Categorical	Frequency	Percentage	Frequency	Percentage
Gender	17 Male 57 Female	23.0% Male 77.0% Female	19 Male 53 Female	26.4% Male 73.6% Female
Med Con	9	12.3%	5	7.2%
Vegetarian	4	5.3%	4	5.6%
Vegan	1	1.3%	1	1.4%
Food Res	7	9.3%	10	14.1%

Note. BMI = Body Mass Index, Med Condition = Medical Dietary Condition, Food Res Diet = Food Restricting Diet, *M* = Mean, *SD* = Standard Deviation

¹All the following subsequent analyses were conducted without the control of significant covariates. When covariates were controlled for, analyses yielded similar findings except for a significant two-way interaction between frame x CFC on subjective norms. However, due to the lack of a significant two-way interaction between frame x CFC on intentions, the proposed mediation by subjective norms was not tested.

Table 3

Correlations Between Continuous Variables and Dependent Variables

Variable	Dependent Variable					
	CFC	C	Intentions	Attitudes	Sub Norms	PBC
BMI	-.05	-.02	.03	-.05	.10	-.23**
Age	.26**	.23**	-.18*	-.17*	-.21*	-.01

Note. BMI = Body Mass Index, Sub Norms = Subjective Norms, PBC = Perceived Behavioural Control, * $p < .05$, ** $p < .01$

Table 4

Descriptive Statistics for Dependent Measures as a Function of Demographic Variables

Variable	Dependent Variable											
	CFC		C		Intentions		Attitudes		Sub Norms		PBC	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
G: Male	3.37	.68	70.53	13.96	4.28	1.15	4.83**	.80	4.64	1.11	4.83	.99
G: Female	3.46	.59	74.89	12.32	4.70	1.13	5.23**	.74	4.57	1.18	5.15	.84
Med Con	3.43	.57	71.57	9.54	4.86	.83	5.36	.50	4.43	.63	5.38	.88
Veg	3.39	.81	80.22	6.26	5.21	.74	5.57	.46	4.86	1.00	5.25	.89
Vegan	3.25	.71	84.50	4.95	5.13	.88	6.00	.00	3.33	.00	5.50	.71
Food Res	3.68	.54	74.68	12.08	4.96	.73	5.23	.66	4.49	1.24	4.99	.84

Note. Sub Norms = Subjective Norms, PBC = Perceived Behavioural Control, G = Gender, Med Con = Medical Dietary Condition, Veg = Vegetarian, Food Res = Food Restricting Diet, M = Mean, SD = Standard Deviation, ** $p < .01$

Effect of CFC and Temporal Frame on Intentions, Attitudes, Subjective Norms, and Perceived Behavioural Control

MANOVA approach. It was predicted that high CFC participants would show greater intentions to consume fruits and vegetables when presented with the long-term positive/short-term negative frame whereas low CFC participants would show greater intentions when presented with the short-term positive/long-term negative frame. To test this hypothesis between CFC and temporal frame and its effects on intentions, attitudes, subjective norms, and perceived behavioural control, I conducted a 2 (temporal frame: ST-, LT+ vs. ST+, LT-) x 2 (CFC: high

vs. low) multivariate analysis of variance (MANOVA). The predicted interaction between temporal frame and CFC was not significant, $F(4, 140) = .16, p = .96$. However, there were significant main effects of temporal frame, $F(4, 140) = 4.02, p = .004$ and CFC, $F(4, 140) = 3.59, p = .008$. Univariate tests from the MANOVA showed that only perceived behavioural control contributed to both of these main effects. Individuals reported more positive perceptions of behavioural control towards eating fruits and vegetables when presented with the ST-, LT+ message frame ($M = 5.24, SD = .81$) than the ST+, LT- message frame ($M = 4.89, SD = .92$), $F(1, 143) = 4.59, p = .03$. Moreover, high CFC individuals reported more positive perceptions of behavioural control towards eating fruits and vegetables ($M = 5.32, SD = .73$) than low CFC individuals ($M = 4.87, SD = .93$), $F(1, 143) = 10.33, p = .002$.

Regression approach. Similar results to the MANOVA were observed using multiple regression and continuous variables, with no significant interaction between temporal frame and CFC on intentions, $\beta = -.04, t(146) = -.32, p = .75$. The Theory of Planned Behaviour variables that were hypothesized to mediate the temporal frame x CFC interactions on intentions also had non-significant interaction effects: attitudes, $\beta = .02, t(146) = .20, p = .84$; subjective norms, $\beta = .20, t(146) = 1.67, p = .10$; and perceived behavioural control, $\beta = .03, t(146) = .24, p = .81$. Because no significant interaction effects were obtained for intentions, the hypothesized mediation of the proposed interaction effects by the Theory of Planned Behaviour variables on intentions was not tested. Also similar to the MANOVA results, main effects were found for temporal frame, $\beta = -.20, t(146) = -2.52, p = .01$ and CFC, $\beta = .25, t(146) = 3.21, p = .002$ on participants' reported perceived behavioural control (see Table 5 for complete regression results).

Table 5

Multiple Regression Analyses for CFC x Frame Interaction on DVs

Step		Intentions	Attitudes	Sub Norms	PCB
		β	β	β	β
1	CFC	.08	-.07	-.03	.25**
	Frame	.08	-.01	-.11	-.20*
2	CFC	.10	-.02	-.17	.23*
	Frame	.08	-.01	-.11	-.20*
	CFC x Frame	-.04	.02	.20	.03
<i>F</i> (step 1)		.86	.01	.99	8.36
<i>R</i> ²		.01	.00	.01	.32
ΔF (change in F for step 2)		.10	.04	2.77	.06
ΔR^2		.00	.00	.02	.00

Note. CFC = Consideration of Future Consequences, DV = Dependent Variable
 Sub Norms = Subjective Norms, PCB = Perceived Behavioural Control, * $p < .05$, ** $p < .01$

Thought Listings

To test the effects of temporal frame and CFC on participants' thought listings, I conducted a 2 (temporal frame: ST-, LT+ vs. ST+, LT-) x 2 (CFC: high vs. low) x 2 (type of thoughts: positive vs. negative) mixed analysis of variance (ANOVA) in which positive and negative thoughts were treated as a within-participants variable (see Orbell & Kyriakaki, 2008). Results first revealed that participants generated more positive thoughts ($M = 1.70$, $SD = 1.27$) than negative thoughts ($M = .70$, $SD = .87$) about fruit and vegetable consumption. A main effect of CFC on type of thoughts was observed, $F(1, 141) = 4.48$, $p = .04$, showing that high CFC participants listed more thoughts overall. However, the predicted temporal frame x CFC x type of thoughts interaction was not significant, $F(1, 141) = .29$, $p = .59$.

Independent Contributions of C and CFC

To further replicate and extend Strathman et al.'s (1994) findings, the independent contributions of CFC over C and vice versa were explored using hierarchical regression analyses.

First, the dependent variable (intention to consume fruits and vegetables) was regressed on the independent variable (C), and then CFC was added as an additional variable in the second block of the model. In order to examine CFC's independent contribution to the dependent variable, results were examined to determine whether the second block added significant variance. In addition, the terms in the first and second blocks of the regression equations were reversed in order to investigate the influence of C over the effect of CFC. Results showed that CFC did not add significant variance over and above C, and vice versa (see Tables 6 and 7). However, there was a marginally significant effect of C at step 1 of the model (Table 6).

