Depressive Symptoms during the Transition to College: Evaluating Trajectories and Predictors among Freshmen & Transfer Students

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Psychology)
in the University of Michigan
2012

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DEDICATION

To my eternally supportive and newly expanded family

ACKNOWLEDGEMENTS

This research was supported by Graduate Student Research Grants from the Rackham Graduate School at the University of Michigan and by a Student Award Program grant from the Blue Cross and Blue Shield of Michigan Foundation. I would like to thank all of the students who participated in the research studies comprising this dissertation.

I would like to thank my research advisor, Chris Peterson, for his endless patience, his vast knowledge, and his enduring humor. Additionally, I am indebted to many faculty members at the University of Michigan for their generous support and guidance: Al Cain, Daniel Eisenberg, Nansook Park, Danny Almirall, Patty Deldin, George Rosenwald, Nestor Lopez-Duran, Shelly Van Etten Lee, Brady West, and Laura Klem. I would also like to thank Jane Gillham for being a mentor and friend for the past decade.

Succeeding in graduate school would not have been possible without the support of Linda Anderson and the Psychology Academic Affairs staff members, particularly Laurie Brannan, Therese Hustoles, and Brian Wallace. Thank you for your patience and for helping me navigate the logistical challenges that come with being a graduate student.

The greatest fortune of my life is that I have a loving family. I would like to thank my parents for their unconditional love and for supporting my every endeavor. My siblings, Karen and Dan, have always been and continue to be my role models and heroes. It has been a joy during the past seven months to be greeted with smiles and coos

from my beautiful daughter, Sarah Annen; you are a wonderful reminder of what is most important in life. And, above all, I would like to thank my wife, Kaite, for being my biggest supporter throughout graduate school.

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GENERAL INTRODUCTION

The Burden of Depression

Depression is one of the most common and costly mental health problems. A recent epidemiological study with a sample representative of the U.S. adult population found that nearly 7% of Americans met criteria for major depressive disorder (MDD) in the previous year (Kessler et al., 2003). Approximately 17% of respondents met criteria for MDD at some point in their lives with a projected lifetime risk of 23% (Kessler et al., 2005). These findings suggest that over 30 million Americans will experience MDD (Kessler et al., 2003). Many others meet criteria for less severe depressive disorders (e.g., dysthymia) or have elevated but subclinical levels of depressive symptoms (Judd, Paulus, Wells, & Rapaport, 1996; Kessler et al., 2005). Subclinical symptoms confer risk for future depressive disorders and are linked to impairments in many crucial areas of functioning (Horwath, Johnson, Klerman, & Weissman, 1994; Judd et al., 1996; Judd, Akiskal, & Paulus, 1997). The prevalence of *depression*, a term we will use to refer to both depressive disorders and subclinical symptoms, appears to have increased over the past several generations (Twenge et al., 2010).

The impact of depression on society is enormous. In the year 2000, the economic burden of depression in the U.S. alone was estimated to exceed 80 billion dollars (Greenberg et al., 2003). The World Health Organization estimates that unipolar depressive disorders are the leading cause of healthy life years lost due to disability

(Mathers, Boerma, & Ma Fat, 2008). Depression interferes with occupational, academic, and interpersonal functioning (Eisenberg, Golberstein, & Hunt, 2009; Hysenbegasi, Hass, & Rowland, 2005; Siegel & Alloy, 1990; Stewart, Ricci, Chee, Hahn, & Morganstein, 2003; Wang et al., 2004). Depression and processes related to depression are also linked to poor health behaviors and medical problems (Collins, Glei, & Goldman, 2009; McDermott, Hawkins, Littlefield, & Murray, 1989; Peterson, Seligman, & Vaillant, 1994; Wickrama, Wickrama, & Lott, 2009). Most youth with depressive disorders report suicidal ideation and nearly one-third report having made at least one suicide attempt by late adolescence (Hatcher-Kay & King, 2003).

Depression among College Students

The adolescent and early adulthood years are a key time in the etiology of depression. The prevalence of depression increases dramatically during adolescence (Hankin, 2006). By the time adolescents have reached the traditional college age, as many as 20-25% have met criteria for a major depressive episode at some point in their lives (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Lewinsohn, Rohde, & Seely, 1998). Studies suggest that many, and perhaps most, people who develop depressive disorders experience their first episode in adolescence or early adulthood (Kessler et al., 2005; Kim-Cohen et al., 2003). Among youth meeting criteria for MDD by the end of high school, there is a high rate of recurrence over the next five years (nearly 70% among women), while many are attending college (Rao, Hammen, & Daley, 1999).

It is not surprising, given these findings, that depression is common among college students. Approximately 7% of college students meet criteria for MDD and over

10% meet criteria for a mood disorder in a given 12-month period (Blanco et al., 2008). A recent study with a large, probability-based sample found that approximately 14% of undergraduates report symptoms indicative of a current unipolar depressive disorder (Eisenberg, Gollust, Golberstein, & Hefner, 2007). Many students who do not meet diagnostic criteria for a depressive disorder report elevated levels of symptoms (Wells, Klerman, & Deykin, 1987). In a recent national survey, 30% of college students reported that, at some point during the previous year, they felt so depressed that it interfered with their functioning (American College Health Association, 2010). Despite their higher levels of affluence and access to care, college students have roughly equal rates of depressive disorders compared to their non-college-attending peers (Blanco et al., 2008). College students have nearly universal access to mental health care, yet less than one-third of students screening positively for depressive disorders receive either medication or psychotherapy[1] (Eisenberg, Golberstein, & Gollust, 2007).

The deleterious impact of depression on functioning is well-documented among college students. Students with depression tend to have lower grade point averages and are more likely to drop out of college than their non-depressed peers (Eisenberg et al., 2009; Haines, Norris, & Kashy, 1996; Hysenbegasi et al., 2005). Depression also impairs social functioning. Depressed college students tend to use maladaptive interpersonal strategies that elicit negative reactions, including social rejection, from peers (Gotlib & Asarnow, 1979; Hammen & Peters, 1978; Jacobson & Anderson, 1982; Joiner & Metalsky, 1995). Aside from conferring risk for academic and psychosocial impairments, college depression is a major public health concern because of the strong link between

[1] In this study, students screening positively for both anxiety and depression were more likely than those with just a positive screen for depression to receive mediation or therapy.

depression and suicide. Suicide is the third leading cause of death among youth ages 15-24 and is likely the second leading cause of death among college students (*10 leading causes of deaths, United States, 2007, ages: 15-24*2007; Suicide Prevention Resource Center, 2004). Approximately 6% of undergraduates report seriously considering suicide in a given year and 8% report having attempted suicide at least once during their lives (Drum, Brownson, Burton Denmark, & Smith, 2009).

Depression in the Context of the Transition to College

College students of traditional age (18-24) are in a stage of development often referred to as *emerging adulthood* (Arnett & Taber, 1994). This period is best described as a bridge between adolescence and adulthood. Traditional college students generally see themselves as having progressed beyond adolescence but do not yet consider themselves adults (Arnett, 1994). Recent generations have delayed many of the events traditionally marking the commencement of adulthood (e.g., marriage, full-time employment, financial independence etc.) in order to pursue higher education (Arnett & Taber, 1994). Students have increasing levels of independence and take on additional responsibilities when reaching college, but most continue to rely on their parents or other adults for important sources of support (e.g., financial assistance). An important function of the college experience is to foster the growth and development of skills that promote success in adulthood (Pascarella & Terenzini, 1991). We attempt to approach the study of college student experiences and mental health within the context of emerging adulthood.

Although traditional college students are shielded from many of the responsibilities of adulthood, the transition to a new post-secondary institution is a major life event during which students face many new challenges, such as increased academic

demands, social challenges, and new daily living responsibilities (Ross, Niebling, & Heckert, 1999). The development of practical life skills (e.g., money management, doing laundry, etc.) needed to meet these challenges is commonly viewed as one of the most important aspects of the college learning experience (Terenzini & And Others, 1994). College students enter an environment in which there is less inherent structure than they are accustomed to at home and in high school. Students spend less time in the classroom and more time in independent study, which requires greater self-discipline and organizational skills. Traditional students also have more freedom in determining the parameters of their social relationships and leisure time (M. R. Clark, 2005). Perhaps the most daunting challenge faced by many during the college transition is to separate from family and friends and to form new social support networks. Developing new relationships and support systems is an important task for new students as they attempt to gain a sense of independence (Zirkel, 1992).

There is considerable evidence that the transition to college is a particularly stressful time. Many longitudinal studies report increases in stress and/or mental health symptoms during the first year of college (Alfeld-Liro & Sigelman, 1998; Andrews & Wilding, 2004; Cooke, Bewick, Barkham, Bradley, & Audin, 2006; Fisher & Hood, 1987; Larose & Boivin, 1998; Pritchard, Wilson, & Yamnitz, 2007; Sargent, Crocker, & Luhtanen, 2006; Sax, Bryant, & Gilmartin, 2004; Tao & Li, 2003; Wintre & Yaffe, 2000). Several studies suggest that the transition is most challenging during the initial weeks of the first academic semester before students have the opportunity to form strong social networks and adjust to their new environment (Compas, Wagner, Slavin, & Vannatta, 1986; Cooke et al., 2006; Gall, Evans, & Bellerose, 2000).

The stressors that come with this transition to college likely put students at elevated risk for depression. The adverse effects of stress on mental health are well documented (Kessler, 1997). Major life events, like changes in one's social network, appear to be causal risk factors for the onset of depression (Kendler, Karkowski, & Prescott, 1999). The effect of major life events tends to be more pronounced when they lead to, or are accompanied by, chronic stressors (Compas, 1987). Although the transition to college is a major life event, students encounter chronic stressors, like academic demands and social stressors, that likely have an impact on mental health. There is considerable evidence for diathesis-stress models, which posit that the relationship between stressful life events and depression is strongest in the presence of preexisting vulnerabilities (Abela, Brozina, & Seligman, 2004; Abramson et al., 1999; Hankin, Fraley, & Abela, 2005; Ingram & Luxton, 2005). Therefore, we would expect students with well-established risk factors for depression, like pessimistic cognitive style (Peterson & Seligman, 1984), to be at greatest risk during the transition.

The majority of studies evaluating mental health during the college transition have had major limitations (Cooke et al., 2006). First, most have relied on relatively small, convenience samples, reducing the likelihood that the findings would generalize to the larger population of new college students. Second, most studies consisted of two or fewer assessments. Studies with single assessments do not provide any information about the course of mental health problems over time. Studies with two assessments only allow analysts to model linear trends; three or more assessments are needed to model non-linear trajectory shapes (e.g., spikes in symptoms with gradual improvement). Second, most studies have measured mental health symptoms at widely-spaced assessments, often

separated by months or even years. This is problematic because the severity of mental health symptoms, particularly depressive symptoms, tends to be unstable and responsive to environmental changes (Tanaka & Huba, 1987). It seems likely that college stress is inconstant, with discrete periods of particularly high stress (e.g., during midterms and finals). Infrequent assessments likely miss important changes in symptoms and the underlying processes driving these changes.

Third, only a minority of studies have evaluated outcomes prior to the start of the first academic semester. A pre-college assessment is needed in order to determine whether there are significant changes in symptoms that coincide temporally with the transition to college. Finally, with few exceptions, researchers have used traditional fixed-effects modeling approaches (e.g., multiple regression) to describe changes over time. Mixed effects and group-based modeling approaches afford the analyst more flexibility in modeling heterogeneity (between-subject variability) in symptom trajectories (Nagin, 2005; Snijders & Bosker, 1999).

There have been several studies evaluating mental health during the transition to college with noteworthy methodological assets. Sax and colleagues evaluated the course of mental health symptoms with a large, representative sample (N = 3,680) drawn from 50 postsecondary institutions in the U.S. This study found that emotional health declined over the course of the first academic year (two assessments), and that stress at the outset of the academic year predicted greater declines in well-being (Sax et al., 2004).

At least five studies have measured symptom trajectories over three or more data points. Gall and colleagues measured mental health across four data points during the first academic year and found that levels of stress and mental health symptoms were

highest early in the academic year, with students showing improved mental health thereafter (Gall et al., 2000). Similarly, in a study with three assessments during the first academic semester, Compas and colleagues found that students reported high levels of negative life events during the transition process (i.e., just before and during the early weeks of the semester). These stressful events were associated with depressive symptoms early but not later in the semester (Compas et al., 1986). Alfeld-Liro and Sigelman reported an increase in depressive symptoms between pre-college and early second semester assessments, with no further change at a third assessment during students' sophomore year (Alfeld-Liro & Sigelman, 1998). In a large sample of first-year students (N = 4,699), Cooke and colleagues found that depressive symptoms increased during the first semester and, although symptoms declined during the second semester, they never returned to pre-college levels (Cooke et al., 2006). Finally, Duchesne and colleagues followed participants from their senior year in high school through their second year in college and found that the transition to college is associated with declining mental health for a substantial minority of students[2]. This study is noteworthy for having multiple assessments (three data points spaced one year apart), a large sample (N = 498), and for taking into account heterogeneity in symptom trends by using group-based longitudinal modeling (Duchesne, Ratelle, Larose, & Guay, 2007).

In summary, there is considerable evidence that stress and mental health symptoms increase during the transition to college. Symptoms appear to be at their worst during the early weeks of the academic semester. There is also evidence of heterogeneity

[2] This study found that two trajectory groups were sufficient in describing trends over time: a group with stable, good mental health and a group with steadily declining mental health. The mental health gap between these two groups existed prior to the start of college, although the gap in symptoms widened during the college transition.

in symptom trajectories, with a substantial minority of students showing a decline in mental health after the start of the academic semester.

Social Support and Connectedness

There is a consistent theme in the college mental health literature emphasizing the importance of social support and connectedness, which is not surprising given that good relationships are at the very foundation of well-being (Peterson, 2006). Studies suggest that students that have strong social support networks and feel a sense of belonging to their communities adjust to college life better academically and emotionally than those who do not (Allen, Robbins, Casillas, & Oh, 2008; Detrie, 2002; Hefner & Eisenberg, 2009; Lee, Draper, & Lee, 2001; Mccoy, 1999). The degree of social integration appears to be a stronger predictor of well-being during the first year of college than academic performance variables (Sax et al., 2004; Wintre & Yaffe, 2000). As noted, the transition to college is often accompanied by a disruption of important, well-established relationships which is a major source of stress for many students (Dyson & Renk, 2006; Larose & Boivin, 1998). The experience of loneliness and homesickness is quite common among new students (American College Health Association, 2010; Fisher & Hood, 1987) and increases risk for emotional and physical health problems (Fisher & Hood, 1988; Pressman et al., 2005).

There is considerable evidence in the health and psychopathology literatures that strong social support and connection can help buffer against the negative impact of stress (Cohen & Wills, 1985). One study of college students, for example, found that those with strong levels of social support were less likely to develop depressive symptoms in response to stressful life events (Cohen & Hoberman, 1983). Given the high levels of

stress that accompany the transition to college, the development of strong support networks early in the first semester of college may be an important protective factor. Students who develop a sense of belonging tend to show decreases in internalizing symptoms over time (Pittman & Richmond, 2008). Students who are unable to form strong social bonds may have difficulty coping with the challenges inherent in college life. Additionally, a failure to make friends may result in a loss of self-esteem or perceived self-efficacy. In sum, social connectedness is likely an important predictor of mental health outcomes during the transition to college.

Transfer Students

The transition to a new college may be particularly daunting for students who transfer from one postsecondary institution to another. The logistical challenges that come with transferring are considerable. Students often find the procedures for enrollment and credit transfer confusing and have difficulty coordinating information between their old and new institutions. Additionally, transfer students sometimes find that the orientation process at their new institutions inadequate, making it difficult to adjust to their new environment (Townsend & Wilson, 2006). Transfer students generally report receiving less support from their academic institutions than "native" students (Davies & Casey, 1999; Kodama, 2002). Meeting the academic demands of the new institution is also challenging. Education researchers have coined the term "transfer shock" referring to the temporary drop in grades that commonly occurs during the first semester after transferring (Diaz, 1994; Hills, 1965). Students who transfer from smaller colleges often have difficulty adjusting to large lecture classes in which they receive less attention and support from faculty members (Davies & Casey, 1999; Townsend &

Wilson, 2006). Additionally, transfer students tend to be older and are more likely than native students to have non-academic responsibilities, such as child-care and significant financial obligations (Davies & Casey, 1999; Ishitani & McKitrick, 2010). Finally, transfer students often find it difficult to gain a sense of belonging to the campus community. Native students typically have established social networks early in their college careers, making it difficult for transfer students to find a niche when they arrive on campus. Furthermore, institutional efforts to promote social engagement may often be tailored to freshmen (Townsend & Wilson, 2006). This is troubling given that participation in the campus community helps transfer students adjust socially to their new environment (Laanan, 2001).

There is surprisingly little research evaluating mental health among transfer students during the transition to a new institution. The vast majority of research concerning the transfer process has focused on academic outcomes (Kodama, 2002; Laanan, 2001). Transfer students make up a large percentage of the U.S. college student population. Of students beginning their postsecondary education career in 1989-1990, 35% had transferred by 1994 (McCormick & Carroll, 1997). Given the large percentage of students who transfer, and the potential stress that accompanies the transfer process, there is a strong need for research evaluating the well-being of these students during their transition to a new school.

Summary and Rationale for Studying College Student Mental Health

A large and growing number of young adults in the U.S. are enrolled in postsecondary education (U.S. Department of Education, National Center for Education Statistics, 2009). Mental health problems, including depression, are common in the

college student population. The transition to a postsecondary institution is accompanied by many stressors that may increase risk for mental health problems. Transfer students face many unique challenges during their transition to a new institution, yet there is little research evaluating mental health outcomes in this population. A priority for college mental health researchers should be to evaluate how students cope with the transition to college and to identify students who are at risk for depression.

Cognitive-Behavioral Framework

Background. In our attempt to gain a better understanding of depressive symptoms during the college transition, we will utilize a cognitive-behavioral (CB) framework. CB theories are prominent in the study of depression and have been the basis for an enormous quantity of research. Although diverse in content, all CB theories emphasize the role of both cognitive processes (e.g., cognitive style and schemas) and behavioral processes (e.g., reinforcement contingencies) in the etiology and treatment of depression. One way in which CB theories differ is in the extent to which they emphasize cognitive versus behavioral processes.

The central theme of cognitively-oriented approaches is that thoughts mediate the relationship between events and consequent emotional experiences and behaviors (Abramson, Seligman, & Teasdale, 1978; Abramson, Metalsky, & Alloy, 1989; Beck, Rush, & Shaw, 1979; Ellis, 1969). People prone to depression are believed to interpret their experiences in a characteristically negative or pessimistic manner, frequently developing a sense of helplessness and hopelessness (Abramson et al., 1978; Abramson et al., 1989; Beck et al., 1979). Pessimistic cognitive processes are often coupled with poor coping strategies and problem-solving skills which can exacerbate and prolong the

experience of depression (D'Zurilla & Goldfried, 1971; Nolen-Hoeksema & Morrow, 1993).

Behaviorally-oriented theories of depression focus less—or sometimes not at all—on thought content, but instead conceptualize depression as resulting from a deficiency in behaviors that lead to rewarding experiences (e.g., pleasure and mastery) (Hopko, Lejuez, Ruggiero, & Eifert, 2003; Lewinsohn, Sullivan, & Grosscup, 1980; Martell, Addis, & Jacobson, 2001). This behavioral deficit is generally attributed to maladaptive reinforcement contingencies, often spurred by changes in a person's environment. Individuals with depression tend to receive positive reinforcement for depressive behaviors (e.g., friends offering sympathy and support in response to passive coping behaviors), and negative reinforcement when avoiding potentially rewarding experiences that cause short-term discomfort. These reinforcement patterns are believed to result in a narrowing of the individual's behavior repertoire, which leads to decreased opportunities for rewarding experiences and increasing levels of depression. Depressive symptoms (e.g., apathy and fatigue) then result in increased use of avoidance and escape behaviors (Ferster, 1973; Lewinsohn & Graf, 1973; Martell et al., 2003). Breaking this pernicious cycle requires a disruption in reinforcement contingencies through the expansion of reward-inducing behaviors (*activation*) and decreased reliance on maladaptive behaviors (e.g., excessive avoidance) (Martell et al., 2003).

It is noteworthy that, although they do not focus on thought content, behavioral activation theorists do address the *function* of cognitive processes. For example, rumination—a stress-response in which a person dwells passively on problems rather than taking active steps to problem-solve or reduce distress—is considered an avoidance

behavior. For behaviorists, the problem with rumination is not that the thought content is pessimistic or self-critical; rather, that the function of the rumination is to avoid active problem-solving behaviors that could make the situation better (Martell et al., 2003).

Despite having sound empirical foundation, behavioral theories and approaches to depression have received far less attention in recent decades than cognitive approaches. Behavioral treatment strategies, although not abandoned, were largely subsumed under cognitive therapies (hence, the term cognitive-behavioral). The most prominent CB theories regard cognitive processes as the central cause of depression. Behavioral processes are regarded as important only in as much as they help maintain or reinforce dysfunctional cognitions (Hollon, 2001; Manos, Kanter, & Busch, 2010).

Recently, there has been renewed interest in behavioral processes in the etiology and treatment of depression. In the mid-1990s, a treatment component analysis showed that the behavioral components of cognitive-behavioral therapy (CBT) were just as effective in treating depression as the full CBT package (Jacobson et al., 1996). This led to the refinement of behavioral theories of depression and a resurgence of purely behavioral treatments, such as Behavioral Activation Therapy for Depression (BATD) (Jacobson, Martell, & Dimidjian, 2001; Martell et al., 2001). BATD uses functional behavior analysis and activity scheduling as its primary tools instead of the cognitive restructuring exercises emphasized in most CBT packages. The early findings from treatment outcome studies suggest that BATD is at least as effective as full CBT packages and well-established pharmacological treatments (Dimidjian et al., 2006; Dobson et al., 2008).

Despite the recent success of behavioral treatments for depression, there is a paucity of research evaluating the theoretical models upon which the treatments are based (Manos et al., 2010). As noted, escape and avoidance behaviors are believed to play a key role in the development and maintenance of depression. The behavior of depressed individuals tends to be passive and motivated by the desire to escape unpleasant experiences (negative reinforcement) rather than the achievement of mastery (positive reinforcement) (Ferster, 1973; Martell et al., 2001). Rewarding experiences require effort and often temporary discomfort. For example, meeting new friends at college involves making the effort to attend social gatherings and coping with the temporary discomfort of interacting with strangers. People prone to depression tend to be highly sensitive to cues signaling potential threat or discomfort (Carver & White, 1994; Gray, 1970), and are, therefore, more motivated to avoid such situations. Avoidance is negatively reinforcing because it results in temporary relief as the person moves away from the threatening stimulus. However, an overreliance on avoidance precludes contact with environmental reinforcers and puts a person at risk for depression (Martell et al., 2001). Studies evaluating behavioral activation models of depression are beginning to surface in the research literature. For example, a recent study with undergraduate college students found that environmental reward mediated the relationship between avoidance and depressive symptoms (Carvalho & Hopko, 2011).

Avoidance has mainly been conceptualized as a dispositional coping response, a personality dimension, and as an approach to problem-solving in the psychology literature. There are several self-report questionnaires that include subscales measuring avoidance as a stable construct. There is little research, however, evaluating avoidance

within the framework of behavioral theories of depression. Most existing questionnaires measuring avoidant tendencies do not focus on the function of avoidant behavior as it relates to depression (Ottenbreit & Dobson, 2004; Ottenbreit & Dobson, 2008).

Recently, researchers have developed two self-report questionnaires intended to measure avoidance as a construct specifically relevant to depression. The Cognitive-Behavioral Avoidance Scale (CBAS) measures trait-like avoidant tendencies (Ottenbreit & Dobson, 2004). Respondents rate the extent to which they use a host of avoidance strategies on a 5-point Likert scale. The CBAS is a multidimensional measure designed to capture different modes (i.e., cognitive vs. behavioral) and domains (social vs. non-social) of avoidance. The authors of the CBAS conceptualize avoidance as a dispositional risk factor for depression and the scale is intended to be used in etiological studies of psychopathology (Ottenbreit & Dobson, 2004). In contrast, the Behavioral Activation for Depression Scale (BADS) is intended to be used in conjunction with behavioral activation treatment as a measure of change in key meditational processes, including the frequency of avoidance. Avoidance, as conceptualized by the authors, is a time-varying construct that should diminish in response to psychotherapeutic intervention. Unlike in the CBAS, the avoidance subscale of the BADS is treated as a unidimensional construct (Kanter, Mulick, Busch, Berlin, & Martell, 2007).

We know of no questionnaires designed to measure avoidant behavior as a multidimensional, time-varying process. We propose that avoidance should be conceptualized as both a dispositional and dynamic construct. Although there are undoubtedly stable individual differences in the predisposition for avoidance, the frequency with which a person uses avoidant behaviors likely varies across different

circumstances. For example, environmental cues (e.g., stressors) may prompt temporary increases in the frequency of avoidance and escape behaviors, particularly among those with avoidant dispositions. This would be consistent with behavioral theories of depression which emphasize the role that environmental changes play in prompting depressive behavior (Martell et al., 2001). Assuming that the frequency of avoidance fluctuates in response to environmental triggers, evaluating the nature of these fluctuations may improve our understanding of the relationship between avoidance and depression. There is a glaring need for longitudinal research evaluating the role of behavioral processes in the development of depression (Manos et al., 2010). Cavalho and Hopko (2011) conducted a longitudinal study (two assessments) evaluating the relationship between avoidance, environment reward, and depressive symptoms. Despite using the CBAS, a trait measure of avoidance, the authors note that they conceptualize avoidance as a state construct. A time-varying measure of avoidance may help facilitate research evaluating avoidance and depression as dynamic, parallel processes.

We liken the relationship of dispositional and situational avoidance to that of cognitive schemas and automatic thoughts. Within Beck's cognitive theory, schemas are stable underlying beliefs which shape the manner in which a person interprets his experiences. In contrast, automatic thoughts are fleeting cognitions that reflect how a person is interpreting a specific situation (Beck, 1967). Dysfunctional schemas confer risk for depressive symptoms mainly in the presence of stressful life events that trigger negative automatic thoughts. That is, automatic thoughts are more proximal mediators of depressive symptoms than schemas (Kwon & Oei, 1992). We propose that, like dysfunctional schemas, dispositional avoidance is a distal risk factor whose relationship

with depressive symptoms will be strongest when environmental stressors prompt increases in avoidant behavior.

Specific conceptualization. For the purposes of this dissertation, we will focus on both cognitive and behavioral risk factors for depression as they relate to the experiences of students transitioning to a postsecondary institution. We propose a diathesis-stress framework in which the stress of transitioning to a new institution triggers underlying vulnerabilities (i.e., rigid cognitive schema, pessimism, and dispositional avoidance). The activation of these latent vulnerabilities leads to maladaptive behavioral responses (i.e., excessive avoidant behavior), which subsequently impedes the development of social connectedness.

We conceptualize social connectedness as both a moderator and mediator of depression. Consistent with stress-buffering theories (Cohen & Hoberman, 1983), we believe that students with higher levels of social connectedness will be better able to manage and cope with stressors. In accordance with behavioral and interpersonal theories of depression, we view social connectedness as an important source of positive reinforcement and a mediator of depressive symptoms. Maladaptive cognitive styles and avoidant coping strategies may preclude the development of strong social bonds and prevent the individual from accessing their many benefits, which subsequently contributes to the development of depressive symptoms (Joiner, 2000). Additionally, we propose that a sense of social self-efficacy is inherent in the experience of social connectedness. Students who feel bonded to their community and peers inevitably have some sense of mastery of their environment (Whitlock, Wyman, & Barreira, 2010). Social connectedness not only provides opportunities for environmental reward, but the

experience of social connectedness itself is rewarding. Although this dissertation focuses specifically on social connectedness as a source of positive reinforcement and mastery, we recognize that non-social experiences of mastery also play an important role in well-being.

Figure 1.1 provides a diagram illustrating our conceptual framework for the development of depressive symptoms during the college transition. The diagram illustrates potential "low risk" and "high risk" pathways. An important feature of our framework is that cognitive, behavioral, and social processes are believed to interact and reinforce each other. We emphasize the role that pessimistic beliefs and avoidance play in limiting contact with social connectedness. It is important to note that the diagram presents a conceptual framework rather than a comprehensive model of depression. In accordance with the theory of equifinality, we believe that there are many potential causal pathways to depression (Cicchetti & Rogosch, 1996). The diagram simply illustrates how cognitive, behavioral, and social processes are likely to contribute to the development of depression in the context of the college transition. The diagram is overly simplistic; we recognize that the processes contributing to depression interact in complex ways with bi-directional influences. We also do not assume that the processes unfold in a specific sequence. Below we provide a case example of a student on a "high risk pathway."

Case Vignette. Caitlin has always been introverted and shy (high on behavioral inhibition) and has had difficulty making friends most of her life. On several occasions in middle school, she experienced peer rejection (punishment) which intensified her discomfort when approaching new people. Caitlin eventually developed maladaptive beliefs that she was socially inept and that social interactions were threatening. In high

school, she made a few close friends who were also socially inhibited but they fulfilled her need for interpersonal connection. After high school, Caitlin and her friends parted ways and went to different colleges. Despite the fact that she was able to create an adequate social support network in high school, her negative beliefs about the nature of interpersonal interactions and her social skills persisted. The thought of having to interact with strangers and develop a new social support network was daunting.

During orientation week, Caitlin had many opportunities to attend social gatherings. However, the thought of attending these gatherings was aversive because she feared her social deficiencies would be exposed and that she would experience rejection. Rather than enduring this distress in the service of meeting new friends, she chose to spend time alone in her dorm room instead (behavioral avoidance), causing a temporary sense of relief (negative reinforcement) but eventually leading to feelings of regret and failure. At home, she watched movies, browsed the internet, and engaged in other passive behaviors. Although she did not find these activities to be very rewarding, they helped distract her from the negative thoughts she was having about not interacting with others (cognitive avoidance and negative reinforcement).

After avoiding social events during her first week at college, Caitlin's drive to avoid was strengthened as she noticed that other students in her residence hall had already made friends; she worried that she would be judged negatively by others if she attended social events on her own. This pattern of avoidance persisted. Caitlin interpreted the fact that she had little social contact with fellow students as confirming evidence for her core belief that she was socially inept. By mid-semester, Caitlin had not made any close friends and derived practically no enjoyment from social interactions on campus.

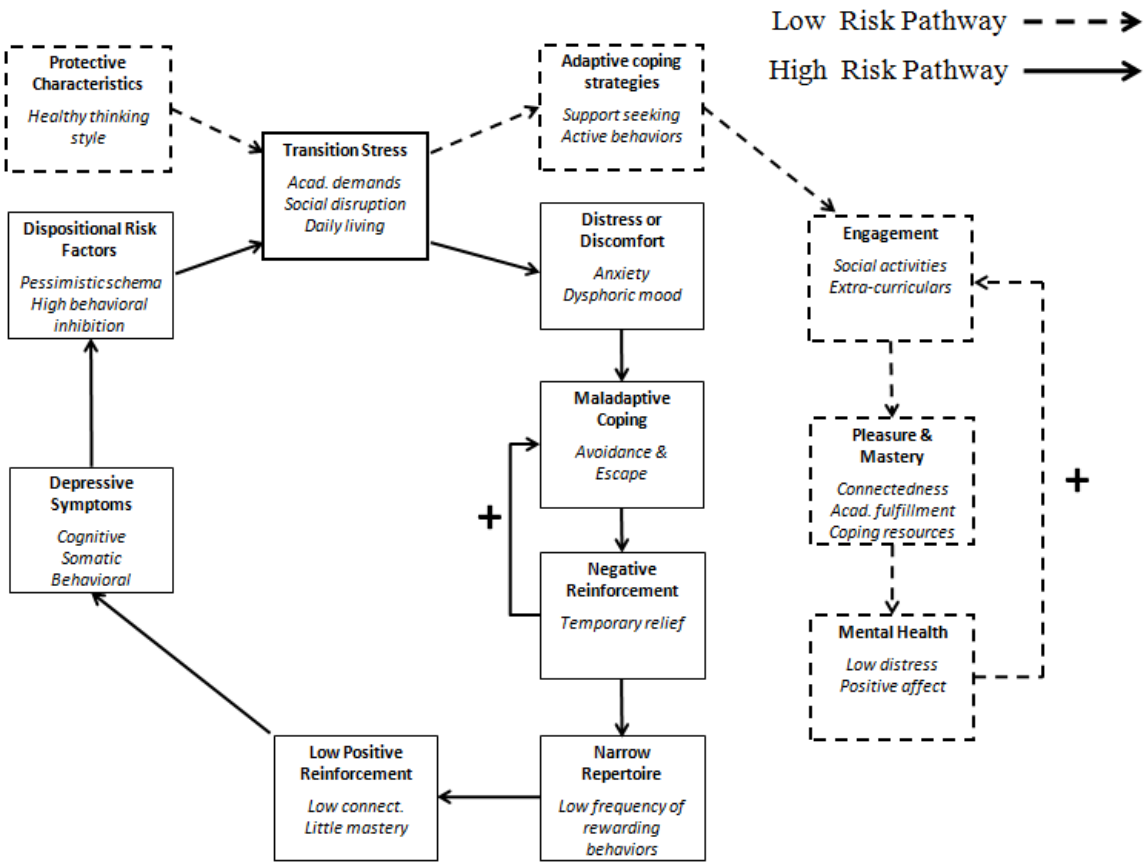
Caitlin had no one to help her navigate the stressors of her new life as a college student. Although she enjoyed her academic work, she felt disconnected from the campus community and was feeling depressed. Her symptoms of depression (e.g., anhedonia and fatigue) strengthened her desire to avoid activities on campus and began taking a toll on her academic work. Caitlin's experience during her first semester at college was marred by a destructive cycle of negative beliefs, avoidance, and depressive symptoms.

