Social Support as a Moderator for Depressive Symptoms and
Well-being During the Transition to University

by

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SOCIAL SUPPORT AND DEPRESSION

Abstract

Nearly 40% of Canadian university students are depressed (Othman et al., 2019). However, strong social support may mitigate adverse outcomes for some students (Santini et al., 2015). This study examined: 1. If students who showed initial depression were more likely to experience poorer end-of-semester outcomes in well-being (i.e., continued depressive symptoms, burnout, and poor social and academic adjustment). 2. If social support was a moderator for initial depression and poorer end-of-semester well-being. 3. If seeing friends face-to-face is a stronger moderator than phone calls or text messages on end-of-semester well-being. Participants ($N=461$) were first-time first-year undergraduates who completed questionnaires in September and in December ($N=368$) of their first semester. Entering university with depressive symptoms was shown to be associated with end-of-semester depression burnout and decreased academic adjustment. Students with initially low depression and high social support had less depression in December. Question three was unsupported, well-being was unaffected by mode of communication and September depression.

Keywords: depression, social support, transition to university, well-being

SOCIAL SUPPORT AND DEPRESSION

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SOCIAL SUPPORT AND DEPRESSION

Table of Contents

Abstract.....	ii
Acknowledgements.....	iii
Table of Contents.....	iv
List of Tables.....	vi
List of Figures.....	vii
List of Appendices.....	viii
Introduction.....	1
Epidemiology and Development of Depression in Children and Adolescents.....	4
Causes of Depression.....	6
Social Support.....	8
<i>Modes of Social Support</i>	12
A Developmental Systems Perspective on Depression during the Transition to University.....	15
Areas of Vulnerability During the Transition to University.....	18
<i>Adjustment to University</i>	18
<i>Academic Burnout</i>	20
The Current Study.....	22
Method.....	23
<i>Participants and Procedure</i>	23
<i>Measures</i>	26
<i>Planned Analysis and Data Management</i>	29
<i>Regression Models</i>	30

SOCIAL SUPPORT AND DEPRESSION

<i>Missing Data</i>	33
Results.....	35
<i>Analytic Strategy</i>	35
<i>Model Results</i>	38
<i>End-of-semester Depression</i>	38
<i>End-of-semester Burnout</i>	39
<i>End-of-semester Social Adjustment</i>	44
<i>End-of-semester Academic Adjustment</i>	45
<i>Modes of Communication in September</i>	47
<i>Modes of Communication in December</i>	49
Discussion.....	57
<i>High Social Support is Typical</i>	60
<i>Perceived Social Support Differs from Frequency of Communication</i>	62
<i>Social support is beneficial at low levels of depression</i>	66
<i>Strengths and Limitations</i>	69
<i>Implications</i>	70
<i>Conclusion</i>	74
References.....	76

SOCIAL SUPPORT AND DEPRESSION

List of Tables

Table 1: <i>Descriptive statistics and correlations for study variables.....</i>	36
Table 2: <i>Number and percentage of missing scale data for study variables.....</i>	36
Table 3: <i>Multiple regression models of September social support predicting end-of-semester outcomes.....</i>	41
Table 4: <i>Multiple regression models of December social predicting end-of-semester outcomes.....</i>	42
Table 5: <i>Partial correlations of depression, social support, and their interactions with end-of-semester outcomes.....</i>	45
Table 6: <i>Multiple regression models of different modes of social support in September, predicting end-of-semester outcomes.....</i>	52
Table 7: <i>Partial correlations for modes of communication in September on end-of-semester outcomes.....</i>	53
Table 8: <i>Multiple regression models of different modes of communication in December predicting end-of-semester outcomes.....</i>	55
Table 9: <i>Partial correlations for modes of communication in December on end-of-semester outcomes.....</i>	56

SOCIAL SUPPORT AND DEPRESSION

List of Figures

Figure 1: <i>Proposed regression models used to test the effect of initial depressive symptoms on poor end-of-semester outcomes.....</i>	31
Figure 2: <i>Proposed moderation relationship between initial depressive symptoms and social support on end-of-semester outcomes.....</i>	31
Figure 3: <i>Proposed regression models used to test mode of a communication is a stronger moderator with initial depressive symptoms on end-of-semester outcomes.....</i>	32
Figure 4: <i>Interaction plot showing December depressive symptoms for different levels of September social support.....</i>	40
Figure 5: <i>Interaction plot showing burnout for different levels of September social support.....</i>	44
Figure 6: <i>Interaction plot showing social adjustment for different levels of September social support.....</i>	46
Figure 7: <i>Interaction plot showing academic adjustment for different levels of September social support.....</i>	48
Figure 8: <i>Interaction plot showing social adjustment for different levels of September phone communication.....</i>	49
Figure 9: <i>Interaction plot showing end-of-semester burnout for different levels of December phone communication.....</i>	54

SOCIAL SUPPORT AND DEPRESSION

Social Support as a Moderator for Depressive Symptoms and Well-being During the Transition to University

High school graduates are pursuing post-secondary education in record numbers in Canada and the United States. In Canada, 63.8% of 19-year-olds were enrolled in post-secondary (Frenette, 2017). Rates are similar in the United States, where 69.1% of high school graduates under 24 are enrolled in 4-year post-secondary programs (United States Department of Labor, 2019). A common misconception is that only privileged, and socially advantaged young people attend university (Hunt & Eisenberg, 2010; Ibrahim, Kelly, Adams, & Glazebrook, 2013). By extension, given that socioeconomic privilege is a protective factor for mental health conditions (Aslund, Leppert, Starrin, Nilsson, 2009; Eisenberg, Hunt & Speer, 2013; Tracy, Zimmerman, Galea, McCauley, Vander Stoep, 2008), university students are assumed to be especially well adjusted and less likely to experience mental health disturbances (Miech & Shanahan, 2000).

Misconceptions about socioeconomic privilege may partly explain why the study of depression in post-secondary settings did not receive much research attention until the early 1990s (Ibrahim et al., 2013). Therefore, a focus on researching mental health in university students is warranted, particularly given rising enrolment rates. For example, from 1980 to 2010, rates of post-secondary attendance doubled in Canada (The Association of Universities and Colleges of Canada, 2011). In the United States, rates of immediate post-secondary enrollment have remained around 67%, since 2000 (National Center for Education Statistics, 2017). With larger populations of students on campuses, larger numbers of students will present with mental health concerns, such as depression,

SOCIAL SUPPORT AND DEPRESSION

particularly given that rates of depression in post-secondary students are elevated compared to the general population. The World Health Organization (2008) deemed depression as the third leading cause of disability worldwide, and by the year 2030 it is predicted to be the leading cause.

A 2019 study showed that 39.5% of undergraduates at a large Canadian university reported moderate to severe depressive symptoms (Othman, Ahmad, Morr, & Ritvo, 2019). Further, a meta-analysis showed that college and university students are more likely to experience depression than other mental health conditions such as anxiety (Eisenberg et al., 2013). The influx of scholarly and popular media coverage has influenced a focus on studying mental health in university students. This has led post-secondary institutions to recognize that students have higher rates of depression, and additional research and resources are necessary (Twenge, Gentile, DeWall, Ma, Lacefield, Schurtz, 2010). Thus, entering university with depression could be related to adverse outcomes, such as poorer university adjustment, burnout, and continued depressive symptoms. However, making the transition to university with depressive symptoms may not affect all students equally. A factor that may lessen the negative outcomes associated with depressive symptoms is social support.

Social support is a positive aspect of interpersonal relationships, acting as a buffer against stress and promoting well-being (Cohen & Wills, 1985). All people need social support, but for those with depression, having or lacking social support could be associated with additional benefits or maladies. Studies show that a lack of social support is a risk for onset and continuation of depression (Cohen, 2004, George, Blazer, Huges & Fowler, 1989; Santini, Koyanagi, Tyrovolas, & Mason, 2015). Furthermore, social

SOCIAL SUPPORT AND DEPRESSION

support has been shown to mitigate continued depression in clinical (George et al., 1989) and non-clinical samples (Pettit, Roberts, Lewinson, Seely, & Yaroslavsky, 2011; Santini et al., 2015). Wherever possible, then, students should leverage preexisting and new social connections available to them during the transition to university. However, research has shown that social support may not always be associated with better outcomes, Cohen (2004) posits that having more social connections could lead to the possibility of more conflict. Another study showed that social support did not have significant predictive effects on depression in university students (Liu et al., 2019). However, the authors only considered social support as a main effect, which fails to consider that social support may be more helpful for some people compared to others. Additionally, many different types of social support exist, and may not be operationalized similarly across studies. For the purpose of this study, social support is defined as perceived social support and frequency of contact with friends (face-to-face, over the phone, or via text message). Previous research has examined the effect of social support on depression, but few studies have tested whether time spent with friends in-person is more beneficial compared to other modes of support, such as mobile phone communication.

The present study examined how students who enter university with depressive symptoms fare during the transition to university. Specifically, if social support could moderate the relationship between initial depressive symptoms and adverse end-of-semester well-being outcomes (i.e., poor social and academic adjustment, burnout, and continued depressive symptoms). First, this study examined whether depressive symptoms present in September during the initial transition to university were associated

SOCIAL SUPPORT AND DEPRESSION

with poorer end-of-semester outcomes and how social support in September, and December were associated with end-of-semester outcomes. Second, this study tested whether social support in September and December moderated the associations between depressive symptoms and end-of-semester outcomes. Lastly, face-to-face time spent with friends was compared to other modes of communication (i.e., talking on the phone or via text message), to examine if face-to-face contact with friends is a stronger moderator for September depressive symptoms on end-of-semester well-being outcomes.

Epidemiology and Development of Depression in Children and Adolescents

Depression is a mood disorder characterized by feelings of sadness and loss of pleasure in daily life. To be diagnosed with Major Depressive Disorder (MDD), a person must present five of nine symptoms nearly every day over two weeks. Symptoms of MDD include depressed mood, significant changes in weight, insomnia or hypersomnia, loss of pleasure, inability to concentrate, psychomotor changes, feelings of worthlessness, fatigue, and thoughts of death or suicidal ideation. If a person has depression, it will affect them in measurable ways related to social, occupational or other important areas of functioning (American Psychiatric Association, 2013).

Depression is typically diagnosed in adolescence but can also occur in childhood. The prevalence in childhood is 2% to 3% (Cohen et al., 1993; Costello et al., 1996) and in adolescence 8% to 15% (Avenevoli, Swendsen, He, Burstein, Merikangas, 2015). However, this rate increases from 2% to 8% during the transition from childhood to adolescence (Costello, Foley, & Angold, 2006; Weir, Zakama, & Rao, 2012). Furthermore, half of major depressive episodes occur before age 20 (Kessler, Foster, Sanders, & Stang, 1995). The mean age of onset is 14.7 in girls and 15.4 in boys

SOCIAL SUPPORT AND DEPRESSION

(Lewisohn, Clarke, Seeley, & Rhode, 1994). A recent longitudinal study examining mental health conditions in university students reported 14.3 as the median age of onset (Auerbach et al., 2018). If depression is present during adolescence, it is highly likely that it will persist into adulthood (Auerbach et al., 2018; Rice, 2009). In adolescence, depressive episodes typically remit after seven to nine months, but for 20% an episode can last for two years or longer (Downey & Coyne, 1990), half the length of a typical 4-year undergraduate degree program. For many, depression is chronic, and remission does not occur (Cicchetti, & Toth, 1998). In those who experience remission, depressive episodes are generally recurrent (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Due to the recurrence of depression and increased prevalence in young adults, it is important to examine depression during vulnerable periods, such as the transition to university. Not only is this a significant developmental period, but research indicates that rates of depression are amplified in post-secondary students (Kessler et al., 1995). The previous study was referring to a diagnosis of depression, however, studies have demonstrated that symptoms of depression can also be associated with negative outcomes (Ayuso-Mateos, Nuevo, Verdes, Naidoo, & Chatterji, 2010).

In recent research, the rates of depressive symptoms in Canadian post-secondary students are high, at almost 40% (Othman et al., 2019). Considering this finding, the timing of when students are reporting depressive symptoms may be important to consider. In September, students are adjusting to multiple changes (e.g., new environment, meeting people in a different social and learning context). During the initial transition students may have varying experiences and feelings, for example, some students may be unsure, optimistic, or already feel overwhelmed. How students feel and

SOCIAL SUPPORT AND DEPRESSION

react toward the initial university context could influence how their semester unfolds.

Compared to the end of the semester when students have been immersed in the university environment, many will have found their footing and adjusted to the new environment while some may still be struggling, students will be aware of their academic standing (i.e., excelling or failing), and they will have formed new social connections, or not.

Further, the end-of-semester is a period where academic demands have accumulated, and students may be feeling more stressed. A study assessed depression in September, December and April and found that depressive symptoms peaked in December (Barker et al., 2018).

Students who enter university with depressive symptoms may be at a disadvantage and could be more likely to experience academic burnout and poor university adjustment (Lin & Huang, 2014). However, students who do not enter university with depressive symptoms may go to develop depressive symptoms later in the semester and also be at a disadvantage. One study showed that students with high levels of depression were more likely to burn out and experience continued depression (Salmela-Aro, Aunola, & Nurmi, 2008). Other studies show that having a depressive episode during the transition to university could result in future episodes and continued depression throughout university, and later in life (Fergusson, Boden, & Horwood, 2007; Schaufeli et al., 2002). Given that the negative implications of depression are substantial, a review of why depression develops is warranted. A multitude of nature- and nurture-based reasons contribute to developing depression.

Causes of Depression

SOCIAL SUPPORT AND DEPRESSION

Familial influences, such as having a parent with depression, and stressful life events can contribute to the development of depression (Cicchetti, & Toth, 1998). Parenting with depression can interfere with a parent's ability to provide adequate support. For example, parents with depression are generally less energetic, may interact more negatively with children, and can be hostile (Colletta, 1983; Downey & Coyne, 1990). Other factors that can contribute to developing depression include experiencing childhood adversity, genetic predispositions, and parental loss (Cicchetti & Rogosch, 2002). A 2017 cohort study examined factors that were present in people who had not experienced any mental illnesses prior to age 38; factors that emerged as predictive of experiencing a persistent mental disorder were childhood poverty, cognitive deficits, and poor childhood physical health (Schaefer et al., 2017). However, not all these factors were associated with having a disorder sometime during one's life, specifically, socioeconomic status and cognitive ability did not differentiate between those who experienced a disorder for a short period of time versus not at all. Individuals who did not develop a mental disorder during the study were found to have differences in childhood temperament, self-control, experienced fewer negative emotions during childhood and a relatively absent history of psychiatric illness in their immediate and extended family (Schaefer et al., 2017).

Once established, depression is heterogeneous (Rice, 2009). Each person exhibits different symptoms, at different times, and their level of impairment varies across areas of functioning (Downey & Coyne, 1990). For example, some people with depression may be primarily despondent but still able to complete necessary tasks, such as attending work or school. Others may be unable to get out of bed. Additionally, variation also exists in

SOCIAL SUPPORT AND DEPRESSION

the severity of depressive symptoms within a person. Some days, a person may be able to cope with day to day life, and other days they may be unable to manage (e.g., becoming teary or angry; Cicchetti, & Toth, 1998; Judd, & Akiskal, 2000). Due to the heterogeneity of depression, finding ways to mitigate depressive symptoms is essential. One factor that has been researched and will be a focus of the current study, is the influence of social support (Bouteyre, Maurel, & Bernaud, 2006; George et al., 1989).