Table 6

Hierarchical Multiple Regression Analysis Examining Increase in Variance on Intentions Accounted for by CFC Over C

	β	F	R^2	ΔF	ΔR^2	p
Step 1						
Conscientiousness	.16	3.63	.03	3.63	.03	.06
Step 2						
Conscientiousness	.16	–	–	–	–	.10
CFC	.00	1.81	.03	.00	.00	.96

Note. Step 1 $df = (1, 144)$, Step 2 $df = (1, 143)$

Table 7

Hierarchical Multiple Regression Analysis Examining Increase in Variance on Intentions Accounted for by C Over CFC

	β	F	R^2	ΔF	ΔR^2	p
Step 1						
CFC	.08	.87	.00	.88	.01	.35
Step 2						
CFC	.00	–	–	–	–	.96
C	.16	1.81	.03	2.72	.02	.10

Note. Step 1 $df = (1, 144)$, Step 2 $df = (1, 143)$

Conscientiousness as Moderator of CFC x Temporal Frame Interaction on Intentions

To test whether C moderated the effects of CFC on intentions, multiple regression analyses were conducted to test for a three-way interaction between temporal frame, CFC, and C. First, the dependent variable (intentions) was regressed on temporal frame, CFC, and C. Next, the dependent variable was regressed on the products of each pair of variables (temporal frame x CFC, temporal frame x C, and CFC x C). Lastly, the dependent variable was regressed on the product of all three variables (temporal frame x CFC x C). Results found a significant three-way interaction between temporal frame, CFC, and C, $\beta = .31$, $t(145) = 2.55$, $p = .01$ (see Table 8 and Figures 1 and 2). Simple slope analyses revealed that there was a significant difference between low and high CFC ($-1 SD$ below the mean and $+1 SD$ above the mean, respectively) for participants presented with the ST-, LT+ frame (but not for the ST+, LT- frame) only at low levels of C, such that participants high in CFC reported greater intentions than those low in CFC, $t(145) = 3.54$, $p = .001$. There were no significant differences between participants low and high in CFC at high levels of C for either frame, (ST-, LT+: $t(145) = 1.78$, $p = .08$, ST+, LT-: $t(145) = .63$, $p = .53$).

Additionally, there was a significant two-way interaction between CFC and C on intentions, $\beta = -.19$, $t(145) = -2.22$, $p = .03$ (see Figure 3). Simple slope analyses revealed that high CFC participants reported greater intentions than low CFC participants at low levels of C, $t(145) = 1.20$, $p = .05$. There were no significant differences between participants high and low in CFC at high levels of C, $t(145) = .63$, $p = .53$.

CFC and Temporal Frame on Behavioural Measure

Logistic regression was used to determine whether the proportion of participants choosing to complete an additional questionnaire to receive a coupon varied as a function of

CFC (high vs. low) and temporal frame (ST-/LT+ vs. ST+/LT-). A total of 63 participants (43%) completed the additional questionnaire whereas 84 participants (57%) chose to skip this option. Results revealed no significant differences for CFC, $B = .70$, Wald $\chi^2 = 2.79$, $df = 1$, $OR = 2.01$, $p = .10$; temporal frame, $B = -.03$, Wald $\chi^2 = .01$, $df = 1$, $OR = .97$, $p = .93$; and CFC x temporal frame, $B = -.89$, Wald $\chi^2 = 2.46$, $df = 1$, $OR = .41$, $p = .12$; indicating that across all conditions, participants did not significantly differ in their decisions to complete the additional questionnaire.

Table 8

Multiple Regression Analysis for CFC x Temporal Frame x C Interaction on Intentions

	β	F	R^2	ΔF	ΔR^2	df
Step 1	–	1.54	.03	–	–	3, 142
CFC	.01	–	–	–	–	–
Frame	.08	–	–	–	–	–
C	.16	–	–	–	–	–
Step 2	–	1.74	.07	1.91	.04	3, 139
CFC	.09	–	–	–	–	–
Frame	.09	–	–	–	–	–
C	.09	–	–	–	–	–
CFC x Frame	-.07	–	–	–	–	–
CFC x C	-.19*	–	–	–	–	–
C x Frame	.11	–	–	–	–	–
Step 3	–	2.48*	.11	6.52*	.04	1, 138
CFC	.11	–	–	–	–	–
Frame	-.01	–	–	–	–	–
C	.08	–	–	–	–	–
CFC x Frame	-.15	–	–	–	–	–
CFC x C	.38**	–	–	–	–	–
C x Frame	.11	–	–	–	–	–
CFC x Frame x C	.31*	–	–	–	–	–