There are several noteworthy points about this case example. First, Caitlin had dispositional characteristics (namely, dysfunctional beliefs, behavioral inhibition, and negative past experiences with social interactions) that put her at risk for the development of depressive symptoms. Second, a major environmental shift (transitioning to college) caused a disruption in Caitlin's social reinforcement patterns. Spending time with friends from home on weekends had been an adequate source of positive reinforcement, but it was no longer available after the college transition. Third, the stress of transitioning to college required Caitlin to employ adaptive coping strategies and to expand her behavioral repertoire. However, transitional stress activated her latent risk factors which interfered with her taking active steps to make new friends. Fourth, her failure to form a new social support network denied her both a source of positive reinforcement and coping resources for managing stress. And finally, her depressive symptoms strengthened her drive to avoid aversive experiences until this became a prepotent response. The integration of these cognitive, behavioral, and social processes within the context of a major life shift is the foundation of the dissertation.

Overview of Dissertation Research

This dissertation is comprised of three research studies, each evaluating depressive symptoms among first-semester freshmen and transfer students at a large, public university. The goal of Study 1 was to evaluate the course, predictors, and impact of depressive symptoms during students' first academic semester. Study 1 addressed three main questions: (1) Do depressive symptoms increase during the first semester?; (2) Does social connectedness serve as a protective factor, tempering the effects of transitional stress?; and (3) Are depressive symptoms associated with impairments in social and role functioning? Study 2, which is divided into two parts (Study 2a and Study 2b), focused on the role of avoidance in the development of depressive symptoms during the college transition. In Study 2a, we developed and evaluated a time-varying measure of avoidance using exploratory factor analysis, confirmatory factor analysis, and structural equation modeling. This new measure of avoidance was then used in Study 2b to evaluate components of our CB conceptual framework. Finally, the purpose of Study 3 was to evaluate differences between freshmen and transfer students in the development of depressive symptoms during the first academic semester. Additionally, Study 3 tested the hypothesis that transfer students would experience more stress and feel less socially connected to the campus community, subsequently conferring risk for depressive symptoms.

Figure 1.1. Cognitive-Behavioral Conceptual Framework.



CHAPTER 2

DESCRIPTION OF DISSERTATION DATA SETS

Data from three separate data sets were used in order to conduct the studies comprising this dissertation. We will refer to these data sets as Data Set 1, Data Set 2, and Data Set 3, throughout. In this section, we provide a description of each data set. Table 2.1 summarizes which data sets and self-report questionnaires were used in each study

Data Set 1

This was a longitudinal data set comprised of five study assessments that were completed by first-semester freshmen and transfer students at a large, public university. These data were used in both Study 1 and Study 3b.

Recruitment & Participant Characteristics. The University of Michigan Institutional Review Board (IRB) approved all study procedures prior to commencement of recruitment activities. Data were collected across two consecutive cohorts of first-semester students during the Fall 2010 and Fall 2011 academic semester. Several weeks before the start of the academic semesters, the Office of the Registrar sent recruitment e-mails to random samples of incoming freshmen and incoming transfer students. Across both cohorts, 1700 freshmen and 950 transfer students received recruitment e-mails. Only students who were 18 years of age or older were eligible to participate in the study. The recruitment e-mail message provided a brief description of the study purpose and activities, as well as a link to the online consent form. The IRB approved a waiver of

written consent, allowing students to provide consent by checking a radio button and by typing their name in a text field at the bottom of the form.

Three hundred and fifty-one students (235 freshmen and 116 transfers) provided consent to participate in the study. The response rate for the first cohort was notably low at 16% for freshmen and 13% for transfers. Response rates were not available for the second cohort as we closed enrollment after 351 participants consented due to limited resources. This poor recruitment rate limited our ability to generalize the findings from this study to the broader population of college students. We initially intended to collect basic demographic data for all participants receiving recruitment e-mails in order to construct probability based response weights. However, due to privacy concerns, the registrar's office would not permit us to access information about the potential pool of participants.

The majority of consenting participants were female (60%) and identified their race as White/Caucasian (66.8%). A significant minority of participants (23.1%) identified as being Asian/Asian American. The mean age was 19.1. As expected, given the high level of affluence among University of Michigan students, participants reported high levels of parental education with 81.5% of the sample reporting that at least one of their parents had a college degree or higher. Nearly half of participants (49%) reported having a parent with a graduate degree. Participant demographic information is summarized in Table 2.2.

Data Collection Procedures. The data for Data Set 1 were collected via five online questionnaire assessments. The first assessments took place 1-3 weeks prior to the start of the Fall 2010 academic semester (Cohort 1) and Fall 2011 semester (Cohort 2).

Participants then completed an assessment during the second week of each month of the academic semester (September, October, November, and December). The total time commitment for participants was approximately 90 minutes, for which they could earn up to $31 compensation. All study questionnaires were completed online using Qualtrics survey software. On the days when assessments were scheduled, participants received e-mails with links to the study questionnaires. These e-mails were always sent at midnight on the second Sunday of each month. Participants were permitted four days to complete the study assessments, which closed on Wednesday of that same week at 11:59pm.

Self-Report Measures

***Depressive symptoms*.** We measured depressive symptoms at all five data points using the Patient Health Questionnaire Depression Module (PHQ-9). The PHQ-9 is a self-report questionnaire designed to assess nine core symptoms of depression. Respondents rate the frequency with which they have experienced each symptom over the past two weeks on a four-point Likert scale, ranging from "Not at all" to "Nearly every day" (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 can be used as a categorical screening instrument for depressive disorders, as an ordinal metric of symptom severity, and as a continuous measure of depressive symptoms. Respondents endorsing five or more symptoms occurring most days over the past two weeks, including either depressed mood or anhedonia, are considered to have a likely Major Depressive Episode. If respondents endorse 2-4 symptoms (including either depressed mood or anhedonia) occurring on most days, their symptoms are categorized as "Other depression." Symptom severity cutoffs are defined by the following categories based on raw total scores: 0-4 = minimal; 5-9 = mild; 10-14 = moderate; and 15-19 = moderately

severe; and 20 or above = severe. Additionally, the PHQ-9 prompts participants to rate the extent to which their symptoms have made it difficult to engage in their daily activities on a single 4-point item ranging from "Not difficult at all" to "Extremely difficult" (Kroenke et al., 2001).

The PHQ-9 has demonstrated good psychometric properties, with internal consistency scores ranging from α =.86 to α =.89 and a test-retest reliability score of r = .84 across a 48-hour period. The instrument has demonstrated criterion validity when compared to diagnostic outcomes derived from clinician interviews, and construct validity when compared to a well-established measure of functional impairment (Kroenke et al., 2001). For the purposes of this study, we omitted item nine of the questionnaire which asks about thoughts of death and self-harm. Given the self-administered, online format of the questionnaires, we could not ask follow-up questions to participants who endorsed this item to determine whether or not they had active suicidal intent. Excluding the ninth item of the PHQ-9 appears to have a negligible impact on the questionnaire's ability to discriminate between those with and without depressive disorders (Kroenke & Spitzer, 2002). The eight-item version has also demonstrated criterion validity in community samples (Kroenke et al., 2009). In order to distinguish the version without the suicidality item from the full measure, we referred to the eight-item version of the questionnaire as the PHQ-8 throughout the manuscript (Kroenke & Spitzer, 2002).

Functional impairment. In addition to the one-item measure of depression-based functional impairment from the PHQ-8, we administered two subscales from the Short Form-36 questionnaire (SF) measuring social role functioning (two items) and role limitations due to emotional problems (three items) at all five data points (Ware &

Sherbourne, 1992). The SF is one of the most widely used measures of quality of life and functioning (Hays & Morales, 2001). The social role functioning and emotional role limitations subscales have demonstrated acceptable internal consistency in a large study of adults 18-64, with αs = .76 and .80, respectively, as well as construct validity (Jenkinson, Coulter, & Wright, 1993). The criterion validity of the full 36-item measure has been demonstrated in studies measuring both physical and mental health (McHorney, Ware, & Raczek, 1993).

***Perceived stress*.** We measured stress using the Perceived Stress Scale (PSS), a 14-item questionnaire that has shown good internal consistency (α >= .84) and test-retest reliability (*r* = .85) in college samples (Cohen & Hoberman, 1983; Cohen, Kamarck, & Mermelstein, 1983). Unlike objective measures of stress, which typically prompt respondents to indicate whether they have experienced a variety of specific life events, the PSS focuses on respondents' cognitive appraisals of stress. The PSS has demonstrated criterion validity in studies measuring both mental health symptoms and physical health (Cohen et al., 1983). The PSS was administered at all five assessments in this study.

***Social connectedness*.** We measured social connectedness using the Social Connectedness Scale—Campus Version (SCS) (Lee & Davis, 2000; Lee, Keough, & Sexton, 2002). The SCS is a 14-item questionnaire with six positively worded and eight negatively worded items. Respondents rate the extent to which they feel a sense of belonging and connectedness with their peers and the campus community in general on a six-point Likert scale. The SCS has demonstrated good internal consistency (α coefficients ranging from .90-.93) as well as convergent and concurrent validity, correlating in the expected direction with measures of social appraisal, stress, self-esteem,

and depressive symptoms (Lee et al., 2002; Lee, 2005). Participants completed the SCS at all assessments except for the first (four times total).

***Optimism/pessimism*.** The Life Orientations Test—Revised (LOT-R) was used to measure dispositional optimism and pessimism. The LOT-R is a 10-item scale which prompts respondents to rate the extent to which they agree with optimistic and pessimistic statements. The initial study of the LOT-R found that the measure has adequate internal consistency ($\alpha = .82$) and was related to criterion variables (including depressive symptoms) even when controlling for host of other factors (Scheier, Carver, & Bridges, 1994). We measured optimism only at the first assessment because it is a relatively stable construct when measured with the LOT-R (Scheier et al., 1994).

***Behavioral inhibition/activation*.** The Behavioral Inhibition/Activation Scale (BIS/BAS) was used as a measure dispositional avoidance and activation (Carver & White, 1994). The BIS/BAS was developed in accordance with Gray's physiological model of personality (Gray, 1970), which emphasizes the role that two neurological systems play in motivation. The behavioral inhibition system (BIS) is sensitive to signals of threat and punishment and inhibits behavior that may prompt these experiences. The behavioral activation system (BAS) is sensitive to signals of reward and prompts approach behavior. Individuals with high BIS activity should show higher frequencies of avoidance and escape behaviors given their sensitivity to punishment cues. In contrast, those with high BAS activity should show higher frequencies of activating behavior given their sensitivity to reward cues (Carver & White, 1994).

The BIS/BAS scale is intended to capture characteristics levels of BIS and BAS activity. The scale consists of 24 items and four subscales (three of which are related to

BAS): drive, fun seeking, reward responsiveness, and behavioral inhibition. The sub-scales have generally shown acceptable internal consistency, although the reliability scores for the subscales related to BAS sometimes fall below $\alpha = .70$ (Carver & White, 1994; Jorm et al., 1999). The BIS/BAS has demonstrated convergent and discriminant validity in a study with measures of optimism, affect, and personality dimensions (Carver & White, 1994).

***Demographic information & mental health history*.** During the first assessment, participants provided basic demographic information, including: sex, race, age, financial situation growing up, current financial situation, parent education level, level of religiousness, and their housing situation during the fall academic semester. Students also answered questions indicating whether or not they were currently, or had ever, received medication or therapy/counseling for mental health issues. Finally, students indicated whether or not they had ever felt as if they needed treatment for a mental health problem. During the final assessment (December), participants indicated whether or not they used professional mental health services at any time during the academic semester.

Data Set 2

These data were collected as part of a cross-sectional study of undergraduates enrolled in introductory psychology courses. Data Set 2 was used as the basis for the development and evaluation of the time-varying, avoidance scale in Study 2a.

Participant Information

***Recruitment procedures*.** The local institutional review board (IRB) approved all study procedures prior to initiating recruitment activities. Participants were undergraduate students at a large, public university enrolled in introductory psychology courses. A

requirement of this course was that students serve as research participants in a subject pool. Students who did not wish to participate in research were afforded the option of completing a writing assignment instead. Researchers interested in recruiting participants from the subject pool registered with the Department of Psychology and provided study inclusion/exclusion criteria. Students completed a prescreening assessment at the beginning of the academic semester in order to determine eligibility for the various subject pool studies. The department maintained a website through which students could view studies for which they met the eligibility criteria and reserved time slots for participation. When reserving time slots, students did not have access to any information about the study aside from the required time commitment. Students received a study consent form with detailed information about the parameters of their participation only at the time of their scheduled appointment, at which time they could decide whether or not to participate.

All students enrolled in introductory psychology courses who were over the age of 18 were eligible to participate in this study. Recruitment and data collection occurred over four academic semesters. The IRB granted an exemption from obtaining a paper-based consent document with participant signatures; instead participants were able to provide consent for the study online by checking a radio button and typing their names in a text field. After reserving time slots on the subject pool website, participants were directed to an online study consent form describing all study procedures. Participants completed the online study surveys immediately after providing consent.

Sample characteristics. A total of 703 participants signed up for the study. The majority of participants identified as being female (n = 444; 63%) and White/Caucasian

(*n* = 483; 68%), although a significant minority of participants identified as being Asian/Asian American (*n* = 117; 17%). The vast majority of participants (91%) were either in their freshmen or sophomore year of college. The mean age of participants was 18.7 with little variability (SD = 1.1). Table 2.3 provides additional demographic information for study participants.

Self-Report Measures

***Depressive symptoms*.** We measured depressive symptoms using the Center for Epidemiological Studies—Depression Scale (CES-D). The CES-D is a widely used 20-item measure that prompts respondents to rate the extent to which they have experienced common symptoms of depression (including cognitive, behavioral, affective, and somatic symptoms) over the previous week (Radloff, 1977). Respondents rate their symptoms using a four-point Likert scale with anchors "Rarely or none of the time (less than 1 day)" to "Most or all of the time (5-7 days)." The CES-D includes four positively worded items (e.g., "I felt hopeful about the future") measuring positive affect that are reversed scored. The CES-D has demonstrated good internal consistency in college samples with Cronbach's α scores ranging from .87 to .90 (Radloff, 1991; Skorikov & Vandervoort, 2003). The CES-D correlates significantly with other well-validated measures of depressive symptoms (Santor, Zuroff, Ramsay, Cervantes, & Palacios, 1995; Tanaka & Huba, 1987) and has excellent acceptability, as indicated by high participation rates in college samples (Radloff, 1991). Finally, the CES-D has demonstrated criterion validity in studies evaluating its sensitivity/specificity as a screening instrument for depressive disorders (Haringsma, Engels, Beekman, & Spinhoven, 2004).

***Social anxiety*.** We measured social anxiety using the Social Avoidance & Distress Scale (SADS) (Watson & Friend, 1969). The SADS is a commonly used, 28-item questionnaire measuring respondents' comfort in social situations and the extent to which they avoid uncomfortable social situations (Hofmann, DiBartolo, Holaway, & Heimberg, 2004; Watson & Friend, 1969). The initial study evaluating the SADS reports evidence of convergent, discriminant, and predictive validity. Notably, undergraduates who scored high on the SADS reported greater desire to avoid a group discussion task and higher distress when faced with the possibility of going through with this task (Watson & Friend, 1969). In a large study of college undergraduates (N = 1,420), the SADS factor structure fit the study data well in a confirmatory factor analysis (RMSEA = .05) (Melka, Lancaster, Adams, Howarth, & Rodriguez, 2010). Although this measure was designed specifically to assess for social anxiety, patients with various anxiety disorders (e.g., Generalized Anxiety Disorder, Obsessive-Compulsive Disorder, and Panic Disorder) score as high on the questionnaire as patients diagnosed with Social Phobia (Turner, McCanna, & Beidel, 1987), suggesting that it may capture symptoms relevant to many forms of anxiety.

Social connectedness. We measured social connectedness using the Social Connectedness Scale—Campus Version (SCS) (Lee & Davis, 2000; Lee et al., 2002). A description of the SCS is provided earlier in our description of Data Set 1.

***Dispositional avoidance*.** We measured dispositional avoidance using the Cognitive-Behavioral Avoidance Scale (CBAS). The CBAS is a 31-item questionnaire that measures respondents' tendency to avoid situations that may cause distress or discomfort (Ottenbreit & Dobson, 2004). The CBAS was designed to measure different

modes (cognitive and behavioral) as well as different domains of avoidance (social and non-social). Respondents receive scores on four subscales reflecting the different combinations of domains and modes of avoidance: cognitive-social, cognitive-non-social, behavioral-social, and behavioral-non-social. The subscales of the CBAS have acceptable internal consistency (α coefficients ranging from .75 to .86), and have demonstrated concurrent, convergent and discriminant validity when compared with other well-established self-report measures (Ottenbreit & Dobson, 2004).

Avoidant & active coping strategies. In addition to the CBAS, we administered the COPE scale in order to measure participants' tendencies to use active and avoidant coping strategies (Carver, Scheier, & Weintraub, 1989). The COPE is a widely-used questionnaire measuring different strategies for coping with stress. In this study, we used the following five subscales of the COPE (24 items total): Active Coping, Planning, Behavioral Disengagement, Mental Disengagement, and Denial. Most of these subscales have demonstrated at least acceptable internal consistency (αs ranging from .62 to .80); however, the Mental Disengagement subscale had poor internal consistency (α = .45) in the initial study evaluating the questionnaire (Carver et al., 1989).

Frequency of avoidance behaviors. The primary purpose of Study 2a was the development and evaluation of the Avoidant Behaviors Scale (ABS), a time-varying measure of avoidant behaviors. All participants in Data Set 2 completed the ABS. A detailed description of the development and content of the ABS is provided in the method section of Study 2a.

Data Set 3

Like Data Set 1, these data were collected as part of a longitudinal study evaluating the emotional health of freshmen and transfer students during their first semester at a new post-secondary institution. Although these data were collected with fewer participants than Data Set 1, this data set contains more study assessments. Data Set 3 was used as the basis for the statistical analyses in Study 2b and Study 3a.

Recruitment & Compensation. The study in which the Data Set 3 data were collected was open to all freshmen and first-semester transfer students at a large, public university. We recruited participants through university-approved e-mail lists and flyers posted in popular locations on campus. Interested participants were directed to a web page where they could access the study consent form. Once students provided consent, they were directed to a participant information form to provide demographic information. Due to limited resources, we closed recruitment once 41 freshmen and 41 transfers provided consent to participate (N = 82). Participants completed two online assessments during each of the four months of the fall semester (eight total assessments). Participants earned up to $35 for their participation: $7 for each month in which they completed both assessments and a bonus of $7 for completing all eight assessments. Three participants (4%) dropped from the study before the final assessment. The participation rate at each study assessment exceeded 90%. Demographic characteristics of study participants are summarized in Table 2.4.

Study Assessments. Participants completed all study assessments online using the *SurveyMonkey* data collection software. On scheduled assessment dates, e-mails with links to the study questionnaires were sent to participants. The study surveys were made

available on Sunday mornings at 12am and were available until Tuesday nights at 11:59pm, allowing students 72 hours to complete the assessments. Non-responders received reminder e-mails 48 and 60 hours after the survey was originally sent. Twice during the course of the study, assessment deadlines were extended by one day to accommodate a considerable number of students who extended their travel plans for holiday weekends. On a few occasions, individual students were allotted an extra day to complete assessments due to extenuating circumstances.

Self-Report Questionnaires

***Depressive symptoms*.** We measured depressive symptoms using the Center for Epidemiological Studies—Depression Scale (CES-D). A summary of the CES-D is provided in the description of Data Set 2. The CES-D was administered at all eight study assessments in this study.

Perceived stress. We measured stress using the Perceived Stress Scale (PSS) (Cohen & Hoberman, 1983; Cohen, Kamarck, & Mermelstein, 1983). A summary of the CES-D is provided in the description of Data Set 1. The PSS was administered at all eight study assessments in this study.

***Social connectedness*.** We measured social connectedness using the Social Connectedness Scale—Campus Version (SCS). A detailed summary of the SCS is provided in the description of Data Set 2. The SCS was administered at the first, third, fifth, and seventh assessments in this study.

***Dysfunctional attitudes*.** We measured core dysfunctional beliefs (schemas) using the Dysfunctional Attitudes Scale—Form A (DAS-A). The DAS-A is comprised of 40-items asking respondent to rate the extent to which they agree with various beliefs and

attitudes on a seven-point Likert scale (Weissman & Beck, 1978). The DAS-A is a widely-used instrument that has demonstrated good internal consistency, stability, convergent validity, and criterion validity. The DAS-A best predicts depressive symptoms during times of stress (Winters, Myers, & Proud, 2002). Given that the DAS-A measures what is believed to be a stable construct, we treated it as a time-invariant variable and only measured it at the first assessment.

***Avoidant behavior*.** We used the Avoidant Behaviors Scale (ABS) to measure the frequency with which students engaged in avoidant behavior. The development and initial evaluation of the ABS is described in Study 2a.

Table 2.1. Summary of Data Sets and Self-Report Instruments Used in Each Study

	Study 1	**Study 2a**	**Study 2b**	**Study 3a**	**Study 3b**
Data Set Used	Data Set 1	Data Set 2	Data Set 3	Data Set 3	Data Set 1
Self-Report Measures					
Depressive Symptoms					
CES-D		x	x	x	
PHQ-8	x				x
Functional Impairment					
SF-36 -Social Function	x				
SF-36 –Role Limitations	x				
Stress					
PSS	x		x	x	x
Social Connectedness					
SCS	x	x	x	x	x
Frequency of Avoidance					
ABS		x	x	x	
Dispositional Avoidance					
CBAS		x			
COPE		x			
Dysfunctional Attitudes					
DAS-Form A			x	x	
Dispositional Optimism					
LOT-R	x				x
Social Anxiety					
SADS		x			

Table 2.2. Demographic Characteristics of Study Participants for Data Set 1.

	Freshmen (n = 235)	*Transfers (n = 116)*	*Overall (N = 351)*
Participant Sex	*n (%)*	*n (%)*	*n (%)*
Female	140 (59.6)	70 (60.3)	210 (59.8)
Male	95 (40.4)	46 (39.7)	141 (40.2)
Race/Ethnicity	*n (%)*	*n (%)*	*n (%)*
Asian/Asian American	44 (19.0)	36 (31.3)	80 (23.1)
Black/African American	7 (3.0)	2 (1.7)	9 (2.6)
Latino/Latina/Hispanic	3 (1.3)	2 (1.7)	5 (1.5)
Middle Eastern	2 (0.9)	3 (2.6)	5 (1.5)
Native American	0 (0.0)	0 (0.0)	0 (0.0)
Pacific Islander	0 (0.0)	0 (0.0)	0 (0.0)
White/Caucasian	165 (71.4)	66 (57.4)	231 (66.7)
Multi-Racial	10 (4.3)	5 (4.3)	15 (4.3)
Declined to Answer	4 (1.7)	2 (1.7)	6 (1.7)
Highest Parent Education	*n (%)*	*n (%)*	*n (%)*
Some high school or less	3 (1.3)	3 (2.7)	6 (1.7)
High school graduate	18 (7.7)	8 (7.1)	26 (7.5)
Some college	19 (8.2)	13 (11.5)	32 (9.3)
College degree	66 (28.3)	46 (40.7)	112 (32.4)
Graduate degree	127 (54.5)	43 (38.1)	170 (49.1)
Declined to Answer	2 (1.0)	3 (2.6)	5 (1.4)
Student Status	*n (%)*	*n (%)*	*n (%)*
Domestic Student	223 (94.9)	82 (71.9)	305 (87.4)
International Student	12 (5.1)	32 (28.1)	44 (12.6)
Declined to Answer	0 (0.0)	2 (1.7)	2 (0.6)
Past Financial Situation	*n (%)*	*n (%)*	*n (%)*
Very Poor, Not Enough to Get By	2 (0.9)	3 (2.6)	5 (1.4)
Enough to Get By but Little Extra	43 (18.3)	37 (31.9)	80 (22.8)
Comfortable	143 (60.9)	65 (56.0)	208 (59.3)

Well To Do	47 (20.0)	11 (9.5)	58 (16.5)
Current Financial Situation	*n (%)*	*n (%)*	*n (%)*
Financial Struggle	31 (13.2)	20 (17.4)	51 (14.6)
Tight Finances	122 (51.9)	75 (65.2)	197 (56.3)
Finances Aren't a Problem	82 (34.9)	20 (17.4)	102 (29.1)
Declined to Answer	0 (0.0)	1 (0.9)	1 (0.3)
Participant Age (Months)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
	Range	*Range*	*Range*
	221.8 (5.0)	246.8 (32.3)	229.3 (21.4)
	216-255	224-458	216-458

Table 2.3. Demographic Characteristics of Study Participants for Data Set 2.

	EFA[a]	*CFA*[b]	*Overall*
Participant Sex	*n* (%)	*n* (%)	*n* (%)
Female	214 (60.8)	230 (65.5)	444 (63.3)
Male	138 (39.2)	120 (34.2)	258 (36.7)
Decline to Answer	0 (0.0)	1 (0.0)	1(0.0)
Race/Ethnicity			
African American/Black	10 (2.8)	13 (3.7)	23 (3.3)
Asian American/Asian	63 (17.9)	54 (15.3)	117 (16.6)
Hispanic/Latino/Latina	9 (2.6)	15 (4.3)	24 (3.4)
Middle Eastern	6 (1.7)	5 (1.4)	11 (1.6)
More Than One Race	7 (2.0)	12 (3.4)	19 (2.7)
Native American	2 (0.6)	1 (0.2)	3 (0.4)
White/Caucasian	246 (69.9)	235 (67.0)	481 (68.4)
Decline to answer	4 (1.1)	10 (2.8)	14 (2.0)
Other	5 (1.4)	6 (1.7)	11 (1.6)
Year in School			
Freshman	236 (67.0)	216 (61.4)	452 (64.3)
Sophomore	83 (23.6)	102 (29.0)	185 (26.3)
Junior	25 (7.1)	20 (5.7)	45 (6.4)
Senior	8 (2.2)	13 (3.7)	21 (3.0)
Student Status			
Domestic	331 (94.0)	326 (92.9)	657 (93.4)
International	21 (6.0)	25 (7.1)	46 (6.6)
Transfer	9 (2.6)	12 (3.4)	21
Non-Transfer	343 (97.4)	339 (96.3)	682
Participant Age (Years)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
	Range	*Range*	*Range*
	18.8 (1.3)	18.7 (1.0)	18.7 (1.1)
	18-35	18-28	18-35

[a]This column summarizes information about participants in the Exploratory Factor Analysis Sample. [b]This column summarizes information about participants in the Confirmatory Factor Analysis Sample.

Table 2.4. Demographic Characteristics of Study Participants for Data Set 3.

	Freshmen (n=41)	*Transfers (n=41)*	*Overall (N=82)*
Participant Sex	*n (%)*	*n (%)*	*n (%)*
Female	27 (65.9)	20 (48.8)	47 (57.3)
Male	14 (34.1)	21 (51.2)	35 (42.7)
Race/Ethnicity	*n (%)*	*n (%)*	*n (%)*
Asian/Asian American	13 (31.7)	13 (31.7)	26 (31.7)
Black/African American	0 (0.0)	0 (0.0)	0 (0.0)
Latino/Latina/Hispanic	3 (7.3)	0 (0.0)	3 (3.7)
Native American/American Indian	0 (0.0)	1 (2.4)	1 (1.2)
White/Caucasian	21 (51.2)	24 (58.5)	45 (54.9)
Other	1 (2.4)	1 (2.4)	2 (2.4)
Did not wish to answer	1 (2.4)	2 (4.9)	3 (3.7)
Unknown	2 (4.9)	0 (0.0)	2 (2.4)
Highest Parent Education	*n (%)*	*n (%)*	*n (%)*
Some high school or less	1 (2.4)	0 (0.0)	1 (1.2)
High school graduate	3 (7.3)	3 (7.3)	6 (7.3)
Some college	3 (7.3)	9 (22.0)	12 (14.6)
College degree	12 (29.3)	10 (24.4)	22 (26.8)
Post-College/ Graduate degree	19 (46.3)	19 (46.3)	38 (46.3)
Unknown	3 (7.3)	0 (0.0)	3 (3.7)
Student Status	*n (%)*	*n (%)*	*n (%)*
Domestic Student	32 (78.0)	29 (71.0)	61 (74.4)
International Student	7 (17.0)	12 (29.3)	19 (23.2)
Declined to Answer	2 (4.9)	0 (0.0)	2 (2.4)

Participant Age (Years)	*Mean (SD)* *Range*	*Mean (SD)* *Range*	*Mean (SD)* *Range*
	18.3 (0.7) 18-21	21.0 (4.4) 18-42	19.7 (3.4) 18-42

CHAPTER 3

STUDY 1: MODELING DEPRESSIVE SYMPTOMS DURING THE COLLEGE TRANSITION

Purpose & Hypotheses

The purpose of this study was to evaluate the course, predictors, and impact of depressive symptoms during the college transition using Data Set 1. This study had three primary aims: (1) to model the course of stress and depressive symptoms during the college transition and evaluate heterogeneity in individual trends; (2) to test the component of our conceptual model which states that social connectedness can buffer against the adverse impact of stress; (3) to evaluate the impact of depressive symptoms on psychosocial functioning. In addressing these aims, we proposed four a-priori hypotheses:

1. In accordance with previous findings, we predicted that students would report increasing levels of perceived stress and depressive symptoms during their first academic semester at the university. Specifically, we predicted that there would be a significant increase in stress and symptoms from baseline (the pre-semester assessment) to the first follow-up assessment (two weeks into the academic semester), and that symptoms would not return to pre-college levels (i.e., stress and symptom levels at time points 3-5 will be significantly greater than at Time 1).

2. We expected that there would be a significant amount of between-subject heterogeneity in the development of depressive symptoms over time. We predicted that multiple latent trajectory groups would emerge in our analyses providing a better summary of the course of symptoms over time than analyses which model only a single trajectory group.
3. We predicted that stress would be positively related to depressive symptoms throughout the academic semester; however, social connectedness would emerge as a significant moderator of the relationship between stress and depressive symptoms. Consistent with the stress-buffering hypothesis, we predicted that the relationship between stress and depressive symptoms would diminish in the presence of high levels of social connectedness.
4. Finally, we predicted that depressive symptoms would be associated with impairments in self-reported social functioning and role functioning throughout the academic semester.

Brief Summary of the Data Set

As noted in Chapter 2, the analyses for this study were based on Data Set 1. Participants (N = 351) were freshmen (n = 235) and transfer students (n = 116) in their first semester at a large, mid-western university. Recruitment e-mails were sent to random groups of students who met the study inclusion criteria (i.e., students in their first semester at the university who were over the age of 18). The majority of participants identified as being White/Caucasian (66.7%) with a significant minority identifying as Asian/Asian American (23.1%). The mean age of participants was 19.1 years, with a range of 18-38. Participants completed five web-based surveys: one assessment in August

(1-3 weeks before the start of the semester) and one during each of the subsequent four months of the fall semester (September, October, November, and December). For more details regarding the data collection procedures, participant characteristics, and study measures, please see the description of Data Set 1 in Chapter 2 and Table 2.2.

Statistical Analysis

Preliminary procedures. Prior to data analysis, we examined the distributions of all continuous covariates and dependent variables for deviations from normality and outliers using quantile-quantile plots, histograms, and boxplots. When violations of distributional assumptions were apparent, we applied power transformations (square root and natural log) in order to better approximate a normal distribution. The transformed variables were used in all analyses. Additionally, we centered continuous covariates by subtracting the grand mean from all individual scores in order to facilitate interpretation of the intercept terms in our analyses and to reduce the impact of multicollinearity. Additionally, we centered the primary dependent variable (natural log transformed depressive symptom scores) so that mean intercept scores of 0 would correspond to the grand mean, which is more easily interpretable than the mean value on the natural log transformed scale.

Primary analyses. We used latent growth modeling approaches to describe symptom development over time. Given our expectation that multiple latent class trajectory groups would emerge from the data, we used growth mixture modeling (GMM) to evaluate symptom development and the impact of processes believed to contribute to the development of symptoms. Unlike traditional approaches to longitudinal analysis, GMM does not make the assumption that a single trajectory group is sufficient in

describing trends over time. Rather, GMM proposes that multiple trajectory groups with qualitatively different trajectory shapes may exist in the population of interest (Muthén, 2004). For example, there could be a group of college students whose depressive symptoms follow a linear trend over the course of the semester, and a separate group whose symptoms grow in quadratic fashion. Rather than summarizing symptom growth with a single set of parameters, GMM allows the analyst to have multiple sets of parameters, each describing variability around a distinct mean trend (Muthén, 2004). GMM identifies a discrete number of distinct trajectory groups and then separates individuals into the most appropriate class according to their individual growth trajectory.