Social Support

Social support is defined as an interpersonal coping resource that is used in times of need to buffer stress (Thoits, 1995). Additionally, social support is viewed as a protective factor against physical and mental maladies, and has been called a basic human need (Kaplan, Cassel, & Gore, 1977). Benefits of social support are present across the lifespan (Feeny & Collins, 2015). As a construct, social support is multifaceted, and can manifest in numerous ways, including perceived social support, instrumental support (e.g., tangible support such as physical help or financial aid; Santini et al., 2015), frequency of support, network size, and quality. Of the many different types of social support, perceived social support is shown to be associated with the most benefits (Billedo, Kerkhof, Finkenauer, & Ganzeboom, 2019; Santini et al., 2015). In a 15-year study of premature mortality using participants aged 18 to 30, having low social support was associated with mortality rates as high as being a smoker (Iribarren et al., 2005). In addition to decreasing adverse outcomes, the reverse is also true; those with more social support had greater well-being (Feeny & Collins, 2015). However, social support tends to decline during life changes (Henderson, 1984). Therefore, the necessity of social support may increase during transitional periods (Buote et al., 2007).

SOCIAL SUPPORT AND DEPRESSION

The transition to university is a life event that could alter the availability of social support. During this transition students will experience differences in the availability of social support (Buote et al., 2007; Lane, Leibert, & Goka-Dubose, 2017). Students begin to depend less on their parents and more on their peers (Pancer et al., 2004). Changes in peer support are also present. Changes can occur due to friends relocating, enrolling in different programs or deciding not to pursue university education. During high school, young people tend to see the same classmates regularly, whereas first year university classrooms often serve hundreds of students. Being in classes with all new people presents the opportunity to build new connections which may result in old connections dissipating. Due to these substantial contextual differences, relationships are reconstructed and social support needs change in both quality and quantity (Tao et al., 2000). Relationships with parents are changing as adult children find their independence. Seeing high school friends less frequently results in friend circles that are different, making spending time with old friends more challenging. Support from teachers may be altered during university as the number of students in each class increases and less one-on-one support is available (Tao et al., 2000). All students experience multiple, significant changes during this period, but students with depression may need additional social support.

Indeed, social support has been shown to be beneficial for people with depression. In a systematic review, Santini and colleagues (2015) found that perceived emotional support was a protective factor for depression in 91.4% of the studies assessed. Additionally, decreased social support was associated with onset or continuation of depression. Considering the previous evidence, most studies show that social support is

SOCIAL SUPPORT AND DEPRESSION

beneficial (Feeny & Collins, 2015; Holt-Lunstad, Smith, & Layton, 2010; Lane & Fink, 2015). Conversely, a recent study assessing predictors of depressive symptoms found no additional benefits of social support in post-secondary students (Liu et al., 2019). The authors instead concluded that the greatest predictor of future depression was baseline depressive symptoms. However, their results should be interpreted with caution because the authors only used three unpublished dissertations of cohort studies in Chinese undergraduates to assess social support, and these studies showed only weak effects of social support predicting depression. Additionally, the studies used to arrive at this conclusion were based on 6- to 12-month follow-up periods. Furthermore, social support was not operationalized, and the studies drawn on used different types of social support (i.e., utility, perceived) and the different types of social support were not compared. Taking these points into consideration the generalizability may be low.

Another point to consider is that symptoms of depression such as seeking reassurance, negative self-talk and social withdrawal may make it more difficult to cultivate relationships that provide adequate social support and could result in decreased perceptions of social support (Coyne, 1976; Stice, Rohde, Gau, Ochner, 2011). Recent research shows that patients with chronic depression had smaller social networks and were less satisfied with their social supports compared to healthy individuals or those with other mental disorders (Visentini, Cassidy, Bird & Priebe, 2018). In college students, Hefner and Eisenberg (2009) showed that levels of social support influenced levels of depression, such that 31% of students with low social support screened positive for depression, while those with medium and high levels of social support screened positive at 16% and 5%, respectively. It is possible that due to the reciprocal nature of

SOCIAL SUPPORT AND DEPRESSION

social support and depression those with lower social support may become more depressed and their increased depressive symptoms may result in even fewer social supports.

Relationships are not always positive. If they are rife with conflict and criticism then the negative effects can be just as strong as the positive effects in predicting poorer adjustment and depressive symptoms (Holahan, Moos, Holahan & Brennan, 1997).

Perceived social support has been shown to be associated with the most benefits, but another aspect of social support that should be examined is the mode, and several modes exist. Some examples include face-to-face interaction, talking on the phone, text messaging, participating in extracurriculars and clubs, and living with other people. Some modes of social support may be more beneficial than others. For instance, someone may perceive more social support from seeing their friends face-to-face compared to talking to them on the phone or via text message. With the ubiquity of cell phone use in relationships (Holte & Ferraro, 2018), it is important to examine how this is affecting perceptions of social support and the relationship with depression and other negative outcomes in university students. The present study will examine if different modes of communication could result in different outcomes for students with depression or not. The modes of communication to be examined are face-to-face interaction compared with texting or talking on the phone, the latter two herein referred to as mobile mediated communication. Mobile mediated communication has been explored in other studies (e.g., Chan, 2018), and is defined as communication using mobile devices. This mode comprises several different types of communication using mobile phones, for example,

SOCIAL SUPPORT AND DEPRESSION

email, text messaging, talking on the phone, and includes various social media apps such as, Facebook, Snapchat, Whatsapp, and Instagram.

Modes of Social Support. Mobile phone use is omnipresent with recent statistics showing that 99% of Americans age 18 to 29 own a cellphone (Pew Research Center, 2019). In 2018, 96% of Canadians aged 15 to 24 used the internet daily or owned a smartphone (Statistics Canada, 2018). In college students, cell phone communication is one of the most common modes of interacting with friends (Jin & Park, 2010). Students may favour this mode because they can interact through various avenues (i.e., emails, text messages, phone calls, instant messages, and social media). The range of options means having access to social supports after relocating may not be as difficult because smart phones can bridge geographical distances. What is still unclear is if connecting with social supports in this manner is as beneficial as seeing someone in-person.

Few studies have compared face-to-face interaction with mobile mediated communication in people with depression. One study showed that face-to-face interaction is associated with advantages, such as decreased loneliness (Jin & Park, 2012), increased well-being (Chan, 2018), and positive mood (Pea et al., 2012). However, a systematic review demonstrated that the association between depression and frequency of face-to-face contact was not consistently related to positive outcomes (Santini et al., 2015). Two of the four studies reviewed showed that less frequent social contact was associated with depression. The effect of mobile mediated communication was not explored. In studies that examined how mobile mediated communication influences social support, results have been mixed.

SOCIAL SUPPORT AND DEPRESSION

One study showed that the use of text messaging can enhance face-to-face interactions in romantic relationships (Novak, Sandbeg, Jeffrey & Young-Davis, 2016). Similarly, Dienlin, Masur, and Trepte (2017), suggest that communication online reinforces face-to-face interaction. Indeed, some people prefer text messaging to telephone or face-to-face communication. A possible explanation is that text messaging allows the person to control the interaction and put thought into their responses (Madell & Muncer, 2007). However, texting does not provide any of the social context or cues associated with in-person interaction. Therefore, the use of mobile phones may be beneficial only for certain people, such as those with social skills deficits because it can be easier and less intimidating (Jin & Park, 2012). Other studies show negative implications of mobile mediated communication.

In one study, participants high in loneliness depended more on mobile mediated communication but subsequently perceived less social support (Kim, 2017). Volkmer and Lerner (2019) found that greater use of cell phones was associated with decreases in well-being, and vice versa, as well-being increased mobile phone use decreased. Using a three-wave longitudinal study, Billedo and colleagues (2019) surveyed international students from a university in Amsterdam every three months. Results indicated that face-to-face interaction with friends in the host-country increased perceived social support at the time of measurement. Facebook interaction with friends in the host-country lowered perceived social support three months later (Billedo et al., 2019). Thus, communicating via mobile phones may not be associated with the same benefits as face-to-face interaction (e.g., better emotional and social support; Kim, Seo, & David, 2015). It follows that, if people with depression require additional social and emotional support,

SOCIAL SUPPORT AND DEPRESSION

they may use mobile mediated communication differently compared to those without depression.

One study suggested that depression may be associated with increased frequency of cell phone use and problematic usage (i.e., to escape from negative affect; Kim et al., 2015). The results supported this notion, but importantly face-to-face communication moderated the relationship between depression and problematic cell phone usage; those who spent more face-to-face time with friends used their phones less frequently and were less likely to engage in problematic usage. Depression may not always be related to increases in mobile phone use. One study showed that those with lower depression severity used their phones more over one week compared to those with higher severity (Elhai, Tiamiyu, Weeks, Levine, Picard, & Hall, 2018). In another study, both in-person support and online support were associated with lower levels of depression (Cole, Nick, Zelkowitz, Roeder, & Spinelli, 2017).

Depression and social support both exhibit individual differences. Depression can manifest in different areas of functioning and present differently across people, and social support can be received in manifold ways from a variety of sources. A reciprocal relationship has also been proposed between depression and social support, wherein higher levels of social support are associated with decreased depression, and vice versa, fewer depressive symptoms predict increased social support (Billedo et al., 2019). Building on these ideas, developmental systems theory will provide a useful framework for understanding the relationship between depression and social support during a period of developmental vulnerability.

SOCIAL SUPPORT AND DEPRESSION

A Developmental Systems Perspective on Depression during the Transition to University

The development of depression is multifaceted and can be understood from a developmental systems theory perspective. Developmental systems theory perspective focuses on relationships between an individual and their developmental context. Each person has their own system, and within each system exists multiple levels of interest (e.g., biological, societal and cultural; Cicchetti & Toth, 1998; Lerner, 2006).

Additionally, reciprocal relationships exist between levels meaning that all levels within a person are constantly *coacting* or interacting. Coaction occurs due to all levels exerting influence on the person (e.g., multiple environmental changes during the transition to university) and the person is influencing the levels (e.g., aspects of a person's character will influence how they are impacted by the new environment; Lerner, 2004; Lerner, 2006). As coaction is constant, plasticity or the potential for change is recognized across the lifespan (Lerner, 2006). Even under adverse circumstances, positive developmental outcomes and experiences are possible with the right combination of resources and supports (Cicchetti & Rogosh, 2002). The power of influences on the person/ levels is dependent on temporality (i.e., timing of influences can impact development throughout the lifespan; Lerner, 2006). Certain influences may be more important at specific times (e.g., social support in the context of a new-found independence; Lerner, 2004; Lerner, 2006).

During transitions several simultaneous new influences are present, which may result in abrupt changes, although many stay on the same path. Staying on the same trajectory (for better or worse; Schulenberg, Bryant, & O'Malley 2004) is referred to as

SOCIAL SUPPORT AND DEPRESSION

continuity. For example, someone who enters university with depression may continue to be depressed throughout university, or a student who performed well in high school continues to excel in university. Most people experience continuity, and mental health conditions are often viewed as continuous (Schulenberg et al., 2004). In contrast, discontinuity is the experience of a trajectory change which is a source of interest in developmental psychopathology (Schulenberg et al., 2004). Experiencing discontinuity can result in favourable or unfavourable outcomes. For example, a student who did not experience depression in high school may become overwhelmed during university and feel depressed. The reverse is also true, a student who is struggling with depression in high school may find their niche in university and end up thriving. Factors that contribute to continuity and discontinuity are more likely to occur during transition periods.

Proximal and distal risk and protective factors exert influence and interact with personal experiences to result in continuity or discontinuity. Proximal influences occur in the present (e.g., the amount of social support one has during the transition to university).

These influences can be self-selected into, for example, someone who is depressed chooses not to attend social events and ends up feeling isolated. Distal influences occur prior to the developmental window of interest and are uncontrolled aspects of the person or environment (e.g., adverse experiences in childhood; Cicchetti & Toth, 1998).

Given that developmental milestones can result in trajectory changes, and that the first semester of the transition to university is one of the most critical developmental periods, it is important to examine the influence of social support on depressive symptoms during this tumultuous time (Schulenberg et al., 2004). Studies show that people with predispositions to mental health disturbances will be more likely to

SOCIAL SUPPORT AND DEPRESSION

experience an episode during stressful periods, such as beginning university (Graber, & Brooks-Gunn, 1996). Therefore, surveying depressive symptoms and levels of social support when students enter university may provide useful information about how they will be functioning at the end of the semester. In September students are just beginning to find their footing and establish relationships in the university context.

Additionally, research demonstrates that greater changes in indices of overall and social well-being occurred during the first-semester compared to the second-semester of university (Conley et al., 2014). Furthermore, research has shown that depressive symptoms are highest at the end of the semester (Barker et al., 2018).

Using a repeated measures design allows for temporal precedence to be established providing the ability to see how starting university with depressive symptoms is influenced by social support, and how this interaction influences end-of-semester outcomes. Compared to a cross-sectional design, using two time points allows for observation of how students fared across the semester after being immersed in the university environment. The principles of developmental systems theory acknowledge that the interaction between each person's depressive symptoms and perceptions of social support will vary.

Testing social support as a moderator provides important information about how people with different severities of depressive symptoms may have varying social support needs. Students high in depression may have positive end-of-semester outcomes if they also report more social support. Students with fewer depressive symptoms and little social support may experience the same end-of-semester outcomes as those with high levels of depressive symptoms and a lot of social support. While this study does not have

SOCIAL SUPPORT AND DEPRESSION

the ability to test the influence of each system, testing social support as a moderator provides information about one factor that could influence depression and subsequently end-of-semester outcomes during the transition to university.

Areas of Vulnerability During the Transition to University

Students with depression during the transition to university may have additional social and academic difficulties. Academic struggles may take the form of lower marks and missed or failed classes (Eisenberg, Gollust, Golbertstein, & Hefner, 2007; Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002). Research shows that individuals with moderate to high depressive symptoms got lower grades compared to those with mild or no symptoms (Othman et al., 2019). This evidence demonstrates that experiencing depression during the transition to university, an inherently stressful time, can result in adverse long-term outcomes. Social difficulties are also present. During the transition to university students report homesickness (Thurber & Walton, 2012; Fisher & Hood, 1988), missing their friends, and feelings of isolation (Buote et al., 2007). The social and academic difficulties present suggest that examining how social support influences end-of-semester outcomes is useful to gain information that could be used for interventions with new students. One aspect of the transition to university is how students adjust to university.

Adjustment to University. Adjustment to university is multifaceted. The current study will focus on two components of university adjustment: academic and social. Academic adjustment refers to responsiveness to educational demands, motivation to complete work, and satisfaction with the chosen institution (Gerdes & Mallinckrodt, 1994). Social adjustment comprises how a student adapts to the social aspects of

SOCIAL SUPPORT AND DEPRESSION

university, such as participation in social activities, satisfaction with social opportunities, navigating social independence and feeling a sense of belonging (Baker & Siryk, 1984; Friedlander, Reid, Shupak & Cribbie, 2007; Gerdes & Mallinckrodt, 1994). University may be more difficult for students who are poorly socially and academically adjusted (Gerdes & Mallinckrodt, 1994). Poor adjustment has been tied to university attrition (Martin Jr Swartz-Kulstad, & Madson, 1999), and several studies show that depression is negatively related to university adjustment (Beyers & Goossens, 2002; Friedlander et al., 2007; Nightingale et al., 2013; Wintre & Yaffe, 1998). Because adjustment is related to completion of university, and those with depression are more likely to be poorly adjusted, it is important to inspect what factors can contribute to better university adjustment. Considering previous findings that social support may be relevant for depression, it follows that it may be relevant for other areas of student well-being, such as university adjustment.