Note. * $p < .05$, ** $p < .01$

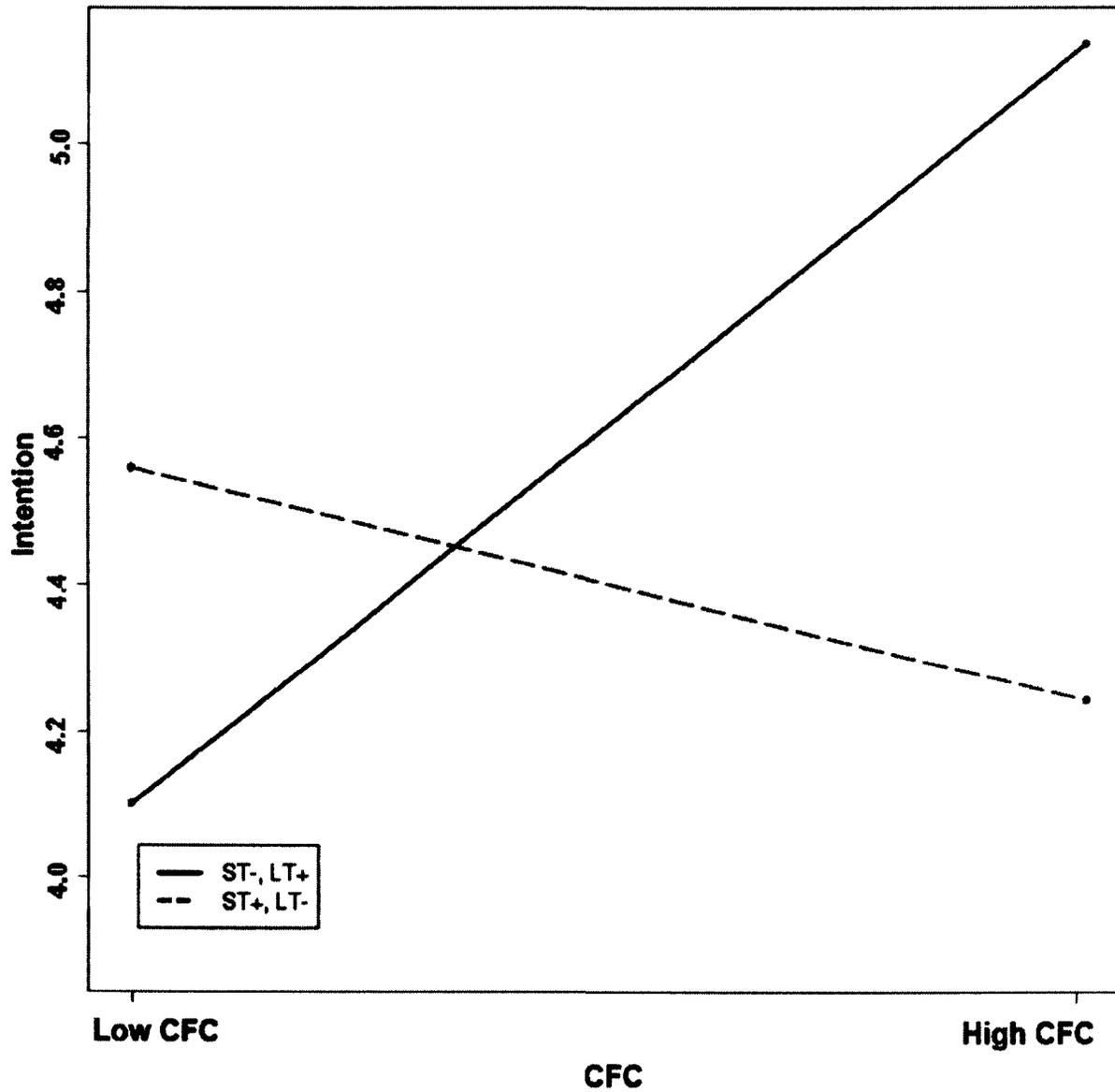


Figure 1. Simple slope graph of three-way interaction between temporal frame and CFC at low level of C. Temporal frame conditions are represented by ST-, LT+ and ST+, LT-. Low CFC and High CFC are defined as $-1 SD$ below and $+1 SD$ above the mean of CFC.

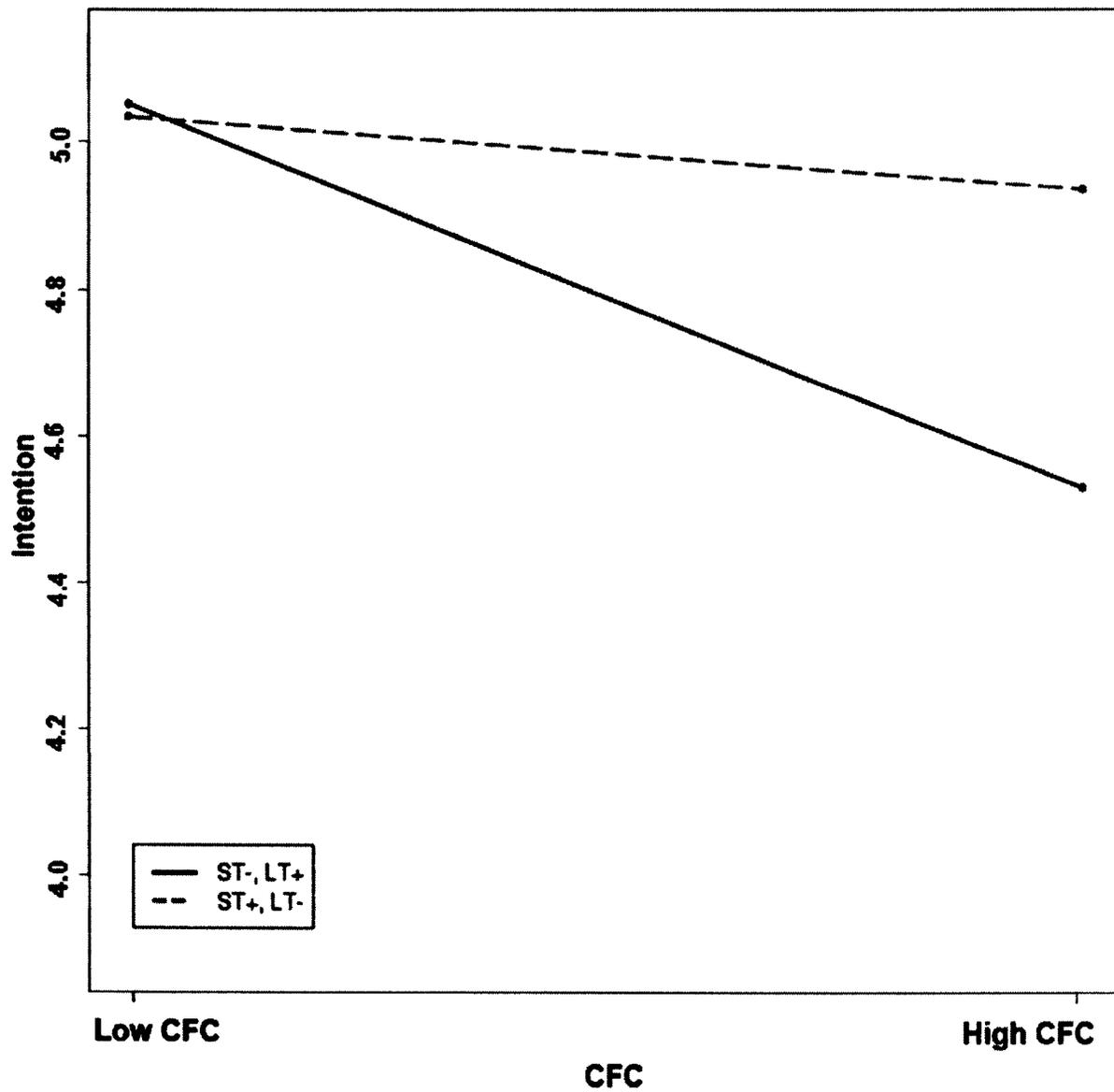


Figure 2. Simple slope graph of three-way interaction between temporal frame and CFC at high level of C. Temporal frame conditions are represented by ST-, LT+ and ST+, LT-. Low CFC and High CFC are defined as $-1 SD$ below and $+1 SD$ above the mean of CFC.