There are several benefits to using GMM rather than traditional regression and mixed modeling approaches. First, in cases in which groups of participants follow qualitatively different trajectory shapes, the group-based modeling approaches, like GMM, may be more appropriate than single-trajectory approaches (Nagin, 2005; Raudenbush, 2001). Second, the GMM approach is highly flexible. Within trajectory groups, the analyst can model different rates of development (e.g., linear, quadratic, cubic, etc.), different effects of covariates, as well as heterogeneity using random intercept and slope factors. Additionally, if multiple trajectory groups are not needed, the analyst can easily specify a single-class, latent growth curve analysis (LCGA) model by dropping the latent class variable. In LGCA, the analyst models heterogeneity by specifying random intercept and growth factors but not multiple trajectory groups (Muthén, 2004). Third, the analyst can create profiles that summarize the characteristics of each group and identify factors that increase probability of group membership. This has significant practical utility (Nagin, 2005). For example, if there were two trajectory

groups in the population, one high-risk group with increasing symptom levels and one low-risk group with stable low levels of symptoms, having profiles of the symptom groups could help researchers and practitioners gauge the likelihood of a given student being in the high risk trajectory.

Model building procedure. Mplus version 6.1 software (Muthén & Muthén, 1998-2010) was used for all latent growth models. In our primary analyses, we used a model comparison approach to building well-fitting yet parsimonious models. This approach involves specifying competing models in a systematic manner and comparing more complex specifications (reference models) to a more parsimonious ones (nested models). This procedure lends itself to hypothesis testing as the reference model (typically representing the alternative hypothesis) is compared to a hierarchically nested model (typically representing the null hypothesis).

We followed recommendations in the literature for building GMM models (Jung, & Wickrama, 2008; Muthen, 2004). The first step in our GMM procedure was to fit a conditional, single-class LGCA model with depressive symptoms as the dependent variable and growth parameters (i.e., the random intercept and slope factors) regressed on all covariates of interest. Including all covariates of interest in the initial step of the modeling procedure allows the analyst to capture as much systematic variability as possible that is attributable to measured variables and helps limit the possibility of over-extracting latent trajectory groups in later steps. We then fit a latent class growth model with two trajectory groups, constraining the within class variances to 0. In subsequent steps, we created more general models by adding higher-order growth terms (i.e., a quadratic slope factor), estimating variability within latent classes, and allowing intercept

and slope terms to vary randomly within specific classes. We used profile plots showing the distribution of trends within each trajectory group to help determine whether higher-order terms and trajectory group-specific intercept and slope factors might improve model fit (Muthén, 2004; Jung & Wickrama, 2007).

When fitting single-class LGCA models, we estimated model parameters using maximum likelihood (ML). As recommended in the literature, we measured the quality of LGCA models using a host of different fit indices (Hu & Bentler, 1998). We reported several fit indices that measure absolute fit, including the χ^2 test of model fit, the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). The χ^2 test of model fit tests whether the data fit the specified model perfectly, with significant values indicating a less than perfect fit. The χ^2 test is too conservative with large samples and often results in the rejection of well-fitting models. Unlike the χ^2 statistic, the RMSEA is a measure of approximate fit with values less than .05 to .06 generally considered indicative of a well fitting model and values less than .08 indicative of reasonable fit (Cudeck & Browne, 1992; Hu & Bentler, 1998). The SRMR is a measure of the discrepancy between the sample and model predicted covariance matrixes, with values less than .08 to .10 generally considered acceptable (Hu & Bentler, 1998; Kline, 2005). We also reported two incremental fit indices, the comparative fit index (CFI) and the Tucker-Lewis Index (TLI). Models with CFI and TLI scores greater than .95 are generally considered well-fitting models (Hu & Bentler, 1998). Likelihood ratio tests and the sample-size adjusted Bayesian Information Criterion (BIC_{adj}) were used to determine preference between competing LGCA models. Likelihood ratio tests compare the likelihood functions of hierarchically nested models and provide a χ^2 test

with significant values indicating preference for the more general model. The BIC_{adj} is a fit index which carries a penalty that increases with the number of parameters. Lower BIC_{adj} values are preferable.

When specifying GMM models, we used robust maximum likelihood estimation (MLR) to estimate model parameters. To aid in determining preference between competing GMM models, we used several indicators of model fit, including the BIC_{adj}, entropy scores, and posterior probability scores. Entropy and posterior probability scores measure how well individuals are classified into latent trajectory groups. These indexes range from 0 to 1 with scores nearer to 1 indicating better classification of individuals into latent classes. Our primary method of determining the appropriate number of classes (i.e., latent trajectory groups) to retain in our model was the parametric bootstrap likelihood ratio test (BLRT), which provides a significance test comparing the likelihood functions of hierarchically nested models. The BLRT allows the user to specify a desired number of bootstrap samples to better estimate the distribution of the likelihood ratio test. A recent simulation study suggests that the BLRT performed better than all competing fit indices at recovering the appropriate number of classes in mixture analyses (Nylund, Asparouhov, & Muthén, 2007).

Overview of Study 1 Results

The following points provide an overview of the main findings from our analyses. A detailed description of the study results follows:

- There were significant increases in both stress and depressive symptoms over the course of the semester with peak levels of stress and symptoms observed in the final month of the semester.

- A single-class latent growth curve model summarized growth in depressive symptoms well; allowing for multiple trajectory classes did not improve model fit.
- The strength of the relationship between perceived stress and depressive symptoms was moderated by social connectedness, such that the positive association between perceived stress and depressive symptoms was weaker in the presence of high versus low levels of social connectedness.
- Students who at baseline reported a perceived need for professional mental health services at some point in their lives endorsed higher pre-college levels of depressive symptoms.
- Students who denied ever using medications to treat mental health concerns at baseline reported greater increases in depressive symptoms over time.
- Depressive symptoms were associated with higher levels of functional impairment at all assessments.

Detailed Description of Study 1 Results

Evaluating Trends of Stress & Depressive Symptoms. In order to describe the trends of depressive symptoms and perceived stress over time, we fit unconditional (no covariates) LGCA models with observed indicators representing symptoms or stress at all five time points regressed on latent growth parameters (random intercepts and slopes). For depressive symptoms, the mean of the intercept term was negative and significantly different than 0 (z = -2.47, p = .01) suggesting that the baseline mean depressive symptom score was lower than the average symptom score over time. The mean of the slope factor was positive and significant (z = 4.89, p = .01) indicating that symptoms

tended to increase over time (see Figure 3.1a). In order to explicate the time effect, we computed all possible pairwise comparisons between the means at the five study assessments holding $\alpha = .05$ across all contrasts using Tukey's HSD (see Figure 3.2). Contrary to our prediction, the increase in symptoms from baseline (August) to the first follow-up assessment (week 2 of the academic semester) was not significant, $\Delta_{\text{Aug-Sep}} = 0.31$ (95% CI: -0.55, 1.18). However, mean symptom scores at all subsequent assessments were significantly greater than the baseline mean score, Δs ranging from 0.98 to 1.41. The largest pairwise difference in means was between the baseline (August) and final follow-up assessment (December), $\Delta_{\text{Aug-Dec}} = 1.41$ (95% CI: 0.53, 2.29).

Perceived stress scores followed a growth pattern that was quite similar to that of depressive symptoms. The mean of the intercept term was negative, suggesting that baseline stress levels were significantly lower than the average level of stress across all assessments: $z = -2.47$, $p = .01$. The mean of the slope term was positive and significant, indicating an overall increase in stress over time: $z = 6.08$, $p < .001$ (see Figure 3.1b). Pairwise comparisons using Tukey's HSD (see Figure 3.3) revealed that there was no significant increase in stress between baseline and the first follow-up: $\Delta_{\text{Aug-Sep}} = 0.86$ (95% CI: -0.64, 2.36). But mean stress scores at assessments 3-5 were all significantly greater than at baseline: Δs ranging from 2.27 to 2.48. The largest pairwise difference in means was between the baseline (August) and final follow-up assessment (December), $\Delta_{\text{Aug-Dec}} = 2.48$ (95% CI: 0.97, 4.00).

Predictors & Correlates of Depressive Symptoms Over Time

Step 1: Specifying a Conditional LGCA Model. The first step of our modeling procedure was to build a conditional LGCA model capturing the systematic variability in

the course of depressive symptoms attributable to the measured covariates. Our initial model included random intercept and a slope factors specifying linear growth in depressive symptoms (PHQ-8 transformed & centered scores) over time. The growth parameters were regressed on time-invariant indicators representing participant demographic characteristics (sex, race, past and current financial status, parental education level, and religiousness), mental health status (prior & current mental health problems and service utilization), and personality traits of interest (behavioral inhibition/activation and dispositional optimism/pessimism). Additionally, observed variables representing depressive symptoms at each time point were regressed on two time-varying predictors, perceived stress and social connectedness, and their interactions. As noted in the description of Data Set 1, perceived stress was measured at all five assessments and social connectedness was measured at all follow-up assessments but not baseline. After specifying the conditional LGCA model, we then reduced the model by dropping non-significant covariates.

The final, reduced LGCA model, summarized in Figure 3.4, yielded excellent fit statistics: χ^2 (70) = 77.16, p = 0.26, RMSEA = .02 (90% CI: .00, .04), both CFI and TLI > .99, and SRMR = .04. The model had two significant, time-invariant predictors of the growth parameters. Not surprisingly, a binary variable indicating whether or not students had ever perceived a need for professional mental health services was a significant predictor of the intercept growth term, z = 3.63, p < .001; students endorsing a past need for professional help reported higher baseline (pre-semester) depressive symptoms. Additionally, a binary indicator specifying whether or not students had ever taken psychotropic medications prior to college was a significant predictor of the slope of

depressive symptoms, z = -2.54, p = .01; students who denied past psychotropic medication use reported greater increases in symptoms over time.

Depressive symptoms were also associated with the time-varying covariates, stress and social connectedness. There was a significant, positive association between stress and depressive symptoms at the baseline assessment, z = 13.25, p < .001. At all subsequent assessments, social connectedness moderated the relationship between stress and depressive symptoms (zs ranging from -2.89 to -3.68 and all ps < .01). We used the simple slopes and Johnson-Neyman techniques to probe the interaction effects (Preacher, Curran, & Bauer, 2006). Stress was a significant, positive predictor of depressive symptoms at all levels of social connectedness; but the strength of this relationship attenuated as social connectedness increased. Figure 3.5 shows the relationship between stress and depressive symptoms at low (1 SD below the mean), average (mean), and high (1 SD above the mean) levels of social connectedness. Although all three lines represent significant positive relationships between stress and depressive symptoms, the slope of the line representing the relationship at high levels of social connectedness is less steep.

***Step 2: Modeling Multiple Trajectory Groups*.** Once a well-specified LGCA model was obtained, we tested whether we could improve our ability to model depressive symptoms over time using GMM with multiple trajectory groups. We constructed several GMMs using the same covariates and relationships specified in our final LGCA model but with a latent class membership variable allowing for multiple trajectory groups. Our first GMM specified a two-class trajectory model with variances within the trajectory groups constrained to 0 and with both trajectory groups following a linear trend[3]. This

[3] This is generally called a latent class growth model (Muthen 2004) or a group-based model (Nagin, 2005 and is not technically a growth mixture model because it does not model within-class variation.

model divided participants into two groups: one group had low baseline symptoms that increased over time (the "low-increasing group"), while the other group was comprised of participants with higher than average but steady symptoms (the "high-stable group"). This model did not provide a significantly better fit to the data than our single-class LGCA model: BLRT (3) = 2.35, p = .50. After evaluating symptom trends within each trajectory group using profile plots, we then created a competing two-class model with the "high-stable group" following a linear trend and the "low-increasing group" following a quadratic trend. This model was also not a significant improvement over our final, single-class LGCA model: BLRT (4) = 19.17, p = .22. Finally, we estimated a two-class GMM model estimating variance within trajectory classes. Again, there was no evidence that this model was a significant improvement over our single-class LGCA model. We therefore concluded that multiple trajectory groups were not needed when modeling the course of symptoms over time in our data set.

Step 3: Evaluating the Relationship between Symptoms & Functioning. The final step of our primary analyses was to evaluate the relationship between depressive symptoms and adaptive functioning. We added endogenous, measured variables at all five assessments to our final LGCA model representing total scores for the social functioning and role-emotional functioning subscales of the Short Form-36 questionnaire. This model was identical to our final LGCA model except that the social and role-emotional functioning variables at each assessment point were regressed on depressive symptoms. Given that the role-emotional and social functioning total scores have a limited range, we treated them as ordered categorical variables in our analysis and estimated model parameters using robust weighted least squares (WLSMV). The model

fit the data well, with all fit statistics in the desired range except for the χ^2 test, which often rejects well-fitting models: χ^2 (260) = 327.59, $p < .01$; RMSEA = .03 (90% CI: .02, .04); CFI = .96 and TLI =.95. At all five assessment points, there was a significant negative relationship between depressive symptoms and role-emotional functioning (*z*s ranging from -3.79 to -7.67 and all *p* values < .001) and between depressive symptoms and social functioning (*z*s ranging from -6.74 to -10.23 and all *p* values < .001).

Discussion

Limitations & Strengths. The findings from this study must be interpreted within the context of several important limitations. First, our data were the product of a convenience sample that may not be representative of the broader college student population. Second, self-report questionnaires were our only source of data. Supplementing self-report instruments with data from outside sources (e.g., family members and roommates) and objective data sources (e.g., academic transcripts and health records) would enrich our analyses. Third, a more thorough evaluation of mental health during the college transition would require a longer period of data collection. Although we had one assessment 1-2 weeks prior to the start of the academic semester, the actual college transition process likely began earlier than our first assessment and the acclimation process likely extends beyond the first semester. The constricted range of our assessments may have precluded observations of important processes contributing to emotional health during the transition period.

This study also had several important strengths. First, this is one of the few existing studies to focus exclusively on mental health during the first semester of college. Most longitudinal studies of college student mental health have widely spaced

assessments that likely miss important fluctuations in mental health processes. Second, we used latent growth modeling analyses which model heterogeneity in individual trends over time and estimate complex specifications of relationships simultaneously. Third, in addition to measuring depressive symptoms, we measured adaptive functioning as a distal outcome variable. Finally, our data set included both freshmen and transfer students in their first semester at a new university. Most studies evaluating mental health during the college transition focus exclusively on freshmen.

Summary & Interpretation of Findings

Stress & Depressive Symptoms during the Transition. The findings from this study supported the overarching premise of this dissertation: the college transition is a time of increasing stress and depressive symptoms. In partial support of hypothesis 1, both perceived stress and depressive symptoms increased significantly during the academic semester. Contrary to our hypotheses, we did not find evidence of significant increases in stress or symptoms during the initial weeks of the semester. Although mean levels of both perceived stress and depressive symptoms increased between the baseline and first follow-up assessment (mid-September), these increases were not significant. However, by the second follow-up assessment (mid-October), stress and depressive symptoms had increased significantly from baseline. There was no evidence of recovery in the later follow-up assessments. In fact, mean levels of stress and depressive symptoms were at their peak during the final weeks of the semester when students were preparing for, or completing, final exams and assignments.

An interesting and unexpected finding emerged from our analyses: students who at baseline *denied* ever using medications to treat mental health problems reported

greater increases in depressive symptoms over time than those who endorsed prior medication use. In accordance with diathesis-stress theories, we expected that students endorsing medication treatment at some point in their lives would likely carry stable risk factors for depression (e.g., neurochemical imbalances or pessimistic explanatory style) and that the stress of the college transition would activate these vulnerabilities leading to a more rapid increase in symptoms. There is considerable research evidence that environmental stressors can precipitate increases in symptoms among individuals who have experienced prior mental health problems (Lewinsohn, Hoberman, & Rosenbaum, 1988). We ran several post-hoc analyses to explore this finding. We found no differences in baseline levels of optimism/pessimism, a stable risk/protective factor for depression, between those who endorsed and denied prior pharmacotherapy. Those endorsing prior medication use reported higher baseline levels of depressive symptoms (which was not surprising) but small *decreases* in symptoms over time, while those denying prior medication treatment reported steady increases in symptoms. By the end of the semester, those who denied pre-college use of pharmacotherapy had roughly equal levels of symptoms compared to those who endorsed prior pharmacotherapy (see Figure 3.6a).

We explored several possible explanations for this finding. First, we considered the possibility that students endorsing past medication use were more likely to use campus mental health services during the academic year, enabling them to cope with the transitional stress more effectively. Forty-three percent of those who endorsed pre-college pharmacotherapy reported using professional mental health services (pharmacotherapy or psychotherapy) during the academic semester. However, groups of students who received and did not receive treatment during the semester reported

symptom increases at roughly equal rates, making this an unlikely explanation. Second, we considered the possibility that this finding was a statistical artifact attributable to the fact that students denying previous pharmacotherapy had more room to report increases in symptoms because they had lower baseline symptoms. This is an unlikely explanation given that the mean level of symptoms in the group endorsing previous medication was in the "mild" range on the PHQ-8 throughout the semester, leaving plenty of room for increases in symptoms. Finally, we considered the possibility that the transition process was less stressful for students who had endorsed prior pharmacotherapy. In a post-hoc analysis, we found that students who endorsed past medication reported high baseline but relatively stable levels of stress throughout the semester, while those who denied past pharmacotherapy reported low baseline but steadily increasing levels of stress (see Figure 3.6b). It is plausible that students who had used psychotropic medication in the past took steps to avoid exacerbating their stress levels during the semester (e.g., taking on fewer classes or extracurricular activities) which prevented increases in depressive symptoms.

Multiple Trajectory Groups. Our second hypothesis, that multiple latent class trajectory groups with different shapes would emerge in our analyses, was not supported. There are at least two ways to interpret this finding. First, it is possible that the covariates in our analysis and the random growth parameters accounted for enough heterogeneity that separate groups of parameters were not needed in summarizing symptom trends. We conducted post-hoc analyses that provide support this interpretation. When rerunning the GMMs described in the results section excluding the time-varying covariates (stress and social connectedness), we found that the models specifying multiple trajectory groups were superior to the single-class LGCA model. This underscores the importance of

including time-varying covariates in model; we likely would have over-extracted latent trajectory groups had perceived stress and social connectedness not been included.

Another plausible interpretation of this finding is that our sample was inadequate for growth mixture modeling. Although our sample was large (N = 351) relative to samples in most longitudinal studies, it may not have been large or diverse enough to capture distinct trajectory groups. A study based on a larger, more representative sample, may have had enough power to capture different trajectory classes even after controlling for covariates. Additionally, students at high risk for mental health problems may have been underrepresented in our sample. We expected that students at high risk for depression would form a trajectory group with a qualitatively different shape than students at low risk. There may not have been enough high risk students in our sample to form a stable trajectory class. The number of students screening positively for a depressive disorder on the PHQ-8 ranged from 6.4% in the first follow-up assessment to 10.6% in the final follow-up assessment. The Healthy Minds Study, a large survey of college undergraduates that also used the PHQ-9, found that approximately 14% of students had screened positively for a depressive disorder (Eisenberg et al., 2007).

Stress-Buffering Hypothesis. Our findings are consistent with the stress-buffering hypothesis (hypothesis 3) which states that social connectedness provides individuals with resources—psychological and otherwise—that ameliorate the negative effects of stress. At all follow-up assessments, the relationship between stress and depressive symptoms was moderated by social connectedness. The strength of the relationship between perceived stress and depressive symptoms decreased in magnitude as levels of social connectedness increased. However, it is notable that even among students

reporting remarkably high levels of social connectedness the relationship between perceived stress and depressive symptoms was positive and significant. This suggests that having high levels of social connectedness may dampen the negative effects of stress, but it does not eliminate them.

These findings, in conjunction with the considerable amount of evidence supporting the stress-buffering hypothesis in the extant literature (Cohen & Wills, 1985), should prompt the development of institutional initiatives and psychosocial interventions designed to increase social connectedness among students making the transition to a new post-secondary institution. Fostering a sense of belonging and connection to the campus community would likely help students cope with the stress of transitioning to a new school and thrive academically and socially during the first semester.

Depressive Symptoms & Adaptive Functioning. In support of hypothesis 4, there was a consistent association between depressive symptoms and social and role functioning during throughout the academic semester. These findings are consistent with past research studies showing negative correlations between depressive symptoms and psychosocial functioning (Judd et al., 1996; Judd et al., 1997). Given that we evaluated the cross-sectional relationship between symptoms and functioning at each assessment, we cannot conclude that symptoms caused impairment in functioning. However, in conjunction with the existing literature, these findings should prompt investigations of the causal relationship between depressive symptoms and adaptive functioning among students who are making the transition to college.

Future Directions

It is our hope that the findings from this study will prompt additional research evaluating the course and impact of depressive symptoms during the college transition. Understanding how students navigate the transition to a new academic institution is no easy task. In the U.S. alone, there are millions of students attending thousands of different institutions of higher education. There is undoubtedly enormous variability in student experiences during the transition process. Characteristics of the individual student and the college environment (e.g., the size of the school, the availability of resources, etc.) will have an impact on student experiences. Additionally, global events and circumstances (e.g., the state of the economy) will likely result in differences across cohorts. This underscores the need for multi-site, multi-wave studies that are more representative of the population of college students making the transition to college. Ultimately, these studies should prioritize the investigation of factors and processes that can be most easily altered in the service of promoting emotional well-being.

This study focused on the role that individual psychological characteristics and experiences play in the development of depressive symptoms during the college transition. But evaluating the course and impact of depressive symptoms on student functioning during the transition process should be a multilevel research endeavor. Future studies should attempt to model the complex interplay between individual characteristics/experiences and qualities of the college environment. Additionally, future research should make efforts to determine which aspects of transitioning are most difficult and what kinds of stressors have the most impact on symptoms over time. We used a global measure of perceived stress in our study. It would be beneficial in future

studies to supplement a measure of global stress (like the PSS) with more idiographic instruments that distinguish between different kinds of stressors. This could help inform efforts on the part of administrators and mental health professionals in developing strategies to improve the transition process.

Another important goal for future research is to determine whether or not symptom trajectories during the first-semester predict long-term outcomes, like academic success and retention, service utilization, and the likelihood of meeting criteria for a mental health disorder during college. It may be that the first semester at college is important in determining how well students will function in later semesters. Students with high levels of depressive symptoms may have difficulty succeeding academically and forming social support networks. Poor academic performance early in college could lead to demoralization and could have an impact on the classes the student is able/willing to take in future semesters. Forming social networks may become more difficult after the first semester because other students in the same cohort may already be satisfied with their group of friends and less likely to make active attempts to incorporate new people into their social circle. In short, the negative impact of depressive symptoms on social and academic functioning during the first semester could have an enduring impact on the overall college experience.

We believe that the findings from this research have practical implications for both administrators at colleges and universities and intervention researchers. Our research highlights the need for administrators to develop programs and policies that promote connectedness and help students manage transitional stress. Post-secondary institutions typically invest substantial resources to improve student experiences. For example, the

university that hosted this research study offers orientation seminars for new students, numerous housing options (including residential colleges), free counseling and psychological services, professional and peer academic counseling, recreational facilities, and a vast number of extracurricular opportunities. Many colleges and universities require students to live on campus during their first year, partly for financial reasons but also to encourage students to participate actively in the campus community. A priority for future research is to evaluate the extent to which existing institutional efforts to improve student experiences are effective. This research is complicated given that students are generally not randomly allocated to receive or not receive campus resources. However, there is active research within the quantitative methodology literature devoted to improving our ability to make causal inferences when randomization is not possible. The knowledge gained by evaluating existing programs and policies could lead to a more efficient use of resources and the development of new, more effective procedures.

For mental health practitioners and intervention researchers, the findings from this study underscore the importance of fostering social connectedness and imparting skills for managing stress during the college transition. The development of transportable psychosocial interventions for students making the transition to college could lead to substantial benefits. These interventions should target students who are at increased risk for depression during the transition process (e.g., those who have a history of mental health difficulties). The college environment provides an ideal infrastructure for psychosocial intervention research. College campuses typically have professional mental health resources on campus to which researchers can refer students who are exhibiting high levels of symptoms. Given that many college students live on campus, it would

typically be easy to find a setting that is convenient for participants. Additionally, many colleges have professional training programs for students in mental health fields and these students need opportunities for clinical experience. Having students in mental health training programs provide the intervention as part of their training could be a sustainable, cost-effective method of delivery.

Conclusion

The findings from this study supported the notion that the college transition is a time of increasing risk for stress and depressive symptoms. Students who endorsed past mental health problems reported higher levels of depressive symptoms over time. Depressive symptoms were associated with impairments in role and social functioning throughout the first academic semester. High levels of social connectedness appeared to buffer students against the adverse effects of stress. The findings from this study should prompt: (1) larger studies evaluating the course and predictors of depressive symptoms during the college transition; (2) evaluations into the specific mechanisms by which social connectedness ameliorates the impact of stress on symptoms; (3) evaluations of existing programs designed to help students manage stress and increase social connectedness during the first semester; (4) development and evaluation of interventions designed to increase social connectedness among students transitioning to college.

Figure 3.1a. Study 1: Depressive Symptoms over the Course of the Fall Semester.

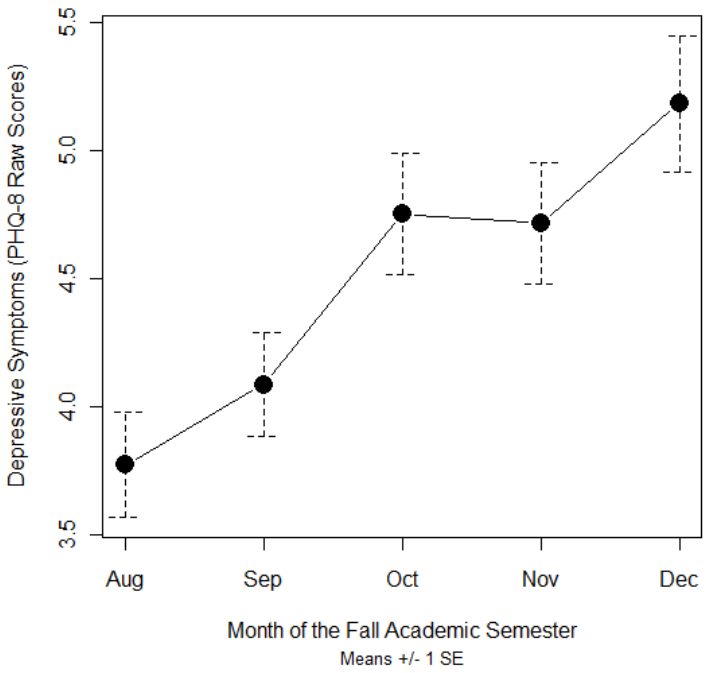


Figure 3.1b. Study 1: Perceived Stress over the Course of the Fall Semester.

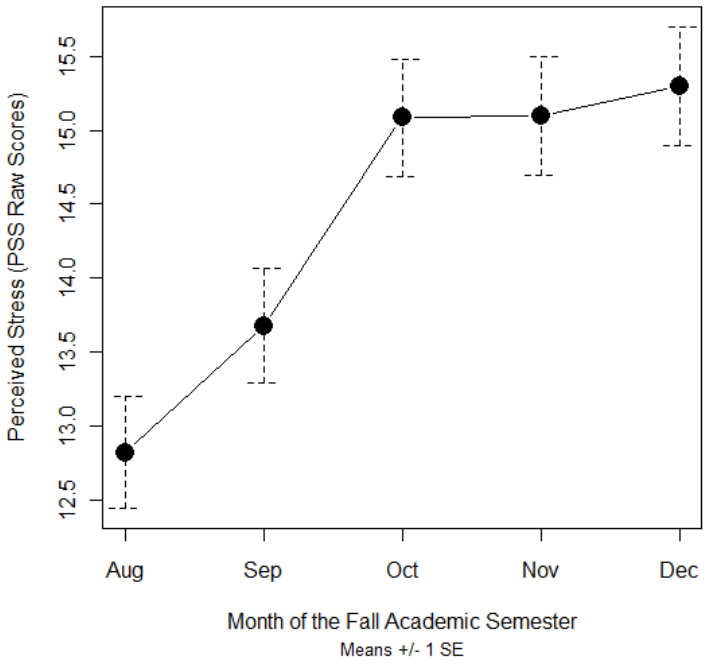


Figure 3.2. Study 1: Pairwise Comparisons of Mean Depressive Symptom Scores.

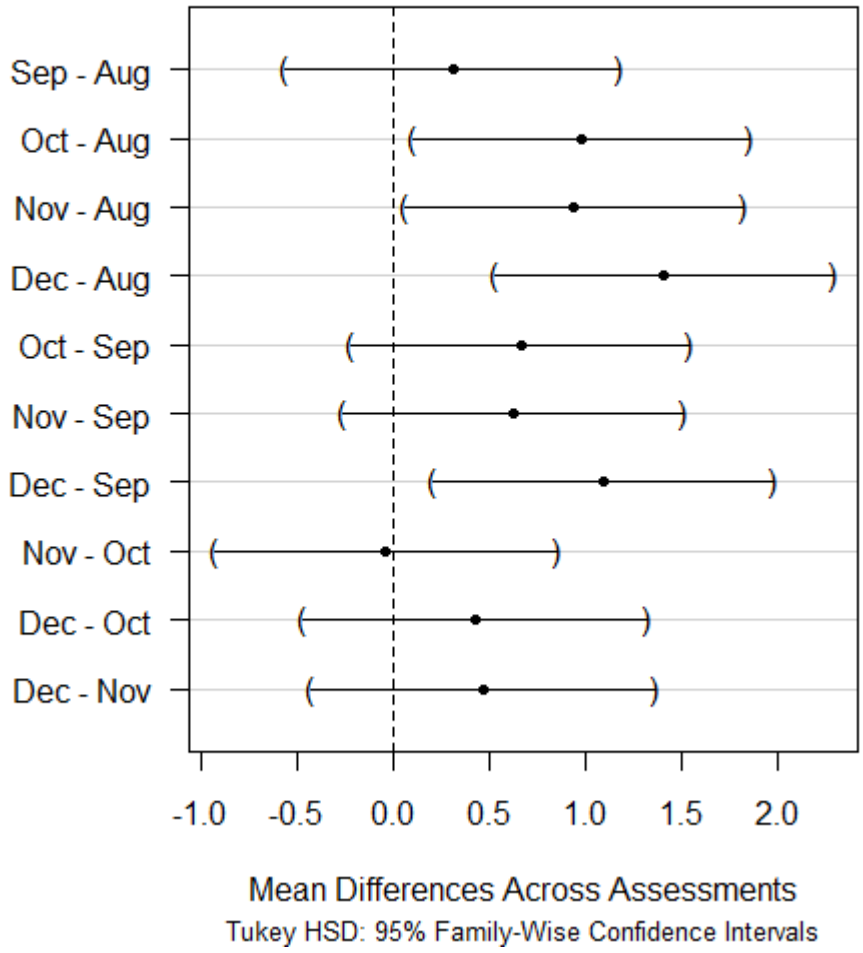


Figure 3.3. Study 1: Pairwise Comparisons of Mean Perceived Stress Scores.

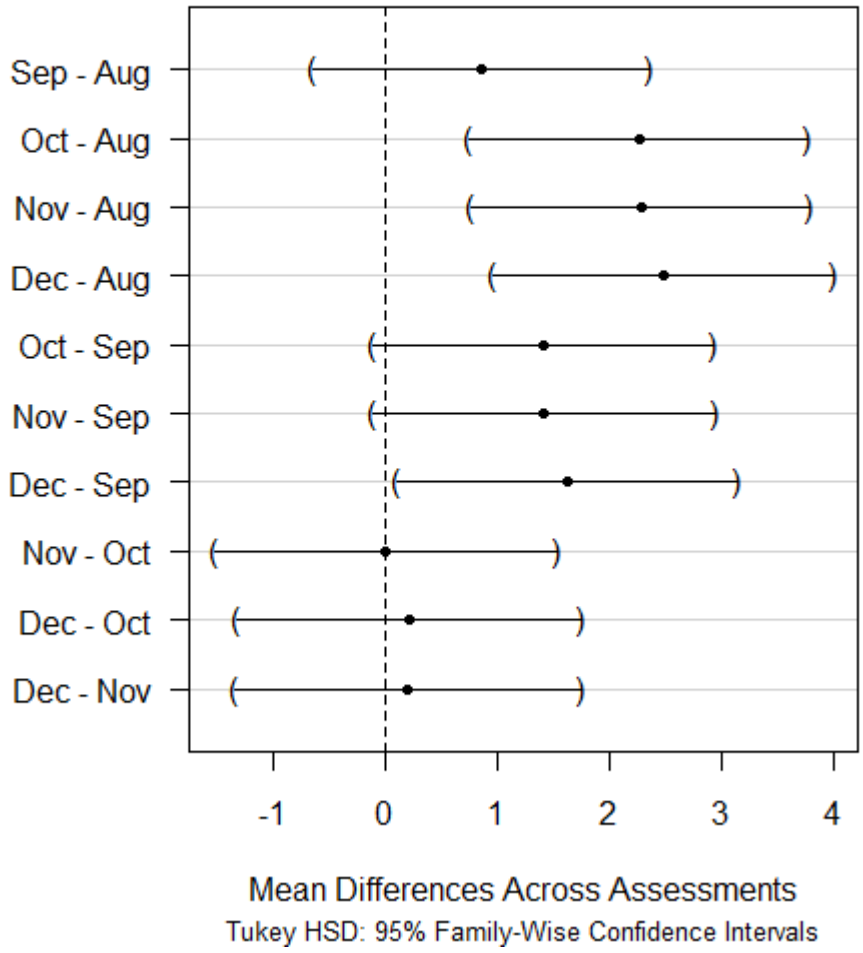


Figure 3.4. Study 1: Latent Growth Curve Model of Depressive Symptoms over Time.