Wintre and Yaffe (1998) found that as depressive symptoms increased across the first-semester, students' adjustment to university also worsened. However, support from friends was associated with adjustment improvements. In another study, having good quality friends was associated with better social adjustment to university in first-year students (Boute et al., 2007). A longitudinal study of students making the transition to university showed that students who perceived increases in social support had better adjustment (Friedlander et al., 2007). Furthermore, Tao and colleagues (2000) showed that students with more social support had better social adjustment. Another factor of university student well-being is burnout. Entering university with depressive symptoms

SOCIAL SUPPORT AND DEPRESSION

may influence chances of experiencing burnout, and it is possible that social support may have an effect on this relationship.

Academic Burnout. Burnout is not a new phenomenon, and has long been studied in vocational settings (e.g., nurses, teachers, social workers, and other helping professionals). Burnout is characterized by exhaustion, cynicism, and feeling unaccomplished (Lin & Huang, 2014; Maroco & Campos, 2012). Burnout has also been observed in students, with implications paralleling those for employees (e.g., missed classes, decreased motivation to complete work, and increased drop out). One of the implications of academic burnout is lower GPA (McCarthy, Pretty, & Catano, 1990), and increased chances of dropping out. If a student drops out, they may lose their chance at post-secondary education, and if many students drop out, this looks unfavourably on the institution (Lin & Huang, 2014; Neuman, Finaly-Neuman, & Reichel, 1990). Due to the negative outcomes associated with burnout, it is valuable to study if students with depression tend to report more burnout and if social support can influence this relationship.

Depression and burnout share some of the same features (e.g., emotional exhaustion or feelings of emptiness, and negative emotions, such as cynicism) but they are distinct constructs (Brenninkmeyer, Van Yperen, & Buunk, 2001). Notable differences in burnout compared to depression are the ability to experience pleasure in day-to-day activities, no significant changes in weight or sleep, feelings of guilt that are more realistic, and the absence of suicidal thoughts (Brenninkmeyer et al., 2001). Burnout in students may occur due to the stressful nature of post-secondary studies. A lot of effort is required, little reinforcement is given, and students are not taught effective

SOCIAL SUPPORT AND DEPRESSION

coping strategies to deal with the combination of academic and personal demands (Neuman et al., 1990). Researchers have labelled burnout as the “erosion of engagement.” (Schaufeli et al., 2002a, p. 465).

Another factor that makes this a topic worthy of research is that students who experience burnout during the transition to university will be less academically engaged (Schaufeli et al., 2002a, 2002b). Using students from Spain, Portugal and the Netherlands, Schaufeli and colleagues (2002a) showed that burnout was negatively correlated with academic performance. Several studies have examined burnout in post-secondary students (e.g., Lin & Huang, 2014; Neuman et al., 1990). Fewer studies have examined how depressive symptoms relate to burnout during the transition to university. Burnout in post-secondary studies may be associated with negative long-term outcomes. Burnout can influence many aspects of students' lives in addition to their university experience, such as relationships with their friends and instructors. Feelings of exhaustion can be transferred into relationships. If a person is exhausted, they may not have the energy to socialize and this could lead to conflicts with friends, family, or significant others which will increase stress for the person. Burnout can be damaging to post-secondary students in academic and vocational settings. A 10-year longitudinal study examined if having depression during university resulted in an altered life trajectory. Results showed that people in low- and moderate-depression trajectory groups had higher salaries and less burnout compared with the high-depression trajectory group (Salmela-Aro et al., 2008). Burnout has been shown to be recurrent, in a longitudinal study of university students making the transition to work showed that those who experienced burnout as a student were more likely to experience workplace burnout (Roberts, Roberts,

SOCIAL SUPPORT AND DEPRESSION

& Sarris, 2018). Therefore, studying how burnout is related to other adverse consequences such as depressive symptoms, and if social support has an impact on this relationship during the transition to university is a worthy research topic.

There are several aspects of mental health and well-being that are relevant during the transition to university. This study focused on whether depressive symptoms at the transition to university were associated with poorer end-of-semester well-being outcomes. By exploring if those who experienced depressive symptoms experienced poorer social and academic adjustment, and were more likely to experience continued depressive symptoms and burnout? Although, entering university with depressive symptoms may not always result in poor end-of-semester outcomes. Social support may be a key factor in mitigating the risk of poor outcomes.

The Current Study

This study examined the influence of depressive symptoms on end-of-semester outcomes and tested if social support could act as a protective factor for depression during the transition to university using three research questions.

1. Do those with depressive symptoms experience poorer social and academic adjustment, academic burnout, and ongoing depressive symptoms (collectively referred to as end-of-semester outcomes)? I predict that students who enter university with more depressive symptoms will experience negative end-of-semester outcomes compared to students who enter university with fewer depressive symptoms.

2. Does higher perceived social support moderate the association between initial depressive symptoms and end-of-semester outcomes? I expect that students who enter university with lower perceived social support and more initial depressive symptoms will

SOCIAL SUPPORT AND DEPRESSION

experience more negative end-of-semester outcomes than those students who enter university with higher perceived social support and more initial depressive symptoms.

3. Is face-to-face time spent with friends (versus mobile mediated communication) a stronger moderator of the association between initial depressive symptoms and end-of-semester outcomes? I predict that students with more initial depressive symptoms who see friends more frequently face-to-face will have more positive end-of-semester outcomes compared to those with more initial depressive symptoms who frequently use mobile mediated communication and do not see their friends in-person as frequently.

For sensitivity purposes, social support measured in September and December were analyzed for all research questions.

Method

Participants and procedure

First-year first-time university students who were 19 and under were recruited to take part in a longitudinal study on aspects of well-being during the transition to university. Recruiting occurred during orientation week in Fall 2018. Undergraduate research assistants recruited students at the orientation fair and provided potential participants with information about the study and compensation. A three-wave longitudinal design was used to assess changes in well-being during the transition to university. Participants initially completed online surveys in September, completed a daily diary during mid-October for 12 days, and completed a follow-up survey in December. Compensation was provided using *amazon.ca* gift codes. For the intake survey, participants received \$10 and were entered in a draw for \$200. For the daily

SOCIAL SUPPORT AND DEPRESSION

diary, participants received \$2 per day completed, a \$6 bonus for completing ten or more days, additionally, for each completed day participants were entered into a draw for \$25. The compensation for the follow-up was the same as the baseline.

In total, 1111 students were interested in the study and completed a 3-item eligibility screening measure. Of those, 744 students were interested in participating and provided their contact information. Of the eligible participants 53.6% completed the intake survey ($N = 478$). The final sample size was $N = 461$. Eighteen participants were removed from the original sample. Six people were over the age requirement. Five people did not complete the demographics section and other measures, and the remaining seven participants had implausible completion times (i.e., under 6 minutes for a 20-minute survey). Upon completion of the intake survey participants were asked if they wanted to be contacted for part two of the Carleton Transitions Study.

The age range was 16.3 to 19.9 ($M = 18.33$, $SD = 0.48$). The sample consists of 53.9% males ($n = 248$), 43.9% females ($n = 202$), and the remaining 1.5% were both female and male ($n = 2$) or chose not to answer ($n = 5$). Participants were able to self-select their ethnicity, 47.4% ($n = 264$) identified as white, 14.1% ($n = 65$) as South Asian (East Indian, Pakistani, Sri Lankan); 15.4% ($n = 71$) Southeast Asian (Chinese, Filipino, Japanese, Korean, Vietnamese); 9.6% ($n = 44$) as Black; 6.3% ($n = 29$) as West Asian / Middle Eastern; 3.9% ($n = 18$) as Indigenous (First Nations, Métis, Inuit); 3.9% ($n = 18$) as Latin American; 0.4% ($n = 2$) as Oceanic and 10.2% chose multiple ethnicities, and 0.4% chose other. International students comprised 5.9% ($n = 27$) of the sample. Living arrangements while in university were assessed. Most participants did not live with their parents (65.6%; $n = 266$), 55.4% ($n = 255$) lived in residence and 10.2% ($n = 47$) lived on

SOCIAL SUPPORT AND DEPRESSION

their own, either alone (2.3%; $n = 11$) or with roommates (7.8%; $n = 36$); the remaining 34.3% ($n = 158$) lived with parents. Of the students who indicated working while studying (26.5%), the mean hours worked was 12.8 ($SD = 6.47$).

To assess socioeconomic status, participants estimated their parents' income and education. Yearly combined parent income was measured on a 12-point scale with 1 being (*less than \$5,000*) and 12 being (*\$200,000 or greater*). The mean parent income fell in the category ranging from \$75,000 to \$100,000. Parental education was measured on a 5-point scale with options 1 (*elementary school*), 2 (*high school*), 3 (*community college/ vocational or Associate's degree*), 4 (*Bachelor's Degree (includes law and medical degree)*) and 5 (*Master's degree or Ph.D.*; mother $M = 3.44$, $SD = 1.10$; father $M = 3.62$, $SD = 1.10$). Less than half of participants reported that their mothers completed a Bachelor's Degree, 178 (39.9%). Father education followed a similar distribution with 177 (38.5%) having completed a Bachelor's Degree. Participants were asked who in their immediate (parents and siblings) and extended family (aunts, uncles, grandparents) had attended post-secondary: Of the sample 15.2% were the first in their family to attend university and 7.8% were the first in their family after a sibling.

The follow-up sample comprised 86% of the original sample ($n = 386$). Participants were asked if they were still enrolled as a student; almost the entire sample was still enrolled (98.9%; $n = 382$). Participants were from several different faculties; the final sample was composed of engineering (37%), arts (36%), science (17.6%), business (6.7%) and 2.4% selected other or multiple programs. The sample is overrepresented by engineering students and underrepresented by arts students; enrollment from the university shows that 24% of students are in engineering and 51% are in arts.

SOCIAL SUPPORT AND DEPRESSION

Measures

Depressive symptoms. Depressive symptoms were measured at intake and follow-up using the Center for Epidemiological Studies – Depression (CES-D; Radloff, 1977). The CES-D is a 10-item measure of depressive symptoms suitable for use with the general population, it has been widely used in research with undergraduate samples. Participants respond to how often they have experienced each of the statements in the past two weeks (e.g., “I felt depressed” and “I felt hopeful about the future.” (reverse scored)). The scale consisted of four options that range from 1 (*rarely or none of the time (less than 2 days)*), 2 (*some or a little of the time (2-5 days)*), 3 (*occasionally or a moderate amount of time (6-9 days)*), to 4 (*most or all of the time*)). The full 20-item CES-D has been shown to possess good test-retest reliability after 4 weeks ($r = .67$) and high internal consistency (in the general population, $\alpha = .85$; Radloff, 1977). The 10-item measure used in this study has also been shown to have good predictive accuracy compared to the 20-item version ($\kappa = .97$, $p < .001$) and was negatively correlated with positive affect ($r = -.63$; Andresen, Malmgren, Carter, & Patrick, 1994), test-retest reliability at 12 months was high ($r = .59$). In a psychiatric sample the 10-item measure showed high internal consistency ($\alpha = .89$; Björgvinsson, Kertz, Bigda-Peyton, McCoy, & Aderka, 2013). The same study established convergent validity of the CES-D short form, wherein it was correlated highly with other measures of depression, such as the BASIS-24 (depression and functioning subscale; $r = .86$, $p < .0001$), and moderately with worry ($r = .46$, $p < .0001$). Divergent validity was also demonstrated when compared with psychosis and substance abuse questionnaires from the BASIS-24, both correlations were low at $.18$ ($p < .001$), and $.09$ ($p < .05$), respectively (Björgvinsson et al., 2013).

SOCIAL SUPPORT AND DEPRESSION

Items are averaged, with higher scores indicating more depressive symptoms (Baseline, $M = 1.99$, $SD = 0.58$, $\alpha = .83$; Follow-up, $M = 2.19$, $SD = 0.64$, $\alpha = .84$)

Social support from friends. For the purpose of the current study, social support is composed of perceived social support and contact frequency (in-person or mobile mediated communication) with friends. Perceived social support was measured at baseline and follow-up using the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988). The MSPSS is a 12-item measure containing three factors: Family (e.g., “I get the emotional help and support I need from my family.”), Friends (e.g., “I can count on my friends when things go wrong.”) and Significant Other (“There is a special person in my life who cares about my feelings.”) Participants endorsed items on a 7-item scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The MSPSS has been validated for use with university populations (Kazarian & McCabe, 1991; Zimet et al., 1988). The scale has high internal consistency ($\alpha = .87$; Kazarian & McCabe, 1991). Total MSPSS scores were found to be negatively related to BDI depressive symptoms ($r = -.31$, $p < .05$; Kazarian & McCabe, 1991). Test-retest scores for the whole scale were high at .85 after 2 to 3 months (Zimet et al., 1988). Scores are averaged, with higher scores indicating more social support, this study utilized the four-item friends’ factor (Baseline, $M = 5.36$, $SD = 1.33$, $\alpha = .91$; Follow-up, $M = 5.39$, $SD = 1.31$, $\alpha = .92$).

Communication with friends was assessed at baseline and follow-up. Using 3 items created for this study, participants respond to the prompt “In a typical week, how often do you talk to your friends” for each of 3-items: in person; on the phone (including Skype, FaceTime, etc.); using text messaging. Each item was responded to on a 6-point

SOCIAL SUPPORT AND DEPRESSION

scale ranging from 0 (*not at all*), 1 (*once*), 2 (*two or three times*), 3 (*most days*), 4 (*once every day*), to 5 (*multiple times every day*; September face-to-face $M = 3.53$, $SD = 1.55$; over the phone $M = 2.39$, $SD = 1.69$; text message $M = 4.14$, $SD = 1.25$, $\alpha = .53$; December face-to-face $M = 3.69$, $SD = 1.44$, over the phone $M = 1.96$, $SD = 1.69$, text message $M = 3.85$, $SD = 1.30$, $\alpha = .57$).

Social and academic adjustment. Measures of social and academic adjustment were collected at follow-up using the Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1989), this questionnaire measures adaptation to social and academic demands of university. The Social Adjustment scale contains 19-items measuring interpersonal coping skills while at university (e.g., “I am meeting as many people and making as many friends as I would like at university”). Participants endorsed statements describing how they would rate their university experience on a scale from 1 (*doesn't apply to me*) to 9 (*applies very closely to me*; $M = 5.66$, $SD = 1.28$, $\alpha = .84$). The academic adjustment scale contains 24-items measuring student's ability to cope with academic demands (e.g., “I'm quite satisfied with my academic situation at university”; $M = 5.90$, $SD = 1.07$, $\alpha = .82$). Baker and Siryk (1984) administered the SACQ to six different samples of undergraduates. Internal consistency was high across administration (social adjustment $\alpha = .81$ to $.90$; academic adjustment $\alpha = .83$ to $.91$). The academic adjustment scale was found to be correlated to first-year student GPA at six different universities ($ps < .01$, $rs = .22$ to $.53$; Baker & Siryk, 1999). The SACQ has been widely used in research and has been translated into several different languages. Validation in a European sample showed high internal consistency (social and academic $\alpha = .84$; Beyers & Goossens, 2002). In the same study, academic and social adjustment were both found

SOCIAL SUPPORT AND DEPRESSION

to be negatively correlated with depressive symptoms at $-.34$ and $-.59$, respectively. Both measures were also negatively correlated with loneliness $-.27$ and $-.66$, respectively (all $ps < .0001$). Higher scores on the academic adjustment scale were associated with higher academic motivation ($.68$, $p < .0001$; Beyers & Goossens, 2002). SACQ scores are averaged with higher scores indicating greater social and academic adjustment.