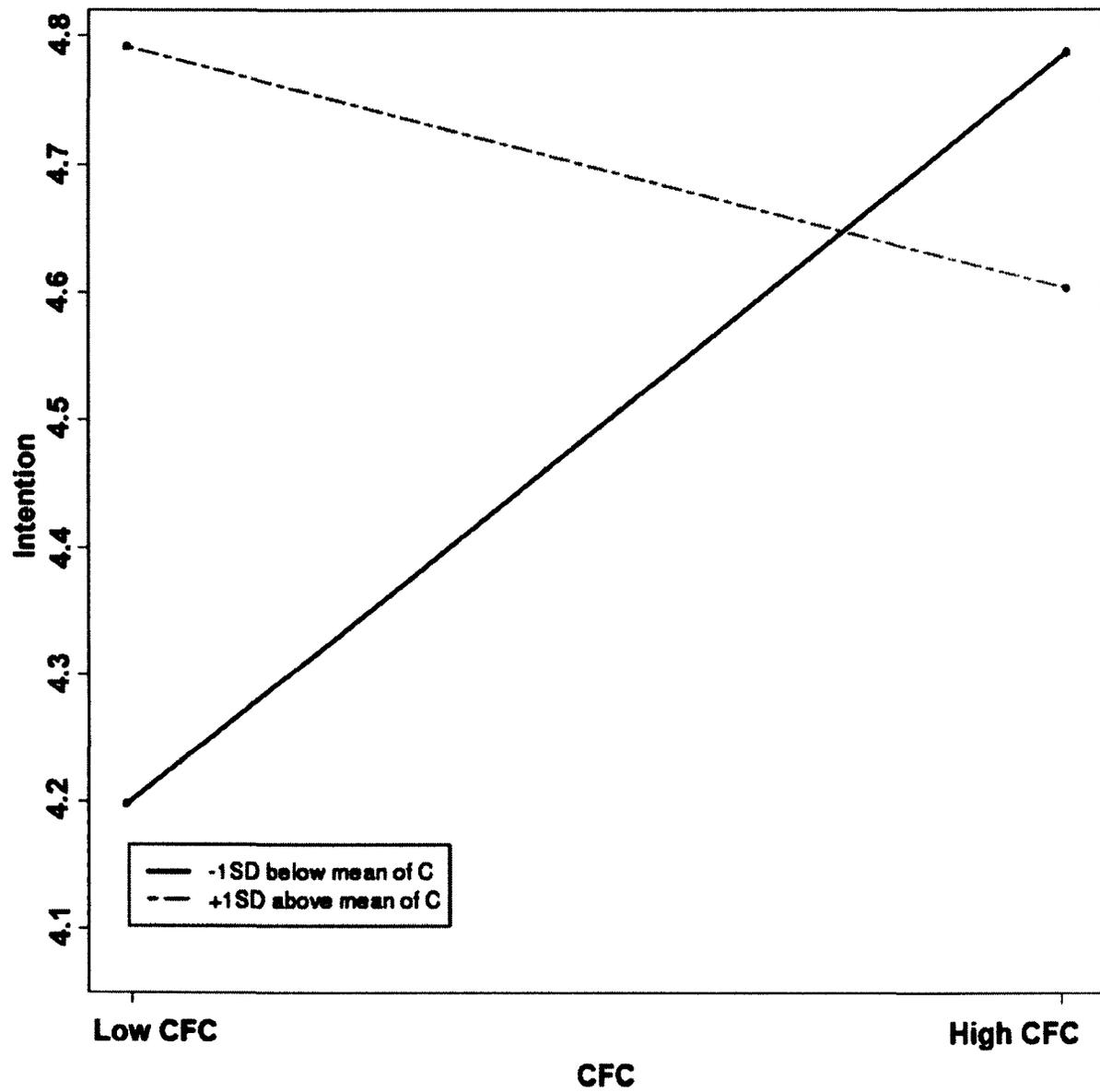


Figure 3. Simple slope graph of two-way interaction between levels of CFC and C. Lines for C are presented at $-1 SD$ below and $+1 SD$ above the mean of C.

Discussion

The primary goal of this study was to examine the effects of different messages on people's intentions and behaviours surrounding healthy eating and the influence of the personality variable of CFC in this domain. Tailoring health messages to individual characteristics allows for the presentation of information to adhere to people's specific needs, and research has suggested that these types of messages are more effective than more general, non-tailored messages (Kreuter, Bull, Clark, & Oswald, 1999; Kreuter & Wray, 2003; Latimer, Katulak, Mowad, & Salovey, 2005). In the present study, messages described either the negative short-term and positive long-term consequences of fruit and vegetable consumption or the positive short-term and negative long-term consequences. Healthy eating has been shown to lead to both positive future outcomes and be beneficial for short-term health, therefore individual differences in whether people consider the distant or immediate consequences of their behaviour were examined for their influence on the effectiveness of messages emphasizing the benefits of performing this behaviour.

In summary, it was predicted that high CFC individuals would show greater intentions to consume fruits and vegetables and would generate more positive relative to negative thoughts when presented with messages that emphasized the positive long-term and negative short-term consequences of this behaviour. Conversely, it was predicted that low CFC individuals would show greater intentions and thoughts when presented with messages that emphasized the positive short-term and negative long-term consequences. However, the hypotheses in the present study examining these effects within a healthy eating domain were unsupported. The same predictions were also made in regards to participant's behaviour, as opposed to intentions, assessing their decisions to receive a coupon by completing an additional questionnaire, and were similarly not

supported. No significant differences were found across levels of CFC and temporal frame, in regards to participants' decisions to complete an additional questionnaire to receive a coupon. In addition, due to the lack of a significant interaction between temporal frame and CFC, the proposed mediation by the Theory of Planned Behaviour variables (hypothesis 2) was not tested.

The third hypothesis sought to extend past research by assessing the independent contributions of CFC over C, and vice versa, to understand if each variable accounted for significant proportions of explained variance in the effects on behavioural intentions. CFC did not add significant variance to that accounted for by C, which showed a marginally significant effect of predicting intentions. Similarly, there was a trend that C added to variance accounted for by CFC, which did not significantly predict intentions.

Lastly, the role of C was investigated to see if it influenced the strength of the effects of CFC. A significant two-way interaction was found between CFC and C, where individuals high in CFC reported greater intentions than low CFC participants at low levels of C. There were no significant differences between high and low CFC individuals at high levels of C, with both groups reporting high intentions. Moreover, a significant three-way interaction between temporal frame, CFC, and C revealed that there was only a significant difference between high and low CFC participants presented with the ST-, LT+ frame (but not the ST+, LT- frame) at low levels of C, with high CFC participants reporting greater intentions than those low in CFC. In regards to high levels of C, there were no significant differences between high and low CFC for either frame.

Interaction between Temporal Frame and CFC

The present study was modeled after three specific studies (Orbell et al., 2004; Orbell & Hagger, 2006; Orbell & Kyriakaki, 2008) that examined the following behaviours: colorectal

cancer screening, type II diabetes screening, and sunscreen use. All of these studies found that varying levels of CFC significantly influenced the impact of different temporally framed messages on intentions and behaviour. However, contrary to the predicted hypotheses and prior research by Orbell and colleagues, no significant interaction between temporal frame and CFC on intentions was found in the present study. One potential explanation for these findings may relate to the sample population under examination. Whereas previous studies by Orbell and colleagues had more diverse community and undergraduate samples, the majority of the sample in the present study consisted of young, undergraduate women. This gender overrepresentation may have contributed to the non-significant interaction between temporal frame and CFC. It has been shown that women are more concerned about eating, body weight, and physical appearance than men (Pliner, Chaiken, & Flett, 1990), which may suggest that, regardless of female participants' level of CFC or which frame they were presented with, they may have already had high intentions to eat healthy in order to maintain the previously mentioned concerns. This may suggest a gender effect on intentions, and, indeed, a trend was found in this direction (Table 4).

Despite these findings, individuals (collapsed across levels of CFC) did report significantly higher perceived behavioural control when presented with information describing the positive long-term and negative short-term consequences of fruit and vegetable consumption, rather than the positive short-term and negative long-term consequences. Perhaps the negative short-term consequences were not perceived as too difficult to overcome for participants because they potentially found it easier to assess their confidence in performing the behaviour at the present time. However, those presented with the long-term negative consequences were less able to perceive whether they could perform these behaviours in the future, perhaps because it may be more difficult to assess how one's perceptions of control will be later in life.

Furthermore, high CFC individuals reported significantly higher perceived behavioural control than low CFC individuals, regardless of which frame they received. This suggests that high CFC individuals may generally have higher perceived behavioural control towards behaviour and these results indicate that the manipulation of temporal frame may not have had as large of an effect as was predicted. For example, individuals who are high in CFC find it easier to forgo short-term benefits for future gain and therefore may likely possess greater perceptions of behavioural control because they are aware of their ability to inhibit behaviour that would satisfy short-term needs.

Although there was also no significant interaction among temporal frame, CFC, and thought listings, high CFC participants reported significantly more thoughts overall than low CFC participants. This may explain a difference in the way high and low CFC participants processed the health information that was presented to them. Perhaps high CFC participants took into consideration both the present and future outcomes of fruit and vegetable consumption, regardless of which frame they received. Although they are more concerned with the long-term outcomes, they may have still internalized the short-term outcomes and then decided that they were of little importance. Conversely, when low CFC participants were presented with either of the frames, they may have focused solely on the short-term consequences and ignored thoughts towards the long-term, reporting fewer thoughts overall. Further research is necessary to understand these underlying mechanisms in order to better explain how individual differences in CFC predict healthy eating.