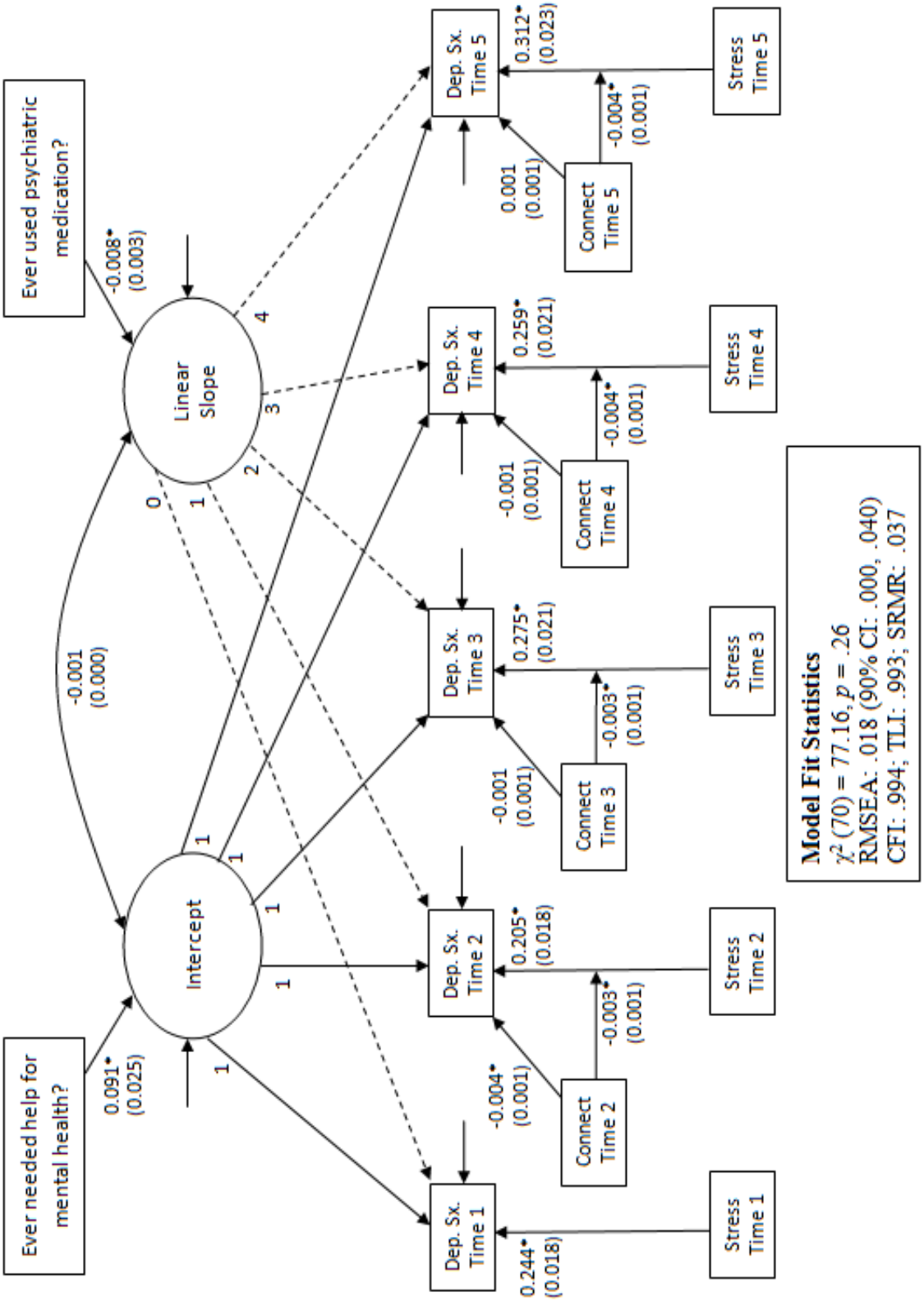


Figure 3.5. Interaction of Perceived Stress & Social Connectedness.

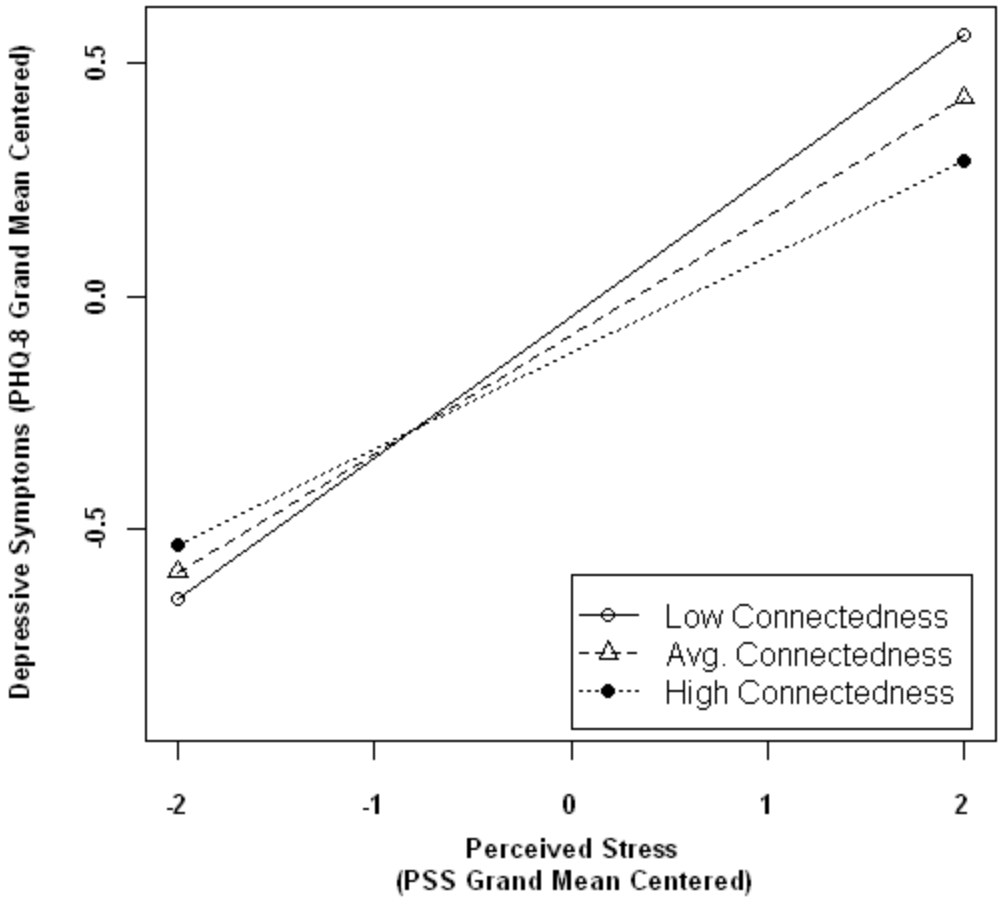


Figure 3.6a. Study 1: Depressive Symptoms by Past Pharmacotherapy Status.

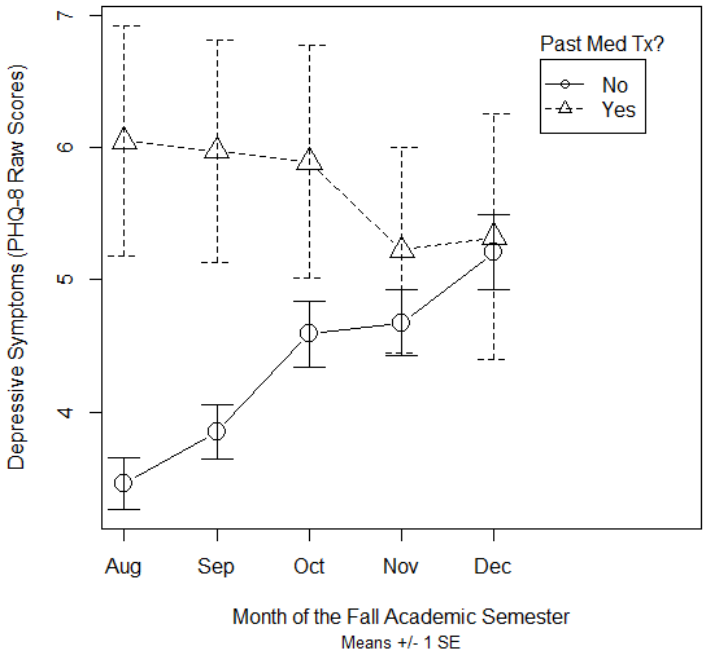
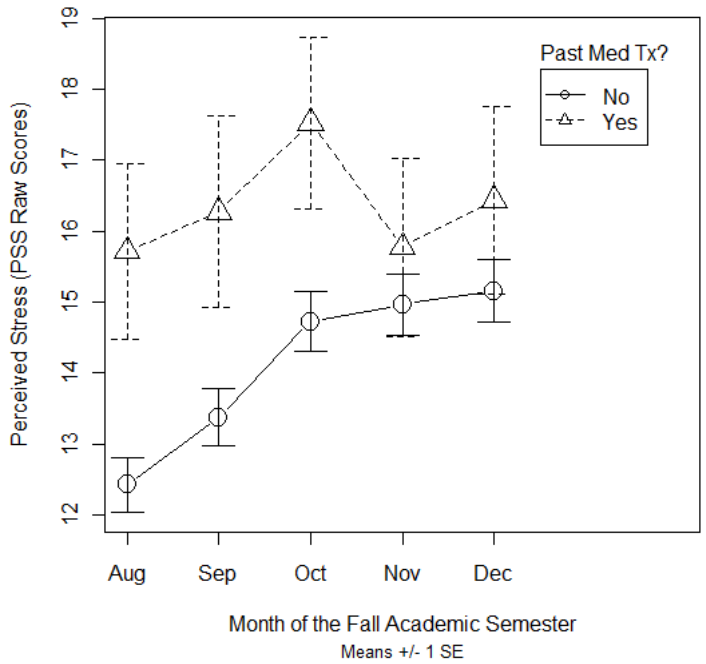


Figure 3.6b. Study 1: Perceived Stress by Past Pharmacotherapy Status.



CHAPTER 4

STUDY 2: AVOIDANCE & DEPRESSIVE SYMPTOMS DURING THE COLLEGE TRANSITION

Purpose

The purpose of Study 2 was to evaluate avoidant behavior as a process that contributes to the development of depressive symptoms during the transition to college. Study 2 was divided into two sub-studies: Study 2a and Study 2b. In Study 2a, we developed and evaluated the psychometric properties of the Avoidant Behaviors Scale (ABS), a time-varying measure of avoidant behavior. We then evaluated the longitudinal relationship between avoidance, using the ABS, and depressive symptoms in Study 2b.

Study 2a

Brief Summary of the Data Set

The findings from Study 2a were based on Data Set 2. Participants (N = 703) were undergraduate students at a large, public university who were enrolled in an introductory psychology subject pool. All students over the age of 18 who were enrolled in introductory psychology were eligible to participate. The majority of participants identified as being female (n = 444; 63%) and White/Caucasian (n = 483; 68%), with a significant minority of students identifying as Asian/Asian American (n = 117; 17%). Nearly all participants were in their freshmen or sophomore year of college (mean age = 18.7). Participants completed a single, web-based assessment comprised of questionnaires measuring depressive symptoms (CES-D), social connectedness (SCS),

social anxiety (SADS), dispositional avoidance (CBAS), avoidant coping style (COPE), and the frequency of avoidant behavior (ABS). For more details about the data collection procedures, participant characteristics, and study measures, please see Chapter 2 of the dissertation and Table 2.3.

Method

Scale Development. The goal of Study 2a was to develop a psychometrically sound instrument for measuring the frequency of avoidant behavior over a discrete period. We used descriptions by behavioral researchers to guide our conceptualization of avoidance (Carvalho & Hopko, 2011; Ferster, 1973; Martell et al., 2001; Ottenbreit & Dobson, 2008; Ottenbreit & Dobson, 2004). The function of avoidant behaviors is to prevent or terminate experiences that cause discomfort or distress. In the context of depression, we expected that avoidance would be most common in situations that held the potential for perceived failure and threat to self-worth. Avoidance can take many forms, including overt behavior (e.g., leaving a party to avoid interactions) or private behavior (e.g., distracting oneself from unpleasant thoughts), and can be active (i.e., taking action to avoid something) or inactive (i.e., sitting passively) in nature. Importantly, we did not assume that all avoidant behavior is maladaptive; rather that avoidance is problematic when its use becomes habitual, precludes contact with environmental reinforcement or the development of important skills, or leads to negative self-appraisals (Beck et al., 1979; Ferster, 1973; Martell et al., 2001).

We took two approaches to developing item content. First, we reviewed literature on the nature of avoidant behavior and its relationship to depression. This helped us develop a sense of the various forms avoidant behavior can take (e.g., social vs. non-

social, active vs. passive) as well as various possible motivations for avoidance (e.g., anxiety, pessimism, distress). We then wrote 38 items that we felt captured a broad range of avoidant behaviors we believed to be common among college students. In doing so, we tried to capture different modes (e.g., cognitive and non-cognitive) and styles (e.g., passive and active) of avoidant behavior. Additionally, we included several items that did not ask about specific avoidant behaviors, but instead asked respondents to indicate the frequency with which they experienced negative consequences as a result of avoidant behavior: e.g., "Regretted having put something off". The items were tailored to be relevant to college students.

All ABS items were negatively worded, with higher levels of endorsement indicating more frequent use of avoidance. We considered including positively worded items which would serve as measures of activation, e.g., "Finished a difficult assignment early." Activation and avoidance are not necessarily antithetical; it is possible for a person to have high levels of both activation and avoidance. Therefore, endorsement of activation items should not lower one's avoidance score. Given that the scale was designed specifically for measuring the frequency of avoidant behavior and other instruments measuring activation exist, we decided not to include activation items. Including only items with negative wording increases the risk that participants will respond in a systematic manner rather than considering the substance of each individual question (Spector, 1992). If this were a significant problem, we would expect many respondents to have little or no variability in their scores across items. We calculated standard deviations for each individual across their ABS item scores and evaluated each

individual's range of responses in order to determine whether there were any extreme cases of invariance in their responses to the ABS items.

Given that we were interested in evaluating avoidance as a time-varying construct, we developed a Likert scale with anchors indicating the approximate frequency with which respondents engaged in each behavior over the previous two weeks. The response scale ranged from "0" to "4"with the following descriptions above the anchor points: "Not in the last two weeks"; "Rarely (once or twice)"; "Fairly often (a few instances)"; "Frequently (many instances)"; and "Very frequently (on most days)". Respondents were instructed to focus only on the previous two weeks and to select the option that best approximates the frequency with which they engaged in the behavior of interest rather than trying to count the number of instances.

We then piloted the scale with a small group of volunteer undergraduate (n = 3) and doctoral (n = 5) psychology students. All of the doctoral students had had experience teaching and/or doing psychotherapy with undergraduate students. Volunteers were asked to indicate if any of the questions were unclear or seemed inapplicable to undergraduate students. Based on feedback from the volunteers, we eliminated five items that they felt were confusing or redundant. Thus, the scale we evaluated in the study had only 33 items.

When evaluating the structure of the ABS, we used a cross-validation approach (Thompson, 2004). This involved dividing our full sample (N = 703) randomly into two subsamples. Using the data from the first subsample—hereafter, referred to as the EFA sample (N = 352)—we conducted an exploratory factor analysis (EFA) in order to evaluate the scale's factor structure without a-priori hypotheses. We then conducted a confirmatory factor analysis (CFA) using the data provided by the second subsample—

hereafter, referred to as the CFA sample (N = 351)—to determine whether the factor structure derived in the EFA was tenable when evaluating data from a separate group of respondents. Combining EFA and CFA in this manner can help increase confidence in the reliability of the determined factor structure (Fabrigar, Wegener, MacCallum, & Strahan, 1999). All EFA and CFA analyses were conducted using Mplus software version 6.1 (Muthén & Muthén, 1998-2010).

Exploratory Factor Analysis. We used the scree plot method and parallel analysis to aid in determining the number of factors to retain in the EFA. Although the scree plot method is superior to other common stopping rules (e.g., retaining all factors with eigenvalues greater than 1), it requires the analyst to use subjective judgment and studies have shown that inter-rater reliability is far from perfect (Zwick & Velicer, 1986). Parallel analysis is less subjective in that the data analyst retains all factors with eigenvalues greater than those drawn from a randomly generated ("parallel") data matrix (Hayton, Allen, & Scarpello, 2004). Parallel analysis has performed better than most other methods of determining factor retention in simulation studies (Fabrigar et al., 1999; Hayton et al., 2004; Zwick & Velicer, 1986). We used the `paran` package in the R software environment (version 2.12.2) to conduct the parallel analysis (Dinno, 2010; R Development Core Team 2011).

Given that the item distributions tended to be positively skewed, we used the MLM estimation method in MPlus. MLM provides the Satorra-Bentler scaled χ^2 statistic (SB-χ^2) rather than the traditional χ^2 measure of model fit, which is prone to bias when the assumption of normality is violated. The Satorra-Bentler correction penalizes the χ^2

estimate of fit based on the degree of kurtosis in the item distributions and is generally robust to normality violations (Kline 2005; Satorra & Bentler 1994).

In addition to the SB-χ^2, we used well-established fit statistics to gauge the quality of the EFA solution, including the Root Mean Squared Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). Unlike the χ^2 statistic, which tests whether the solution is a perfect fit, the RMSEA is a measure of approximate fit with values less than .05 to .06 generally considered indicative of a well fitting model and values less than .08 indicative of reasonable fit (Cudeck & Browne, 1992; Hu & Bentler, 1998). The SRMR is a measure of the discrepancy between the sample and model predicted covariance matrixes, with values less than .08 to .10 generally considered acceptable (Hu & Bentler, 1998; Kline, 2005). We also evaluated the quality of the factors using factor determinacy scores, which represent the correlation between estimated and true factor scores (Muthén & Muthén, 1998-2010). After selecting the factor model, we evaluated the internal consistency of the measured variables for each underlying factor using the Cronbach α internal consistency statistic (Cronbach, 1951).

Given findings from the literature evaluating an existing multidimensional scale of avoidance (Ottenbreit & Dobson, 2004), we anticipated that the ABS's underlying factors would be correlated. Therefore, we used an oblique (promax) factor rotation, which allows factors to be correlated.

Confirmatory Factor Analysis. In order to test whether the factor model derived in the exploratory analyses fit well when applied to the CFA sample's data, we specified a measurement model with the ABS items (observed indicators) regressed on latent factors representing the underlying dimensions recovered in the EFA. Indicators were

regressed only on the factor with which it loaded most strongly in the EFA solution. One factor loading per latent construct was set to 1 for scaling purposes (Kline, 2005). We used MLM estimation in order to minimize bias due to non-normality in the item distributions. In addition to the SB-χ^2, the RMSEA and SRMR described earlier, we used two incremental fit statistics: the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). Including different families of fit statistics can help improve confidence in the viability of the solution (Hu & Bentler, 1998).

To validate our factor structure, we compared our proposed factor model to plausible competing models. In order to determine preference between competing models we used two tools: the Satorra-Bentler χ^2 difference test (T_{RD}) and the Bayes Information Criterion (BIC). The T_{RD} statistic compares the fit of two hierarchically nested models, providing a significance test to see if the reference model is superior to the nested model. The BIC is helpful in model selection because it evaluates the likelihood of the model producing the observed data but imposes a penalty that increases with the number of parameters, thus favoring parsimonious solutions.

Evaluating the validity of the ABS. After establishing the factor structure and reliability of the ABS using EFA and CFA, our next step was to establish convergent validity by evaluating its relationship with established measures. All analyses evaluating the validity of the ABS were based on the full sample (N = 703). We tested for evidence of convergent validity by evaluating the relationships between the ABS factors and the various subscales of the CBAS and COPE scales. We expected significant positive correlations between the ABS subscales and all four subscales of the CBAS. We expected significant positive correlations between ABS scores and the Behavioral Disengagement,

Mental Disengagement, and Denial subscales of the COPE scale, and significant negative correlations with the Active Coping and Planning subscales.

In order to test for evidence of criterion validity, we used structural equation modeling (SEM) to evaluate the relationship between the ABS subscales, social connectedness, social anxiety symptoms, and depressive symptoms. We tested two hypotheses regarding the nature of the relationship between avoidant behavior and the criterion variables.

First, we hypothesized that avoidant behavior would be related to both social connectedness and depressive symptoms and that social connectedness would mediate the relationship between avoidance and depressive symptoms (Criterion Model 1). In testing the mediation model, we estimated the following regression pathways: path *a*, the direct relationship between the predictor variable (SA) and the mediator (social connectedness); path *b* the direct relationship between the mediator and the outcome variable (depressive symptoms); path *c*, the direct relationship between the independent and outcome variables without controlling for the mediator; path *c*', the relationship between the independent and outcome variables while controlling for the mediator; and path *ab*, the indirect effect of the independent variable on the outcome variable through the mediator. SEM allows for simultaneous estimation of all paths. We estimated standard errors in the mediation model using 5000 bootstrap samples. The bootstrap method results in more accurate estimates of the standard error of the mediated effect (MacKinnon, Lockwood, & Williams, 2004).

Second, we predicted that there would be a direct relationship between avoidance and depressive symptoms even when accounting for the relationship between avoidance

and social anxiety symptoms and the relationship between social anxiety symptoms and depressive symptoms (Criterion Model 2). The purpose of this model was to demonstrate that the relationship between avoidance and depressive symptoms is not entirely attributable to social anxiety.

Overview of Study 2a Results

The following points provide an overview of the main findings from our analyses. A detailed description of the study results follows:

- A three-factor solution emerged from exploratory and confirmatory factor analyses of the Avoidant Behaviors Scale with the following factors: Task Avoidance, Social Avoidance, and Problem Solving Avoidance.
- We found evidence of convergent validity: The Avoidant Behaviors Scale factors correlated in expected directions with subscales from the Cognitive-Behavioral Avoidance Scale and the COPE scale.
- We found mixed support for criterion validity hypotheses: There was a positive relationship between Problem Solving Avoidance and depressive symptoms; there was an indirect effect of Social Avoidance on depressive symptoms through social connectedness; the relationship between Task Avoidance and depressive symptoms was not significant.
- There were significant positive associations between Task Avoidance and depressive symptoms and between Social Avoidance and depressive symptoms even when accounting for associations with social anxiety symptoms.

Detailed Description of Study 2a Results

Descriptive Analyses. As noted, the distributions of the ABS items tended to be positively skewed with respondents reporting low frequencies of most avoidant behaviors. Four participants (0.57%), one from the EFA sample and three from the CFA sample, had no variability in their responses across items. We reran all analyses excluding these suspicious cases but found that they had no substantive impact on our findings. The results reported here include these four cases.

Exploratory Factor Analysis. The results of the parallel analysis showed that the eigenvalues for the first three factors drawn from the EFA sample data were larger than the parallel eigenvalues drawn from the simulated data matrix, suggesting that a three-factor solution was best. This finding was at odds with our interpretation of the scree plot, which appeared to suggest a four-factor solution (see Figure 4.1). We chose to evaluate both the three- and four-factor EFA models and select the solution with the most interpretable factor structure.

Consistent with the results of the parallel analysis, the three-factor EFA yielded what we believed to be the most highly interpretable solution. The three emerging factors were consistent with existing theories and research about the nature of avoidance. As expected, the SB-χ^2 fit statistic was significant, indicating a less than perfect solution, SB-χ^2 (432) = 815.67, $p < .001$. However, the other fit indices suggested that the three-factor solution was a reasonably good fit to the data: RMSEA = .050[4] and SRMR = .044. The factor determinacy scores for the three factors all exceeded 0.90 (ranging from .94 to

[4] MPlus version 6.1 does not provide confidence intervals for the RMSEA estimate when using MLM estimation in EFA analyses.

.96) suggesting good correspondence between estimated and true factor scores. See Table 4.1 for a summary of the 33-item solution.

Among items loading most strongly on the first factor, there was a consistent theme related to procrastinating and avoiding unpleasant or challenging responsibilities. We will refer to this factor as "Task Avoidance" (TA) throughout this paper. None of the items loading on the TA factor involved avoidance of social situations. Although most of the TA items could best be classified as passive avoidance, a couple of items were clear examples of active avoidance (e.g., "Avoided stressful assignments by working on something less important"). Items describing both cognitively and behaviorally-based avoidance strategies loaded strongly on TA.

Nearly all items loading on the second factor involved avoiding situations involving interaction with others. An exception was the item "Worked extra hours to avoid dealing with a problem." The nature of the problem being avoided in this question is ambiguous and could be social or non-social. Those endorsing these items likely expect negative outcomes in social situations, a hallmark characteristic of individuals with social anxiety. All items in this factor were behaviorally-based, rather than cognitively-based, forms of avoidance. We will refer to this factor as "Social Avoidance" (SA) throughout this paper.

The emerging theme from the third factor, which we will refer to as Problem Solving Avoidance (PSA), was avoidance of actions aimed at resolving or ameliorating existing problems. Several of the items in the PSA factor involve avoidance of social confrontation (e.g., "Avoided someone because you though s/he was upset with you") while others described avoidance of internal conflict (e.g., "Tried to convince yourself a

bad situation was okay when it really wasn't"). Of note, an item meant to capture ruminative responses to conflict, "Kept thinking about something bad that happened rather than doing something to make the situation better," loaded strongly on this factor. This is consistent with behavioral theories of depression that conceptualize rumination as an avoidance strategy in which the individual wallows in negative thoughts and emotions rather than confronting problems in an active manner (Martell et al., 2001). This factor also contained items consistent with experiential avoidance in that they involve avoidance of cognitive experiences likely to elicit strong negative emotions (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996).

In order to test whether the three-factor model was stable and to reduce the number of items in the scale, we ran two additional iterations of the three-factor EFA after removing items with the following suboptimal properties: communalities below .40 (i.e., high residual variances), low factor loadings (< .32) on all factors, and cross-loadings (> .31 on more than 1 factor). This resulted in a reduced model with 15 items[5] (see Table 4.2). The factor structure obtained in the initial 33-item EFA remained apparent even after removing suboptimal items; however, it is notable that the four items remaining in the PSA factor all involved cognitive avoidance strategies. The reduced model had fit statistics comparable to those obtained in the 33-item solution: SB-χ^2 (63) = 111.31, $p < .001$; RMSEA = .047; SRMR = .030. The factor determinacy scores for the reduced model were .94, .93, and .91 for the TA, SA, and PSA factors, respectively. All three factors had adequate internal consistency (α_{TA} = .88, α_{SA} =.82, & α_{PSA} =.80). The 15-item version of the ABS is available as an appendix.

[5] We retained three items in the 15-item solution that had communalities below .40 but otherwise had strong psychometric properties.

Confirmatory Factor Analysis. We next evaluated the viability of the 15-item, three-factor solution within a CFA framework (CFA Model 1). Using the data provided by the CFA sample (n = 351) we specified a measurement model using MLM estimation in which the three avoidance dimensions were treated as reflective latent factors and the 15 ABS items as indicators of these factors (see Figure 4.2). Given the strong relationship between the avoidance factors in the EFA, we estimated all possible correlations between the three latent factors.

As expected given the rigidity of the hypothesis, the scaled χ^2 test of model fit was significant, SB-χ^2 (87) = 160.91, $p < .001$, suggesting that the model was not a perfect fit. However, the other fit statistics suggested that the model fit the data reasonably well. The RMSEA statistic was essentially equal to the commonly used cutoff for close fit with a confidence interval falling within the range of reasonable fit (RMSEA = .049, 90% CI: .037, 0.61). Both incremental fit indices exceeded .90 (CFI = .952 and TLI = .942) and the SRMR (.051) was below conventional cutoff values indicating close fit.

We then compared CFA Model 1 to three plausible alternative models with competing conceptualizations of the factor structure. The first comparison model (CFA Model 2) had a single latent factor and was used to test whether our preferred three-factor solution was superior to a unidimensional model. Given the strong correlation between SA and PSA in both samples and the fact that several variables in the 33-item EFA solution loaded strongly on both factors, we specified a competing two-factor solution with the SA and PSA combined into a single factor (CFA Model 3). Finally, we compared CFA Model 1 to a nearly identical three-factor model but with factor

correlations fixed to 0 (CFA Model 4). CFA Model 1 was superior when compared to all the three competing models with T_{RD} statistics ranging from 62.01 and 366.38 and all *p* values < .001 (see Table 4.3).

Construct & Criterion Validity. To demonstrate convergent validity, we evaluated the relationship between the subscales of the ABS and the subscales of the CBAS and COPE. We specified measurement models in which the three ABS factors were correlated with the four CBAS factors (RMSEA = .035; CFI = .92; TFI = .92; SRMR = .05) and the five COPE factors (RMSEA = .029; CFI = .96; TFI = .96; SRMR = .04). As predicted, there were significant positive correlations between all ABS and CBAS factors (*r*s ranging from .33 to .84). The ABS factors were positively correlated with the Denial, Mental Disengagement and Behavioral Disengagement subscales of the COPE (*r*s ranging from .26 to .76), and negatively correlated with Active Coping and Planning, with *r*s ranging from -.32 to -.52 (see Table 4.4).

Next, we tested our hypotheses that higher levels of avoidant behavior would predict higher levels of depressive symptoms and that social connectedness would mediate the relationship between SA and depressive symptoms (Criterion Model 1). We specified an SEM model in which TA and PSA had direct effects on depressive symptoms and SA had an indirect effect through social connectedness (see Figure 4.3). The model was a reasonably good fit to the data (RMSEA = .040, 90% CI: .038 to .042). As predicted, PSA was a significant predictor of depressive symptoms (*b* = 0.68, *SE* = 0.07). Contrary to our prediction, TA was not a significant predictor of depressive symptoms in this model (*b* = -0.03, *SE* = 0.03). The direct effects of SA on social connectedness (path *a* in the mediation model) and social connectedness on depressive

symptoms (path *b* in the mediation model) were significant: *b* = -0.76, *SE* = 0.07 and *b* = -0.23, *SE* = 0.03, respectively. When controlling for the effect of the mediator, the relationship between SA and depressive symptoms was not significant (path *c*': *b* = -0.11, *SE* = 0.10). However, the indirect effect of SA on depressive symptoms through social connectedness (path *ab*) was significant (*b* = 0.18, *SE* = 0.03).

Finally, we specified an SEM model to test whether there was a direct relationship between the three avoidance factors and depressive symptoms, independent of their relationship with social anxiety (Criterion Model 2). In this model, we regressed depressive symptoms (an endogenous factor) on the three avoidance subscales (exogenous factors) while allowing both depressive symptoms and the avoidance factors to correlate with social anxiety symptoms (SADS). Given that the SADS indicators were binary, we used robust weighted least squares estimation (WLSMV) to compute model parameters. The model fit reasonably well (RMSEA = .033; CFI & TLI > .90). Social anxiety was correlated significantly with depressive symptoms (*b* = 0.07, *SE* = 0.01) and the avoidance factors ($b_{\text{TA-SADS}}$ = 0.16, *SE* = 0.03; $b_{\text{SA-SADS}}$ = 0.28, *SE* = 0.03; $b_{\text{PSA-SADS}}$ = 0.22, *SE* = 0.03). The direct effects of SA and PSA on depressive symptoms were significant when accounting for the correlations with social anxiety: *b* = 0.12, *SE* = 0.05 and *b* = 0.60, *SE* = 0.07, respectively. TA, however, was not a significant predictor of depressive symptoms in this model: *b* = -0.05, *SE* = 0.03 (see Figure 4.4).

Study 2a Summary

Taken together, the findings from Study 2a provided support for a three-factor model of avoidance as measured by the ABS. The emerging factors—Task Avoidance (TA), Social Avoidance (SA), and Problem Solving Avoidance (PSA)—were consistent

with constructs described in the existing literature. The ABS factors correlated in the expected direction with subscales from two established, trait-like measures of avoidant tendencies (evidence of convergent validity). The SA and PSA factors were significantly related to depressive symptoms (concurrent validity) even when controlling for the effects social anxiety symptoms. Additionally, social connectedness mediated the effect of SA and depressive symptoms, which was consistent with our hypothesis that one mechanism connecting avoidance and depressive symptoms is the impediment of strong social bonds. Contrary to our hypotheses, there was little evidence that TA was related to depressive symptoms. It is plausible that the avoidance of tasks and responsibilities does not confer risk for depression. However, an alternative explanation is that TA may only have an impact on depressive symptoms in the presence of stressful life events; a hypothesis that we explored in Study 2b.

Study 2b

Purpose & Hypotheses

The purpose of Study 2b was to evaluate the relationship between avoidance, as measured by the ABS, and depressive symptoms in a longitudinal study. Although a compelling factor structure emerged and the ABS subscales were related to scales measuring similar constructs, longitudinal research was necessary to support our core hypotheses regarding the nature of avoidance. In this study, we tested the following hypotheses: (1) that those endorsing dysfunctional cognitions would report more frequent avoidant behaviors over time; (2) that the frequency of avoidant behaviors would increase during times of high stress; (3) that the frequency of avoidant behavior would be related to depressive symptoms over time even when controlling for stress and dysfunctional

attitudes; (4) that the relationship between avoidance and depressive symptoms would be strongest in the presence of stress; and (5) that there would be an indirect effect of social avoidance in the early weeks of the semester on depressive symptoms later in the semester through social connectedness; that is, avoidant behavior early in the semester would preclude the development of social bonds and increase risk for depressive symptoms.