Burnout. Academic burnout was measured at follow-up using the Maslach Burnout Inventory – Student Survey (MBI-SS; Schaufeli et al., 2002a). The MBI-SS contains 15-items related to academic burnout and contains three subscales: exhaustion, cynicism and academic efficacy. For the purpose of this study only the five-item exhaustion subscale (e.g., “I feel emotionally drained by my studies”) was used. The other two subscales were not used as we did not feel they tapped into the construct we were trying to measure; cynicism is the mean of 4 items (e.g., “I have become more cynical about the potential usefulness of my studies”) and academic efficacy is the mean of 6 reverse coded items (e.g., “During class I feel confident that I am effective in getting things done”). Items are endorsed on a 7-point scale that ranges from 1 (*never*) to 7 (*always*). The MBI-SS was shown to have adequate internal consistency (exhaustion, $\alpha = .66$; Schaufeli et al., 2002b). Academic performance was found to be negatively related to exhaustion ($r = -.08$, $p < .01$; Schaufeli et al., 2002b). In the same study negative correlations were found between overall burnout and engagement ($r = -.90$). Subscale scores are averaged, higher scores are indicative of more of each burnout factor (exhaustion, $M = 3.86$, $SD = 1.46$, $\alpha = .83$).

Planned Analysis and Data Management

SOCIAL SUPPORT AND DEPRESSION

Research questions will be examined using multiple regression models. All final models will be assessed to ensure assumptions of linearity, normal distribution and homoscedasticity are not violated. Potential outliers will be examined using the semi-studentized residuals of the outcomes against predictor variables to detect influential observations. Any influential observations will be identified graphically and through statistical diagnostic factors (e.g., leverage, Cook's distance). Baseline depressive symptoms and social support will be examined for multicollinearity using the Variance Inflation Factor. Previous research has indicated that social support and depressive symptoms have a modest negative correlation ($r = -.31, p < .05$; Kazarian & McCabe, 1991). Considering this, it is not expected that the correlation of depressive symptoms and social support will have a high enough correlation to result in multicollinearity.

Regression models. The first research question will use multiple regression to test the main effect of baseline depressive symptoms on end-of-semester outcomes (see Figure 1). Baseline depressive symptoms will be used to predict end-of-semester outcomes (i.e., continued depressive symptoms, burnout, social and academic adjustment). The second research question will test the interaction of social support and baseline depressive symptoms on end-of-semester outcomes (see Figure 2). The interaction of baseline depressive symptoms and perceived social support will be added to the models tested for research question 1. If a significant interaction is found between initial depressive symptoms and social support the interaction will be further examined by plotting and testing simple slopes (Preacher, Curran, & Bauer, 2006).

SOCIAL SUPPORT AND DEPRESSION

Figure 1. Proposed regression models used to test the effect of initial depressive symptoms on end-of-semester outcomes.

Figure 2. Proposed regression models testing the moderation of social support and initial depressive symptoms and end-of-semester outcomes.

The third research question will test interactions between depressive symptoms and modes of social support (see Figure 3). First, partial correlations will be assessed to probe the magnitude of the main effect for each mode of social support in a model without any interaction terms. Next, three interactions will be added to assess whether

SOCIAL SUPPORT AND DEPRESSION

effects of initial depressive symptoms on end-of-semester outcomes depend on levels of in-person communication, communication over the phone, and communication by text messaging. The magnitudes of each interaction effect will also be examined by inspecting partial correlations.

Figure 3. Proposed regression models used to test which mode of communication is the stronger moderator with initial depressive symptoms on end-of-semester outcomes.

Each of the analyses adjusted for the following demographics: gender, age, if students are the first in their family to attend university, family income, living with parents, living in residence or not, and working while studying.

All predictor variables and relevant covariates (e.g., age, parent income) were centered in order for the intercept to become more meaningful and to represent the average person's score on the outcome variable of interest in the predicted model.

Categorical variables were dummy coded (i.e., coded as 0 or 1). I used data from a larger longitudinal study in which sample size was determined based on power to detect group

SOCIAL SUPPORT AND DEPRESSION

differences in a latent profile analysis and power requirements for two-level multilevel models. For that study, Monte Carlo simulations were performed to determine the sample size needed to detect fixed and random effects of small effect size (i.e., Cohen's D of .20), accounting for dropout over time. A sample of $n = 400$ was found in simulations to result in a power of .82 or greater.

Missing data. Missing responses were examined using independent samples t -tests and Chi-Square tests comparing participants who were present/absent at the follow-up with baseline scores on measures of depression, social support and covariates to indicate if there were differences in attrition. No attrition related differences were found for depression or social support measures ($ps > .05$). A gender difference was found $\chi^2(1) = 15.14, p < .001$, indicating that 22.6% of males and 8.9% of females did not complete the follow-up. Chi-square tests indicated no other demographic differences ($ps > .05$). Missing data was imputed using a multiple imputation procedure. This procedure is favourable to other missing data techniques because it produces unbiased estimates of data missing at random and allows all cases to be retained (Baraldi & Enders, 2010). Multiple imputation uses predicted values plus model error to impute the missing values. This process creates several filled-in data sets which repeat the results a specific number of times and pool the results. Multiple imputation was completed using Blimp 2.2 Software (Enders, Du & Keller, 2019; Enders & Levy, 2018). Blimp allows users to specify the number of burn-in iterations, thinning interval, and imputations. Burn-in iterations are completed to ensure the algorithm has converged and the potential scale reduction values (PSR; Gelman & Rubin, 1992) that reflect imputation convergence have stabilized prior to saving any data. For this analysis, 2000 iterations were performed prior

SOCIAL SUPPORT AND DEPRESSION

to saving the first imputed dataset. The thinning interval specifies the number of iterations between each saved dataset. The number used for this study was 1000 meaning that 1000 iterations were completed between each saved imputation. According to Enders and colleagues (2018, 2019) at least 20 imputations are necessary to maximize power and result in power comparable to maximum likelihood estimation. However, more imputations are always better because producing more imputed data sets adds computing time but, will result in a model that has better convergence in order to yield unbiased parameter estimates. For this study, 100 imputed datasets were saved for each model. Blimp outputs PSR values after every 50 iterations. Prior to saving any data the PSRs were examined to ensure the imputation algorithm was correctly converging. PSR values can go as low as 1.00, but values between 1.05 to 1.10 are optimal and indicate acceptable convergence (Keller & Enders, 2019). Additionally, trace plots of the PSR values for model variables were examined to ensure convergence and model stability. Data was missing primarily at the scale level, not the item level. Although most scale data were complete, approximately 5% of data were missing for each scale (see table 2). Enders and colleagues (2018, 2019) suggest it is favourable to impute at the scale level if there is little missingness at the item level, because scale scores are better at capturing the construct of interest than single items which may only tap into one aspect of the construct. Data for each model was imputed separately and included September depressive symptoms, social support (September and December imputed separately), the interaction between social support and depressive symptoms (Models 1 to 4), or the interaction between depression and frequency of communication (Models 5 to 8) and covariates resulting in 16 sets of imputed data with each dataset containing 100

SOCIAL SUPPORT AND DEPRESSION

imputations. The final results of all Models consist of the pooled results of 100 imputed datasets to produce the slope coefficients (Baraldi & Enders, 2010).

Results

Analytic strategy

Table 1 shows the descriptive statistics for study variables. The results in the tables to follow are the multiple regression parameter estimates obtained by pooling the results from each of the 100 datasets using PROC MIANALYZE in SAS (Version 9.4) using Rubin's rules (Rubin, 1976). Regression models and partial correlations were corrected for multiple testing using the Benjamini-Hochberg false discovery rate procedure (Benjamini & Hochberg, 1995). This procedure rank orders the p -values in descending order and compares each p -value against an adjusted threshold that accounts for a set false discovery rate (FDR; 5% in the present study). For example, if there were 12 tests the one with the smallest p -value (rank 1 out of 12) would be compared to a new p -value threshold that is determined according to the following equation:

$$FDR \times \frac{rank}{total\ number\ of\ tests} = adjusted\ p$$

$$.05 * \frac{1}{12} = .0042$$

If the original p -value is lower than .0042 then it remains significant. The false discovery rate is a maximum of 5% in the scenario that all null hypotheses are true in the population. The more null hypotheses that are false in the population, the smaller that rate becomes. Ranks and calculations are based on a false discovery rate of 5% assuming all null hypotheses are true.

SOCIAL SUPPORT AND DEPRESSION

Table 1. *Descriptive statistics and correlations for study variables.*

Variable	M(SD)	Range	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Sept. depression	1.15(0.49)	0-3	-												
2. Dec. depression	1.19(0.64)	0-3	.45	-											
3. Sept. social support	5.37(1.33)	1-7	-.03	-.15	-										
4. Dec. social support	5.39(1.31)	1-7	-.08	-.28	.60	-									
5. Burnout	3.85(1.46)	1-7	.38	.59	-.12	-.21	-								
6. Social adjustment	5.06(1.00)	2.42-8.50	.04	-.21	.28	.32	-.08	-							
7. Academic adjustment	5.79(0.95)	2.46-8.21	-.17	-.57	.22	.25	-.55	.28	-						
8. Sept. face-to-face	3.53(1.55)	0-5	-.15	-.14	.24	.09	-.07	.17	.10	-					
9. Dec. face-to-face	3.69(1.44)	0-5	-.11	-.13	.11	.14	-.10	.27	.15	.46	-				
10. Sept. phone	2.38(1.69)	0-5	-.0060	.0051	.17	.05	.0008	.10	-	.22	.12	-			
									.0011						
11. Dec. phone	1.95(1.70)	0-5	.02	-.0092	.17	.14	.0082	.15	.0017	.17	.24	.40	-		
12. Sept. text	4.13(1.25)	0-5	.04	.03	.26	.15	-.01	.12	.0047	.38	.32	.29	.19	-	
13. Dec. Text	3.85(1.30)	0-5	.03	-.0089	.19	.23	.59	.11	.05	.22	.37	.21	.33	.37	-

Table 2. *Number and percentage of Missing scale data for study variables*

Variable	N missing	% missing
September depression	27	5.8
December Depression	21	5.4
September social support	23	4.9
December social support	17	4.4
Academic adjustment	16	4.1
Social adjustment	11	2.8
Burnout	20	5.1

SOCIAL SUPPORT AND DEPRESSION

In order to obtain partial correlations and R^2 using multiple imputation data, a transformation is necessary to pool the correlations coefficients from each of the 100 datasets. Harel (2009) suggests transforming data using Fisher's z transformation. This transformation is completed on the imputed data using the following steps: first, R^2 is calculated, and square rooted, then Fisher's z -transformation is used to obtain the normalized estimate and variance in the 100 datasets. Using the datasets containing the estimates and variances, the results are combined using Rubin's rules (Rubin, 1976) to produce a confidence interval which is then inverse transformed, the results are then squared (Harel, 2009). These steps allow for the combined estimate of R^2 and partial correlations to be obtained when using imputed data (Harel, 2009).

Presence of outliers were examined visually by plotting semi-studentized residuals to determine if any discrepant observations (i.e., an absolute value of four standard deviations from zero) were present prior to analyses. No observations fell within this range. After graphically examining for presence of outliers, scores were converted to z -scores. Any z -score greater than ± 3.29 was considered an outlier. One observation had a z -score of 3.42 on social adjustment. However, this observation fell below the cut-off for both Cook's distance and leverage, indicating that this outlier was not influential in the regression model. There were two participants who appeared to be responding randomly to demographic information and had extreme values on some scale measures, however, given the size of the sample it is unlikely these responders would significantly impact the results. Prior to imputing the data, analyses were completed with and without these participants and there were no differences in the results. As such, these participants were retained. Normality of the residuals were examined for December depressive symptoms,

SOCIAL SUPPORT AND DEPRESSION

burnout, social and academic adjustment by examining histograms, P-P and Q-Q plots, Kolmogorov-Smirnov tests of normality were conducted. The plots did not show any problematic deviations from normality. Significant Kolmogorov-Smirnov tests indicated that burnout $D(366) = 0.07, p = .001$ and December depressive symptoms, $D(366) = 0.09, p < .001$, were not normally distributed, given that this is not a clinical sample it is expected that these would not follow a normal distribution. While social adjustment $D(375) = .03, p = .20$ and academic adjustment $D(370) = 0.05, p = .06$, were normally distributed. Normality was also examined using kurtosis and skewness-ratios. A ratio greater than ± 3.29 suggest data have significant skewness or kurtosis. No dependent variable had a ratio greater than ± 3.29 suggesting there was no issues with kurtosis. Linearity was examined by plotting standardized residuals against predicted values for each dependent variable. There appeared to be no systematic relationship between predicted versus standardized values and the data appeared linear. Heteroskedasticity was examined using the same plots, visual inspection indicated no evidence to suggest systematic patterns within the data.

Model Results

End-of-semester depression. Table 3 shows multiple regression model results predicting end-of-semester depression, burnout, social adjustment, and academic adjustment from depression and social support measured in September (Model 1), and their interactions (Model 2), controlling for age, gender, ethnicity, first generation student status, living with parents, living in residence, parent education, parent income, and working while studying. September depressive symptoms significantly predicted continued depression in December. In Model 1, each one unit increase in September

SOCIAL SUPPORT AND DEPRESSION

depressive symptoms was associated with an increase of 0.59 units or 0.92 standard deviations in December depressive symptoms, indicating stability in depressive symptoms across the first semester. When all other regressors were held constant, depression in September was found to be correlated with December depression (partial $r = .46, p < .001$; see Table 5). September social support was negatively related to December depressive symptoms. Each one unit increase in September social support was associated with a 0.08 unit decrease in December depressive symptoms or 0.13 of a standard deviation. Holding all other regressors constant, social support in September was found to be correlated with December depression (partial $r = -.18, p < .01$). Model 2 showed a significant interaction between social support and depressive symptoms. Figure 4 shows that differences in end-of-semester depressive symptoms on social support are visible primarily for those who were initially low in depression. At low levels of September depression, high social support appears to be protective against end-of-semester depression. For those students initially high in depression, having greater social support at the same time does not appear to benefit their levels of depression at the end of the semester. When the interaction between September social support and September depression was added to the model it explained an additional 2% of the variance (see Table 3). When I repeated this analysis using social support measured in December instead of September, all end-of-semester effects were similar (see Tables 4 and 5, Models 3 and 4).

End-of-semester burnout. September depressive symptoms were positively related to end-of-semester burnout. In Model 1, each one unit increase in September depressive symptoms was associated with an increase of 1.16 units or 0.79 standard

SOCIAL SUPPORT AND DEPRESSION

deviations. Holding all other regressors constant, depression in September was found to be correlated with end-of-semester burnout (partial $r = .36$, $p < .001$; see Table 5). There was no evidence of an interaction with social support (Model 2), which was associated with a decrease of .16-units or 0.11 standard deviations in burnout.

Figure 4. Interaction plot showing December depressive symptoms for different levels of September social support. Students 1 *SD* below mean September social support are labeled as *low September social support*, students 1 *SD* above mean September social support are labeled as *high September social support*.