Mediation of Effects by Theory of Planned Behaviour Variables

The Theory of Planned Behaviour variables of attitudes, subjective norms, and perceived behavioural control have been shown in previous studies to act as mediators of the effects of

temporal framing on behavioural intentions (Orbell et al. 2004; Orbell & Hagger, 2006; Orbell & Kyriakaki, 2008). Although the present study attempted to extend these findings in a healthy eating domain, no mediation tests were conducted due to the lack of significant interaction effects between temporal frame and CFC on intentions.

Independent Contributions of CFC and C

CFC did not significantly add variance to C; in fact, it did not add any variance at all. However, when assessing C's contributions, a marginally significant effect at the first step of the model was found, suggesting that C did explain a proportion of the variance, unlike CFC. In the case of CFC, its unique effects may be less accounted for within a healthy eating domain, as opposed to other behaviours previously examined by Strathman et al., such as smoking. One possible explanation for CFC's weak predictive results, which Strathman et al. also alluded to in regards to CFC and alcohol consumption, focuses on the relationship between eating fruits and vegetables in the present and the associated health outcomes of this behaviour later in life. As an example, the association between smoking cigarettes and the risk of developing lung cancer in the future is widely known (Steptoe et al., 2006), yet similar links between fruit and vegetable consumption may be less known. Although many people understand that eating fruits and vegetables can have positive effects, it may be that not all have a clear understanding of this behavioural relationship. For example, different fruits and vegetables may have higher or lower health values, confusion may exist as to what are appropriate or healthy portion sizes, or some may see fruits and vegetables as unhealthy if they are not organically grown or contaminated with pesticides. Therefore, the importance of establishing a clear link between the performance of a given behaviour and its later outcomes may be a good indicator of CFC's predictive capacity.

Although not significant, *C* did show that it was a stronger predictor of intentions towards eating fruits and vegetables than CFC, as overall, there were trends that it accounted for more variance in intentions. Perhaps the underlying facets of *C* (e.g. achievement striving, self-discipline, self-efficacy, etc.) allow one to engage in healthy eating with less difficulty, which in turn results in the ability to maintain such behaviour over time.

***C* as a Moderator of CFC**

When *C* was low, results supported previous findings by Orbell and colleagues in showing that high CFC participants reported significantly greater intentions when presented with the short-term negative/long-term positive frame (See Figure 1, solid line). Although not significant, results showed a similar trend to Orbell's past studies, where low CFC participants displayed higher intentions than high CFC participants when presented with the short-term positive/long-term negative frame (See Figure 1, dotted line). However, one surprising finding showed that under the condition of High *C*, a marginally significant trend ($p = .07$) indicating that low CFC participants, rather than high CFC, displayed greater intentions with the long-term positive frame (See Figure 2, solid line), which is contrary to what has been reported in past studies regarding the interactive effects between temporal frame and CFC. Perhaps this suggests that the temporal frame x CFC interaction holds true when *C* is low but not when *C* is high, suggesting that high *C* may outweigh any negative effects produced by CFC when it is paired with a theoretically opposing temporal frame. Support for this speculation can be seen at high levels of *C*, where both high and low CFC participants showed greater intentions, regardless of frame. The same mechanism also underlies the two-way interaction. Perhaps the various facets related to the *C* construct, such as achievement striving, self-discipline, and self-efficacy, allow

one to consume fruits and vegetables with less difficulty because it is a behaviour that requires one to use such skills to be successful.

Overall, CFC may not be the strongest predictor of intentions to consume fruits and vegetables because the relationship between this behaviour and its health outcomes later in life may not be as clear as those for other behaviours (as was discussed previously in more detail). Therefore, perhaps having the skills necessary to perform healthy eating behaviour, such as those that make up the facets of C, make it a stronger predictor of intentions to consume fruits and vegetables than CFC because these skills enable one to successfully perform this behaviour.

Alternate Theories

Research indicates that many people use the adage “everything in moderation” as a strategy for dealing with inconsistencies and confusions around food (Lupton & Chapman, 1995). Thus, perhaps some individuals believe that the amount of fruits and vegetables that they consume are adequate, yet choose to use this healthy behaviour to justify their consumption of unhealthy food. Such strategies have been studied and labeled as compensatory health beliefs (Rabiau, Knauper, & Miquelon, 2006), which by definition are beliefs that the negative effects of a volitional unhealthy behaviour can be compensated for by engaging in another volitional healthy behaviour. The use of the concept of volition is used to emphasize that compensatory health beliefs are pertinent to behaviours that require self-control. Trope & Fishbach (2000) describe these situations as those where short-term outcomes are in opposition to long-term outcomes. Perhaps high C individuals would be less prone to compensate healthy behaviour with unhealthy behaviour, as self-control falls within the spectrum of C facets.

An alternate perspective that may explain food decision-making is the area of delay discounting (Epstein, Salvy, Carr, Dearing, Bickel, 2010). This theory suggests that people may

prefer smaller immediate rewards over larger delayed ones. This theory has been applied to healthy eating research, specifically to the study of obesity. For example, research has shown that obese youth are more likely to choose smaller, immediate rewards, and that they have greater difficulty delaying gratification when offered food items rather than non-edible alternatives (Bonato & Boland, 1983). This suggests that issues with delay of gratification are specific to eating behaviour, and given that the theory focuses on immediate rewards over those that are delayed, it may be applied to study the effects of CFC on eating behaviour. Furthermore, delay discounting may have implications for understanding the mechanisms of C on healthy eating, as delay of gratification is associated with the self-discipline facet of C.

Limitations

There were a number of limitations with the present study. First, there were limits to the availability of outcome measures, as the cross-sectional design of the study did not allow for participants to be measured on another occasion. This also constrained the interpretation of the results, as it is unknown whether participants' behavioural intentions actually translated into real behaviour. Accordingly, follow up measures of participants' eating habits would have been useful in assessing the impact of the health information presented to them. The study was also administered online, which can hinder the ability to directly observe participants and ensure that they are conducting themselves appropriately. Additionally, there are limitations to the generalizability of the research findings, as the sample consisted mostly of young, undergraduate women.

Although temporal framing is an effective way to assess the CFC construct, as it allows for the costs and benefits of a given behaviour to be framed according to *when* their outcomes occur, a potential issue may arise when using these results in applied settings. If trying to

promote health behaviour, describing its negative outcomes may seem counterintuitive, as these negatives may outweigh the positives for certain people. For example, if the results of a study that used temporal messages to better understand the effects of CFC were to be applied to a public policy campaign, what aspects of the health information should be emphasized? If only the long-term positive outcomes of a given behaviour are described, where does that leave those people who are low on CFC, or vice versa with high CFC for short-term positive outcomes? Furthermore, is it important to acknowledge the negative aspects of the behaviour or will these produce adverse effects? Perhaps further research should seek to understand whether presenting individuals with the negative aspects of performing a healthy behaviour has any motivating effects. For example, one may perceive the difficulty involved with a given behaviour as a way to overcome a challenge.

Lastly, issues surrounding statistical power may have prevented certain results from being detected. For instance, the results for the MANOVA temporal frame x CFC interaction might have been significant if power was higher. An inspection of observed power revealed very low values: intentions = .06, attitudes = .08, subjective norms = .12, and perceived behavioural control = .06. Perhaps a larger sample size would have identified greater effects and therefore could be expanded upon in future research.