Brief Description of the Data Set

This study used Data Set 3 which is comprised of data from 82 first-semester students (41 freshmen and 41 transfer students). Participants completed online assessments eight times (two during each of the four months of the semester) during their first semester at a large, mid-western university. The first assessment took place during the second week of the semester (September) and the final assessment took place during week 15 (December). Participants completed measures of depressive symptoms (CES-D), avoidance (ABS), and stress (PSS) at each assessment, and a measure of social connectedness (SCS) at four of the eight assessments (once per month). A complete description of Data Set 3 is available in Chapter 2 and Table 2.4 provides a summary of participant characteristics.

Method

Statistical Analyses. In order to gauge the amount of within-individual variability in ABS scores over time, we calculated a ratio of the mean within-subject standard deviation score (SD_{within}) to the mean between-subject standard deviation score ($SD_{between}$) for each ABS factor (Nesselroade & Salthouse, 2004). Additionally, we

calculated the range in ABS scores over time for each individual and compared the average within-subject range scores to the $SD_{between}$ scores for each factor.

For our primary analyses, we used linear mixed-effects modeling (LMM) to evaluate (1) the course and predictors of avoidance (TA, SA, & PSA) over time, and (2) the impact of the ABS factors and other covariates (i.e., dysfunctional attitudes, stress and social connectedness) on depressive symptoms over time. We conducted LMM analyses using the `nlme` package in the R software environment (Pinheiro, Bates, DebRoy, & Sarkar, 2010; R Development Core Team 2011). Estimates of model parameters were calculated using restricted maximum likelihood (REML) estimation. The covariance matrix used for the random effects in these analyses was unstructured, meaning that variances and covariances of the random effects were estimated simultaneously. There was a two-level nesting structure for the study data, with longitudinal measurement occasions (level 1) nested within individual participants (level 2). We applied power transformations (e.g., square root & natural log) to all covariates in order to better approximate normality and centered all covariates to minimize the impact of multicollinearity.

We used the "Top-Down" strategy to building statistical models (West, Welch, & Galecki, 2007, p. 43). In this approach, the analyst begins by creating a complex model with all covariates of interest included in order to capture as much systematic variability in the dependent variable as possible. The analyst then selects random effects to be included in the model. Next, a structure for the residual covariance matrix is selected. Finally, the model is reduced in a systematic manner by dropping fixed effects that are not making a significant contribution. We determined preference between competing

models using likelihood ratio tests, which compare the likelihood functions of hierarchically nested models using a χ^2 test. We also used the Akaike Information Criterion (AIC) and Bayes Information Criterion (BIC) to aid in determining preference between competing models. The AIC and BIC evaluate the likelihood of the model producing the observed data but favor parsimony by imposing penalties that increase with the number of parameters. *F* and *t* tests were used to test the significance of individual fixed effects parameters. We used graphical procedures (e.g., quantile-quantile plots and box plots) to evaluate the tenability of model assumptions regarding the distribution of residuals and random effects.

In order to test whether dysfunctional attitudes and stress were significant predictors of avoidant behavior over time, we ran three separate sets of LMM analyses with TA, SA, and PSA as dependent variables. Given that there were two significance tests of primary interest for each of these three sets of analyses, we used conservative *p* values ($\alpha = .05/6 = .008$) when evaluating whether PSS and DAS were significant predictors of avoidance. We used conventional cutoffs for significance in the behavioral sciences literature ($\alpha = .05$) when evaluating the impact of other covariates on depressive symptoms.

In order to evaluate longitudinal mediation effect specified in hypothesis 5, we built an autoregressive (AR) path model using Mplus 6.1 Software (Muthén & Muthén, 1998-2010). The AR model allows the analyst to specify various contemporaneous and longitudinal mediation pathways (MacKinnon, 2008). Each mediation effect contains the following: (1) direct effect of the independent variable on the mediator (path *a*); (2) the direct effect of the mediator on the outcome variable (path *b*); the direct effect of the

independent variable on the outcome variable controlling for the mediator (path *c'*), and the indirect effect of the independent variable on the outcome variable through the mediator (path *ab*). For the purposes of this study we modeled three separate mediation pathways related to hypothesis 5. The first evaluated the impact of SA at time 1 on depressive symptoms at time 3 through social connectedness at time 3 (Mediation Effect 1). The second evaluated the impact of SA at time 3 on depressive symptoms at time 5 through social connectedness at time 5 (Mediation Effect 2). Finally, we estimated the indirect effect of SA at time 1 on depressive symptoms at time 5 through social connectedness at time 3 (Mediation Effect 3). Mplus allows the user to evaluate all pathways simultaneously. Confidence intervals for mediated effects were calculated using 2000 bootstrap samples.

We used the online interaction utilities described in Preacher et al. (2006) in order to probe the nature of significant two-way interactions. The online utilities use R software (R Development Core Team 2011) to calculate simple slopes of the DV on the IV at multiple levels of the moderator, and provide "regions of significance," or cutoff points, identifying the specific levels of the moderator at which the slope of the DV on the IV is significant.

Overview of Study 2b Results

The following points provide an overview of the main findings from our analyses. A detailed description of the study results follows:

- Students reporting high levels of dysfunctional attitudes at the first assessment reported more avoidant behavior over the course of the semester compared to students reporting low levels of baseline dysfunctional attitudes.

- Students reported higher levels of avoidance during times of high stress.
- The relationship between Task Avoidance and depressive symptoms was strongest in presence of high stress; but the relationship between Problem Solving Avoidance and depressive symptoms was strongest at low levels of stress.
- There is an indirect effect of Social Avoidance on later depressive symptoms through social connectedness.

Detailed Description of Study 2b Results

Descriptive statistics for the study measures can be found in Table 4.5. There was a considerably amount of within-individual variability in ABS scores over time, with SD_{within} scores larger than 50% of the $SD_{between}$ scores for all three factors (range 53% to 58%). The mean range of ABS scores within individuals was equal to approximately 1.5 SDs for each of the ABS factors (range 1.40 to 1.55). Participants endorsed TA far more frequently than SA or PSA throughout the semester.

Avoidance Trends. There was a significant quadratic effect of time for the SA and PSA factors over the course of the study, $t(518) = 2.84$, $p < .01$ and $t(518) = -2.39$, $p < .05$, respectively. The mean SA score declined considerably during the first month of the semester and stabilized during the middle of the semester. For PSA, the quadratic effect reflects a pattern of initially increasing scores reaching a peak during the middle of the semester and then declining during the latter half of the semester. There was a near significant quadratic effect of time for TA with scores increasing and peaking at mid-semester and then declining toward the end of the semester, $t(518) = -1.88$, $p = .06$ (see Figure 4.5). In all cases, allowing intercept and slope terms to vary across individuals

improved model fit. We included a linear random slope term in models predicting PSA and SA and both linear and quadratic growth terms when predicting TA (see Tables 4.6-4.8).

Predictors of Avoidance. Both stress and dysfunctional attitudes were significant, positive predictors of all three ABS factors, even when controlling for each other's effects and the effects of time. In all three sets of analyses, we first fit a model with a well-specified mean structure and reduced the model using the Top-Down strategy described in the method section. The initial model with all covariates of interest specified and the final (reduced) model for all three sets of analyses are summarized in tables 4.6-4.8. Students reporting high levels of baseline dysfunctional attitudes reported higher levels of TA [$t(78) = 3.10$, $p = .003$], SA [$t(77) = 3.31$, $p = .001$], and PSA [$t(77) = 3.41$, $p = .001$] over the course of the semester. Stress was positively related to TA [$t(518) = 12.55$, $p < .001$], SA [$t(518) = 6.43$, $p < .001$], and PSA [$t(78) = 13.01$, $p < .001$]. There was no evidence from our models that the strength of the relationships between dysfunctional attitudes, stress, and the ABS factors changed over time; all interactions with *Time* (i.e., week of the academic semester) were not significant. Interestingly, men reported higher levels of both SA [$t(77) = 2.98$, $p = .004$] and PSA [$t(77) = 3.36$, $p = .001$] over time.

Predictors of Depressive Symptoms. Using the Top-Down modeling strategy, our initial model evaluated the time-varying, fixed effects of time, stress, social connectedness, the three avoidance factors (TA, SA, and PSA), and their interactions. We also controlled for demographic characteristic (i.e., sex, race, age, and international/domestic student status) in the initial model. A summary of the initial and

final models with depressive symptoms as the dependent variable can be found in Table 4.9. Depressive symptoms tended to decrease over the course of the study in a linear fashion but there was no significant time effect, [$t(430) = -0.86$, $p < .39$]. Allowing symptom trajectories to vary randomly across participants over time significantly improved model fit, [χ^2 (2) = 7.97, $p = .01$]. There was a significant positive relationship between stress and depressive symptoms [$t(430) = 11.36$, $p < .001$] and a significant negative relationship between social connectedness and depressive symptoms [$t(430) = -4.08$, $p < .001$]. There was a significant main effect of SA, with higher levels of SA corresponding to higher depressive symptoms: [$t(430) = 5.15$, $p < .001$]. The effect of PSA on depressive symptoms was moderated by stress, [$t(430) = -3.80$, $p < .001$], with the relationship between PSA and depressive symptoms strongest in the presence of low levels of stress (see Figure 4.6a). The effect of TA on depressive symptoms was also moderated by stress, [$t(430) = 3.04$, $p = .003$], with the relationship between TA and depressive symptoms strongest in the presence of high levels of stress (see Figure 4.6b). Dysfunctional attitudes were not a significant predictor of depressive symptoms in our final model, [$t(78) = -0.31$, $p = .761$].

With regard to the mediation models, we only found support for Mediation Effect 1 (see Figure 4.7). There was an indirect effect of SA at time 1 (week 2 of the semester) on depressive symptoms at time 3 (week 6) through social connectedness at time 3, $b = -0.71$, $SE = 0.28$, $p = .01$. This suggests that students who were socially avoidant in the early weeks of the academic semester reported higher depressive symptoms by the second month of the semester and that this effect may be (at least partly) attributable to lower levels of social connectedness. We did not find support for Mediation Model 2,

suggesting that social avoidance during the second month of the semester did not lead to an indirect effect on depressive symptoms during the third month of the semester: b = -0.16, SE = 0.16, p = .31. We also did not find evidence for a more distal indirect link between social avoidance in the first month of the semester and depressive symptoms in month 3: b = -0.17, SE = 0.19, p = .37.

Study 2b Summary

The findings from Study 2 generally supported our conceptualization of avoidance as a time-varying construct which posits risk for depressive symptoms. As expected given our conceptualization of avoidance as a time-varying construct, there was considerable variability in individual ABS scores over time. On average, individuals had a range of scores on the ABS subscales over time that was equal to approximately 1.5 times the between subject SDs. There were significant changes in the mean levels of all three avoidance dimensions over time. Trends in the avoidance dimensions appeared to be better summarized by quadratic growth functions than linear growth functions.

Consistent with hypothesis 1, participants reporting high levels of dysfunctional attitudes at the outset of the study reported greater frequencies of avoidance over time. Those reporting more stress over the course of the semester reported greater frequencies of all three forms of avoidant behavior, as predicted in hypothesis 2. We found mixed support for hypothesis 3: There was a significant main effect of SA on depressive symptoms, but the effects of both TA and PSA were moderated by stress. TA was only a significant predictor in the presence of moderate to high levels of stress. We were surprised to find that the effect of PSA on depressive symptoms was significant at low and moderate, but not high, levels of stress. We explored possible explanations for this

finding below. Finally, we found only partial support for hypothesis 5. There was a significant indirect relationship of SA during the initial weeks of the semester on depressive symptoms during the second month of the semester through month 2 social connectedness; however, we did not find support for indirect links between SA and depressive symptoms at later points in the semester.

Study 2 General Discussion

The findings from studies 1 and 2 provided preliminary evidence that the ABS is a valid and useful instrument in longitudinal studies evaluating the development of depressive symptoms. This instrument could help facilitate research evaluating behavioral theories of depression.

It is important to clarify the intended use of the ABS and how it differs from similar instruments. The ABS was intended to be used in etiological studies evaluating proximal processes that contribute to the onset and maintenance of depressive symptoms. In contrast, dispositional avoidance measures, like the CBAS, aid researchers in identifying individuals with stable traits that increase risk for depression. Ideally, longitudinal research evaluating the relationship between avoidance and depression would use the CBAS and ABS as complementary instruments, with the CBAS identifying at-risk individuals and the ABS measuring fluctuations in the expression of this risk factor. There is also an important distinction between the ABS and BADS. The BADS was developed to measure progress of behavioral therapies targeting processes linked to depression, like avoidance and activation. The ABS was not designed, and should not be used, for this purpose.

The relationship between avoidance and depression is not direct in behavioral activation models; rather, avoidance is related to depression via its impact on levels of activation and reinforcement. Thus, studies evaluating the relationship between the ABS and depressive symptoms should also include measures of reinforcement, like the Environmental Reward Observation Scale (EROS). Consistent with diathesis-stress framework, we would also recommend using the ABS in conjunction with a measure of stress.

Limitations

Study Design. The findings from this study should be interpreted within the context of several important limitations. First, both studies relied on undergraduate convenience samples, limiting our confidence that the findings would generalize to larger populations. Second, the studies used only self-report rating scales, which have well-established limitations. Third, in Study 2, we made the assumption that changes in ABS scores over time at least partly reflected true variability in the frequency of avoidant behavior; but our analyses could not distinguish between true variability and variability due to measurement error.

Scale Design. Measuring key constructs in behavioral activation models is quite challenging. One of the major challenges is that the same behaviors can have very different functions and consequences across individuals and contexts (Manos et al., 2010). For example, putting off a major assignment in favor of watching a movie could be a maladaptive strategy in some circumstances (i.e., when the function is to avoid the challenge) or it could be a useful strategy (e.g., as a reward for completing other important activities). The ABS, like most self-report instruments, cannot account for

functional differences across individuals and contexts. Activity/mood logs using experience sampling could provide a more in-depth, personalized assessment of the function of behaviors, and are better suited to precise temporal analysis of the relationship between avoidance, reinforcement, and mood for individual respondents. However, such methodologies are expensive, time-consuming, and difficult to use in large etiological studies. The ABS could be a useful alternative for researchers in evaluating the overall relationship between use of common avoidance strategies and other processes related to depression.

There is reason to question how accurately self-report instruments can capture avoidant behavior. Making inferences about the function of behavior (as required by several of the ABS items)—even one's own behavior—may be difficult. It is likely that individuals engage in behaviors whose function is to avoid unpleasant experiences but are not consciously aware that they are doing so. Additionally, there is evidence that self-report instruments do a poor job of distinguishing between avoidant behavior and distress (Gamez, Kotov, & Watson, 2010). The latter two limitations underscore the importance of verifying that fluctuations in ABS scores coincide with changes in other measures of avoidant behavior (e.g., observation or daily behavior logs). Finally, the ABS captures only a handful of the infinite population of behaviors that could function as avoidance, so it is plausible that respondents could score low on the ABS but use avoidance strategies frequently.

Despite these limitations, we believe the ABS could be a useful instrument. The goal of the ABS was to get a general sense of the frequency with which individuals used behaviors that likely function as avoidance over a discrete time period. It was promising

that we obtained evidence of convergent and criterion validity using well-established self-report measures in two separate studies.

Future Directions

The studies described in this manuscript provided only preliminary support for the ABS. Developing a sound instrument typically requires several iterations of testing and refinement (Clark & Watson, 1995). We are in the process of modifying the scale to improve its psychometric properties and to ensure that it adequately represents the constructs of interest. We outline several important priorities for future research below that would help confirm the validity of the ABS, and our general conceptualization of the relationship between avoidance and depression.

Refining the ABS. The first priority for future research is to improve the scale itself. We are particularly concerned that the wording of the items in the TA factor are imprecise, obscuring the nature of the latent construct. Unlike SA and PSA, the unifying theme of TA is the domain in which the avoidance occurs, but the function of the avoidant behaviors in this factor is unclear. Procrastination is a heterogeneous construct that can be driven by many different processes (Lay, 1987). We believe that some processes that lead to procrastination are more relevant to the study of depression than others. Lay (1987) makes an important distinction between pessimistic procrastinators, who feel burdened by responsibilities and doubt their ability to perform them well, and optimistic procrastinators, who are confident in their ability to complete the task at hand but put them off for other reasons (e.g., trouble delaying gratification). We are most interested in the former group. Consistent with CB theories, we believe that people prone to depression frequently avoid challenging tasks and responsibilities because of

pessimistic expectations about the outcomes of these behaviors. The function of procrastination for these individuals may be to avoid substantiating underlying feelings of inadequacy with a poor performance. In its current form, the TA factor fails to capture the motivation for avoidance and thus fails to distinguish between optimistic and pessimistic procrastinators[6]. This may contribute to the fact that TA was only a significant predictor of depressive symptoms in the presence of stress. An additional problem with the TA factor is that it does not distinguish between pessimistic avoidance and avoidance that is secondary to depressive symptoms, like fatigue or anhedonia.

Additionally we plan to expand the PSA subscale by adding more items related to experiential avoidance and rumination. We are interested to know whether these two forms of avoidance will continue to load on the same factor or whether separate factors will emerge with the addition of new items. We also plan to add items capturing avoidance strategies that were not present in our initial evaluation of the scale (e.g., substance use as a method of escape).

Evaluating the Validity of the ABS. A priority for future research is to evaluate whether the ABS is valid and useful across different populations and contexts. Studies should evaluate whether the factor structure is invariant across various demographic characteristics (e.g., sex and ethnicity) and whether the magnitude of the relationship between the ABS and criterion variables (e.g., depressive symptoms) is consistent across different populations. A related priority should be to test whether the ABS factor structure is stable over repeated time assessments. It will be particularly important to evaluate the ABS in samples at elevated risk for depression, including those who have

[6] It is noteworthy that dysfunctional attitudes predicted greater frequency of task avoidance, suggesting that TA is likely capturing some degree of pessimistic procrastination.

had previous depressive episodes but are in recovery, and those who have never had a depressive episode. Such studies would enable us to gain a better understanding of the role avoidance plays in the onset and maintenance of depressive episodes.

Another objective for future research should be to test our assumption that measuring fluctuations in the frequency of avoidance provides meaningful information above dispositional measures of avoidance. It is possible that the ABS is simply a proxy measure of dispositional avoidance. If this were the case, it would be more efficient to have only a single administration of a dispositional measure and not include a measure of variability over time. This seems unlikely to us given the amount of within-individual variability in ABS scores over time. Longitudinal studies including both the CBAS and ABS could help address this question explicitly.

Evaluating the Nature of Avoidance. An important objective for researchers studying behavioral theories of depression will be to clarify the mechanisms linking activation, avoidance, and depressive mood states. It is unclear at the moment whether levels of avoidance and activation make unique contributions to the development of symptoms, or whether avoidance increases risk only indirectly through its impact on levels of activation and positive reinforcement. As previously noted, one could theoretically have high levels of avoidance and activation. For example, an individual may frequently avoid specific experiences (e.g., troubling thoughts) but may also be a very active and goal oriented person in other domains of life. Would avoidance in this one domain be damaging despite high levels of activation, or does avoidance need to be pervasive in order to confer risk? Behaviorists emphasize that the relationship between avoidance and depression is attributable to diminished contact with positive reinforcers

(Carvalho & Hopko, 2011). However, it is important to consider the role of cognitive mechanisms. For example, a person may interpret the very act of avoidance as a failure, reinforcing painful underlying beliefs (e.g., "I am a coward."). This process may be sufficient to induce an enduring depressive mood state. Thus, the priming of poignant schema may also contribute to the relationship between avoidance and depression. Using the ABS in combination with measures of activation, positive reinforcement, and cognitive style could help shed light on mechanisms linking avoidance and depression.

Future research should also evaluate higher level constructs that may contribute to frequent use of avoidant strategies. In our studies, we found that dysfunctional attitudes predict the frequency of avoidant behavior over time. It is likely that well established personality traits (e.g., introversion and neuroticism) are linked to avoidance. We also expect that neurological processes, like high levels of punishment sensitivity (i.e., a highly activated Behavioral Inhibition System) and reward (i.e., a highly active Behavioral Activation System) have an impact on avoidant tendencies (Gray, 1970; Carver & White, 1994).

Finally, our findings underscore the importance of studying the relationship between avoidance in combination with parallel processes, like stress and activation. We expected that avoidance in combination with stress would be particularly deleterious. However, this was only true of the TA factor. The magnitude of the relationship between SA and depressive symptoms was not dependent on stress levels, and the nature of the stress by PSA interaction was the opposite of what we expected. We predicted that PSA strategies would be most damaging during periods of high stress. At this point, we can only speculate as to why PSA was related to depressive symptoms at all but the highest

levels of stress. Perhaps some of the PSA strategies are not maladaptive during highly stressful times. Confronting distressing cognitions during stressful periods may induce negative mood states that impair one's ability to cope. It may be more effective to use cognitive avoidance strategies, like distraction or denial, until the stress abates and then confront the problems when the stress is manageable. This may be particularly true when individuals have little perceived (or real) control over the stressors.

Conclusion

The findings from Study 2 suggest that the Avoidant Behaviors Scale (ABS) has desirable psychometric properties among college students from a public, Midwestern university. The ABS yielded three dimensions of avoidant behavior that correlate in expected directions with well-established measures of avoidant behavior (convergent validity) and criterion variables (i.e., depression and anxiety symptoms, stress, and social connectedness). The three dimensions of avoidance had distinct longitudinal trajectories during students' first semester at a new university. Individuals who reported high levels of dysfunctional attitudes reported more frequent avoidant behaviors over time and individuals reported more frequent avoidant behaviors during times of stress. All three dimensions of avoidance were related to depressive symptoms. The strength of the relationship between task avoidance and depressive symptoms was strongest in the presence of high levels of stress, and the relationship between problem solving avoidance and depressive symptoms was weakest in the presence of stress. One mechanism that may have contributed to the relationship between social avoidance and depressive symptoms was a failure to develop strong social bonds; social avoidance during the early weeks of the semester may be particularly damaging in terms of developing social

connectedness and depressive symptoms. Future research should focus on refining the ABS and explicating the complex relationship between avoidance and depression.

Table 4.1. Study 2a: 33-Item Exploratory Factor Analysis Results.

		Promax Rotated Loadings			Factor Structure Matrix		
Item #	h^2	TA	SA	PSA	TA	SA	PSA
1	0.258	0.496	-0.130	0.110	0.497	0.188	0.325
2	0.211	0.152	0.137	0.246	0.368	0.369	0.424
3	0.305	-0.071	-0.176	0.683	0.251	0.223	0.529
4	0.564	0.673	-0.163	0.233	0.731	0.322	0.533
5	0.360	0.174	0.528	-0.050	0.408	0.584	0.390
6	0.311	-0.021	-0.092	0.624	0.308	0.294	0.553
7	0.524	0.778	0.032	-0.126	0.718	0.341	0.361
8	0.326	-0.004	0.114	0.493	0.350	0.426	0.564
9	0.300	0.340	0.145	0.154	0.505	0.413	0.450
10	0.537	0.557	0.004	0.245	0.705	0.438	0.581
11	0.412	0.142	0.500	0.080	0.440	0.622	0.483
12	0.530	0.152	0.125	0.537	0.537	0.543	0.708
13	0.572	0.748	-0.057	0.059	0.755	0.355	0.472
14	0.339	0.011	0.374	0.260	0.355	0.545	0.505
15	0.538	0.214	0.073	0.534	0.571	0.519	0.709
16	0.530	0.752	0.035	-0.072	0.726	0.365	0.401
17	0.611	-0.132	0.789	0.082	0.312	0.775	0.504
18	0.520	-0.226	0.610	0.295	0.256	0.684	0.546
19	0.434	0.536	0.192	0.009	0.637	0.466	0.452
20	0.614	-0.042	0.812	-0.013	0.356	0.782	0.478

21	0.507	-0.009	0.292	0.496	0.435	0.603	0.676
22	0.534	0.742	-0.020	-0.003	0.730	0.349	0.430
23	0.340	0.211	0.153	0.314	0.476	0.458	0.538
24	0.316	-0.066	0.141	0.501	0.305	0.426	0.551
25	0.506	0.781	-0.071	-0.068	0.705	0.276	0.355
26	0.388	0.131	0.208	0.376	0.461	0.512	0.587
27	0.407	-0.103	0.228	0.528	0.328	0.513	0.612
28	0.333	0.432	-0.061	0.246	0.549	0.311	0.466
29	0.402	0.050	0.639	-0.049	0.340	0.632	0.387
30	0.439	0.050	0.013	0.623	0.430	0.434	0.661
31	0.389	0.333	0.333	0.063	0.538	0.540	0.475
32	0.351	0.181	0.196	0.313	0.467	0.486	0.547
33	0.291	0.310	0.137	0.183	0.488	0.409	0.456

Note. h^2 = communality score; TA = Task Avoidance dimension of the Avoidant Behaviors Scale; SA = Social Avoidance dimension of the Avoidant Behaviors Scale; Problem Solving Avoidance dimension of the Avoidant Behaviors Scale.

Table 4.2. Study 2a: 15-Item Exploratory Factor Analysis Results.

		Promax Rotated			Factor Structure		
Item Number & Text	h^2	TA	SA	PSA	TA	SA	PSA
16. Work done later in day than planned	0.57	**0.78**	0.06	-0.09	0.76	0.32	0.39
25. Too much time on aimless activities	0.52	**0.74**	-0.08	0.01	0.72	0.24	0.38
7. Left challenging assignment till last minute	0.53	**0.73**	-0.01	-0.01	0.73	0.29	0.40
22. Couldn't get motivated to start on work	0.56	**0.72**	-0.03	0.07	0.75	0.31	0.46
13. Regretted putting something off	0.56	**0.70**	-0.05	0.13	0.75	0.32	0.49
19. Let chores pile up	0.46	**0.53**	0.18	0.07	0.64	0.44	0.48
20. Made excuse for why you could not socialize	0.65	0.03	**0.85**	-0.08	0.34	0.81	0.49
17. Turned down an invitation	0.59	-0.08	**0.73**	0.10	0.28	0.76	0.53
18. Worked extra hours to avoid a problem	0.52	-0.10	**0.68**	0.12	0.25	0.72	0.51
29. Stayed in room to avoid roommates	0.38	0.06	**0.57**	0.03	0.31	0.61	0.43
11. Passed on opportunity to meet new friends	0.37	0.17	**0.48**	0.05	0.40	0.58	0.46
15. Tried best not to think about a problem	0.61	0.13	-0.02	**0.71**	0.52	0.50	0.77
21. Convinced self couldn't make bad situation better	0.60	-0.06	0.21	**0.65**	0.40	0.61	0.75

12. Kept thinking about problem rather than doing something	0.54	0.09	0.11	**0.60**	0.48	0.54	0.73
30. Tried to convince self a bad situation was ok	0.37	0.04	0.07	**0.54**	0.37	0.44	0.61

Note. h^2 = communality score; TA = Task Avoidance dimension of the Avoidant Behaviors Scale; SA = Social Avoidance dimension of the Avoidant Behaviors Scale; Problem Solving Avoidance dimension of the Avoidant Behaviors Scale.

Table 4.3. Study 2a: Summary of Comparisons between Hierarchically Nested SEM Models.

Model Description	χ^2 (*df*)	BIC	RMSEA (90% CI)	CFI	TLI	SRMR	TRd
3-factor ABS model with correlated factors (CFA Model 1)	160.91* (87)	13558.89	.049 (.037, .061)	.952	.942	.051	-
1-factor ABS model (CFA Model 2)	444.57* (90)	13899.72	.106 (.096, .116)	.771	.733	.088	249.99*
2-factor ABS model with correlated factors (CFA Model 3)	220.90* (89)	13621.30	.065 (.054, .076)	.915	.899	.061	62.01*
3-factor ABS model with factor correlations set to 0 (CFA Model 4)	400.91* (90)	13835.92	.099 (.089, .109)	.799	.766	.225	366.38*

Note. BIC = Bayes Inference Criterion; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residul; TRd = Satorra-Bentler Scales Chi-Square Difference Test.

Table 4.4. Study 2a: Correlations among ABS Subscales and Convergent Validity Measures

	Task Avoidance			Social Avoidance			Problem Solving Avoidance		
	r	*z*	SE	*r*	*z*	SE	*r*	*z*	SE
CBAS									
Behavioral-Social	.33	0.16	0.03	.84	0.30	0.03	.56	0.24	0.03
Behavioral Non-Social	.54	0.20	0.03	.71	0.20	0.03	.67	0.24	0.03
Cognitive-Social	.46	0.20	0.03	.59	0.18	0.02	.64	0.26	0.04
Cognitive-Non-Social	.71	0.26	0.03	.65	0.17	0.02	.72	0.42	0.04
COPE									
Behavioral Disengagement	.41	0.15	0.02	.58	0.15	0.02	.64	0.22	0.03
Mental Disengagement	.76	0.15	0.02	.69	0.09	0.02	.74	0.13	0.02
Planning	-.32	-0.15	0.03	-.35	-0.12	0.02	-.45	-0.20	0.02
Denial	.26	4.49	0.02	.44	7.21	0.02	.54	8.33	0.02
Active	-.43	-0.16	0.02	-.39	-0.10	0.02	-.52	-0.17	0.02

Note. All *p* values corresponding to *r* were $p < .0001$; CBAS = Cognitive Behavioral Avoidance Scale; COPE = COPE Scale.

Table 4.5. Study 2b: Descriptive Statistics for Time-Varying Measures.

	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8
ABS-TA								
M	1.61	1.59	1.63	1.83	1.66	1.67	1.64	1.48
SD	0.93	0.91	0.80	0.83	0.92	0.86	0.83	0.84
N	80	77	77	76	74	74	73	74
ABS-SA								
M	0.91	0.73	0.71	0.67	0.67	0.69	0.59	0.65
SD	0.82	0.74	0.71	0.75	0.72	0.78	0.74	0.83
N	80	77	77	76	74	74	73	74
ABS-PSA								
M	0.83	0.88	0.95	0.96	0.82	0.85	0.69	0.72
SD	0.77	0.79	0.80	0.83	0.73	0.78	0.75	0.83
N	79	77	77	76	74	74	73	74
CES-D								
M	13.62	14.03	13.06	14.16	13.26	13.05	12.50	12.11
SD	9.28	9.27	8.69	9.49	9.29	10.30	9.22	9.41
N	81	77	77	76	74	74	74	75
PSS								
M	21.77	23.16	22.70	23.50	22.30	22.47	22.69	21.43
SD	7.51	8.40	7.74	7.94	7.93	7.53	6.82	8.40
N	81	77	77	76	74	74	74	74
SCS								
M	58.61	NA	61.66	NA	61.16	NA	62.78	NA
SD	13.17	NA	13.35	NA	14.22	NA	13.64	NA
N	80	NA	77	NA	74	NA	73	NA

Note. ABS-TA = Task Avoidance Subscale of the Avoidant Behaviors Scale; ABS-SA = Social Avoidance Subscale of the Avoidant Behaviors Scale; ABS-PSA = Problem-Solving Avoidance Subscale of the Avoidant Behaviors Scale; CES-D = Center for Epidemiological Studies—Depression Scale total score; PSS = Perceived Stress Scale total score; SCS = Social Connectedness Scale—Campus Version total score.

Table 4.6. Study 2b: Summary of LMM Analyses Predicting Task Avoidance.

	Initial Model			**Final Model**		
Fixed Effects	*df*	*t*	*p*	*df*	*t*	*p*
β_0 (Intercept)	481	0.31	.759	518	0.51	.612
β_1 (Week)	481	-2.06	.040	518	-0.79	.431
β_2 (Week^2)	481	-2.17	.031	518	-1.88	.061
β_3 (PSS)	481	12.61	.000	518	12.55	.000
β_4 (DAS)	66	2.49	.016	78	3.10	.003
β_5 (Sex)	66	0.56	.579	-	-	-
β_6 (Race)	4, 66	0.33[a]	.855	-	-	-
β_7 (Student Age)	66	-0.67	.504	-	-	-
β_8 (International)	66	0.95	.344	-	-	-
β_9 (Week x PSS)	481	-1.43	.153	-	-	-
β_{10} (Week x DAS)	481	0.59	.556	-	-	-
β_{11} (DAS x PSS)	481	-0.32	.749	-	-	-
Random Effects	*Lower 95% CI*	*Estimate*	*Upper 95% CI*	*Lower 95% CI*	*Estimate*	*Upper 95% CI*
σ (Intercept)	0.414	0.502	0.609	0.474	0.570	0.686
σ (Int., Week)	-	-	-	-0.210	0.081	0.359
σ (Int., Week^2)	-	-	-	-0.663	-0.427	-0.113
σ (Week)	-	-	-	0.039	0.050	0.063
σ (Week, Week^2)	-	-	-	-0.039	0.356	0.655
σ (Week^2)	-	-	-	0.006	0.008	0.012
σ (Residual)	0.450	0.480	0.511	0.371	0.399	0.429
Fit Statistics						
AIC	-	1025.70	-	-	996.77	-
BIC	-	1098.88	-	-	1049.46	-

Note. All continuous covariates were centered around their grand mean prior to analysis. PSS = total score for the Perceived Stress Scale, DAS = total score for the Dysfunctional Attitudes Scale, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion.
[a] Estimate for this parameter is based on a Type I Sum of Squares *F* test.