SOCIAL SUPPORT AND DEPRESSION

Table 3. *Multiple regression models predicting December depression, burnout, social and academic adjustment.*

Outcome	Dec. Depression		Burnout		Social Adjustment		Academic Adjustment	
Effect(SE)	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Intercept	1.91(0.16)***	1.92(0.16)***	4.57(0.40)***	4.56 (0.40)***	4.14(0.27)***	4.14(0.27)***	5.17(0.25)***	5.16 (0.25)***
Sept. Dep	0.59(0.06)***	0.59(0.06)***	1.16(0.16)***	1.17 (0.16)***	0.06(0.11)	0.06 (0.11)	-	-0.37 (0.10)***
Sept. SS	-0.08(0.02)***	-	-0.16(0.06)*	-0.15 (0.06)**	0.20(0.04)***	0.20(0.08)***	0.37(0.10)***	0.15 (0.04)***
Sept. Dep X SS	-	0.08(0.02)*** 0.14 (0.05)**	-	-0.12 (0.11)	-	-0.02 (0.08)	-	-0.16 (0.08) ^a *
Gender	-0.19(0.06)**	-0.20 (0.06)**	-0.22(0.14)	-0.22 (0.15)	0.28(0.10)**	0.28(0.10)**	-0.06(0.10)	-0.05 (0.10)
Ethnicity	-0.04(0.06)	-0.04 (0.06)	0.03(0.15)	0.03 (0.15)	0.04(0.11)	0.03 (0.11)	-0.02(0.10)	-0.02 (0.10)
Age	-0.02(0.06)	-0.02 (0.06)	-0.00(15)	-0.00 (0.15)	-0.17(0.11)	-0.17 (0.11)	0.01(0.11)	0.01 (0.11)
First gen.	0.05(0.10)	0.05 (0.10)	0.09(0.23)	0.09 (0.23)	0.05(0.17)	0.05 (0.17)	0.08(0.15)	0.08 (0.15)
Live at home	-0.28(0.12)*	-0.27 (0.11)*	-0.16(0.28)	-0.18 (0.28)	0.15(0.20)	0.15 (0.20)	0.62(0.19)***	0.61 (0.19)**
Live in res.	-0.39(0.11)***	-0.39 (0.11)***	-0.39(0.27)	-0.39 (0.27)	0.61(0.19)*	0.61(0.19)**	0.66(0.18)***	0.65 (0.18)***
Parent ed.	-0.09(0.09)*	-0.09 (0.09)	-0.16(0.23)	-0.17 (0.23)	0.10(0.15)	0.10 (0.15)	0.20(0.14)	0.20 (0.14)
Parent incm.	0.00(0.01)	-0.00 (0.01)	-0.01(0.03)	-0.01 (0.03)	0.02(0.02)	0.02 (0.02)	0.04(0.02)*	0.04 (0.02)*
Working	-0.06(0.08)	-0.07 (0.09)	0.24(0.19)	0.25 (0.19)	-0.03(0.13)	-0.03 (0.13)	-0.21(0.13)	-0.21 (0.13)
R ² D	-	0.02	-	0.0036	-	.0010	-	0.01

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. ^a Denotes tests that were not significant after correction for multiple tests using the Benjamini-Hochberg false discovery rate procedure. Sept. SS = September Social support, First gen. = first generation student, Live in res = live in residence, par ed. = parent education, par incm. = parent income.

Table 4. *Multiple regression models of December social support, September Depression and their interaction predicting December depression, burnout, social and academic adjustment.*

SOCIAL SUPPORT AND DEPRESSION

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Dec. SS = September Social support, First gen. = first generation student, Live in res

Outcome	Dec. Depression		Burnout		Social Adjustment		Academic Adjustment	
Effect(SE)	Model 3	Model 4	Model 3	Model 4	Model 3	Model 4	Model 3	Model 4
Intercept	1.96(0.15)***	1.96(0.15)***	4.50(0.40)***	4.52(0.40)***	4.18(0.27)***	4.19(0.27)***	5.19(0.26)***	5.13(0.25)***
Sept. Dep	0.58(0.06)***	0.58(0.06)***	1.06(0.15)***	1.06(0.16)***	0.15(0.11)	0.15(0.11)	-	-
Dec. SS	-	-	-	-	0.24(0.04)***	0.23(0.04)***	0.34(0.10)***	0.34(0.10)***
Dec. Dep X SS	0.13(0.02)***	0.13(0.02)***	0.19(0.06)***	0.19(0.06)***	-	0.04(0.08)	0.16(0.04)***	0.17(0.04)***
Gender	-	-	-	-	-	-	-	-
Ethnicity	0.21(0.06)***	0.21(0.06)***	-0.26(0.15)	-0.27(0.15)	0.29(0.10)**	0.28(0.10)**	-0.05(0.10)	-0.02(0.10)
Age	-0.05(0.06)	-0.05(0.06)	0.02(0.15)	0.02(0.15)	0.05(0.11)	0.05(0.11)	-0.01(0.10)	-0.00(0.10)
First gen.	-0.05(0.06)	-0.05(0.06)	-0.04(0.16)	-0.03(0.16)	-0.11(0.10)	-0.11(0.10)	0.03(0.11)	0.03(0.11)
Live at home	0.07(0.09)	0.07(0.09)	0.09(0.23)	0.09(0.23)	0.07(0.16)	0.07(0.16)	0.07(0.15)	0.06(0.15)
Live in res.	-0.31(0.11)**	-0.31(0.11)**	-0.14(0.29)	-0.14(0.29)	0.14(0.20)	0.14(0.20)	0.63(0.19)***	0.64(0.18)***
Parent ed.	-	-	-0.32(0.27)	-0.32(0.27)	0.57(0.19)**	0.56(0.19)**	0.66(0.18)***	0.67(0.17)***
Parent incm.	0.40(0.10)***	0.40(0.10)***	-0.12(0.22)	-0.12(0.22)	0.07(0.15)	0.07(0.15)	0.14(0.14)	0.14(0.14)
Working	-0.08	-0.08	-0.01(0.03)	-0.01(0.03)	0.02(0.02)	0.02(0.02)	0.04(0.02)*	0.046(0.02)*
R ² Δ	-0.00(0.01)	-0.00(0.01)	0.29(0.19)	0.28(0.19)	-0.07(0.13)	-0.07(0.13)	-0.21(0.12)	-0.20(0.13)
	-	0.03	-	0.0020	-	0.0020	-	0.02

= live in residence, par ed. = parent education, par incm. = parent income

SOCIAL SUPPORT AND DEPRESSION

Table 5. *Partial correlations of depression, social support, and their interactions with end-of-semester outcomes.*

	Dec. Depression	Burnout	Social Adjustment	Academic adjustment
Sept. Depression (Model 1)	.46*** [.37, .54]	.36*** [.26, .45]	.03 [-.07, .14]	-.20*** [-.30, -.09]
Sept. Depression (Model 3)	.46*** [.37, .54]	.36*** [.26, .45]	.08 [-.03, .19]	-.18*** [-.28, -.07]
Sept. SS (Model 1)	-.18** [-.28, -.07]	-.15** [-.25, -.04]	.27*** [.18, .37]	.21*** [.11, .31]
Dec. SS (Model 3)	-.28*** [-.37, -.18]	-.18*** [-.28, -.07]	.32*** [.22, .41]	.22*** [.13, .32]
Sept SS. X Dep. (Model 2)	.17** [.06, .27]	-.06 [-.17, .05]	-.01 [-.13, .10]	-.12 _a * [-.23, -.01]
Dec. SS X Dep. (Model 4)	.20*** [.10, .30]	.04 [-.07, .15]	.03 [-.08, .13]	-.15** [-.25, -.04]

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. _a Denotes tests that were not significant after correction for multiple tests using the Benjamini-Hochberg false discovery rate procedure. Square brackets denote 95% confidence intervals for each partial correlation. Sept. SS = September social support, Dec SS = December social support, Dep. = depression.

When the interaction between September social support and September depression was added to the model it explained an additional 0.36% of the variance (see Table 3). Social support in September was found to be correlated with end-of-semester burnout (partial $r = -.15, p < .01$) when all other regressors were held constant. Figure 5, illustrated from Model 2 coefficients, shows that the association between initial depression and end-of-semester burnout is largely the same for students with initially higher and lower social support. When I repeated this analysis using social support measured in December instead of September, all effects were similar (see Tables 4 and 5, Models 3 and 4).

End-of-semester social adjustment. September depression was unrelated to social adjustment in both models ($ps > .05$). However, there was a positive association between September social support and social adjustment of 0.20 units or 0.20 standard deviations for each one unit increase in September social support. Holding all other regressors constant, social support in September was found to be correlated with end-of-semester social adjustment (partial $r = .27, p < .001$; see Table 5). When the interaction between September social support and September depression was added to the model it explained an additional 0.10% of the variance (see Table 3). Figure 6 (illustrated from Model 2 coefficients) shows that students with high social support in September reported slightly better social adjustment regardless of their level of depressive symptoms in September. When I repeated this analysis using social support measured in December, all effects were similar (see Tables 4 and 5, Models 3 and 4).

Figure 5. Interaction plot showing burnout for different levels of September social support. Students 1 *SD* below mean September social support are labeled as *low September social support*, students 1 *SD* above mean September social support are labeled as *high September social support*.

End-of-semester academic adjustment. September depressive symptoms showed a negative association with academic adjustment. For each one unit increase in September depression there was a decrease of 0.37 units or 0.39 standard deviations in end-of-semester academic adjustment. Holding all other regressors constant, depression in September was found to be correlated with end-of-semester academic adjustment (partial $r = -.20$, $p < .001$; see Table 5). Social support in September was positively related to academic adjustment. For each one unit increase in September social support there was an increase of 0.15 units or 0.15 standard deviations in academic adjustment.

Figure 6. Interaction plot showing social adjustment for different levels of September social support. Students 1 *SD* below mean September social support are labeled as *low September social support*, students 1 *SD* above mean September social support are labeled as *high September social support*.

Holding all other regressors constant social support in September was found to be correlated with end-of-semester academic adjustment (partial $r = .21$, $p < .001$). Similar to the findings for end-of-semester depression, a significant interaction in Model 2 showed that differences in academic adjustment on social support were visible primarily for those already low in depressive symptoms at the start of the semester. Students with high social support and low depression were more well-adjusted academically by the end of the semester, whereas students initially high in depression reported similar academic adjustment scores regardless of initial social support (see Figure 7). However, after correcting for multiple tests using the Benjamini-Hochberg false discovery rate procedure

this interaction was no longer significant (Benjamini & Hochberg, 1995). When the interaction between September social support and September depression was added to the model it explained an additional 1% of the variance (see Table 3). When I repeated this analysis using social support measured in December, all effects were similar (see Tables 4 and 5, Models 3 and 4).

Modes of communication in September. Table 6 shows multiple regression model results predicting end-of-semester depression, burnout, social adjustment, and academic adjustment from depression and frequency of communication (Face-to-face, over the phone and via text) measured in September (Model 5), and their interactions (Model 6) controlling for the same covariates as previous models. There were no main effects for the different modes of communication in September, and no significant interactions of September depression with the modes of communication (i.e., face-to-face, phone, or text message) on December depression, burnout, or academic adjustment (see Table 6, Models 5 and 6). Model 6 showed a significant interaction between September depressive symptoms and phone communication predicting end-of-semester burnout. Figure 8 (illustrated using Model 6 coefficients) showed that social adjustment was slightly different for those on the low and high ends of September depressive symptoms. Students low in depressive symptoms with low phone communication had higher social adjustment than those with higher social support, and students with high depressive symptoms benefitted from more phone communication in September. After correcting for multiple tests this interaction was no longer significant. When the interaction between September phone communication and September depression was added to the model it explained an additional 3% of the variance (see Table 6).

Figure 7. Interaction plot showing the effect of September depression on end-of-semester academic adjustment for different levels of September social support. Students 1 *SD* below mean September social support are labeled as *low September social support*, students 1 *SD* above mean September social support are labeled as *high September social support*.

Table 7 shows partial correlations which were examined to determine which mode of communication was most strongly related to each end-of-semester outcome. December depression was most strongly associated with face-to-face communication (partial $r = -.04$). On end-of-semester burnout text messaging had the strongest partial correlation of $-.07$. Face-to-face communication and text message both had the highest partial correlation of $.07$ on end-of-semester social adjustment. Face-to-face communication had the highest association with academic adjustment (partial $r = .06$). Next, the confidence intervals of the interaction between September depressive symptoms and each mode of communication were compared to determine if face-to-face

time spent with friends was a stronger moderator than mobile mediated communication on end-of-semester outcomes. All confidence intervals were found to overlap with one another indicating that none of the interactions differed from one another and therefore, none of the modes of communication were superior (see Table 7).

Figure 8. Interaction plot showing the effect of September depression on end-of-semester social adjustment for different levels of September phone communication. Students 1 *SD* below mean September phone communication are labeled as *low September phone communication*, students 1 *SD* above mean September phone communication are labeled as *high September phone communication*.

Modes of communication in December. Table 8 shows the modes of communication in December (Model 7) and their interactions (Model 8) controlling for the same covariates as previous models. On end-of-semester depression no significant main effects were found for any of modes of communication in December, and no significant interactions. between September depression and the modes of communication

in December were found. A significant interaction was found between phone communication and September depression on end-of-semester burnout. Figure 9 illustrated from Model 8 coefficients shows that differences in end-of-semester burnout on are visible primarily for those who were initially low in depression. At low levels of September depression, high phone communication appears to be related to higher end-of-semester burnout. For those students initially high in depression, having higher or lower phone communication at the same time does not alter their levels of burnout at the end of the semester. When this interaction was added to the model it explained an additional 2% of the variance. After correcting for multiple tests this interaction was no longer significant. Face-to-face communication in December was positively related to end-of-semester social adjustment. Each one unit increase in December face-to-face communication was associated with a 0.15 increase in end-of-semester social adjustment. Face-to-face communication in December was positively related to end-of-semester academic adjustment. Each one unit increase in face-to-face communication was associated with a 0.08 unit increase in academic adjustment (see Table 8, Model 7). Table 9 shows partial correlations which were compared to determine which mode of communication in December was most strongly associated with end-of-semester outcomes. Face-to-face communication was most strongly associated with end-of-semester Depression (partial $r = -.05$), burnout (partial $r = -.05$) and significant associations were found with end-of-semester social adjustment (partial $r = .20$) and end-of-semester academic adjustment (partial $r = .11$; see Table 9).

However, none of the partial correlations remained significant after correcting for multiple tests. To determine which moderator was most strongly associated with end-of-

semester outcomes the confidence intervals of the interactions between the modes of communication in December and September depressive symptoms were compared for each end-of-semester outcome. All confidence intervals were found to overlap with one another suggesting that no significant differences exist between the interaction of September depressive symptoms and December modes of communication.

Figure 9. Interaction plot showing the effect of September depression on end-of-semester burnout for different levels of December phone communication. Students 1 *SD* below mean December phone communication are labeled as *low December phone communication*, students 1 *SD* above mean December phone communication are labeled as *high December phone communication*.