Conclusions and Future Directions

Despite the present study's main hypotheses of interactions between CFC and temporal frame being largely unsupported, it is important to note that this is the first study (to the best of my knowledge) that examined CFC within a healthy eating domain; thus, further research with larger samples may be warranted to determine the reliability of the present results. In addition, given the novel nature of the present study (in regards to the specific variables that were tested),

noteworthy results were uncovered concerning the variables of CFC and C. It would be interesting to see whether the interactive effects of CFC and C would replicate when tested on other health behaviours. Perhaps studies assessing effective health communication strategies could consider designing messages that simultaneously tailor to two or more individual difference variables. For example, high CFC participants would likely sacrifice present needs to fulfill future desired outcomes, while high C individuals would have the capacity to plan their future goals accordingly. Messages could be designed that address aspects of both constructs which could potentially tailor to more than one personality dimension at the same time.

C appeared to produce stronger effects than CFC within the current study's healthy eating domain. Future research should examine where specific individual difference variables such as C are most salient, in order to target the most appropriate characteristics for specific behavioural interventions.

Overall, the present findings offer novel insight into personality variables previously linked to health outcomes. Understanding individual differences in the way people consider the long-term and short-term consequences of their actions and the ways that Conscientiousness allows one to achieve specific goals may help to uncover new ways in which the positive health consequences of certain behaviours can be successfully attained.

References

- Adams, J., & Nettle, D. (2009). Time perspective, personality and smoking, body mass, and physical activity: An empirical study. *British Journal of Health Psychology, 14*, 83–105.
- Adams, J., & White, M. (2009). Time perspective in socioeconomic inequalities in smoking and body mass index. *Health Psychology, 28*, 83-90.
- Ajzen, I. (1985). *Action control: From cognition to behavior*. Berlin, Germany: Springer-Verlag.
- Ajzen, I. (1991). The theory of planned behavior. *Organization Behavior and Human Decision Processes, 50*, 179-211.
- Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., et al. (1995). The effects of message framing on mammography utilization. *Health Psychology, 14*, 178–184.
- Bazzano, L. A., Serdula, M. K., & Liu, S. (2003). Dietary intake of fruits and vegetables and risk of cardiovascular disease. *Current Atherosclerosis Reports, 5*, 492-499.
- Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin, 130*, 887-919.
- Bonato, D. P., & Bolan, F. J. (1983). Delay of gratification in obese children. *Addictive Behaviors, 8*, 71-64.
- Boninger, D. S., Gleicher, F., & Strathman, A. (1994). Counterfactual thinking: From what might have been to what may be. *Journal of Personality and Social Psychology, 67*, 297-307.
- Chapman, G. B. (2005). Short-term cost for long-term benefit: Time preference and cancer control. *Health Psychology, 24*, 41-48.

- Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual*. Odessa, FL: Psychological Assessment Resources.
- Cox, D., & Cox, A. D. (2001). Communicating the consequences of early detection: The Role of evidence and framing. *Journal of Marketing*, *65*, 91–103.
- Croll, J. K., Neumark-Sztainer, D., & Story, M. (2011). Healthy eating: What does it Mean to adolescents? *Journal of Nutrition Education*, *33*, 193-98.
- Crockett, R. A., Weinman, J., Hankins, M., & Marteau, T. (2009). Time orientation and health-related behaviour: Measurement in general population samples. *Psychology & Health*, *24*, 333-350.
- Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., & Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychology*, *18*, 189–196.
- Dorr, N., Krueckeberg, S., Strathman, A. & Wood, A. (1999). Psychosocial correlates of voluntary HIV antibody testing in college students. *AIDS Education and Prevention*, *11*, 14-27.
- Edwards, A., Elwyn, G., Covey, J., Matthews, E., & Pill, R. (2001). Presenting risk Information: A review of the effects of “framing” and other manipulations of patient outcomes. *Journal of Health Communication*, *6*, 61–82.
- Epstein, L. H., Salvy, S. J., Carr, K. A., Dearing, K. K., Bickel, W. K. (2010). Food reinforcement, delay discounting and obesity. *Physiology & Behavior*, *100*, 438-445.
- Finney, L., & Iannotti, R. (2002). Message framing and mammography screening: A theory-driven intervention. *Behavioral Medicine*, *28*, 5–14.

- Food Marketing Institute (2001). Reaching out to the whole health consumer. *Prevention Magazine*. Rodale Incorporated.
- Food Marketing Institute (2002). Shopping for health. Retrieved from <http://www.fmi.org>.
- Genkinger, J. M., Platz, E. A., Hoffman, S. C., Comstock, G. W., & Helzlsouer, K. J. (2004). Fruit, vegetable, and antioxidant intake and all-cause, cancer, and cardiovascular disease mortality in a community dwelling population in Washington County, MD. *American Journal of Epidemiology*, *160*, 1223–1233.
- Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. C. (2006). The International Personality Item Pool and the future of public-domain personality measures. *Journal of Research in Personality*, *40*, 84-96.
- John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 102–138). New York: Guilford Press.
- Jones, L. W., Sinclair, R. C., Courneya, K. S. (2003). The effects of source credibility and message framing on exercise intentions, behaviors, and attitudes: an integration of the elaboration likelihood model and prospect theory. *Journal of Applied Social Psychology* *33*, 179–196.
- Kahneman, D., & Miller, D. T. (1986). Norm theory: comparing reality to its alternatives. *Psychological Review*, *93*, 136-153.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263-91.
- Kreuter, M. W., Bull, F. C., Clark, E. M., & Oswald, D. L. (1999). Understanding how

- people process health information: A comparison of tailored and nontailored weight-loss materials. *Health Psychology, 18*, 487–494.
- Kreuter, M. W., Wray, R. J. (2003). Tailored and targeted health communication: strategies for enhancing information relevance. *American Journal of Health Behavior, 27*, 227–232.
- Latimer, A.E., Katulak, N.A., Mowad, L., Salovey, P. (2005). Motivating cancer prevention and early detection behaviors using psychologically tailored messages. *Journal of Health Communication, 10*, 137–155.
- Law, M. R. & Morris, J. K. (1998). By how much does fruit and vegetable consumption reduce the risk of ischemic heart disease? *European Journal of Clinical Nutrition, 52*, 549-556.
- Linville, P. W., Fischer, G. W., & Fischhoff, B. (1993). AIDS risk perceptions and decision biases. In J. B. Pryor & G. D. Reeder (Eds.), *The social psychology of HIV infection* (pp. 5–38). Hillsdale, NJ: Lawrence Erlbaum.
- Lupton, D. & Chapman, S. (1995). A healthy lifestyle might be the death of you: Discourses on diet, cholesterol control and heart disease in the press and among the lay public. *Sociology of Health and Illness, 17*, 477-494.
- MacCallum, R. C., Zhang, S., Preachers, K. J. & Rucker, D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods, 7*, 19-40.
- McCaul, K. D., Johnson, R. J., & Rothman, A. J. (2002). The effects of framing and action instructions on whether older adults obtain flu shots. *Health Psychology, 21*, 624–628.
- Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast

- self-examination attitudes, intentions, and behavior. *Journal of Personality and Social Psychology*, 52, 500–510.
- Millar, M. G., & Millar, K. (2000). Promoting safe driving behaviors: The influence of message framing and issue involvement. *Journal of Applied Social Psychology*, 30, 853–856.
- Myers, R. E., Ross, E. A., Wolf, T. A., Balshem, A., Jepson, C., & Millner, L. (1991). Behavioral interventions to increase adherence to colorectal cancer screening. *Medical Care*, 29, 1039–1050.
- O'Connor, D. B., Warttig, S., Conner, M., & Lawton, R. (2009) Raising awareness of hypertension risk through a web-based framing intervention: Does consideration of future consequences make a difference? *Health & Medicine*, 14, 213-219.
doi:10.1080/13548500802291618
- Orbell, S., & Kyriakaki, M. (2008). Temporal framing and persuasion to adopt preventive health behavior: Moderating effects of individual differences in consideration of future consequences on sunscreen use. *Health Psychology*, 27, 770-779.
doi:10.1037/0278-6133.27.6.770
- Orbell, S., Perugini, M., & Rakow, T. (2004) Individual differences in sensitivity to health communications: Consideration of future consequences. *Health Psychology*, 23, 388-396.
doi:10.1037/0278-6133.23.4.388
- Orbell, S., & Hagger, M. (2006). Temporal framing and the decision to take part in type diabetes screening: Effects of individual differences in consideration of future consequences on persuasion. *Health Psychology*, 25, 537-548.
- Oude Griep, L. M., Geleijnse, J. M., Kromhout, D., Ocke, M. C., & Verschuren, M. W. M.

- (2010). Raw and processed fruit and vegetable consumption and 10-year coronary heart disease incidence in a population-based cohort study in the Netherlands. *PLoS One*, 5, 1-6.
- Paquette, M. C. (2005). Perceptions of healthy eating. *Canadian Journal of Public Health*, 96, 15-19.
- Perez, C. E. (2002). Fruit and vegetable consumption. Retrieved from <http://www.statcan.gc.ca/pub/82-229-x/2009001/deter/fvc-eng.htm>.
- Peters, B.R., Joireman, J., & Ridgeway, R.L. (2005). Individual differences in the consideration of future consequences scale correlate with sleep habits, sleep quality, and GPA in university students. *Psychological Reports*, 96, 817-824.
- Pliner, P., Chaiken, S., & Flett, G. L. (1990). Gender differences in concern with body weight and physical appearance over the life span. *Personality and Social Psychology Bulletin*, 16, 263-273.
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*, 31, 437-448.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers*, 36, 717-731.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879-891.
- Rabia, M., Knäuper, B., & Miquelon, P. (2006). The eternal quest for optimal balance between

- maximizing pleasure and minimizing harm: The compensatory health beliefs model. *British Journal of Health Psychology*, *11*, 139-153.
- Roberts, B. W., Walton, K. E., & Bogg, T. (2005). Conscientiousness and health across the life course. *Review of General Psychology*, *9*, 156-168.
- Rodin, J., & Salovey, P. (1989). Health psychology. *Annual Review of Psychology*, *40*, 533.
- Rothman, A. J., Bartels, R. D., Wlaschin, J., Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: how theory can inform practice. *Journal of Communication*, *56*, 202–220.
- Rothspan, S., & Read, S. J. (1996). Present versus future time perspective and HIV risk among heterosexual college students. *Health Psychology*, *15*, 131–134.
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin*, *121*, 3–19.
- Rothman, A. J., Salovey, P., Antone, C., Keough, K., & Martin, C. D. (1993). The influence of message framing on intentions to perform health behaviors. *Journal of Experimental Social Psychology*, *29*, 408–433.
- Salovey, P. (2005). *Science and Medicine in Dialogue: Thinking through Particulars and Universals*. Westport, CT: Praeger.
- Schneider, T. R., Salovey, P., Apanovitch, A. M., Pizarro, J., McCarthy, D., Zullo, J., et al. (2001). The effects of message framing and ethnic targeting on mammography use among low-income women. *Health Psychology*, *20*, 256–266.

- Strathman, A., Gleicher, F., Boninger, D.S. & Edwards, C. S. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology*, 66, 742-752.
- Stephoe, A., Wardle, J., Smith, H., Kopp, M., Skrabski, A., Vinck, J., & Zotti, A. M. (2006). Tobacco smoking in young adults from 21 European countries: association with attitudes and risk awareness. *Addiction*, 90, 571-582.
- Taylor, S.E. (2003). *Health Psychology*, 5th ed. McGraw-Hill, New York.
- Terman, L. M., & Oden, M. H. (1947). Genetic studies of genius: IV. The gifted child grows up: Twenty-five years follow-up of a superior group. Stanford, CA: Stanford University Press.
- Trope, Y., & Fishbach, A. (2000). Counteractive self-control in overcoming temptation. *Journal of Personality and Social Psychology*, 79, 493-506.
- United States Department of Agriculture, (2008). Is dietary knowledge enough? Hunger, stress, and other roadblocks to healthy eating. Retrieved from www.ers.usda.gov/Publications/ERR62.
- United States Department of Agriculture, Center for Nutrition Policy and Promotion (2006). Development of MyPyramid. Retrieved from <http://www.cnpp.usda.gov/MyPyramidDevelopment.htm>.
- Van Duyn, M. A., & Pivonka, E. (2000). Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: selected literature. *Journal of the American Dietetic Association*, 100, 1511-1521.
- Watson, D., & Clark, L. A. (1993). *Handbook of mental control*. Upper Saddle River, NJ: Prentice Hall.

World Health Organization (2005). *Preventing chronic diseases: A vital investment*. World Health Organization, Geneva.

Appendix A

Message Frame Passage #1 –Short-Term Negative, Long-Term Positive

Fruits and vegetables are important components of a healthy diet, and their sufficient consumption could help prevent major health problems. Health Canada recommends eating between 5 and 10 servings of fruits and vegetables per day.

Some people find that eating fruits and vegetables gives them peace of mind throughout their life that they are reducing their chances of developing heart disease and certain types of cancer. They may also find that they can prevent vitamin deficiency in the future, as the consumption of fruits and vegetables provides essential vitamins and nutrients over time. They also find that eating fruits and vegetables can lead to better digestion in the long term. Some people find that eating fruits and vegetables can be too time consuming to prepare on a daily basis. They may also find that eating fruits and vegetables can be too costly for them right now. Some people also find that they immediately prefer the taste of other food items to the taste of fruits and vegetables.

Appendix B

Message Frame Passage #2 – Short-Term Positive, Long-Term Negative

Fruits and vegetables are important components of a healthy diet, and their sufficient consumption could help prevent major health problems. Health Canada recommends eating between 5 and 10 servings of fruits and vegetables per day.

Some people find that eating fruits and vegetables gives them immediate peace of mind that they are reducing their chances of developing heart disease and certain types of cancer. They may also find that they can immediately prevent vitamin deficiency, as the consumption of fruits and vegetables provides essential vitamins and nutrients on a daily basis. They also find that eating fruits and vegetables can lead to better digestion in the short term. Some people find that eating fruits and vegetables can be too time consuming to prepare throughout their lifetime. They may also find that eating fruits and vegetables can be too costly for them in the long term. Some people also find that over time they may prefer the taste of other food items to the taste of fruits and vegetables.

Appendix C

Consideration of Future Consequences Scale

For each of the statements below, please indicate whether or not the statement is characteristic of you. If the statement is extremely uncharacteristic of you (not at all like you) please fill-in a "1"; if the statement is extremely characteristic of you (very much like you) please fill-in a "5". Use the numbers in the middle if you fall between the endpoints. Please keep the following scale in mind as you rate each of the statements below.