Table 4.7. Study 2b: Summary of LMM Analyses Predicting Social Avoidance.

	Initial Model			**Final Model**		
Fixed Effects	*df*	*t*	*p*	*df*	*t*	*p*
β_0 (Intercept)	481	0.08	.938	518	-2.70	.007
β_1 (Week)	481	-3.90	.000	518	-2.20	.028
β_2 (Week^2)	481	2.72	.007	518	2.84	.005
β_3 (PSS)	481	7.23	.000	518	6.43	.000
β_4 (DAS)	66	2.52	.014	77	3.31	.001
β_5 (Sex)	66	2.55	.013	77	2.98	.004
β_6 (Race)	4, 66	0.52[a]	.720	-	-	-
β_7 (Student Age)	66	-0.15	.883	-	-	-
β_8 (International)	66	0.15	.880	-	-	-
β_9 (Week x PSS)	481	1.53	.126	-	-	-
β_{10} (Week x DAS)	481	-0.35	.723	-	-	-
β_{11} (DAS x PSS)	481	-0.85	.394	-	-	-
Random Effects	*Lower 95% CI*	*Estimate*	*Upper 95% CI*	*Lower 95% CI*	*Estimate*	*Upper 95% CI*
σ (Intercept)	0.015	0.018	0.022	0.016	0.019	0.023
σ (Int., Week)	-	-	-	-0.210	0.081	0.359
σ (Week)	-	-	-	0.001	0.002	0.002
σ (Residual)	0.016	0.017	0.018	0.014	0.015	0.016
Fit Statistics						
AIC	-	-2638.29	-	-	-2960.19	-
BIC	-	-2565.11	-	-	-2916.30	-

Note. All continuous covariates were centered around their grand mean prior to analysis. PSS = total score for the Perceived Stress Scale, DAS = total score for the Dysfunctional Attitudes Scale, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion.
[a] Estimate for this parameter is based on a Type I Sum of Squares *F* test.

Table 4.8. Study 2b: Summary of LMM Analyses Predicting Problem Solving Avoidance.

	Initial Model			**Final Model**		
Fixed Effects	*df*	*t*	*p*	*df*	*t*	*p*
β_0 (Intercept)	480	0.01	.993	517	-1.49	.137
β_1 (Week)	480	-3.39	.001	517	-2.20	.028
β_2 (Week^2)	480	-1.68	.094	517	-2.39	.017
β_3 (PSS)	480	12.33	.000	517	13.01	.000
β_4 (DAS)	66	3.40	.001	77	3.41	.001
β_5 (Sex)	66	3.81	.000	77	3.36	.001
β_6 (Race)	4, 66	0.32[a]	.861	-	-	-
β_7 (Student Age)	66	-0.04	.965	-	-	-
β_8 (International)	66	-1.23	.223	-	-	-
β_9 (Week x PSS)	480	-0.12	.906	-	-	-
β_{10} (Week x DAS)	480	0.45	.653	-	-	-
β_{11} (DAS x PSS)	480	-0.48	.630	-	-	-
Random Effects	*Lower 95% CI*	*Estimate*	*Upper 95% CI*	*Lower 95% CI*	*Estimate*	*Upper 95% CI*
σ (Intercept)	0.055	0.067	0.082	0.058	0.069	0.083
σ (Int., Week)	-	-	-	-0.108	0.221	0.506
σ (Week)	-	-	-	0.004	0.006	0.008
σ (Residual)	0.068	0.072	0.077	0.064	0.068	0.073
Fit Statistics						
AIC	-	-1059.00	-	-	-1225.37	-
BIC	-	-985.85	-	-	-1181.50	-

Note. All continuous covariates were centered around their grand mean prior to analysis. PSS = total score for the Perceived Stress Scale, DAS = total score for the Dysfunctional Attitudes Scale, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion.
[a] Estimate for this parameter is based on a Type I Sum of Squares *F* test.

Table 4.9. Study 2b: Summary of LMM Analyses Predicting Depressive Symptoms.

	Initial Model			**Final Model**		
Fixed Effects	*df*	*t*	*p*	*df*	*t*	*p*
β_0 (Intercept)	396	14.60	.000	430	107.53	.000
β_1 (Week)	396	-0.65	.514	430	-0.86	.393
β_2 (Week^2)	396	1.12	.262	-	-	-
β_3 (PSS)	396	11.43	.000	430	11.36	.000
β_4 (TA)	396	0.84	.401	430	1.59	.112
β_5 (SA)	396	4.63	.000	430	5.15	.000
β_6 (PSA)	396	4.22	.000	430	5.23	.000
β_7 (SCS)	396	-3.50	.001	430	-4.08	.000
β_8 (DAS)	66	-0.20	.841	78	-0.31	.761
β_9 (Sex)	66	0.17	.865	-	-	-
β_{10} (Race)	4, 66	1.39 [a]	.248	-	-	-
β_{11} (Student Age)	66	0.02	.986	-	-	-
β_{12} (International)	66	1.40	.165	-	-	-
β_{13} (TA x Week)	396	-0.11	.916	-	-	-
β_{14} (SA x Week)	396	1.54	.123	-	-	-
β_{15} (PSA x Week)	396	0.51	.613	-	-	-
β_{16} (TA x PSS)	396	2.73	.007	430	3.04	.003
β_{17} (SA x PSS)	396	0.59	.553	-	-	-
β_{18} (PSA x PSS)	396	-3.33	.001	430	-3.80	.000
Random Effects	*Lower 95% CI*	*Estimate*	*Upper 95% CI*	*Lower 95% CI*	*Estimate*	*Upper 95% CI*
σ (Intercept)	0.156	0.194	0.241	0.164	0.200	0.244
σ (Int., Week)	-	-	-	-0.009	0.481	0.784
σ (Week)	-	-	-	0.008	0.014	0.024
σ (Residual)	0.210	0.225	0.242	0.202	0.218	0.234
Fit Statistics						
AIC	-	208.91	-	-	141.03	-

	BIC	-	308.17	-	-	200.26	-

Note. PSS = Perceived Stress Scale total score; TA = Task Avoidance total score; SA = Social Avoidance total score; PSA = Problem Solving Avoidance total score; SCS = Social Connectedness Scale total score; DAS = Dysfunctional Attitudes Scale total score; AIC = Akaike Information Criterion; BIC = Bayes Information Criterion.
[a] Estimate for this parameter is based on a Type I Sum of Squares *F* test.

Figure 4.1. Study 2a: Results of ABS Parallel Analysis.

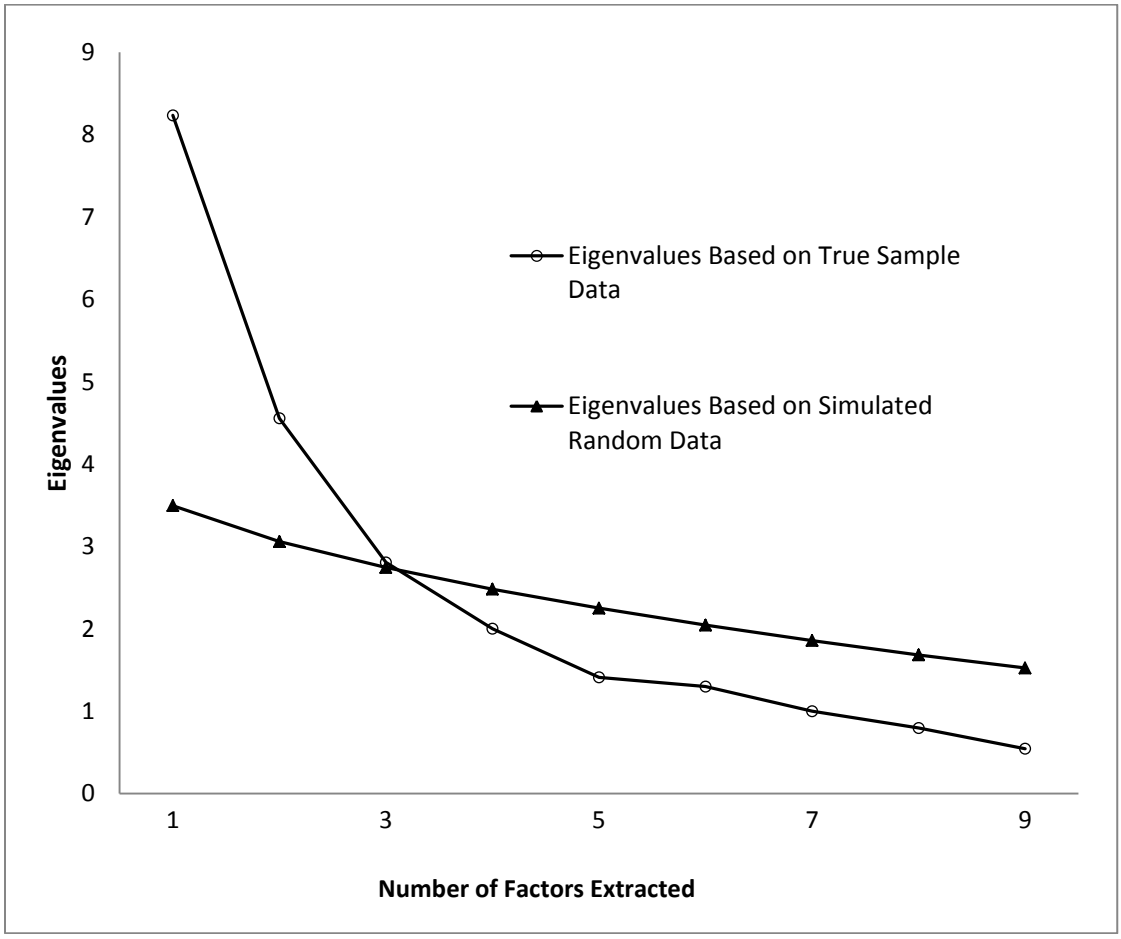


Figure 4.2. Study 2a: Confirmatory Factor Analysis of the ABS.

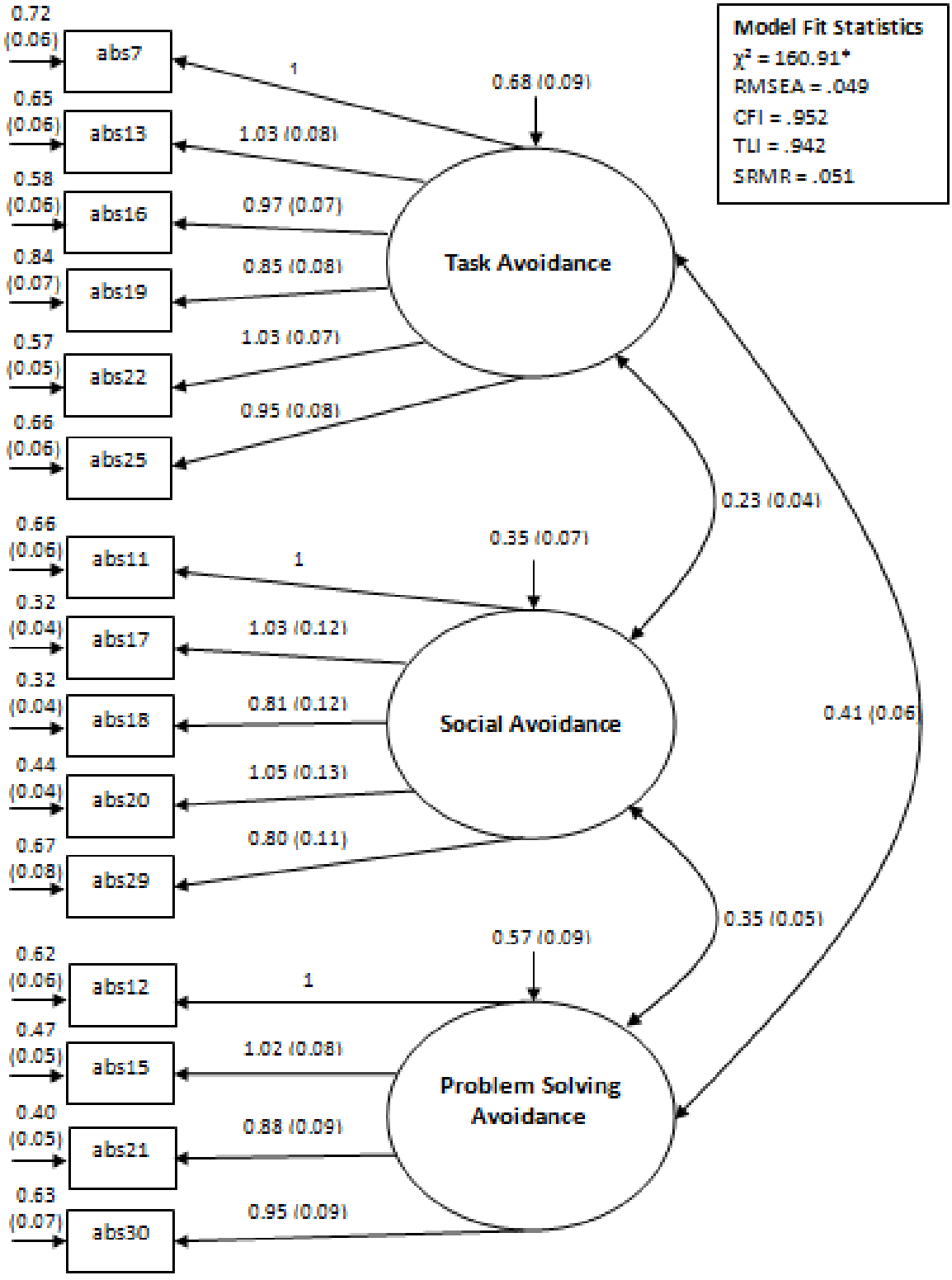


Figure 4.3. Study 2a: Criterion Validity Model 1.

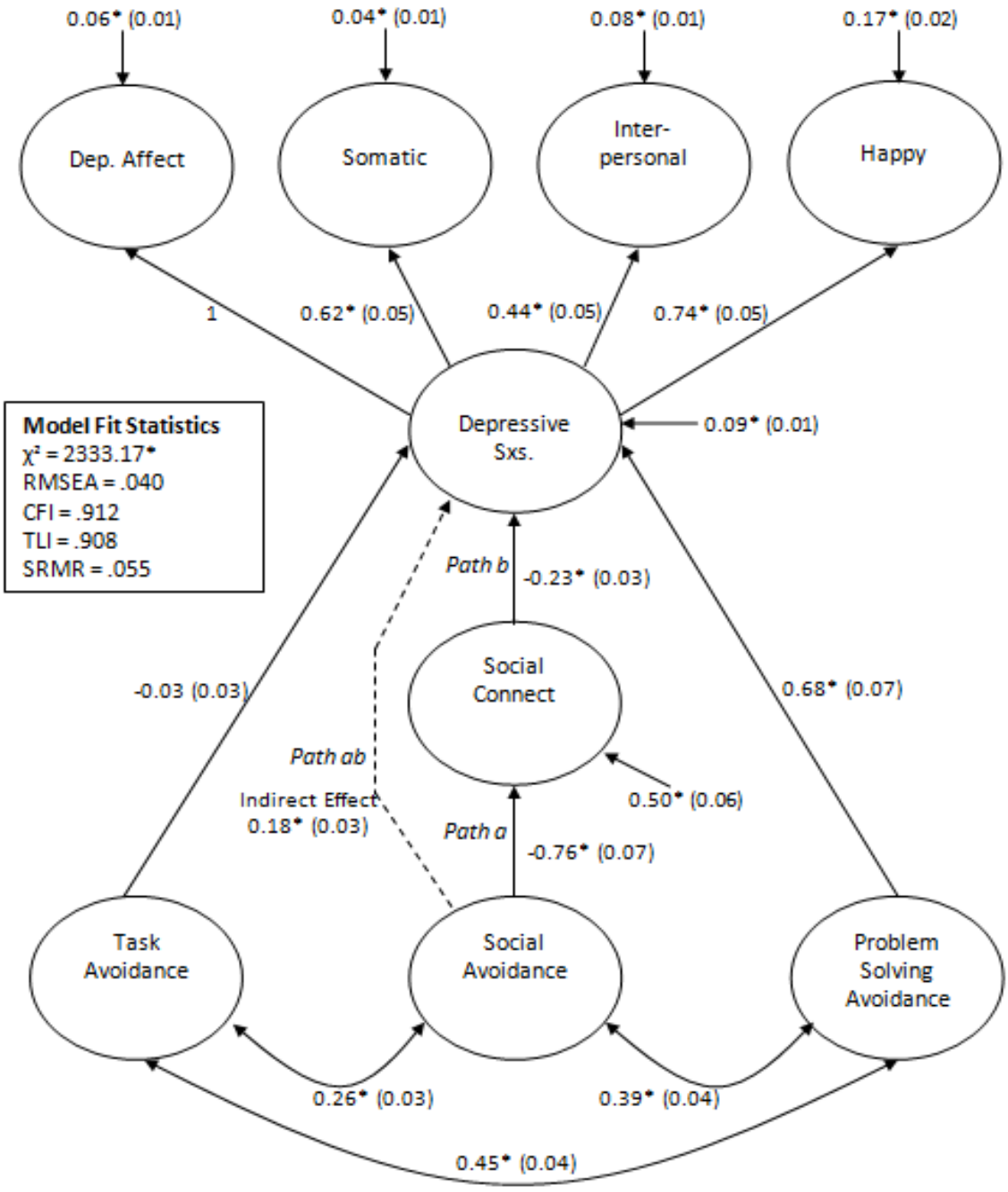


Figure 4.4. Study 2a: Criterion Validity Model 2.

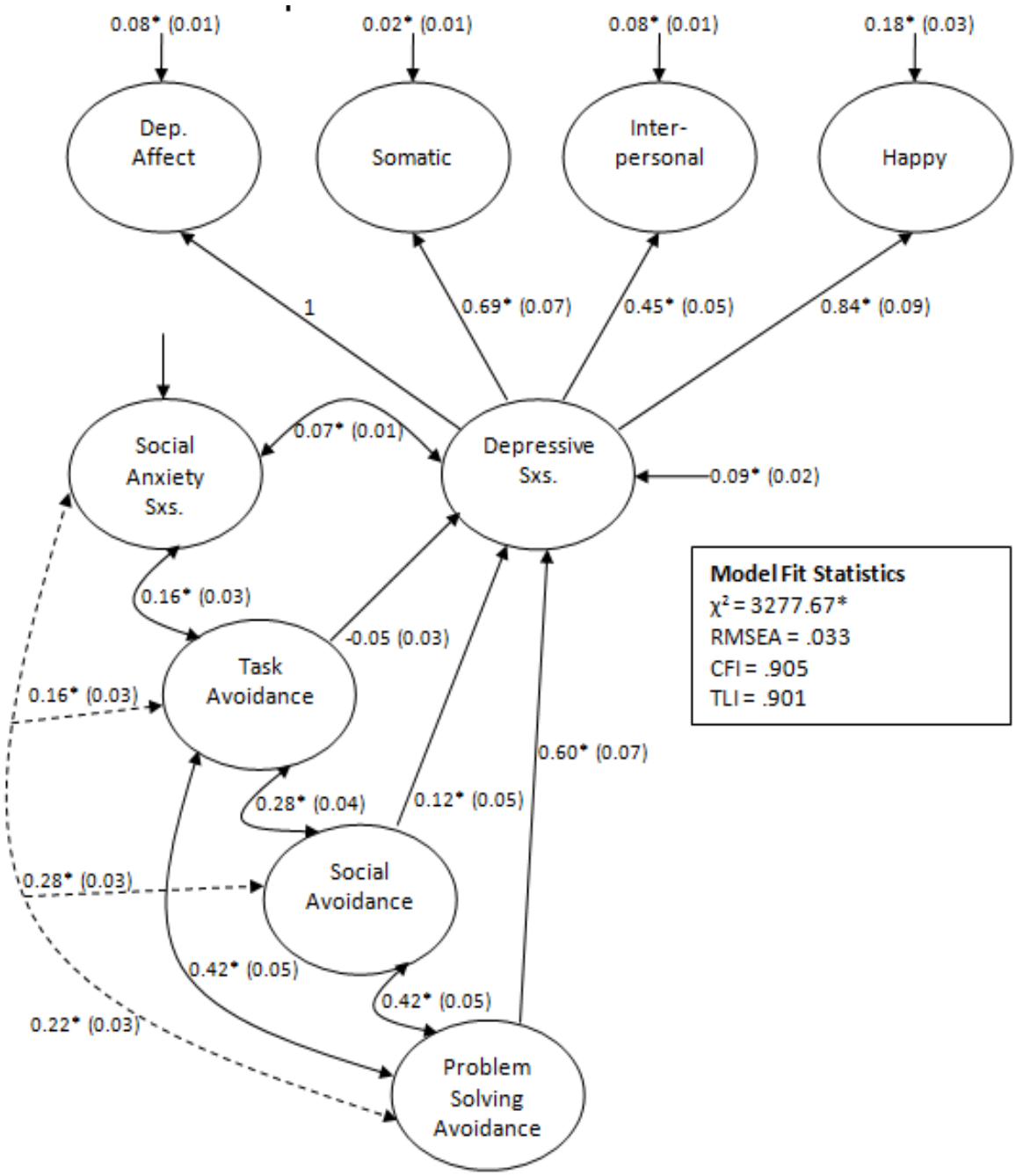


Figure 4.5. Study 2b: Avoidance Trends during the First Academic Semester.

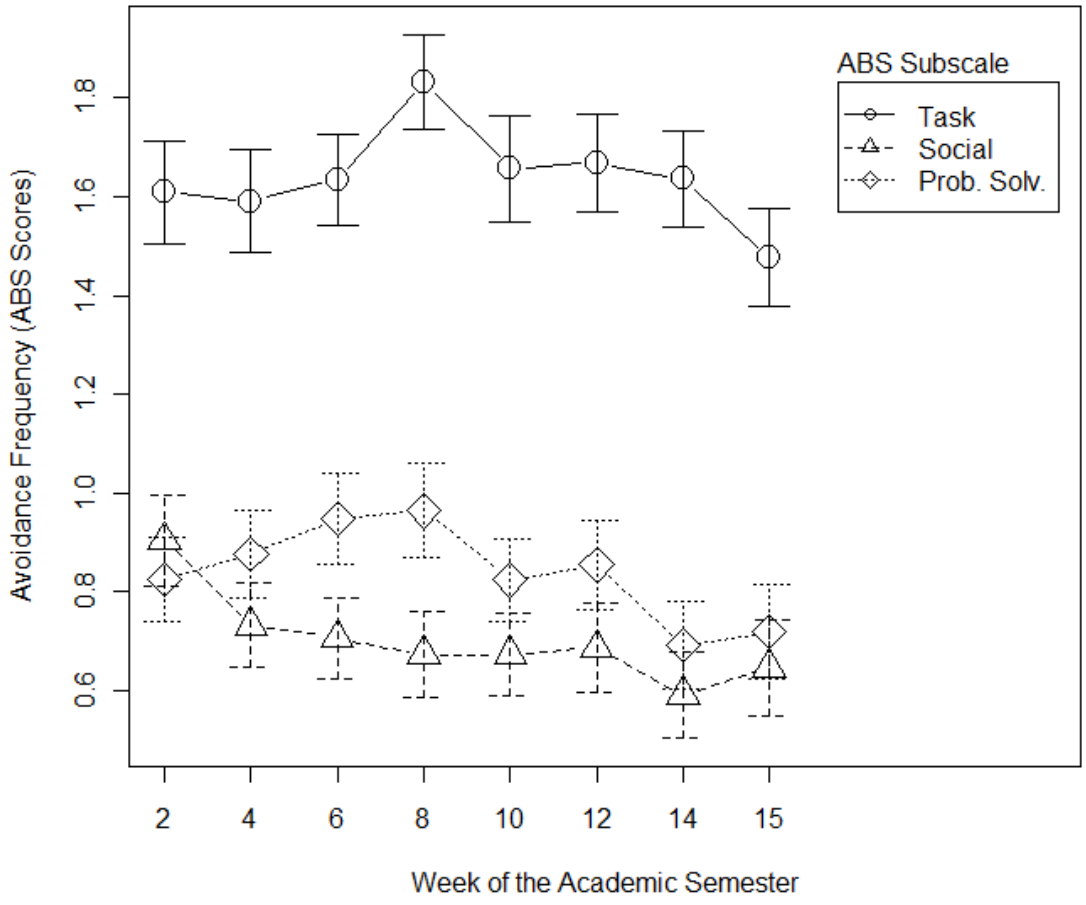


Figure 4.6a. Study 2b: Problem Solving Avoidance x Stress Predicting Depressive Symptoms.

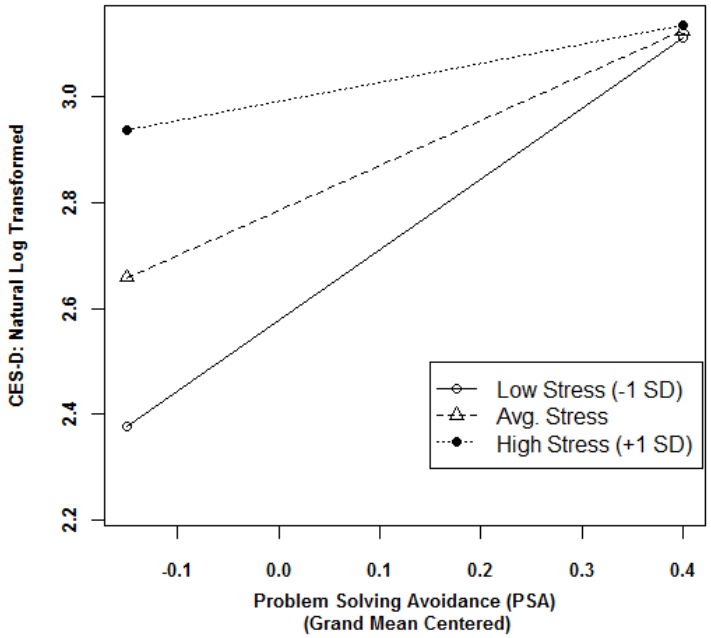


Figure 4.6b. Study 2b: Task Avoidance x Stress Predicting Depressive Symptoms.

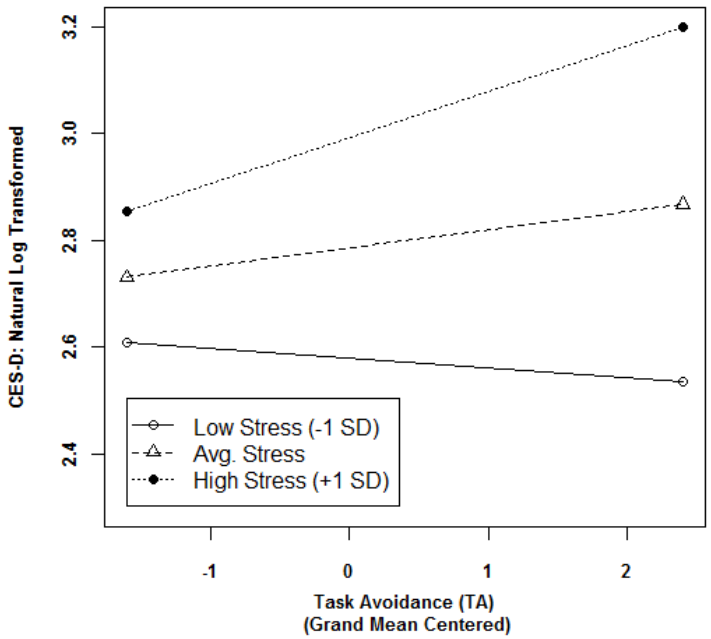
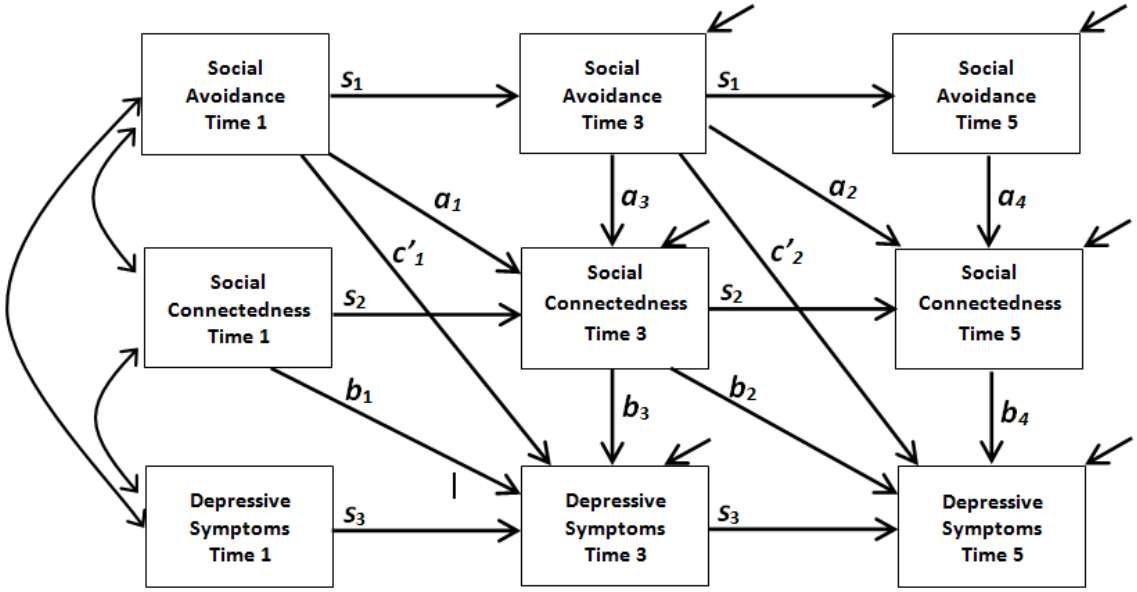


Figure 4.7. Study 2b: Autoregressive Mediation Path Model.



Mediation Effect 1 (path a1*path b3): b = -0.71, SE = 0.28, p = .01
Mediation Effect 2 (path a2*path b4): b = -0.16, SE = 0.16, p = .33
Mediation Effect 3 (path a1*path b2): b = 0.17, SE = 0.19, p = .37

CHAPTER 5

STUDY 3: COMPARING SYMPTOM TRAJECTORIES OF FIRST-SEMESTER FRESHMEN & TRANSFER STUDENTS

Purpose & Overview

The purpose of Study 3 was to evaluate whether or not notable differences existed between first-semester freshmen and transfer students in the development of depressive symptoms during the college transition. As noted, in the general introduction, there is a paucity of research evaluating mental health outcomes in transfer students despite evidence that transfer students face many unique challenges. We expected that transfer students would experience greater levels of stress and have more difficulty gaining a sense of connection to their peers and the broader campus community. To investigate these predictions, we ran separate analyses using two of our three data sets. In Study 3a, we used Data Set 3 to evaluate whether *Transfer* (a dichotomous variable with freshman = 0 and transfer student = 1) was a significant predictor of depressive symptoms during the first semester and whether effects on perceived stress and social connectedness accounted for this relationship. We then replicated and extended our analyses in Study 3b using data from Data Set 1.

Data Analysis Strategy

Modeling Symptom Development

In both Study 3a and Study 3b, we used linear mixed-effects modeling (LMM) using the `nlme` package in the R software environment to build a well-fitting model of

depressive symptoms over time (Pinheiro et al., 2010; R Development Core Team 2011). Given that we already developed models of depressive symptoms over time for Data Set 1 and Data Set 3 in Study 1 and Study 2b, respectively, we used the final models from those studies as starting points for our analyses. In both studies, we used a "Top Down" modeling approach comparing complex reference models to more parsimonious, hierarchically nested models (West et al., 2007, p. 43). The likelihood ratio test (LRT) was the primary tool used to determine preference between competing, nested models. Additionally, we used the Akaike Information Criterion (AIC), which favors parsimonious models, as a supplement to the LRT when performing model comparisons. We estimated model parameters using Restricted Maximum Likelihood (REML); however, when comparing models that differed only in their specification of fixed effects parameters, we used Maximum Likelihood (ML) estimation. Individual covariates were evaluated using *t*-tests.

Mediation Analyses. A central goal of Study 3 was to test whether time-varying processes (i.e., perceived stress and social connectedness) could account for the hypothesized differences between freshmen and transfer students on depressive symptoms. In both studies 3a and 3b, we specified multiple-mediation models evaluating the indirect effect of student status (freshman vs. transfer student) on depressive symptoms through both perceived stress and social connectedness. We also tested moderated-mediation models in which the indirect effect of student status on depressive symptoms was moderated by social connectedness; specifically, we tested whether the direct path between perceived stress and depressive symptoms (path *b*) was moderated by social connectedness (Preacher, Rucker, & Hayes, 2007, see Model 3).

In a simple mediation model, there is an independent variable of interest that is hypothesized to influence the outcome variable indirectly through a third variable (i.e., the mediator). The simple mediation model is composed of the following: a direct effect of the independent variable on the mediator (path *a*); a direct effect of the mediator on the outcome variable controlling for the effect of the independent variable (path *b*); an indirect effect of the independent variable on the outcome variable through the mediator (path *ab*); a direct effect of the independent variable on the outcome variable controlling for the effect of the mediator (path *c'*); and a total effect, *c*, which in models with observed variables can be calculated as the sum of *c'* and *ab* (Hayes, 2009; MacKinnon, 2008).