Table 6. *Multiple regression models of different modes of social support in September, September Depression and their interactions predicting December depression, burnout, social and academic adjustment.*

Outcome	Dec. Depression		Burnout		Social Adjustment		Academic Adjustment	
Effect(SE)	Model 5	Model 6	Model 5	Model 6	Model 5	Model 6	Model 5	Model 6
Intercept	1.86(0.17)***	1.86(0.17)***	4.48(0.40)***	4.44(0.40)***	4.30(0.28)***	4.34(0.28)***	5.30(0.27)***	5.30(0.27)***
Sept. Dep	0.60(0.07)***	0.61(0.07)***	1.15(0.16)***	1.17(0.16)***	0.04(0.12)	0.04(0.12)	-0.38(0.11)***	-0.40(0.11)***
Face-to-face	-0.02(0.02)	-0.01(0.02)	0.04(0.05)	0.04(0.05)	0.05(0.04)	0.04(0.04)	0.04(0.04)	0.05(0.04)
Text	0.01(0.03)	0.01(0.03)	-0.08(0.07)	-0.09(0.07)	0.06(0.05)	0.07(0.05)	-0.04(0.05)	-0.04(0.05)
Phone	0.0035(0.02)	0.0049(0.02)	0.0020(0.05)	0.0046(0.05)	0.04(0.03)	0.04(0.03)	0.0036(0.03)	-0.0008(0.03)
Face x Dep.	-	-0.01(0.04)	-	-0.03(0.09)	-	0.08(0.07)	-	-0.07(0.06)
Ph. X Dep.	-	-0.06(0.04)	-	-0.16(0.10)	-	0.15(0.07) _a *	-	0.10(0.06)
Text x Dep.	-	0.03(0.06)	-	-0.12(0.14)	-	0.09(0.10)	-	0.01(0.09)
Gender	-0.16(0.06)	-0.16(0.06)	-0.25(0.15)	-0.24(0.15)	0.21(0.11)	0.20(0.11)	-0.12(0.10)	-0.12(0.10)
Ethnicity	-0.05(0.06)	-0.04(0.06)	0.04(0.15)	0.05(0.15)	0.06(0.11)	0.05(0.11)	-0.01(0.10)	-0.01(0.10)
Age	-0.03(0.07)	-0.04(0.07)	0.04(0.15)	0.02(0.16)	-0.14(0.11)	-0.12(0.11)	0.04(0.11)	0.05(0.11)
First gen.	0.06(0.10)	0.07(0.10)	0.13(0.24)	0.18(0.24)	0.01(0.17)	-0.03(0.17)	0.07(0.16)	0.06(0.17)
Live at home	-0.30(0.12)*	-0.30(0.12)*	-0.14(0.28)	-0.14(0.28)	0.12(0.21)	0.13(0.21)	0.64(0.19)***	0.64(0.19)***
Live in res.	-0.40(0.11)***	-0.40(0.11)***	-0.40(0.27)	-0.38(0.27)	0.58(0.19)	0.58(0.19)	0.68(0.18)***	0.68(0.18)***
Parent ed.	-0.06(0.09)	-0.06(0.09)	-0.07(0.23)	-0.07(0.23)	0.03(0.16)	0.03(0.16)	0.14(0.14)	0.14(0.14)
Parent incm.	-0.01(0.01)	-0.00(0.01)	-0.02(0.03)	-0.02(0.03)	0.01(0.02)	0.02(0.02)	0.05(0.02)*	0.05(0.02)*

Working	-0.04(0.08)	-0.05(0.08)	0.29(0.20)	0.29(0.20)	-0.04(0.14)	-0.03(0.14)	-0.24(0.13)	-0.24(0.13)
R ² Δ	-	.01	-	.02	-	.03	-	.01

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. ^a Denotes tests that were not significant after correction for multiple tests using the Benjamini-Hochberg false discovery rate procedure. Sept. SS = September Social support, Face = Face-to-face, First gen. = first generation student, Live in res = live in residence, par ed. = parent education, par incm. = parent income.

Table 7. *Partial correlations for modes of communication in September on end-of-semester outcomes.*

	December Depression	Burnout	Social Adjustment	Academic adjustment
September Depression	.45*** [.36, .54]	.38*** [.28, .46]	.02 [-.09, .13]	-.19*** [-.29, -.09]
Face-to-face communication	-.04 [-.15, .07]	.04 [-.07, .14]	.07 [-.04, .17]	.06 [-.04, .17]
Text	.02 [-.09, .12]	-.07 [-.18, .04]	.07 [-.03, .17]	-.05 [-.16, .06]
Phone	.01 [-.10, .12]	.0064 [-.10, .11]	.06 [-.04, .17]	.0024 [-.10, .11]
Face-to-face x Depression	-.02 [-.12, .09]	-.02 [-.12, .09]	.02 [-.04, .17]	-.06 [-.16, .04]
Phone X Depression	-.09 [-.20, .03]	-.09 [-.20, .02]	.13 ^a * [.02, .23]	.09 [-.02, .19]
Text X Depression	.03 [-.08, .13]	-.05 [-.15, .06]	.05 [-.06, .15]	.01 [-.10, .11]

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Square brackets denote 95% confidence intervals for each partial correlation. ^a Denotes tests that were not significant after correction for multiple tests using the Benjamini-Hochberg false discovery rate procedure.

Table 8. *Multiple regression models of different modes of social support in December, September Depression and their interactions predicting December depression, burnout, social and academic adjustment.*

Outcome	Dec. Depression		Burnout		Social Adjustment		Academic Adjustment	
Effect(SE)	Model 7	Model 8	Model 7	Model 8	Model 7	Model 8	Model 7	Model 8
Intercept	1.86(0.17)***	1.86(0.17)***	4.45(0.39)****	4.46(0.39)***	4.33(0.27)***	4.33(0.27)***	5.26(0.26)***	5.26(0.26)***
Sept. Dep	0.60(0.07)***	0.61(0.07)***	1.12(0.16)***	1.24(0.17)***	0.11(0.11)	0.10(0.12)	-0.36(0.11)**	-0.38(0.12)**
Face-to-face	-0.02(0.02)	-0.01(0.02)	-0.02(0.06)	-0.02(0.06)	0.15(0.04)***	0.16(0.04)***	0.08(0.04)*	0.08(0.04)*
Text	0.01(0.03)	0.01(0.03)	-0.04(0.06)	-0.03(0.06)	-0.01(0.05)	-0.01(0.05)	-0.02(0.04)	-0.02(0.04)
Phone	-	-	0.01(0.05)	0.0034(0.05)	0.07(0.03)	0.07(0.03)	-	0.0002(0.03)
	0.0023(0.02)	0.0034(0.02)					0.0004(0.03)	
Face x Dep.	-	-0.01(0.04)	-	0.11(0.10)	-	0.02(0.07)	-	-0.02(0.06)
Phone x Dep.	-	-0.06(0.04)	-	-0.24(0.10) _a *	-	0.03(0.07)	-	0.04(0.07)
Text x Dep.	-	0.03(0.06)	-	-0.04(0.13)	-	0.16(0.10)	-	0.02(0.09)
Gender	-0.16(0.06)	-0.16(0.06)	-0.24(0.15)	-0.22(0.15)	0.18(0.10)	0.17(0.10)	-0.10(0.10)	-0.11(0.10)
Ethnicity	-0.05(0.06)	-0.04(0.06)	0.02(0.16)	0.04(0.16)	0.13(0.11)	0.12(0.11)	-0.00(0.10)	-0.00(0.10)
Age	-0.03(0.07)	-0.04(0.07)	-0.04(0.16)	-0.10(0.16)	-0.06(0.11)	-0.03(0.11)	0.05(0.11)	0.05(0.11)
First gen.	0.06(0.10)	0.07(0.10)	0.09(0.23)	0.10(0.23)	0.04(0.16)	0.04(0.16)	0.09(0.16)	0.09(0.16)
Live at home	-0.30(0.12)*	-0.30(0.12)*	-0.12(0.30)	-0.14(0.30)	0.16(0.21)	0.18(0.20)	0.66(0.20)	0.67(0.20)
Live in res.	-	-	-0.36(0.29)	-0.36(0.28)	0.57(0.19)**	0.58(0.19)**	0.70(0.18)***	0.70(0.18)***
	0.40(0.11)***	0.40(0.11)***						
Parent ed.	-0.06(0.09)	-0.06(0.09)	-0.08(0.23)	-0.09(0.22)	0.03(0.15)	0.05(0.15)	0.14(0.14)	0.14(0.14)
Parent incm.	-0.01(0.01)	-0.00(0.01)	-0.02(0.03)	-0.02(0.03)	0.01(0.02)	0.01(0.02)	0.05(0.02)*	0.05(0.02)*

Working	-0.04(0.08)	-0.05(0.08)	0.28(0.19)	0.25(0.19)	-0.07(0.13)	-0.06(0.13)	-0.24(0.13)	-0.23(0.13)
R ² Δ	-	.01	-	.02	-	.02	-	.0040

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. ^a Denotes tests that were not significant after correction for multiple tests using the Benjamini-Hochberg false discovery rate procedure. Dec. SS = December social support, Face = Face-to-face, First gen. = first generation student, Live in res = live in residence, par ed. = parent education, par incm. = parent income.

Table 9. *Partial correlations for modes of communication in December on end-of-semester outcomes.*

	December Depression	Burnout	Social Adjustment	Academic adjustment
September Depression	.46*** [.37, .54]	.37*** [.27, .46]	.05 [-.06, .16]	-.19** [-.30, -.08]
Face-to-face	-.05 [-.16, .05]	-.05 [-.16, .05]	.20*** [.10, .30]	.11 ^a * [.01, .21]
Text	.01 [-.09, .12]	-.03 [-.14, .07]	.01 [-.12, .10]	-.02 [-.13, .08]
Phone	-.01 [-.11, .10]	.0094 [-.10, .12]	.11 ^a * [.01, .21]	-.0006 [-.10, .10]
Face-to-face x Depression	.03 [-.08, .13]	.06 [-.04, .17]	.02 [-.09, .11]	-.01 [-.12, .09]
Phone X Depression	-.08 [-.19, .04]	-.13 ^a * [-.24, -.02]	.02 [-.09, .14]	.03 [-.07, .15]
Text X Depression	.03 [-.08, .14]	-.02 [-.12, .09]	.09 [-.02, .20]	.01 [-.09, .12]

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Square brackets denote 95% confidence intervals for each partial correlation. ^a Denotes tests that were not significant after correction for multiple tests using the Benjamini-Hochberg false discovery rate procedure

Discussion

The purpose of this study was to examine the impact of depression and social support in first-year first-time students making the transition to university. Students responded to questionnaires in September, during the initial period of acclimating to university life (e.g., moving into residence, starting classes, and meeting new people). Students were surveyed again in December, a time where students should be more adjusted, but one that has been shown to be more stressful (Barker et al., 2018) as it is the end of the first semester and by this time students will be aware of their academic standing (i.e., if they are passing or failing). Three research questions were examined: First, do students who enter university with depressive symptoms experience poorer end-of-semester well-being (i.e., continued depression, burnout, and decreased social and academic adjustment)? Students who entered university with increased depressive symptoms were expected to show poorer end-of-semester outcomes than those with fewer depressive symptoms. Second, does higher perceived social support moderate the association between initial depressive symptoms and end-of-semester outcomes? Students who enter university with more depressive symptoms and lower social support were expected to show the poorest end-of-semester outcomes. Lastly, is face-to-face time spent with friends (versus mobile mediated communication) a stronger moderator of the association between initial depressive symptoms and end-of-semester well-being? It was predicted that students with more initial depressive symptoms who saw friends more frequently face-to-face would have more positive end-of-semester outcomes compared to those with more initial depressive symptoms who frequently use mobile mediated communication and do not see their friends in-person as frequently.

As expected, depressive symptoms in September were positively associated with end-of-semester depression and burnout and negatively related to academic adjustment but unrelated to social adjustment. Social support (measured in September and December) was shown to be beneficial for all end-of-semester outcomes. Social support was negatively associated with end-of-semester depression and burnout and positively related to social and academic adjustment. However, the effect sizes related to the negative impacts of depression were substantially larger than the positive impacts of social support (e.g., depression in September predicting continued depressive symptoms in December was associated with a 0.92 standard deviation increase whereas social support in September was only associated with a 0.12 standard deviation decrease in December depressive symptoms). Depressive symptoms in September were associated with moderate effects on end-of-semester burnout (i.e., a 0.79 standard deviation increase) and small effects on academic adjustment (a standard deviation decrease of 0.39) and social adjustment (a standard deviation increase of 0.06). This suggests that the negative effects of depression are more impactful than the positive effects of social support. Social support in September showed only small effect sizes (i.e., standard deviation changes between 0.11 and 0.20) and similar effects in December with standard deviation changes of between 0.13 and 0.24.

Interactions between September depressive symptoms and social support were found for end-of-semester depression and academic adjustment. However, the interaction between September depressive symptoms and social support on end-of-semester academic adjustment was no longer significant after correction for multiple tests. Students who reported high levels of social support (in September and December) and

low levels of depressive symptoms in September had less end-of-semester depression. However, at high levels of depression in September, differing levels of social support predicted similar levels of end-of-semester depression. This supports the prediction that students with higher social support and less depression would have better outcomes, but it does not support the prediction that students with lower social support and high depression would have worse end-of-semester well-being. At high initial depression, the level of social support did not matter (i.e., those with low and high social support had similar end-of-semester outcomes). Further, social support did not moderate effects of depression on end-of-semester burnout or social adjustment.

Research question three was not supported. It was expected that time spent with friends (compared to mobile mediated communication) would be a stronger moderator of the association between initial depressive symptoms and end-of-semester outcomes. However, all the different modalities of communication were similarly (and weakly) related to end-of-semester outcomes. Further, when comparing the moderation effects of each modality with September depressive symptoms there were no significant differences between interacting via face-to-face communication, the phone, or text message on any of the end-of-semester outcomes, suggesting that no modality was a stronger moderator of depressive symptoms. This was true for the interaction with September depressive symptoms and the modes of communication measured in September and December.

Unlike research question two, the results for the third research question differed when frequency of communication was reported in September versus December. In September, no main effects were found for any of the modes of communication on end-of-semester well-being. One interaction was observed between September depressive

symptoms and phone communication on end-of-semester social adjustment. Visual inspection of the simple slopes indicated that this interaction was very small and symmetrical (see Figure 8), showing weak differences in end-of-semester social adjustment at low and high ends of depression. Students with initially low depression and less phone communication were slightly better adjusted, and students with initially high depression and more phone communication were also slightly better adjusted. A test of this interaction was not significant after correction for multiple tests suggesting that this may have been a false positive (Type I error), and it is unlikely to be true in the population.

In December, frequency of face-to-face communication was positively related to social and academic adjustment as indicated by regression coefficients. No associations were found for frequency of text message or phone communication. A significant interaction between depression and frequency of phone communication was observed for burnout. A plot of the simple slopes (Figure 9) showed that at low levels of depression high phone communication was associated with increased burnout compared to low levels of phone communication. This association was also no longer significant after correcting for multiple tests indicating that it was also not a true effect and would likely not replicate in another sample. The effect sizes were all very small for these tests as well (i.e., standard deviation changes between 0.003 and 0.15).

High Social Support is Typical

Social support and depression alone were each associated with end-of-semester outcomes in the expected directions. In September and December, social support was found to be beneficial for end-of-semester well-being. Specifically, it was associated with

lower depressive symptoms and burnout and increased social and academic adjustment. Depression was associated with continued depression, higher burnout and decreased academic adjustment. However, when the interaction of social support and depression was added to the model it did not contribute as predicted and only explained between 0.036% and 3% additional variance across models. After correction for multiple tests, the only significant interaction observed was in predicting end-of-semester depression. This interaction indicated that at low levels of September depressive symptoms, high social support in September (and December) protected against end-of-semester depressive symptoms. A lack of other significant interaction effects could be that this sample consisted primarily of participants who already have high social support and low depression making it difficult to detect true interactions. This is evidenced by high social support scores ($m = 5.36$ in September, $m = 5.38$ in December). On the seven-point scale only 23 students (4.9% of the sample) had a mean score below the midpoint (three or lower). Similarly, for scores of depressive symptoms in September, 209 students (almost half the sample; 45.3%) scored one or less, and only 6.9% of students ($n = 32$) scored over two on the scale ranging from 0 to 3. This means that the combination of low social support (i.e., three or lower) and high depression (i.e., two or higher) occurred rarely. In September there were only two people, and in December only eight people, who had this combination of scores. Having so few participants reporting the combination of scores implied by the research question calls into question whether an interaction effect could be reliably detected.