1=extremely uncharacteristic

2=somewhat uncharacteristic

3=uncertain

4=somewhat characteristic

5=extremely characteristic

___ 1. I consider how things might be in the future, and try to influence those things with my day to day behavior.

___ 2. Often I engage in a particular behavior in order to achieve outcomes that may not result for many years.

___ 3. I only act to satisfy immediate concerns, figuring the future will take care of itself.

___ 4. My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.

___ 5. My convenience is a big factor in the decisions I make or the actions I take.

___ 6. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.

___ 7. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.

___ 8. I think it is more important to perform a behavior with important distant consequences than a behavior with less-important immediate consequences.

___ 9. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.

___ 10. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.

___ 11. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.

___ 12. Since my day to day work has specific outcomes, it is more important to me than behavior that has distant outcomes.

Appendix D

IPIP NEO-PI-R Conscientiousness Domain 20-Item Scale

On the following page, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes *you*. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.

Response Options: 1: Very Inaccurate 2: Moderately Inaccurate 3: Neither Inaccurate nor Accurate 4: Moderately Accurate 5: Very Accurate

1. Am always prepared.
2. Pay attention to details.
3. Get chores done right away.
4. Carry out my plans.
5. Make plans and stick to them.
6. Complete tasks successfully.
7. Do things according to a plan.
8. Am exacting in my work.
9. Finish what I start.
10. Follow through with my plans.
11. Waste my time.
12. Find it difficult to get down to work.
13. Do just enough work to get by.
14. Don't see things through.
15. Shirk my duties.
16. Mess things up.
17. Leave things unfinished.
18. Don't put my mind on the task at hand.
19. Make a mess of things.
20. Need a push to get started.

Appendix F

Demographic Questions

1. Gender:
 - a) Male
 - b) Female

2. Ethnicity:
 - a) Caucasian
 - b) African
 - c) Asian
 - d) Middle Eastern
 - e) Hispanic
 - f) Other (please specify): _____

3. Age: _____

4. Height (feet): _____

5. Weight (pounds): _____

6. Do you suffer from any medical conditions that may restrict or affect your diet?
 - a) Yes (e.g., diabetic, restrict sugar): Please describe _____
 - b) No

7. Are you vegetarian?
 - a) Yes
 - b) No

8. Are you vegan?
 - a) Yes
 - b) No

9. Are you currently on a food restricting diet?
 - a) Yes: Please describe _____
 - b) No

Appendix G

SONA Recruitment Notice

Study Name: Evaluations of Health Information Regarding Eating Practices

Description: The researchers of this study are interested in examining students' evaluations of health information regarding fruit and vegetable consumption. This study involves reading health information and describing your thoughts about this information, and responding to and completing a series of questions and measures.

This study has been approved by the Carleton University Ethics Committee for Psychological Research (#12-234). Please also note that all data are confidential and anonymous.

Eligibility requirements: We are looking for undergraduate university students aged 16 and above enrolled at Carleton University.

Duration and locale: The study should take approximately one hour to complete and will be conducted online.

Compensation: You will receive a 0.5% grade increase towards your final grade in PSYC 1001, PSYC 1002, PSYC 2001 or PSYC 2002 for participating.

Researchers:

Jakub Racek (jracek@connect.carleton.ca)

Dr. Mary Gick, Faculty Supervisor (mary_gick@carleton.ca)

Appendix H

Informed Consent

The purpose of an informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. The informed consent should provide sufficient information such that you have the opportunity to determine whether or not you wish to participate in the study.

Research title: Evaluations of Health Information Regarding Eating Practices

Research Personnel: M.A. student, Jakub Racek (jracek@connect.carleton.ca)
Faculty supervisor, Mary Gick, Ph.D. (mary_gick@carleton.ca)

If you have any ethical concerns about this study please contact Dr. Monique Sénéchal, (Chair of the Carleton University Ethics Committee for Psychological Research) at 520-2600 ext. 1155, monique_sénéchal@carleton.ca). If you have any other concerns, please contact Dr. Anne Bowker (Chair of the Department of Psychology) at 520-2600 ext. 8218, anne_bowker@carleton.ca.

Purpose and Task requirements: The purpose of this study is to examine individuals' evaluations of health information regarding fruit and vegetable consumption. The study involves reading a short passage concerning fruit and vegetable consumption, describing your thoughts about this information, and responding to and completing a series of questions and measures.

Location and Duration: The study will be completed online and should take no longer than one hour to complete.

Remuneration: You will receive a 0.5% grade increase towards your final grade in PSYC 1001, PSYC 1002, PSYC 2001 or PSYC 2002 for participating in this study.

Potential risk and discomfort: The study should not pose any risk or discomfort to you.

Anonymity/Confidentiality: The researchers will keep all of your data confidential and will have sole access to your responses. Your name will not be associated with collected data and no identifying information (IP address, etc.) will be collected during the study to maintain your anonymity.

Right to withdraw: Your participation in this study is completely voluntary. You have the right to withdraw from the study at any time and are free to leave any questions unanswered. You will not be penalized for these actions.

This study has received clearance by the Carleton University Psychology Research Ethics Board (Reference #12-234, insert your ethics reference number once obtained).

I have read the above form and understand the conditions of my participation. My participation in this study is voluntary, and I understand that if at any time I wish to leave the experiment, I may do so without having to give an explanation and with no penalty whatsoever. Furthermore, I am also aware that the data gathered in this study are confidential and anonymous with respect to my personal identity. My endorsement (clicking on the "I AGREE" button below) indicates that I agree to participate in the study, and this in no way constitutes a waiver of my rights. I am at least 16 years of age.

I AGREE

I DISAGREE

Appendix I

Debriefing

What are we trying to learn with this research?

We are hoping to understand whether individual differences in one's preference to consider the future or present consequences of their behaviour, as well as the tendency to be organized and reliable, influences their responses to information about healthy eating practices.

What are our hypotheses and predictions?

We are predicting that participants will show greater intentions to consume more fruits and vegetables when presented with information that is aligned with their preferred time-orientation (future vs. present). This research hopes to further understand the role of personality differences in healthy eating behaviour, as health messages may be more effective if tailored to individual characteristics.

Where can I learn more?

Orbell, S., & Kyriakaki, M (2008). Temporal framing and persuasion to adopt preventive health behavior: Moderating effects of individual differences in consideration of future consequences on sunscreen use. *Health Psychology, 27*, 770-779.

Strathman, A., Gleicher, F., Boninger, D.S. & Edwards, C. S. (1994) The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology, 66*, 742-752.

Is there anything I can do if I found this experiment to be emotionally draining?

Yes. If you feel any distress or anxiety after participating in this study or would like to learn how to live a healthier lifestyle, please feel free to contact the Carleton University Health and Counselling Services at: 613-520-6674 or www.carleton.ca/health or the Distress Centre of Ottawa and Region at 613-238-3311, www.dcottawa.on.ca.

What if I have questions later?

If you have any remaining concerns, questions, or comments about the experiment, please feel free to contact Jakub Racek (jracek@connect.carleton.ca) or Faculty supervisor, Mary Gick, Ph.D. (mary_gick@carleton.ca).

Should you have any ethical concerns about this research, please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research) at 520-2600 ext. 1155, monique_sénéchal@carleton.ca. If you have any other concerns, please contact Dr. Anne Bowker (Chair of the Department of Psychology) at 520-2600 ext. 8218, anne_bowker@carleton.ca. Please refer to the study's ethics approval number (provided by the Carleton University Psychology Research Ethics Board) when making inquiries (12-234).

Thank you for participating!