The simple mediation model can be generalized to accommodate multiple mediator variables, which examine multiple indirect effects simultaneously. This is preferable to specifying separate regression equations for each hypothesized indirect effect for several reasons. First, a multiple mediation model allows the analyst to test whether there is an overall indirect effect of an independent variable on an outcome variable through a set of mediators. That is, the effect of the independent variable on the outcome may be carried through multiple mediators and a multiple mediator model allows one to examine the total indirect effect across all mediation pathways. Second, in multiple mediator models, each indirect effect is conditional on the other indirect effects. Ignoring the influence of the other indirect effects by specifying several separate models with only one mediator rather than specifying all the indirect effects in one model may yield misleading results. Finally, multiple mediator models allow for a comparison of the relative magnitudes of the indirect effects. This is important because some indirect effects

may be more powerful than others (Preacher & Hayes, 2008). In our studies, there were two time-varying processes that we believed might account for differences in depressive symptoms between freshmen and transfer students; therefore, we used multiple mediation models to test our hypotheses.

In our conceptual framework, social connectedness is viewed as both a mediator of depressive symptoms and as a moderator of the effect of stress and depressive symptoms. Given that in both studies 1 and 2b we found significant interactions between perceived stress and social connectedness, we evaluated a moderated-mediation model in which the pathway connecting perceived stress to depressive symptoms (path *b*) was moderated by social connectedness.

When evaluating mediation hypotheses, we used the `MEDIATE` and `MODMED` programs in the IBM SPSS Statistics Version 19 environment (Hayes & Preacher, 2011; (Preacher et al., 2007). These programs were designed to test mediation and moderated-mediation effects, respectively. The `MEDIATE` program allows users to specify multiple mediators in the same model and to have categorical predictor variables with multiple levels. The `MODMED` program allows the user to specify a host of different models in which one of the paths in a mediation model is dependent on levels of another variable. Both the `MEDIATE` and `MODMED` programs allow the user to control for the effects of covariates that are not specified in the mediation pathways and to estimate standard errors using non-parametric bootstrapping. Bootstrapping is desirable because, unlike traditional mediation approaches (e.g., the Sobel test), it does not make the typically untenable assumption that the sampling distribution of the indirect effect is normally distributed (Hayes, 2009). The `MODMED` program offers both simple slopes and the Johnson-Neyman

techniques for probing interaction effects. The Johnson-Neyman technique identifies boundaries of the moderator variable within which (or outside of which) the effect of the predictor variable on the outcome variable is significant (Preacher et al., 2006).

Study 3a

Brief Description of the Data Set

This study used Data Set 3 which is comprised of data from 82 first-semester students (41 freshmen and 41 transfer students). Participants completed web-based assessments eight times (two during each of the four months of the semester) during their first semester at a large, mid-western university. The first assessment took place during the second week of the semester (September) and the final assessment took place during week 15 (December). Participants completed measures of depressive symptoms (CES-D) and stress (PSS) at each assessment, and a measure of social connectedness (SCS) at four of the eight assessments (once per month). A complete description of Data Set 3 is available in Chapter 2 and Table 2.4 provides information about the study participants.

Hypotheses

We proposed the following a-priori hypotheses for Study 3a:

1. Transfer students would report higher levels of perceived stress and lower levels of social connectedness throughout the semester when compared to freshmen.
2. Transfer students would report higher levels of depressive symptoms throughout the semester when compared to freshmen.
3. The differences in social connectedness between freshmen and transfer students would account for the differences in depressive symptoms (mediation hypothesis).

4. Perceived stress would also mediate the relationship between student status and depressive symptoms, but the strength of this mediated effect would depend on levels of social connectedness (moderated-mediation hypothesis).

Overview of Study 3a Results

The following points provide an overview of the main findings from our analyses. A detailed description of the study results follows:

- Transfer students reported higher levels of depressive symptoms than freshmen throughout the academic semester.
- Both perceived stress and social connectedness were mediators of the relationship between student status (freshman vs. transfer student) and depressive symptoms.
- We did not find support for our proposed moderated-mediation model: The strength of the mediated effect of student status on depressive symptoms through perceived stress did not depend on levels of social connectedness.
- Post-hoc analyses showed that group differences in depressive symptoms between freshmen and transfer students were driven by transfer students living off campus. Transfer students living on campus reported declining depressive symptoms over the course of the semester while off-campus transfer students did not.

Detailed Description of Study 3a Results

Preliminary Analyses. Prior to data analysis, we examined the distributions of all continuous covariates and dependent variables for deviations from normality and outliers using quantile-quantile plots, histograms, and boxplots. When violations of distributional

assumptions were apparent, we applied power transformations (square root and natural log) in order to better approximate normal distributions. The transformed variables were used in all analyses. Additionally, we centered continuous covariates by subtracting the grand mean from all individual scores in order to facilitate interpretation of the intercept terms in our analyses and to reduce the impact of multicollinearity.

Evaluating Symptom & Stress Trends. We evaluated conditional mean profile plots showing the development of symptoms over time among freshmen and transfer students. Figure 5.1a shows mean depressive symptom scores for both groups at each study assessment. Transfer students reported higher levels of symptoms at each time point, with standardized mean difference scores (i.e., Cohen's *d*) ranging from 0.39 to 0.61 (Cohen, 1992). Freshmen group means on the CES-D ranged from 9.79 to 11.86, and transfer group means ranged from 14.46 to 16.97. Transfer students were significantly more likely to score above the high-symptom cutoff score (>23) on the CES-D, $\chi^2(1) = 17.22$, $p < .001$. Sixty-one percent of transfer students ($n = 25$) as compared to only 27% of freshmen ($n = 11$) scored above the CES-D cutoff at some point during the study. Nineteen students (13 transfer students and 6 freshmen) scored above the CES-D cutoff score multiple times over the course of the semester.

Mixed-Effects Modeling. As noted previously, we began our modeling procedure using the final model from Study 2b which is summarized in Table 4.9. We added a binary variable to the model, *Transfer*, indicating whether participants were freshmen or transfer students and the interaction between *Transfer* and *Time* (week of the academic semester). The effects of *Transfer* and the *Transfer* by *Time* interaction were not significant: $t(77) = 1.24$, $p = .22$ and $t(77) = -0.02$, $p = .98$, respectively. The model

containing these effects was not superior to the simpler, nested model χ^2 (1) = 1.92, p = .17. We retained the *Transfer* variable in our model, however, because we were expecting this effect to be masked in the presence of the two proposed mediator variables, perceived stress and social connectedness.

Mediation Analyses

Multiple Mediation Analysis. We next tested our proposed multiple mediation model with indirect effects of *Transfer* on depressive symptoms (CES-D) through perceived stress (PSS) and social connectedness (SCS) using the `MEDIATION` program. When describing the specific indirect effects through perceived stress we will use the subscript $_1$ (e.g., path a_1), and we will use the subscript $_2$ (e.g., path a_2) when describing indirect effects through social connectedness. When specifying the multiple mediation model, we controlled for psychological process variables (baseline dysfunctional attitudes, task avoidance, social avoidance, and problem solving avoidance) that were included in the final LMM model but were not part of the indirect effects.

The specific indirect effect of *Transfer* on depressive symptoms through perceived stress was significant (path a_1b_1), b = 0.06 (95% CI = 0.03, 0.09). Both the direct effect of *Transfer* on perceived stress (path a_1) and the direct effect of perceived stress on depressive symptoms (path b_1) were significant: b = 1.83, SE = 0.51, p < .001 and b = 0.31, SE = 0.02, p < .001, respectively. The specific indirect effect of *Transfer* on depressive symptoms through social connectedness was also significant (path a_2b_2), b = 0.02 (95% CI = 0.01, 0.04). Both the direct effect of *Transfer* on social connectedness (path a_2) and the direct effect of social connectedness on depressive symptoms (path b_2) were significant, b = -5.34, SE = 1.16, p < .001 and b = -0.05, SE = 0.01, p < .001,

respectively. The direct effect of *Transfer* on depressive symptoms controlling for the effect of the mediators (path *c'*) approached significance, $b = 0.05$, SE = 0.03, $p = .07$. Figure 5.3 provides a summary of the multiple mediation model.

Moderated-Mediation Analysis. Using `MODMED` we tested whether the indirect effect of perceived stress on depressive symptoms was moderated by social connectedness. As in the multiple mediation model we controlled for the effects of the psychological process variables that were not part of the indirect effects (dysfunctional attitudes, task avoidance, social avoidance, and problem solving avoidance). Figure 5.4 provides a summary of the moderated-mediation model. The direct effect of *Transfer* on perceived stress (path *a*) was significant: $b = 1.83$, SE = 0.51, $p < .001$. The direct path from perceived stress to depressive symptoms was also significant: $b = 0.31$, SE = 0.02, $p < .001$. The direct effect of *Transfer* on depressive symptoms (path *c'*) approached significance: $b = 0.05$, SE = 0.03, $p = .05$. However, contrary to our hypothesis, the indirect effect of *Transfer* on depressive symptoms through perceived stress was significant at all levels of social connectedness with little variability in the strength of the effect. The indirect effect was of similar magnitude regardless of whether participants reported low levels of social connectedness (1 SD below the mean) or high levels of social connectedness (1 SD above the mean): $b = 0.05$, SE = 0.02, $p < .001$ and $b = 0.06$, SE = 0.02, $p < .001$, respectively.

Post-Hoc Analyses. At the recommendation of a former transfer student familiar with our research, we ran post-hoc analyses to see whether differences between freshmen and transfer students on depressive symptoms were partly due to the fact that transfer students were more likely to live off campus than freshmen. Living off campus could

result in students feeling disconnected from the campus community and having less access to helpful campus resources. We created a binary variable (*Campus*) indicating whether or not students lived on campus (on-campus = 0; off-campus = 1). Students providing campus zip codes were coded as living on campus and all others were coded as living off campus. The majority of transfer students (n = 27, 65.9%) provided off-campus zip codes. Unfortunately, all except one freshman provided an on-campus zip code precluding a meaningful 2 x 2 moderation analysis (i.e., *Transfer* by *Campus*) given that one of the four cells was nearly empty. We therefore created another categorical variable (*Student Status*) with three levels indicating whether students were freshmen, on-campus transfer students, or off-campus transfer students. The data provided by the lone freshman living off campus were dropped from these analyses.

We evaluated a conditional mean profile plot to evaluate symptom trends of freshmen, on-campus transfer students, and off-campus transfer students (see Figure 5.1b). An interesting pattern emerged in which on- and off-campus transfer students followed remarkably different trends. On- and off-campus transfer students reported approximately equal levels of depressive symptoms at the baseline assessment. After a minor increase in symptoms between the first and second assessments, on-campus transfer students reported notable decreases in symptoms during the remainder of the semester. By the end of the semester, on-campus transfer students and freshmen reported approximately equal levels of depressive symptoms. Off-campus transfer students, by contrast, reported relatively stable, high levels of depressive symptoms throughout the semester. Standardized mean difference scores (i.e., Cohen's d) comparing off-campus transfer students to freshmen ranged from 0.36 (assessment 2) to 0.86 (assessment 4).

Standardized mean difference scores comparing off-campus transfer students to on-campus transfer students ranged from -0.23 (assessment 2) to 0.75 (assessment 4).

In our post-hoc analyses, we also observed differences between freshmen, on-campus transfer students, and off-campus transfer students on perceived stress and social connectedness. As can be seen in Figure 5.2a, on-campus transfer students reported lower levels of stress than off-campus transfer students at all but one assessment (*d*s ranging from -0.35 at assessment 2 to 0.64 at assessment 7). Freshmen also reported lower levels of stress than off-campus transfer students (*d*s ranging from 0.30 at assessment 1 to 0.70 at assessment 8). Off-campus transfer students reported relatively high levels of stress throughout the semester. Additionally, as can be seen in Figure 5.2b, off-campus transfer students reported lower levels of social connectedness than both freshmen (*d*s ranging from -0.65 at assessment 5 to -0.81 at assessment 3) and on-campus transfer students (*d*s ranging from -0.40 at assessment 1 to -0.84 at assessment 1) throughout the semester. These findings suggest that on- and off-campus transfer students may have very different experiences during their first semester at a new university. Given that these findings were based on post-hoc analyses in a small sample, we interpreted them cautiously. In Study 2b, we ran formal analyses to determine whether differences in perceived stress and social connectedness may account for the fact that off-campus transfer students report higher levels of depressive symptoms than both freshmen and on-campus transfer students during the college transition.

Study 3a Summary

The findings from Study 3a generally supported our hypotheses that transfer students would report higher levels of stress and depressive symptoms and lower levels

of social connectedness than freshmen. Additionally, we found evidence from a multiple mediation model of indirect effects of the *Transfer* variable (freshmen vs. transfer students) on depressive symptoms through both perceived stress and social connectedness. We did not find support, however, for a moderated-mediation model which posited that social connectedness would moderate the indirect effect of *Transfer* on depressive symptoms through perceived stress. In post-hoc analyses, we found that differences between freshmen and transfer students were driven by off-campus transfer students. Off-campus transfer students reported high and relatively stable levels of depressive symptoms and stress throughout the semester, whereas on-campus transfer students reported decreasing symptoms and stress as the semester progressed. Additionally, off-campus transfer students reported considerably lower levels of social connectedness than freshmen and on-campus transfer students. These findings raised important questions about the role that living on/off campus plays in the development of symptoms during the college transition that we attempted to address in Study 3b.

Study 3b

Purpose

The purpose of Study 3b was to replicate and extend the finding of Study 3a using a larger data set (Data Set 1). As in Study 3a, we evaluated differences between freshmen and transfer students on perceived stress, social connectedness, and depressive symptoms. However, given the post-hoc findings from Study 2, we also focused on whether or not students lived on or off campus.

Brief Description of the Data Set

This study used Data Set 1. These data were collected as part of longitudinal study of first semester freshmen and transfer students at a large public university. Participants (N = 351, including 235 freshmen and 116 transfer students) were recruited across two consecutive cohorts via e-mail announcements sent to a random group of incoming freshmen and transfer students. Participants completed five online assessments. The baseline assessment took place in August before the start of the fall academic semester and there was one follow-up assessment during each of the four months of the semester (September through December). At baseline participants provided demographic information and indicated whether or not they had ever had mental health problems or received professional mental health treatment. They also completed baseline measures of optimism/pessimism (LOT-R) and behavioral inhibition/activation (BIS/BAS). Measures of depressive symptoms (PHQ-8) and perceived stress (PSS) were completed at all five assessments, and a measure of social connectedness (SCS) was completed at all four follow-up assessments. See Chapter 2 for a more detailed description of the data collection procedures and Table 2.2 for information about study participants.

Data Set 1 provided a couple of advantages over the Data Set 3, which was used in Study 3a, in evaluating differences across groups. First, Data Set 1 was based on a larger sample of students, providing more power to detect between-group differences. And second, Data Set 1 included an assessment that took place prior to the start of the academic semester. This is important because it allows us to evaluate whether differences between freshmen, on-campus transfer students, and off-campus transfer students predate

the start of the academic semester, or whether these differences emerge after the semester begins.

We expected that, with a larger data set, we would be able to evaluate whether living situation (on vs. off campus) would moderate the effect of student status (freshmen vs. transfer students). However, as in Study 3a, very few freshmen (6.8%) reported living off-campus, precluding meaningful tests of a 2-by-2 interaction effect of student status and living situation. Therefore, we created a single categorical variable (*Student Status*) with three levels for between-group analyses, coding students as freshmen, on-campus transfer students, or off-campus transfer students. The few off-campus freshmen in the data set were excluded from between-group analyses.

Hypotheses

We posited the following a-priori hypotheses for Study 3b:

1. *Student Status* (a multinomial variable coding participants as off-campus transfers students, freshmen, or on-campus transfer students) would be related to baseline depressive symptoms, with both on- and off-campus transfer students reporting higher levels of baseline symptoms than freshmen.
2. There would be significant indirect effects of *Student Status* on depressive symptoms through both perceived stress and social connectedness (multiple mediation model). We expected off-campus transfer students to report higher levels of depressive symptoms than both freshmen and on-campus transfer students over the course of the semester but that these effects would be accounted for by higher levels of stress and lower levels of social connectedness.

3. There would be a significant moderated-mediation effect whereby the indirect effect of *Student Status* on depressive symptoms through perceived stress would be moderated by levels of social connectedness and week of the semester (*Time*). Specifically, we proposed that the direct effect of perceived stress on depressive symptoms (path *b* in the mediation model) would be moderated by social connectedness, and that the direct effect of *Student Status* on perceived stress (path *a* in the mediation model) would be moderated by *Time.* We proposed the *Student Status* by *Time* interaction hypothesis because the magnitude of the group differences between off-campus transfer students and on-campus transfer students increased as the semester progressed in Study 3a.

Overview of Study 3b Results

The following points provide an overview of the main findings from our analyses. A detailed description of the study results follows:

- Both off-campus transfer students and freshmen tended to report increasing levels of depressive symptoms during the semester whereas on-campus transfer students did not.
- We found support for our multiple-mediation model: There was an indirect effect of student status on depressive symptoms through both social connectedness and perceived stress. The multiple-mediation model held when comparing off-campus transfer students to both freshmen and on-campus transfer students.
- We found support for our moderated-mediation model: The strength of the indirect effect of student status on depressive symptoms through perceived

stress was strongest at low levels of social connectedness. This moderated-mediation effect held when comparing off-campus transfer students to both freshmen and on-campus transfer students. The relationship between student status (comparing off- and on-campus transfer students) and perceived stress was moderated by time, with differences in perceived stress emerging later in the semester.

Detailed Description of Study 3b Results

Preliminary Analyses. Prior to data analysis, we examined the distributions of all continuous covariates and dependent variables for deviations from normality and outliers using quantile-quantile plots, histograms, and boxplots. When violations of distributional assumptions were apparent, we applied power transformations (square root and natural log) in order to better approximate a normal distribution. The transformed variables were used in all analyses. Additionally, we centered continuous covariates by subtracting the grand mean from all individual scores in order to facilitate interpretation of the intercept terms in our analyses and to reduce the impact of multicollinearity.

Descriptive Analysis of Group Trends. Using conditional mean profile plots, we evaluated trends on all three time-varying measures: depressive symptoms (PHQ-8), perceived stress (PSS), and social connectedness (SCS). Consistent with Study 3a, on-campus and off-campus transfer students differed in their development of perceived stress, social connectedness, and depressive symptoms during the semester.

At baseline, freshmen reported significantly lower levels of depressive symptoms compared to off-campus transfer students, $\Delta = 1.38$ (95% CI: 0.14, 2.61) [7], but the difference between freshmen and on-campus transfers was not significant at baseline, $\Delta = 1.23$ (95% CI: -0.26, 2.72). On- and off-campus transfer students reported roughly equal levels of baseline symptoms $\Delta = -0.15$ (95% CI: -1.89, 1.59); however, after a minor increase in symptoms during the initial weeks of the semester, on-campus transfers reported declining symptoms while those living off- campus reported increasing symptoms. Unlike in Study 3a, when they reported relatively stable mean levels of depressive symptoms, freshmen in this study reported steadily increasing symptoms over the course of the semester (see Figure 5.5). By December, on-campus transfer students reported slightly lower levels of depressive symptoms ($M = 4.41$, $SD = 4.77$) compared to freshmen ($M = 4.95$, $SD = 4.53$), while off-campus transfer students reported considerably higher levels of symptoms ($M = 6.45$, $SD = 5.94$). Cohen's *d* effect sizes comparing freshmen and off-campus transfer students ranged from 0.21 (during the first month of the semester) to 0.52 (during the second month of the semester). Effect sizes comparing on- and off-campus transfer students ranged from -0.09 (during the first month of the semester) to 0.42 (during the fourth month of the semester).

The group trends were similar when evaluating perceived stress: freshmen reported significantly lower levels of stress compared to off-campus transfer students at baseline, $\Delta = 2.89$ (95% CI: 0.62, 5.16), but not compared to on-campus transfer students, $\Delta = 2.32$ (95% CI: -0.42, 5.06). On-campus transfer students reported an initial increase then steadily decreasing stress, while both off-campus transfer students and

[7] Confidence intervals for all comparisons are based on Tukey's HSD, maintaining a 95% family-wise type 1 error rate across all possible comparisons.

freshmen reported increasing stress over time (see Figure 5.6a). By the end of the semester, on-campus transfer students reported roughly equal levels of stress (M = 14.41, SD = 6.68) compared to freshmen (M = 14.77, SD = 7.34). Effect sizes comparing freshmen and off-campus transfer students ranged from 0.15 (during the first month of the semester) to 0.42 (at the pre-college assessment). Effect sizes comparing on- and off-campus transfer students ranged from -0.28 (during the first month of the semester) to 0.47 (during the fourth month of the semester).

Throughout the semester, freshmen reported the highest levels of connectedness to their peers and the campus community (see Figure 5.6b). At the first follow-up assessment, the first time point when social connectedness was measured, freshmen reported significantly higher levels of social connectedness compared to both on- and off-campus transfer students: Δ = -8.95 (95% CI: -14.57, -3.32) and Δ = -8.27 (95% CI: -13.00, -3.54), respectively. Freshmen reported relatively stable levels of social connectedness, with a small increase at the final follow-up assessment. On-campus transfer students reported the greatest increase in connectedness over time, while off-campus transfer students reported relatively low levels of connectedness throughout the semester. Effect sizes comparing freshmen to off-campus transfer students ranged from 0.60 (during the first month of the semester) to 0.76 (during the second month of the semester). Effect sizes comparing transfer students living on- and off-campus ranged from -0.05 (during the first month of the semester) to 0.37 (during the third month of the semester).

Linear Mixed-Effects Modeling (LMM) Procedure. Our first step was to create a model with a well-specified mean structure to capture as much systematic variability in

depressive symptoms as possible. We then tested several correlation patterns for the residual covariance matrix (including compound symmetry, first-order autoregressive, and Toeplitz structures), but found that a simple correlation structure was preferable. Finally, we reduced the model by removing non-significant covariates and then compared the reduced models to the more complex competing models using likelihood ratio tests. Our final LMM model is summarized in Table 5.1.

Our final LMM modeled between-subject variability in the intercept and allowed individual slopes to vary randomly over time. Students reporting higher baseline optimism reported fewer depressive symptoms over the course of the semester, t (308) = -2.22, p = .03, and students reporting a history of mental health problems at baseline had higher levels of symptoms over time, t (308) = 2.76, p < .01. Consistent with the findings from latent growth models in Study 1, there was a significant interaction between perceived stress and social connectedness, whereby the strength of the positive relationship between perceived stress and depressive symptoms decreased at higher levels of social connectedness, t (308) = -5.01, p < .001. The main effect of the *Student Status* variable was not significant in the presence of the hypothesized mediators (perceived stress and social connectedness), F (2, 308) = 1.31, p = .28. The interaction of *Student Status* and *Time* was not significant, F (2, 881) = 0.86, p = .42.

Mediation Analyses. We constructed two mediation models that were similar to those described in Study 3a. The first was a multiple mediation model specifying indirect effects of the *Student Status* variable on depressive symptoms through both perceived stress and social connectedness. The second was a moderated-mediation model in which the indirect effect of *Student Status* on depressive symptoms through perceived stress was

moderated by social connectedness. In both mediation models, we controlled for the covariates in our final LMM model that were not part of the indirect effects. We used bootstrapping with 5000 re-samples to estimate standard errors in both mediation models.

Multiple Mediation Model. Given that the *Student Status* variable was a multinomial categorical variable, each specific indirect effect could be partitioned into three contrasts. We focus on the following two contrasts: off-campus transfer students vs. freshmen (hereafter, Contrast 1) and off-campus transfer students vs. on-campus transfer students (hereafter, Contrast 2). We coded the *Student Status* variable so that the mediation analyses tested whether perceived stress and social connectedness mediated group differences in Contrast 1 and Contrast 2. Figure 5.7 summarizes the multiple mediation model with the indirect effects through perceived stress and social connectedness. For the sake of clarity, the specific indirect effects through perceived stress and social connectedness are shown separately and the effects of the covariates that were not part of the mediation pathways are not shown.

Omnibus Indirect Effects. The omnibus indirect effect of *Student Status* on depressive symptoms through perceived stress was not significant: $b = 0.01$ (95% CI: -0.01, 0.04). As expected, perceived stress was positively related to depressive symptoms (path b_1): $b = 0.27$, $SE = 0.01$, $p < .001$. The omnibus indirect effect of *Student Status* on depressive symptoms through social connectedness was significant: $b = -0.01$ (95% CI: -0.02, -0.01). Social connectedness was negatively related to depressive symptoms (path b_2): $b = -0.03$, $SE = 0.01$, $p < .001$.

Contrast 1: Freshmen vs. Off-Campus Transfer Students. The specific indirect effect examining perceived stress as a mediator of the differences between freshmen and

off-campus transfer students (path a_1b_1) was significant: b = -0.05 (95% CI: -0.08, -0.01). The direct effect of Contrast 1 on perceived stress (path a_1) was significant with freshmen reporting significantly lower levels of stress than off-campus transfer students: b = -0.17, SE = 0.06, p = .005. The specific indirect effect examining social connectedness as a mediator of the differences between freshmen and off-campus transfer students (path a_3b_2) was significant: b = -0.03 (95% CI: -0.04, -0.01). The direct effect of Contrast 1 on social connectedness (path a_3) was significant with freshmen reporting higher levels of social connectedness than off-campus transfer students: b = 9.78, SE = 1.17, p < .001. The direct effect of Contrast 1 on depressive symptoms (path c'_1) was not significant: b = -0.04, SE = 0.03, p = .12. In sum, both perceived stress and social connectedness were significant mediators of the effect of Contrast 1 on depressive symptoms.

Contrast 2: On-Campus vs. Off-Campus Transfer Students. The specific indirect effect examining perceived stress as a mediator of the differences between on-campus and off-campus transfer students (path a_2b_1) was significant: b = -0.04 (95% CI: -0.09, -0.00). The direct effect of Contrast 2 on perceived stress (path a_2) was significant with on-campus transfer students reporting lower levels of stress: b = -0.16, SE = 0.08, p < .05. The specific indirect effect of Contrast 2 on depressive symptom through social connectedness (path a_4b_2) was significant: b = -0.02 (95% CI: -0.03, -0.01).The direct effect of Contrast 2 on depressive symptoms (path c'_2) was also significant with transfer students living on campus reporting fewer depressive symptoms than those living off campus: b = -0.09, SE = 0.03, p = .01. In sum, both perceived stress and social connectedness were significant mediators of the effect of Contrast 2 on depressive symptoms.

Moderated-Mediation Models. We ran two separate moderated-mediation models: one for Contrast 1 (freshmen vs. off-campus transfer students) and one for Contrast 2 (on- vs. off-campus transfer students). In both models, we specified that the relationship between perceived stress and depressive symptoms (path *b*) was moderated by social connectedness. Additionally, given that off-campus transfer students appeared to follow a different trend for perceived stress, we specified that the relationship between the group contrast variables and the mediator (path *a*) would be moderated by *Time.* Figures 5.8 and 5.9 show the moderated-mediation models with covariates not included in the diagrams for the sake of clarity.

Contrast 1: Freshmen vs. Off-Campus Transfer Students. When evaluating the specific indirect effect of Contrast 1 on depressive symptoms through perceived stress, we found that there was a significant interaction between perceived stress and social connectedness predicting depressive symptoms: b = -0.03, SE = 0.01, p =.04. When probing the nature of the interaction, we found that path *b* was significant at both low (1 *SD* below the mean) and high (1 *SD* above the mean) levels of social connectedness: b = -0.06 (95% CI: -0.10, -0.03) and b = -0.04 (95% CI: -0.07, -0.02), respectively. Although the indirect effect was significant at both low and high levels of social connectedness, the effect was stronger at lower levels of social connectedness. The interaction of Contrast 1 and *Time* predicting perceived stress was not significant in this model: b = -0.01, SE = 0.01, $p < .20$. The magnitude of the effect of Contrast 1 on perceived stress did not vary significantly over time.

Contrast 2: On-Campus vs. Off-Campus Transfer Students. When evaluating the specific indirect effect of Contrast 2 on depressive symptoms through perceived stress,

we again found that there was a significant interaction between perceived stress and social connectedness predicting depressive symptoms: b = -0.02, SE = 0.01, p < .04. When probing the nature of the interaction, we found that path b was significant at both low (1 *SD* below the mean) and high (1 *SD* above the mean) levels of social connectedness: b = -0.07 (95% CI: -0.13, -0.01) and b = -0.05 (95% CI: -0.11, -0.01), respectively. Although the indirect effect was significant at both low and high levels of social connectedness, the effect was stronger at lower levels of social connectedness. The interaction between Contrast 2 and *Time* predicting perceived stress was also significant: b = -0.04, SE = 0.02, p < .01. As expected, given the group mean profile plots, the effect of Contrast 2 on perceived stress was not significant at baseline, b = 0.09 (95% CI: -0.02, 0.21), but became stronger over time and was significant by the end of the semester, b = -0.12 (95% CI: -0.21, -0.04).

Study 3b Summary

The results of Study 3b generally replicate the findings of Study 3a. At first glance, first-semester transfer students appear to be at increased risk for stress, low social connection, and depressive symptoms compared to freshmen. However, a more nuanced analysis shows that on- and off-campus transfer students followed qualitatively different growth patterns on the three time-varying constructs. At the baseline assessment, freshmen reported significantly lower depressive symptoms compared to off-campus but not on-campus transfer students, partially supporting hypothesis 1. On- and off-campus transfer students reported similar levels of baseline symptoms; but over time, on-campus transfer students reported slight improvements in stress and depressive symptoms while off-campus transfer students reported increasing stress and symptoms. There was a

discrepancy in the findings of Study 3a and Study 3b in that freshmen in the first study reported relatively stable mean levels of stress and symptoms throughout the semester, whereas freshmen in the second study reported steady, albeit modest, increases in both stress and symptoms.

We found evidence supporting both of our proposed mediation models. The findings from the multiple mediation model suggested that differences between off-campus transfer students and freshmen (Contrast 1) and off-campus and on-campus transfer students (Contrast 2) were mediated by both perceived stress and social connectedness (hypothesis 2). We found partial support for our moderated-mediation model (hypothesis 3): the indirect effects of *Student Status* (contrasts 1 and 2) on depressive symptoms through perceived stress were moderated by social connectedness. The direct effect of perceived stress on depressive symptoms (path *b*) in this model was stronger at lower of social connectedness; however, path *b* remains significant even at high levels of social connectedness. For Contrast 2, but not Contrast 1, the direct effect of *Student Status* on perceived stress (path *a*) was moderated by *Time.* Significant differences between on- and off-campus transfer students in perceived stress emerged late in the semester.

Study 3 General Discussion

Limitations & Strengths

The findings from Study 3 should be interpreted within the context of several limitations. There were several research design shortcomings. First, as with all of the studies in this dissertation, the Study 3 data were drawn from convenience samples that were likely not representative of the broader college student population. Second, we

relied solely on data from self-report questionnaires leaving our analyses open to reporting bias. And third, our assessments covered only a limited time period. Extending study assessments in both temporal directions would lead to a better understanding of the development of depressive symptoms during the college transition.

There are also several notable limitations with our statistical analyses. First, although we developed our models using LMM, an approach suitable for analyzing clustered data (i.e., time points nested within individuals), our mediation analyses did not take into account the multilevel nature of the data sets. There have been recent advances in meditational analysis that allow for examination of indirect effects in multilevel models and models with random effects (Bauer, Preacher, & Gil, 2006). Additionally, more rigorous longitudinal mediation models can be achieved using SEM and latent growth models (Selig & Preacher, 2009; Preacher, Zyphur, & Zhang, 2010). We plan to replicate our meditational analyses using these advanced techniques in the near future. Second, due to the fact that students were not randomly assigned to either their student status (i.e., freshman or transfer student) or their housing status (i.e., on or off campus), we cannot make causal inferences from our meditational analyses. We believe that dynamic psychological processes like stress and social connectedness contribute to differences between freshmen and transfer students and between on- and off-campus students. However, due to the non-experimental nature of our studies, it remains unclear what processes are driving the observed differences. It is noteworthy, however, that our mediation models did account for the effects of covariates that were not part of the mediation pathways. Finally, our analyses did not evaluate the temporal sequence with which the proposed meditational processes (i.e., stress and social connectedness) and

outcome processes (i.e., depressive symptoms) occurred. Ideally, the data analyst would show that changes in meditational processes occurred prior to changes in the outcome variable. Our analyses simply showed that there was a correlation between the proposed mediators and outcome variable.

Study 3 also had several notable strengths. First, we were able to replicate and extend several findings from Study 3a using an independent sample. This increases our confidence in the validity of the findings. Second, both studies included frequent assessments across a discrete time period. This allowed us to better capture the development of time-varying processes during the transition period. And finally, to our knowledge, there are few existing studies evaluating mental health processes among transfer students despite the common perception that the process of transferring is stressful. Altogether, studies 3a and 3b evaluated the experiences of 157 transfer students during their first semester at a new university. We believe the Study 3 findings make a significant contribution to our knowledge about these students' experiences.

Interpretation of Findings & Future Directions

Studies 3a and 3b provided a consistent message that there are differences in the development of mental health processes among freshmen, transfer students living on campus, and transfer students living off campus. Prior to the start of the first academic semester and during the early weeks of the semester, freshmen reported lower levels of stress and depressive symptoms and higher levels of social connectedness than both on- and off-campus transfer students. As the semester unfolded, however, on- and off-campus transfer students diverged in their development of all three time-varying processes.