Other research from university samples similarly indicates that high social support is the norm in university students. Hefner and Eisenberg (2009) surveyed 1,378 students

at a large American University, and of their sample only 8.8% ($n = 122$) scored between one and three on the seven-point scale. In the general population, high social support is also the norm. In a study conducted in Norway using a large sample ($n = 40,659$) of the general population, 95% had friends who could help them when necessary, and 91.2% had friends whom they could speak to confidentially, and 89.3% of respondents had both. Participants who said no to both items were classified as low social support and comprised only 3.2% of the sample (Grav, Hellzèn, Romild, & Stordal, 2011). Although most people have high social support, those who lacked or reported low social support were shown to be more likely to suffer from depression. In the Norwegian study, the prevalence of depression was 35% in the subsample classified as having low social support compared to 21.7% in the medium support group, and 7.7% in a high support group. This was also true in the university student sample: Hefner and Eisenberg (2009) showed that a higher score on social support was significantly related to lower chance of depression. Additionally, longitudinal studies have shown that during emerging adulthood levels of depressive symptoms decrease and perceived social support increases (Galambos, Barker, & Krahn, 2006; Galambos, Fang, Horne, Johnson, & Krahn, 2017; Pettit et al., 2011).

Perceived Social Support Differs from Frequency of Communication

The two methods of measuring social support did not produce similar results which was unexpected. Perceived social support produced similar effects when measured in September and December and was associated with all outcomes in the expected directions. In contrast, the different modes of communication showed different results depending on time of measurement and effects did not resemble those for perceived

social support. In September no main effects were found for any of the modes of communication. Regarding moderation, out of a total of 24 interactions (12 in September and 12 in December), two interactions, one in September and one in December were initially significant but both were rendered not significant after correction for multiple tests. Further, these two interactions were associated with different outcomes, but both involved September depressive symptoms and phone communication. In September, one interaction was found between phone communication and September depression on end-of-semester social adjustment. In December, face-to-face communication was positively related to social and academic adjustment, and an interaction was found between phone communication and depression on end-of-semester burnout. Since both interactions turned out to be not significant after correction for multiple tests, and they differed across times of measurement, I do not believe these are true effects that would replicate in another sample.

One possible explanation for why the two methods of assessing social support did not produce similar effects is that there are too few people communicating infrequently. Participants were asked to respond to the prompt: “How often in a typical week do you talk to your friends” for each mode of communication (i.e., “in person”; “on the phone (including Skype, FaceTime, etc.)”; “using text messaging”). The responses ranged from “not at all” corresponding to a score of 0 to “multiple times every day”, a score of 5. Like the measure of perceived social support, these items were also highly endorsed with most participants reporting talking to friends “most days” or more frequently. For face-to-face communication just over three quarters of the sample (76%; $n = 333$) reported seeing friends most days or more frequently. For text messaging this number was even higher

with 87.4% of participants texting their friends most days or more ($n = 382$).

Interestingly, the one mode of communication that did produce interaction effects was phone communication which was the most variably endorsed of all the modes of communication. Specifically, 50.4% ($n = 204$) of the sample scored from 0 to 3 (“not at all” to “two to three times”). This further suggests that the lack of significant effects for the other modes of communication could be due to limited sampling variability. High responses to cell phone and face-to-face communication indicate that a large portion of the sample are communicating regularly with friends, and that it is possible there were not enough people scoring low on this measure to be representative of the effect we are trying to observe (i.e., we are lacking sufficient information about people who are communicating less with friends). McCabe, Kim & King (2018) suggest that range restriction of moderator variables can be a problem when working with skewed moderators or large sample sizes, both of which are present in this data. In these cases, simple slopes may not accurately represent the true nature of the effects at those values.

Another possibility is that this measure is not actually capturing social support. The question asked students how often they communicated with friends across the three different modes of communication; we did not ask about the length, valence, or quality of these interactions. It is possible to frequently talk to or see friends while still not feeling supported. Hefner and Eisenberg (2009) compared differences in structure (quantity) and function (quality) of perceived social support measured using the same instrument that was used in this study (i.e., the MSPSS). Their results showed that 31% of those with low *quality* social support (a score of between 1 and 3 out of 7 on the MSPSS) were classified as having probable depression compared to 16% with medium quality (corresponding to a

score of 4 to 5 out of 7) and 5% in the high-quality category. *Quantity* of social support, evaluated with two items that asked participants how often they spoke with or saw friends or family members over the past year, was unrelated to probable depression. Further, frequency of contact measures were weakly correlated with MSPSS support quality with correlation coefficients between .1 and .3 (Hefner & Eisenberg, 2009). We also observed weak correlations in the current study between perceived social support (i.e., MSPSS) and the modes of communication variables in September. Correlation coefficients between the MSPSS and phone communication was .17, followed by face-to-face communication at .24, and text message at .26. These were similar in December (r s between .14 and .23; see Table 1). These low correlations may suggest that perceiving high-quality social support does not require frequent interaction or that social support and frequency of communication are two distinct constructs.

Unfortunately, this study was not able to determine which of the modes of communication was a stronger moderator with initial depressive symptoms because all the modes of communication were equally weak and did not differ from one another. This was a surprising finding considering that the popular narrative is that technology and social media are contributing to poorer mental health. However, upon further review of the literature it appears that a study conducted by Twenge, Joiner, Rogers, & Martin (2018) found an association between social-media and depressive symptoms in adolescents which has influenced the public narrative (e.g., NPR, 2017) suggesting that technology use is leading to depression. However, other academics have criticized this research due to its cross-sectional nature. In one study, Heffer, Good, Daly, MacDonell, & Willoughby (2019) conducted a six-year longitudinal study using two samples

(adolescents and undergrads) and they found that more social media use did not predict depressive symptoms, but depressive symptoms did predict more social media use among adolescent girls. Additionally, other empirical work shows that use of technology (i.e., increased screen time) does not meaningfully decrease well-being (Orben & Przybylski, 2019). Research on social support received through Facebook has shown mixed results. One study showed that levels of perceived support were higher for face-to-face support than for support via Facebook (Olson, Liu, & Shultz, 2012). But it was also shown that when people had increased online communication with one another, they also tended to engage in offline activities. Their findings indicate that people who communicate regularly with their friends online also frequently see friends in person, and having more social support regardless of the modality is better.

Social support is beneficial at low levels of depression

One of the interesting, and unexpected findings was that perceived social support was only protective against end-of-semester depression for those who entered university with initially low depressive symptoms. The interaction between social support and initial depressive symptoms was found to positively modify end-of-semester outcomes in depression and academic adjustment but these effects were only present in those who entered university with low depressive symptoms. Those who entered university with high depressive symptoms showed no differences on end-of-semester outcomes depending on their level of social support. Aside from skewed sampling issues identified earlier, two other reasons stand out that may explain why no differences were found in students with initially high depressive symptoms. First, negative effects of high levels of depression are stronger than the positive effects of social support (i.e., people with higher

depressive symptoms do not gain as much from social support). Second, people with depressive symptoms may tend to have more negative social supports.

Seeing no differences in the level of social support for those with high depressive symptoms may suggest that when it comes to depression, the positive effects of social support are only beneficial for students who have initially low depressive symptoms. This suggests that the negative impacts of depression are stronger than the positive effects of social support, and that at higher levels of depressive symptoms, social support alone may not be enough and other resources in addition to social support may be necessary. The beneficial effects of high social support were present at depression scores below two out of three. A score of two on the CES-D corresponds to students endorsing the items “occasionally or a moderate amount of time (6-9 days)” during a two-week period. This means that students were experiencing depressive symptoms about half the time over a two-week period. In this study the main effects of depression were much stronger than those of social support (approximately 7 times larger; the standard deviation change was 0.92 for depression and only 0.12 for social support). This may suggest that at high levels of depressive symptoms, influences of social support itself are not powerful enough to attenuate symptoms of depression. Students at this level of depression likely need more comprehensive care to modify depressive symptoms in December. One prospective study tested whether social support was related to clinical improvements outpatients with depression when controlling for other risk factors. In addition to social support, severity and duration of the depressive episode were found to be strong predictors of recovery (Brugha et al., 1990). It may be the case that social support only contributes to limiting

depression for those with mild symptoms are that are manageable with self-care strategies.

Another possible explanation is that students with depression have adequate social support, but within relationships that are more negative than positive, for example, relationships with difficult individuals that have more conflict and that could end up being more exhausting than fulfilling. Lincoln (2000) reviewed studies that measured negative and positive aspects of social support. Twenty out of 28 studies showed that negative social support was more detrimental to well-being than the positive impacts of social support. Further, Offer and Fischer (2018) suggest that people tend to maintain ties with difficult individuals. In a survey of over 1,100 respondents who described over 12,000 relationships with family, friends and co-workers, participants reported that 15% of their network consisted of "difficult or demanding" individuals. In a daily process study conducted with university students across 21 days, students with more depressive symptoms reported significantly more negative than positive daily social interactions (Steger & Kashdan, 2009). A study with adolescents examined the positive and negative aspects of support from best friends (La Greca & Harrison, 2005). The results interestingly showed that positive aspects of relationships with best friends protected against anxiety, but not depression. The negative aspects of best friendship, however, did predict continued depression. La Greca and Harrison (2005) proposed that having a best friend to confide in could reinforce feelings of depression. Conversations between supports that consist of discussing problems and focusing on negative emotions has been labeled *co-rumination* (Rose, 2002). In a study with emerging adults, high levels of co-rumination were strongly associated with social support ($r = .57, p < .01$; Ames-Sikora,

Donohue, & Tully; 2017). This may provide an explanation of why having low or high social support did not make a difference in students with initially high depressive symptoms. Perhaps some students high in depressive symptoms are frequently co-ruminating with friends – these students perceive plenty of social support, but the support is not helping make progress to reduce depressive symptoms.

Strengths and Limitations

This study has several strengths. First, many studies investigating social support and depression have been cross-sectional (for a review see Santini et al., 2015). The current study used two timepoints and had a high retention rate of 86%. Second, many studies in psychology that use university students consist of convenience samples that are not typically representative of the actual university population (i.e., they are composed of mostly White, mostly female, psychology majors). In contrast, this study recruited students from all over campus and achieved a sample that was gender balanced (i.e., 53.9% male), ethnically diverse (52.6% minority) and composed of students from a variety of disciplines, resulting in a sample that was demographically representative of students at Carleton University.

There are some limitations that should be noted. First, the current study surveyed students during their first semester, not the entire first year and used only two points. A larger number of repeated measures would provide more information about the changes that are taking place during students' first semester at university. Due to this we are lacking information to make causal inferences, making it difficult to know whether social support influences or reflects ongoing depression, so we can observe the co-occurrence of these measures but cannot determine the direction of the effects. As previously discussed,

there were few students with high depressive symptoms and low social support. This could be due to selection bias (i.e., highly depressed/under supported students opting not to participate in research). This study only focused on perceived social support and frequency of social interaction from friends. Research from university samples has shown that university students still receive social support from parents and significant others (e.g., Hefner & Eisenberg, 2009). Further, social support has been demonstrated to be multifaceted (Gariépy, Honkaniemi, & Quesnel-Vallée, 2016) and we only measured specific aspects of social support (i.e., perceived social support and frequency of contact), and only the positive impacts of social support. Although this study examined only social support from friends, future research should examine how parents and significant others provide support during the transition to university and how these supports differ from peer support. One thing that could have impacted perceptions of social support is if students relocated for university—another measure that was not included in the present study but could be valuable in future research.

Implications

The findings from the current research could aid mental health professionals at post-secondary institutions to improve campus services. One mental health initiative present at many institutions is peer support (e.g., Carleton University, 2016; Linden, Grey, & Stuart, 2018; Healthy Minds Healthy Campuses, 2017). If support from friends is not beneficial for those with more severe depressive symptoms, this raises the question of whether or not peer support programs at universities are truly helpful. Many universities have peer support programs, but it is challenging to find out the efficacy of these programs. Horgan, McCarthy & Sweeny (2013) used an online peer support forum

for university students in Ireland with depressive symptoms. At the beginning of the study participants were granted access to the peer support forum which they could use as often as they wished. Depressive symptoms were assessed at the beginning of the study and 6 weeks later. Although the initial sample was 118, only 17 participants actually used the online forum, and no significant differences were found between pre- and post-test depression scores. These findings could suggest that in students with depression, peer support may not be utilized or beneficial.

However, universities across Canada continue to fund peer support programs despite the possibility that these services may not be overly beneficial for student wellness, or frequently utilized. Healthy Minds Healthy Campuses (2017) interviewed organizers of volunteer peer support programs at post-secondary institutions in British Columbia. Each peer support program was different, and like other mental health services on campuses each university houses their own program. Thus, the training for volunteers could vary widely making it difficult to compare efficacy between institutions. However, peer support programs could be a first step for students seeking support to act as a referral source to other mental health services. The defining features of peer support were independence from societal stigma and professional authorities. These qualities may be what draws students to these programs.

As demonstrated by the current study, using peers as supports may not be useful for all students. Unfortunately, those who need the support most (i.e., students with higher depressive symptoms). Universities should examine the efficacy of peer support programs for students with depression and other mental health challenges to determine if these programs are worth funding (i.e., if they are frequently utilized and helpful in

increasing student wellness). If they are not helpful, the funds may be better spent on increasing awareness of mental health challenges during the emerging adulthood years or creating anti-stigma campaigns that normalize seeking professional help.

Linden, Gray and Stuart (2018) conducted a review for the Mental Health Commission of Canada to develop a national framework of approaching student mental health which will be unveiled in 2020. Interestingly, their review indicated that although students report significant distress, a minority of students actually seek help, especially men, marginalized populations, and distance education students. The report also identified several barriers to seeking help including confidentiality concerns, lack of time, not believing the problem warranted professional help, uncertainty about treatment efficacy, and preferring to rely on other sources of support (i.e., friends, family, or significant others). Seeking support only from loved ones could be problematic because they are likely not equipped to provide the necessary supports for those with severe depression. Additionally, as previously discussed friendships may be negative and could foster co-rumination. Not believing the problem warranted professional help could be lessened by educating incoming students on mental health challenges during university (e.g., three quarters of mental disorders onset by age 24; Kessler et al., 2005).

It could be advantageous to build a mandatory wellness in university class for all new students. This class could teach students about the prevalence of mental health conditions during the emerging adulthood years, and how to know when they were reaching the point of burnout or developing symptoms of mental health conditions, when to seek professional help, along with what kind of supports are useful for certain issues (i.e., when it is appropriate to seek peer compared to professional support). A study

conducted on individuals with severe mental illness in the general population indicated that 65.7% of those surveyed believed that their problem did not require treatment.

Further, almost a quarter of these individuals did not receive treatment because they were concerned about what others would think (Kessler et al., 2001). This suggests that educating students on when to seek professional support would be beneficial.

If support from friends is not beneficial for those with depression as our research suggests, we believe that going forward there should be a focus on reducing stigma associated with seeking professional help. Eisenberg, Downs, Golderstein & Zivin (2009) examined stigma related to health seeking behaviour in university students by comparing two types of stigma. Public stigma was defined as collectively held negative beliefs and stereotypes, whereas, personal stigma comprises an individual's beliefs, stereotypes and prejudices towards mental health. Personal stigma was significantly negatively associated with seeking help in the form of medication, therapy and even nonclinical supports. Personal stigma was also found to be higher in the following types of students: males, younger, Asian, and international, some of the same groups that Linden and colleagues (2018) identified, suggesting that these are the groups that need to be targeted in de-stigmatizing campaigns. As universities service such a diverse student body it is likely that specialized services are warranted as a one size-fits-all approach may not be beneficial for the myriad needs in the student body. Universities would benefit from having mental health professionals from diverse backgrounds. Professionals with expertise in supporting minority, international and LGBTQ+ students may result in more students seeking help.

Conclusion

This study provided insights on how entering the transition to university with depressive symptoms impacts end-of-semester well-being (i.e., continued depressive symptoms, burnout, and social and academic adjustment), and if social support was able to modify these outcomes. As expected, entering university with depressive symptoms was associated with poorer outcomes.

When considering social support as a moderator for initial depressive symptoms it was surprising to find that social support was not as protective as expected. Specifically, social support was only beneficial for those without depressive symptoms or mild depressive symptoms when they entered university. At higher levels of initial depression, the amount of social support students received was unrelated to their depressive symptoms in December. These findings suggest that students with greater depressive symptoms likely require a more comprehensive strategy for managing symptoms and cannot exclusively rely on their network of social supports. Advising people to reach out to friends and family is overly simplistic and unlikely to benefit students whose symptoms are more persistent.

This study also examined if face-to-face support was a stronger moderator than mobile mediated communication (i.e., phone or text message) with initial depressive symptoms on end-of-semester outcomes. Although this study did not find any moderation differences between initial depressive symptoms and social support received through mobile mediated communication compared with face-to-face interaction, this is an important question that should be examined in future research (e.g., creating measures that assess perceived social support across the modes of communication). As smartphones are ubiquitous and technology-mediated communication is only going to

continue to increase with time research should examine what support can be received through text message or FaceTime, Skype, etc. This study indicated that the modes of communication and initial depressive symptoms did not moderate well-being outcomes. Future studies could examine these different modes of communication from a perspective of perceived social support instead of frequency of communication. As perceived social support has been shown to have stronger effects across studies where frequency of support was not shown to be helpful (Hefner & Eisenberg, 2009). Additionally, it would be useful to track support through technology over longer periods (e.g., daily surveys) and have students report how supported they felt when using the various modes of communication. This would provide a more comprehensive picture of the relationship between social support received via cell phones and how this relationship changes with time. Additionally, future research should compare the differences between positive and negative impacts of social support in those with depression, as it is possible that people with depression are more greatly impacted by negative social supports.

This study provided important information about the nature of social support during the transition to university and how social support is related to depression. Although perceived social support was found to be beneficial, it was only helpful for end-of-semester outcomes in students with initially low depressive symptoms, but at high levels of depression level of social support did not make a difference. This finding suggests that when students are highly depressed, they should be encouraged to use other mental health supports on campuses (e.g., counselling), instead of simply relying on friends.

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Appendix A: Baseline Survey Informed Consent Form

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 must provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study. This study has received clearance by the Carleton University Psychology Research Ethics Board (#109236).

Study Title: Carleton Transitions Study

Faculty Investigator. This research is co-ordinated and overseen by Dr. Andrea Howard, Associate Professor, Department of Psychology. If you have questions or concerns, please contact Dr. Howard (email: andrea.howard@carleton.ca; phone: 613-520-2600 x3055). If you have any ethical concerns about this research, please contact Dr. Bernadette Campbell (Chair, Carleton University Research Ethics Board - B; email: ethics@carleton.ca; phone: 613-520-2600 x 4085).

Purpose. The purpose of this study is to learn about different factors that influence a successful transition to university. We are interested in understanding whether factors like students' relationships with their parents, academic habits and interests, social activities, mental health, and health-related behaviours differ between students who are thriving and students who are struggling during their first semester at Carleton.

Your participation. Participation in this study includes filling out an online questionnaire about your background (e.g., demographics), thoughts about your parents, thoughts about your academic goals, your typical academic and social habits, work and finances, health behaviours such as sleep, exercise, and substance use, and some questions about mental health and well-being including feelings of depression and anxiety. This questionnaire will take about 20 minutes to complete. After completing the questionnaire, you may be invited to participate in a follow-up study involving short daily surveys delivered to your mobile phone. You may also be invited to complete a second 20-minute questionnaire in a few months to reflect back on your first semester.

Your academic data. To help us learn about academic aspects of success during the transition to university, we are also seeking your permission for Carleton administrative staff to link your academic data (Fall, 2018 and Winter, 2019) to the data you provide as part of the Carleton Transitions Study. Your academic data will include your GPA, the number of courses you were enrolled in and number of withdrawals, and your academic standing at the end of each semester.

Compensation: As compensation for your time, you will receive a **\$10 amazon.ca** gift code. As a bonus for completing our intake survey, you will also be entered into a **draw for a \$200 amazon.ca** gift code. You will be informed of the results of the draw at the end of September.

Potential risks or discomfort: Some of the questionnaire items ask about sensitive

topics such as alcohol and drug use and mental health symptoms that make some people feel uncomfortable. You may choose to skip any items that you don't feel comfortable answering. There are no other anticipated risks or discomfort associated with this study.

Right to withdraw. Your participation in this study is voluntary. If you choose to participate, it is desirable that you complete as many questions as possible, but you may choose not to respond to individual survey items at your discretion. You will receive your compensation even if you choose to withdraw. If you choose to withdraw from the study, you have the right to request that your data be deleted. You may do so by contacting Dr. Howard by email.

Confidentiality. The data collected in this study are strictly confidential. Data are collected online by Qualtrics.com following a strict policy regarding confidentiality and data protection. We store your data at Carleton University on a secure server accessible only by the Faculty Investigator and authorized research personnel. Only researchers approved to work on this project will see your data, and all personally-identifying information (your name and email) will, at the earliest possible opportunity, be stored separately from your survey responses. Data will be permanently deleted from Qualtrics servers within one year of completing data collection. Data stored and protected by Qualtrics on Toronto-based servers may be disclosed via a court order or data breach. With your consent to participate in this study, you acknowledge this.

Data containing no personally-identifying information will be securely stored by Dr. Howard for an indefinite period of time and used for future research and teaching purposes and may be shared with trusted colleagues or other competent professionals (pursuant to Standard 8.14 of the APA's Ethical Principles of Psychologists and Code of Conduct manual). Personal identifiers providing a link to the data will be destroyed (deleted) no later than May, 2020. Any requests for data deletion must be received by this time.

Consent to Participate. Please check the box "I agree" to indicate that you have read and understood the nature and purpose of the study. By checking this box, you acknowledge that a copy of the consent form has been made available to you online, and acknowledge your willingness to participate in this study.

- ☐ I agree
- ☐ I disagree

Appendix B: Baseline Survey Demographics

Are you an international student?

- ☐ Yes
- ☐ No

What is your current living situation?

- ☐ In university residence/campus housing (alone or with roommates)
- ☐ Living with parents or other guardians
- ☐ Living off-campus, on my own
- ☐ Living off-campus, with roommates (not parents or guardians)
- ☐ Other (please specify)

Has anyone else in your family ever attended university? (Check all that apply)

- ☐ No, I am the first person in my family to go to university
- ☐ Yes, one or more of my siblings also went to university
- ☐ Yes, one or more of my parents also went to university
- ☐ Yes, one or more of my aunts/uncles also went to university
- ☐ Yes, one or more of my grandparents also went to university

What is your age in years and months? (Example: If you had your 18th birthday 2 months ago, you would write 18 years, 2 months)

- ☐ Years
- ☐ Months

What is your racial/ethnic background? Check all that apply.

- ☐ First Nations, Inuit, or Métis
- ☐ Black (African or Caribbean origin)
- ☐ White/Caucasian (European origin)
- ☐ South Asian origin (e.g., East Indian, Pakistani, Sri Lankan)
- ☐ West Asian/Middle Eastern/Arabic origin (e.g., Iranian, Lebanese, Afghan)
- ☐ Southeast Asian origin (e.g., Chinese, Filipino, Japanese, Korean, Vietnamese)
- ☐ Latin American origin (e.g., Mexican, Colombian, Guyanese)
- ☐ Oceanic origin (Australian, New Zealander, Pacific Islands)
- ☐ Other origins (please specify)

In what year did you graduate from high school?

- ☐ 2018
- ☐ 2017
- ☐ 2016 or earlier

In what degree program are you currently enrolled?

- ☐ Bachelor of Arts (B.A.)
- ☐ Bachelor of Science (B.Sc.)
- ☐ Bachelor of Architectural Studies
- ☐ Bachelor of Cognitive Science
- ☐ Bachelor of Commerce
- ☐ Bachelor of Communication and Media Studies
- ☐ Bachelor of Computer Science
- ☐ Bachelor of Economics
- ☐ Bachelor of Engineering
- ☐ Bachelor of Global and International Studies
- ☐ Bachelor of Health Sciences
- ☐ Bachelor of Humanities
- ☐ Bachelor of Industrial Design
- ☐ Bachelor of International Business
- ☐ Bachelor of Information Technology
- ☐ Bachelor of Journalism
- ☐ Bachelor of Mathematics
- ☐ Bachelor of Music
- ☐ Bachelor of Public Affairs and Policy Management
- ☐ Bachelor of Social Work
- ☐ Other program not listed
- ☐ Multiple programs

Excluding work related to a co-op program, are you employed during the current academic term?

- ☐ Yes, off campus
- ☐ Yes, on campus
- ☐ Yes, both on and off campus
- ☐ No, but I am looking for work
- ☐ No, and I am not looking for work

On average, how many hours per week do you work for pay?

What is your father's highest level of completed education?

- ☐ Elementary school
- ☐ High school
- ☐ Community college/vocational diploma or Associate's degree
- ☐ Bachelor's degree (includes law and medical degree)
- ☐ Master's degree or Ph.D.

What is your mother's highest level of completed education?

- ☐ Elementary school
- ☐ High school
- ☐ Community college/vocational diploma or Associate's degree
- ☐ Bachelor's degree (includes law and medical degree)

- Master's degree or Ph.D.

Which of these categories best describes your parent's total income in the past 12 months?

- Less than \$5,000
- \$5,000 to \$9,999
- \$10,000 to \$14,999
- \$15,000 to \$24,999
- \$25,000 to \$34,999
- \$35,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$124,999
- \$125,000 to \$149,999
- \$150,000 to \$199,999
- \$200,000 or greater

Appendix C: Communication with Friends Measure

On average, how many hours per week do you:
Spend time with friends

In a typical week, how often do you talk to your friends...

	Not at all	Once	Two or three times	Most days	Once every day	Multiple times every day
In person?						
On the phone (including Skype, FaceTime, etc.)?						
Using text messaging						

Appendix D: Center for Epidemiological Studies – Depression

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past two weeks.

	Rarely or none of the time (less than 2 days)	Some or a little of the time (2-5 days)	Occasionally or a moderate amount of time (6-9 days)	Most or all of the time (10-14 days)
I was bothered by things that usually don't bother me.				
I had trouble keeping my mind on what I was doing.				
I felt depressed.				
I felt that everything I did was an effort.				
I felt hopeful about the future.				
I felt fearful.				
My sleep was restless.				
I was happy.				
I felt lonely.				
I could not get "going."				

Appendix F: Follow-up Informed Consent Form

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 must provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study. This study has received clearance by the Carleton University Psychology Research Ethics Board (#109236).

Study Title: Carleton Transitions Study: End-of-Semester Follow-up

Faculty Investigator. This research is co-ordinated and overseen by Dr. Andrea Howard, Associate Professor, Department of Psychology. If you have questions or concerns, please contact Dr. Howard (email: andrea.howard@carleton.ca; phone: 613-520-2600 x3055). If you have any ethical concerns about this research, please contact Dr. Bernadette Campbell (Chair, Carleton University Research Ethics Board - B; email: ethics@carleton.ca; phone: 613-520-2600 x 4085).

Purpose. The purpose of this study is to follow up with students who participated earlier in the semester to help us learn about different factors that influence a successful transition to university. As before, we are interested in understanding whether factors like students' relationships with their parents, academic habits and interests, social activities, mental health, and health-related behaviours differ between students who are thriving and students who are struggling during their first semester at Carleton.

Your participation. Participation in this follow-up phase includes filling out an online questionnaire updating information about your academics, your current work, finances, and health, your feelings about how you've adjusted to university life, and some questions about mental health and well-being including feelings of depression and anxiety. This questionnaire will take about 20 minutes to complete.

Compensation: As compensation for your time, you will receive a **\$10 amazon.ca** gift code. As a bonus for completing our follow-up survey, you will also be entered into a **draw for a \$200 amazon.ca** gift code. You will be informed of the results of the draw at the end of December.

Potential risks or discomfort: Some of the questionnaire items ask about sensitive topics such as alcohol and drug use and mental health symptoms that make some people feel uncomfortable. You may choose to skip any items that you don't feel comfortable answering. There are no other anticipated risks or discomfort associated with this study.

Right to withdraw. Your participation in this study is voluntary. If you choose to participate, it is desirable that you complete as many questions as possible, but you may choose not to respond to individual survey items at your discretion. You will receive your compensation even if you choose to withdraw. If you choose to withdraw from the study, you have the right to request that your data be deleted. You may do so by contacting Dr. Howard by email.

Confidentiality. The data collected in this study are strictly confidential. Data are collected online by Qualtrics.com following a strict policy regarding confidentiality and data protection. We store your data at Carleton University on a secure server accessible only by the Faculty Investigator and authorized research personnel. Only researchers approved to work on this project will see your data, and all personally-identifying information (your name and email) will, at the earliest possible opportunity, be stored separately from your survey responses. Data will be permanently deleted from Qualtrics servers within one year of completing data collection. Data stored and protected by Qualtrics on Toronto-based servers may be disclosed via a court order or data breach. With your consent to participate in this study, you acknowledge this.

Data containing no personally-identifying information will be securely stored by Dr. Howard for an indefinite period of time and used for future research and teaching purposes and may be shared with trusted colleagues or other competent professionals (pursuant to Standard 8.14 of the APA's Ethical Principles of Psychologists and Code of Conduct manual). Personal identifiers providing a link to the data will be destroyed (deleted) no later than May, 2020. Any requests for data deletion must be received by this time.

Consent to Participate. Please check the box "I agree" to indicate that you have read and understood the nature and purpose of the study. By checking this box, you acknowledge that a copy of the consent form has been made available to you online, and acknowledge your willingness to participate in this study.

- ☐ **I agree**
- ☐ **I disagree**

Appendix H: Student Adaptation to College Questionnaire - Academic

Here are some more statements that describe experiences of university that may or may not apply to you. Read each statement carefully and **slide the bar underneath** to indicate **how well it applies to you**, ranging from Doesn't apply to me at all (1) to Applies very closely to me (9).

Doesn't apply to me at all	2	3	4	5	6	7	8	Applies very closely to me
I have been keeping up to date on my academic work								
I know why I'm in university and what I want out of it								
I am finding academic work at university difficult								
I have not been functioning well during examinations								
I am satisfied with the level at which I am performing academically								
I'm not working as hard as I should at my coursework								
My academic goals and purposes are well defined								
I'm not really smart enough for the academic work I am expected to be doing now								
Getting a university degree is very important to me								
I haven't been very efficient in the use of study time lately								
I enjoy writing papers for courses								
I really haven't had much motivation for studying lately								
Lately I have been having doubts regarding the value of university education								
I am satisfied with the number and variety of courses available at university								
Recently I have had trouble concentrating when I try to study								
I'm not doing well enough academically for the amount of work I put in								
I am satisfied with the quality or the caliber of courses available at university								
I am attending classes regularly								
I am enjoying my academic work at university								
I'm having a lot of trouble getting started on homework assignments								
I am satisfied with my program of courses for this semester								
Most of the things I am interested in are not related to any of my coursework at university								
I am very satisfied with the professors I have now in my courses								
I'm quite satisfied with my academic situation at university								