Living on campus during the first semester appeared to be a protective factor for transfer students.

There is an important question that emerged from these studies: Why did on-campus transfer students adjust better than those living off campus? One possibility is that the experience of living on campus fostered positive adjustment. From this standpoint, living on campus could be viewed as a positive intervention. Colleges and universities generally offer a broad range of academic and social resources for students, including libraries, gymnasiums, counseling & guidance services, and extracurricular programs. Students living on campus have better access to these resources than students living off campus. Use of these resources may help students cope with the challenges of making the college transition. In contrast, living off campus comes with additional challenges, like commuting to campus. Our findings are consistent with the hypothesis that the additional stress that comes with living off campus could partially account for differences in depressive symptoms.

Perhaps even more importantly, students living on campus were in close proximity to their peers and likely had better opportunities than those living off campus to participate in campus social networks. Our studies suggested that students living on campus developed a greater sense of belonging and connection to the campus community and that social connectedness may have partially accounted for group differences in depressive symptoms during the college transition. The positive mental health correlates of social connectedness are well-established (Bond, Butler, Thomas, Carlin, Glover, Bowes, & Patton, 2007; Williams & Galliher, 2006; Yoon, Lee, & Goh, 2008). Students with strong social bonds may receive more support from their peers during challenging

times and likely have a stronger sense of social self-efficacy. Our findings from Study 3b, although not from Study 3a, were also consistent with stress-buffering hypothesis which states that individuals with strong social bonds are better able to stave off the negative impact of stress.

An alternative explanation for the fact that on-campus and off-campus transfer students had different growth patterns is that there are unobserved characteristics or processes at play. Given that students were not randomized to either their student status or housing placement, it is plausible that there were important preexisting differences between groups that accounted for the divergent symptom development. We did not find significant differences between on- and off-campus transfer students on any of the baseline demographic or psychological process variables; however, the two groups may have differed in characteristics that we did not measure.

The most important direction for future research is to design a study that allows us to make causal comparisons between students living on and off campus. A research team at the University of Michigan is currently planning a multisite study evaluating whether living on campus leads to benefits in mental health, social, and academic functioning. The innovation of this study is the use of research methods (e.g., regression discontinuity analysis) that increase confidence in causal explanations when randomization is not feasible. These researchers are also seeking partnerships with colleges and universities that have excess demand for campus housing and determine which students receive on-campus placements via random lottery. This would allow for evaluation of the effects of living on campus in the context of a natural experiment.

Although we cannot make causal inferences about the effects of the transition process, it is noteworthy that in Study 3b, there were significant pre-semester differences between off-campus transfer students and freshmen and there was no evidence that the magnitude of this effect changed over time. It, therefore, seems unlikely that the college transition process was responsible for causing the differences between freshmen and off-campus transfer students. The same cannot be said for the differences that emerged between on- and off-campus transfer students. These two groups started the semester looking very similar in terms of their psychological functioning but diverged over the course of the semester. Given that our sample contained too few off-campus freshmen to allow for meaningful 2x2 moderation analyses (*Transfer* by *Campus*), we do not know whether living on campus is a protective factor specific to transfer students or whether it generalizes to other students. Future research should evaluate differences between freshmen living on and off campus during the transition period.

An interesting discrepancy emerged between studies 3a and 3b. In Study 3a, freshmen reported relatively stable and low levels of depressive symptoms. In contrast, freshmen reported steady increases in depressive symptoms in Study 3b. It is unclear from our findings whether this discrepancy reflected a cohort effect or whether the differences were attributable to the fact that we used different measures of depressive symptoms in the two studies (the CES-D in Study 3a and the PHQ-8 in Study 3b). It is possible that the cohort of students who participated in Study 3a had protective characteristics that prevented increases in symptoms during the transition. Alternatively, the process of transitioning may have been different across the two studies. Although both studies took place at the same institution, they were separated by 3-4 years. The

transition process could have become more difficult in the years between the two studies. Past research has shown that there are important differences across measures of depressive symptoms (Skorikov & Vandervoort, 2003). The PHQ-8 and CES-D may capture different aspects of depression, which could explain the discrepant trajectories.

The findings from these studies have important implications for both college administrators and mental health researchers. If larger, multisite studies replicate the group differences we observed, transfer students living off campus should be considered an at-risk population. There are many practical steps by administrators that could be taken to increase social connectedness and reduce stress among those living off campus (e.g., expansion of on-campus housing, creation of off-campus satellite communities, and special transportation and parking services for off-campus students). Many academic institutions have already implemented programs specifically designed to improve the college experience for students living off campus. However, these measures may not be effective if students with pre-existing mental health problems or risk factors are self-selecting into off-campus housing. Students with mental health problems (e.g., depression, social anxiety, eating disorders) may see living off-campus as a method of avoiding the distress that accompanies living in close proximity to other students. This underscores the importance of mental health screening and intervention focused on students living off campus. If students living off campus have less interaction with fellow students and campus housing personnel, they may be less likely to be identified as having mental health problems and receive services. We plan to evaluate this hypothesis using data from the Healthy Minds Study, which surveys thousands of students from over a dozen academic institutions.

Conclusion

The findings from studies 3a and 3b suggest that there are differences in the development of mental health processes among freshmen, transfer students living on campus, and transfer students living off campus during the college transition. Off-campus transfer students appear to be at increased risk depressive symptoms during their first semester at a new university. Further, these differences appear to be partly attributable to the fact that off-campus transfer students experience higher levels of stress and lower levels of social connectedness than their peers. Administrative support policies and psychosocial interventions targeting off-campus transfer students could be highly beneficial. However, more research is needed to determine whether our findings generalize to the larger college student population.

Table 5.1. Study 3b: Summary of LMM Analyses Predicting Depressive Symptoms.

			Final Model		
Fixed Effects	*df*	*Estimate*	*SE*	*t*	*p*
β_0 (Intercept)	883	2.104	0.020	104.78	0.00
β_1 (Week of the Semester)	883	0.003	0.002	1.65	0.10
β_3 (Perceived Stress)	883	0.251	0.014	18.23	0.00
β_7 (Social Connectedness)	883	-0.002	0.001	-3.20	0.00
β_8 (Optimism)	308	-0.022	0.010	-2.21	0.03
β_9 (Frosh vs. Trans-Off)[a]	308	0.024	0.033	0.72	0.47
β_{10} (Frosh vs. Trans-On)[b]	308	-0.039	0.039	-1.00	0.32
β_{21} (Need Psych Services Ever)[c]	308	0.074	0.027	2.76	0.01
β_{12} (Perceived Stress by Social Connectedness Interaction)	883	-0.003	0.001	-5.01	0.00
	Lower		*Upper*		
Random Effects	*95% CI*	*Estimate*	*95% CI*		
σ (Intercept)	0.168	0.188	0.212	-	-
σ (Int., Week)	-0.094	0.160	0.395	-	-
σ (Week)	0.012	0.016	0.021	-	-
σ (Residual)	0.211	0.224	0.237	-	-
Fit Statistics					
AIC	-	435.08	-	-	-
BIC	-	501.15	-	-	-

Note. PSS = AIC = Akaike Information Criterion; BIC = Bayes Information Criterion.
[a] Binary predictor variable distinguishing freshmen and transfer students living off campus.
[b] Binary predictor variable distinguishing freshmen and transfer students living on campus.
[c] Binary predictor variable indicating whether or not students had ever perceived a need for mental health services before the start of the semester.

Figure 5.1a. Study 3a: Depressive Symptom Trends for Freshmen and Transfer Students.

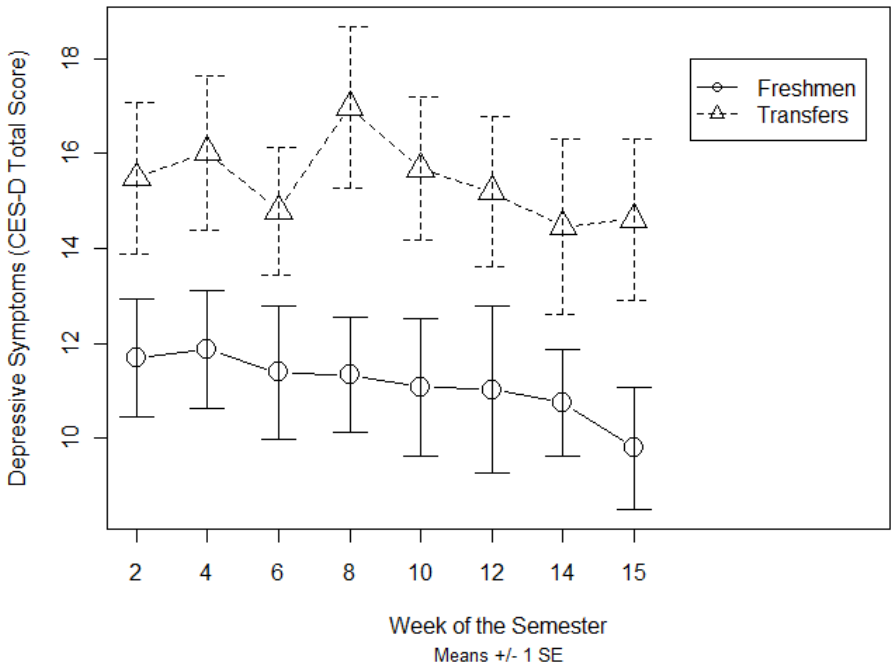


Figure 5.1b. Study 3a: Depressive Symptom Trends by Student Status (Freshmen vs. Transfer Students) & Housing (On- vs. Off-Campus).

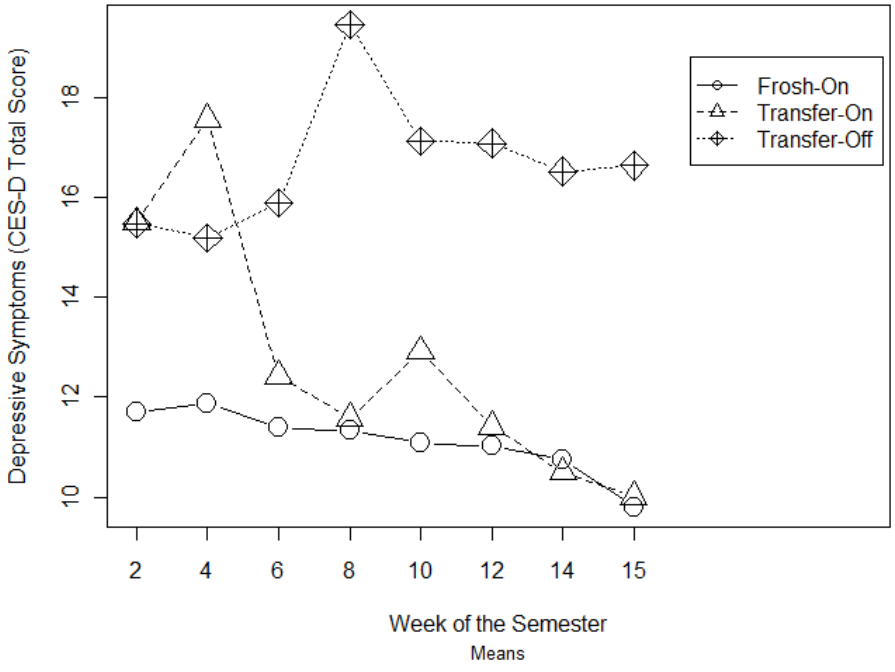


Figure 5.2a. Study 3a: Perceived Stress Trends by Student Status (Freshmen vs. Transfer Students) & Housing (On- vs. Off-Campus).

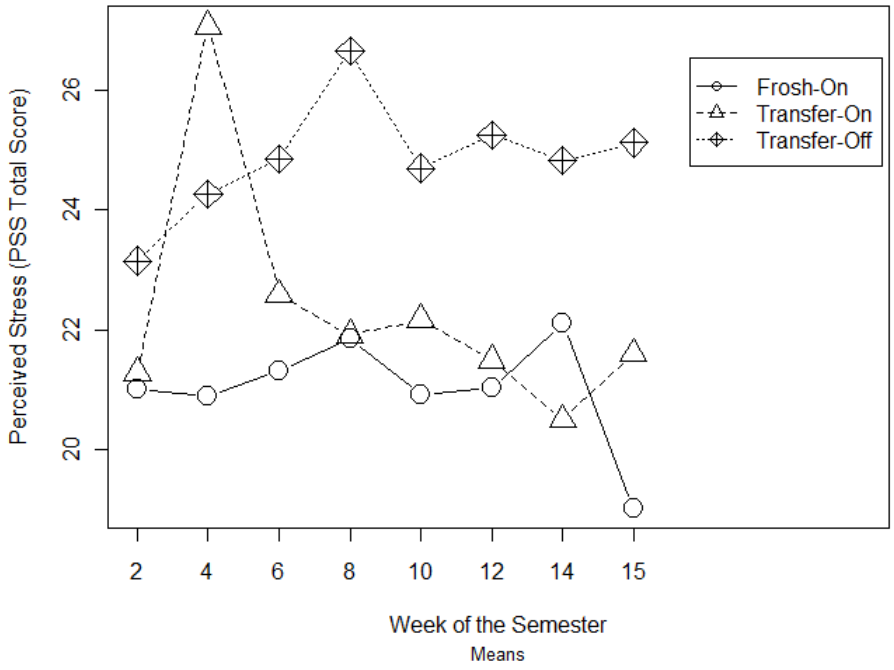


Figure 5.2b. Study 3a: Social Connectedness Trends by Student Status (Freshmen vs. Transfer Students) & Housing (On- vs. Off-Campus).

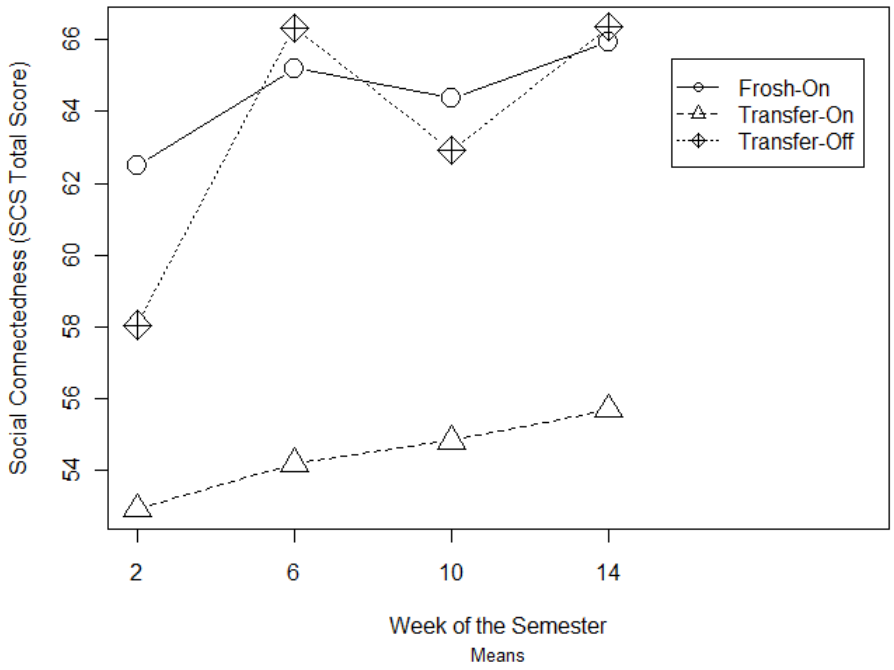


Figure 5.3. Study 3a: Multiple Mediator Model with Indirect Effects of *Transfer* (Freshmen vs. Transfer Students) on Depressive Symptoms through Perceived Stress & Social Connectedness.

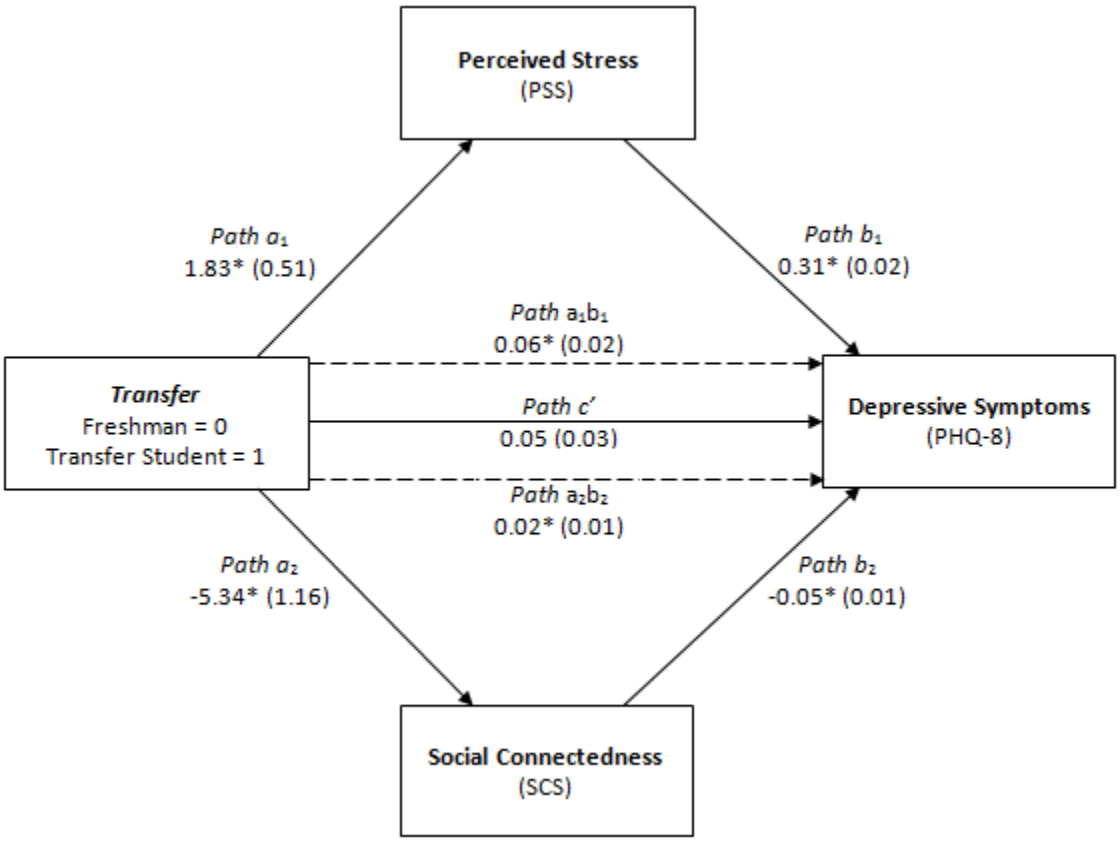


Figure 5.4. Study 3a: Moderated-Mediation Model with the Indirect Effect of *Transfer* on Depressive Symptoms through Perceived Stress Moderated by Social Connectedness.

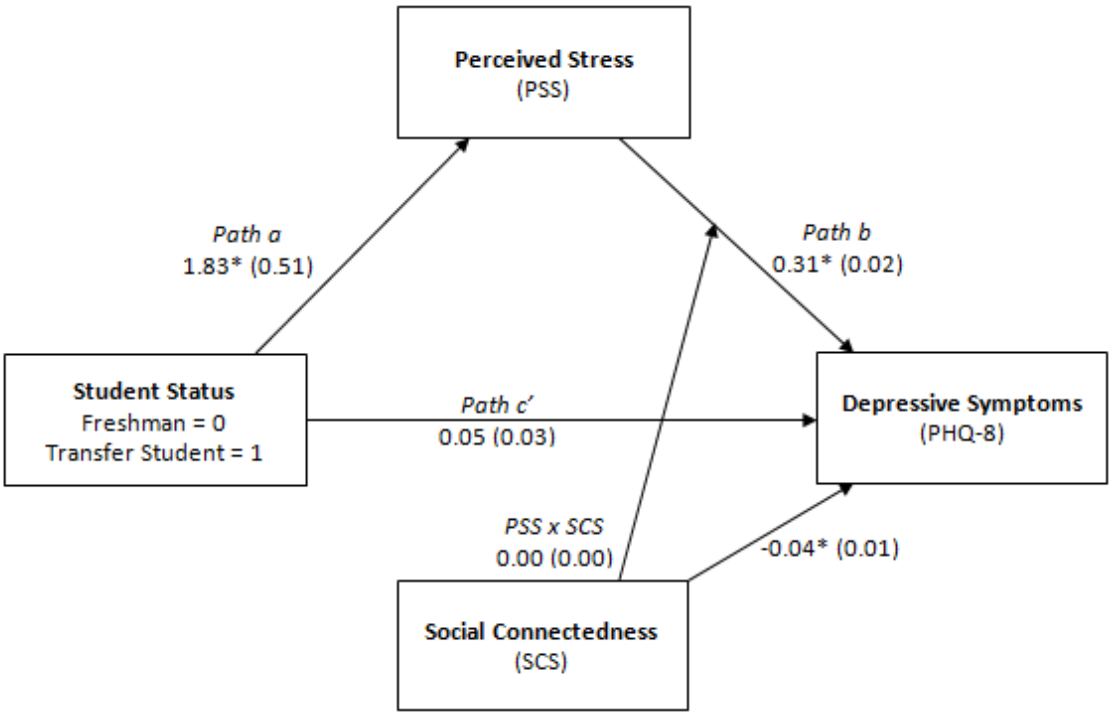


Figure 5.5. Study 3b: Depressive Symptom Trends by Student Status and Housing (On- vs. Off-Campus).

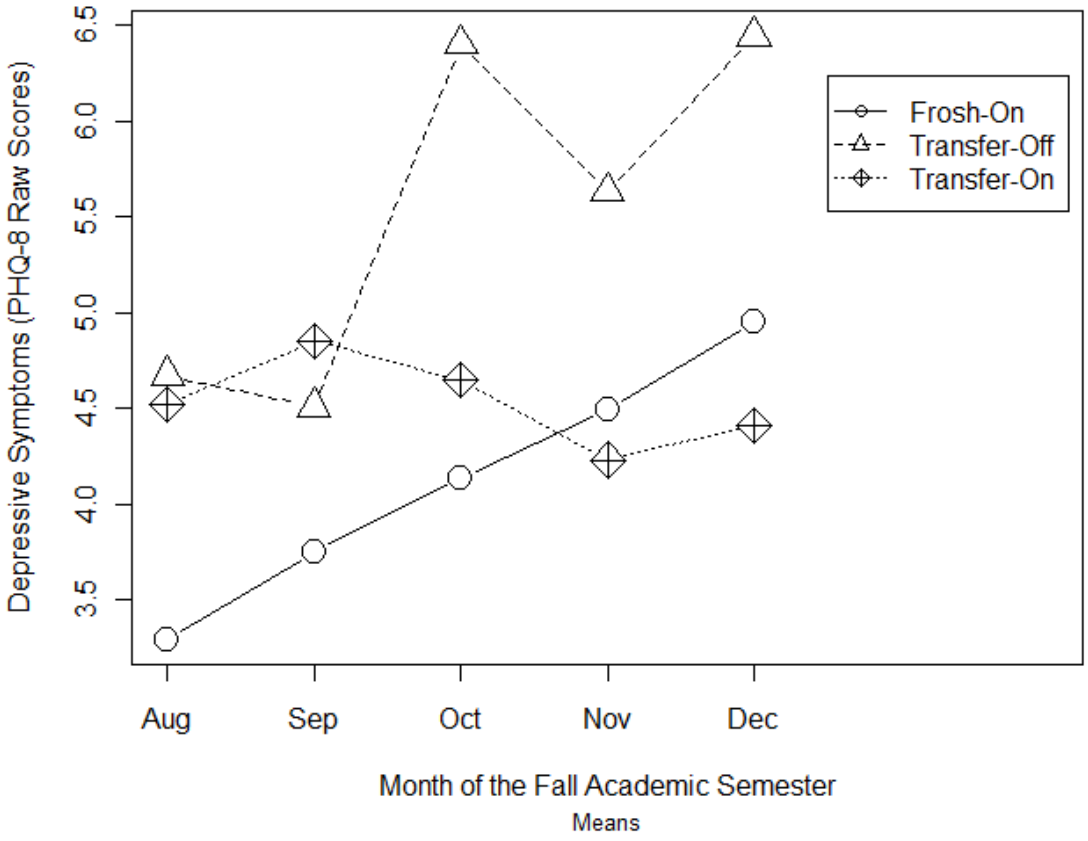


Figure 5.6a. Study 3b: Perceived Stress Trends by Student Status (Freshmen vs. Transfer Students) and Housing (On- vs. Off-Campus).

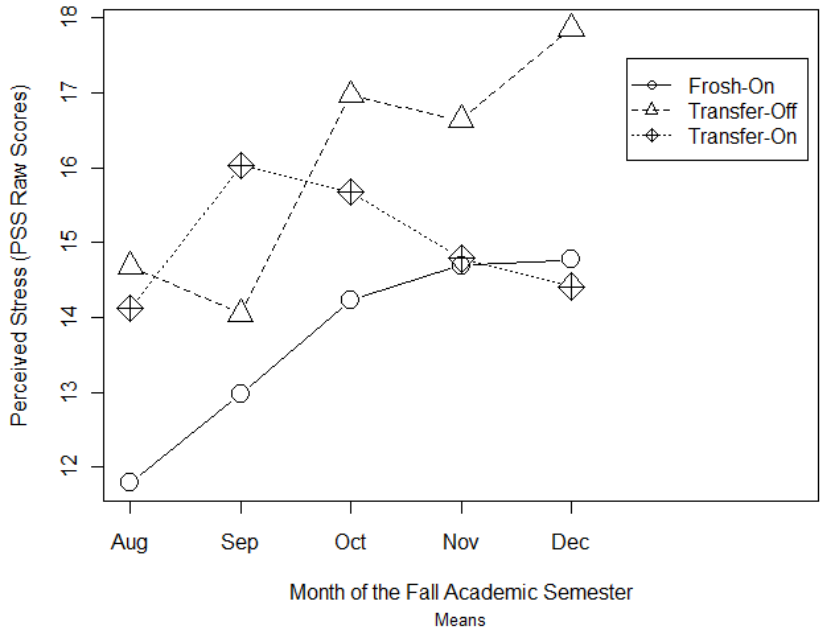


Figure 5.6b. Study 3b: Social Connectedness Trends by Student Status (Freshmen vs. Transfer Students) and Housing (On- vs. Off-Campus).

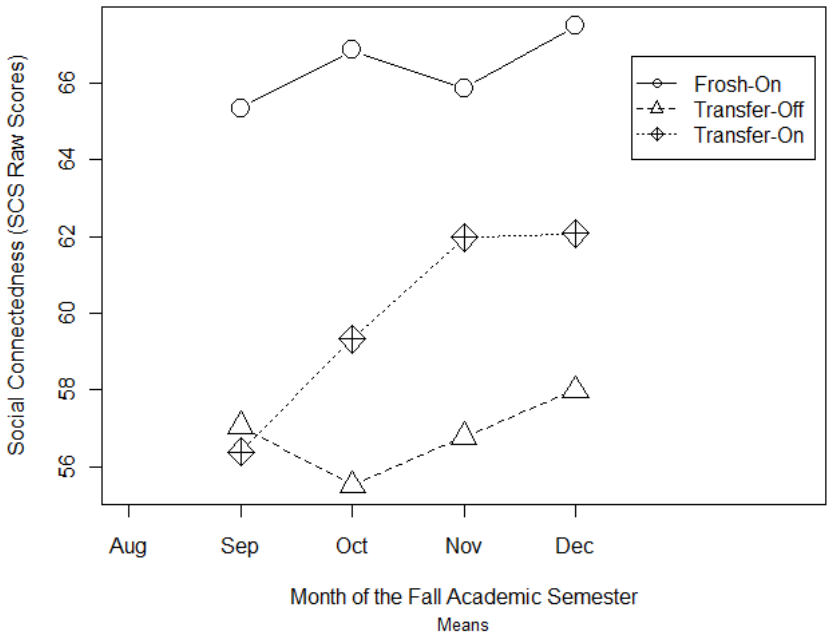
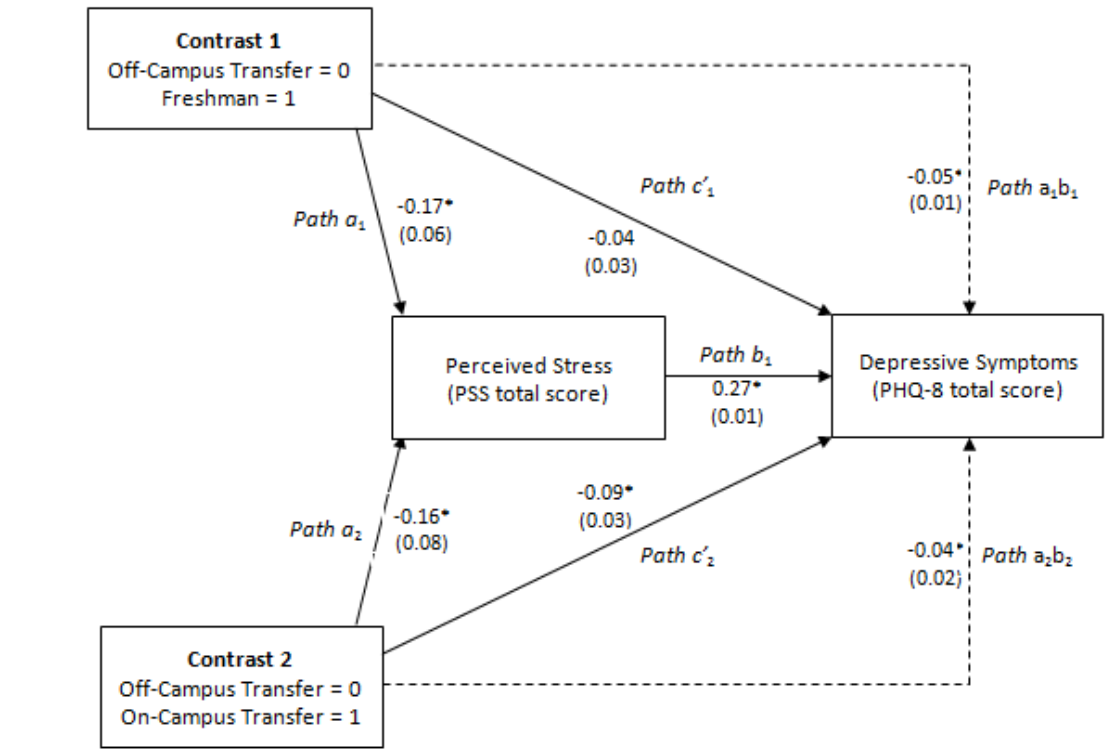


Figure 5.7. Study 3b: Multiple Mediator Model with Indirect effects of *Student Status* on Depressive Symptoms through Perceived Stress and Social Connectedness.



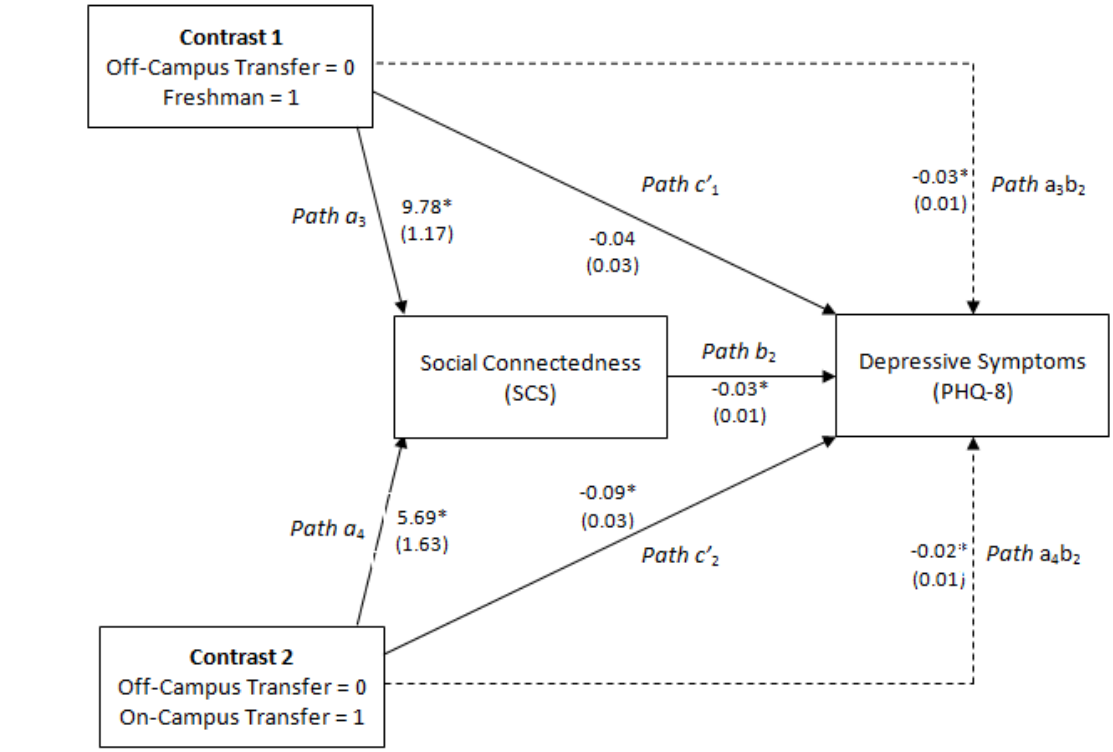
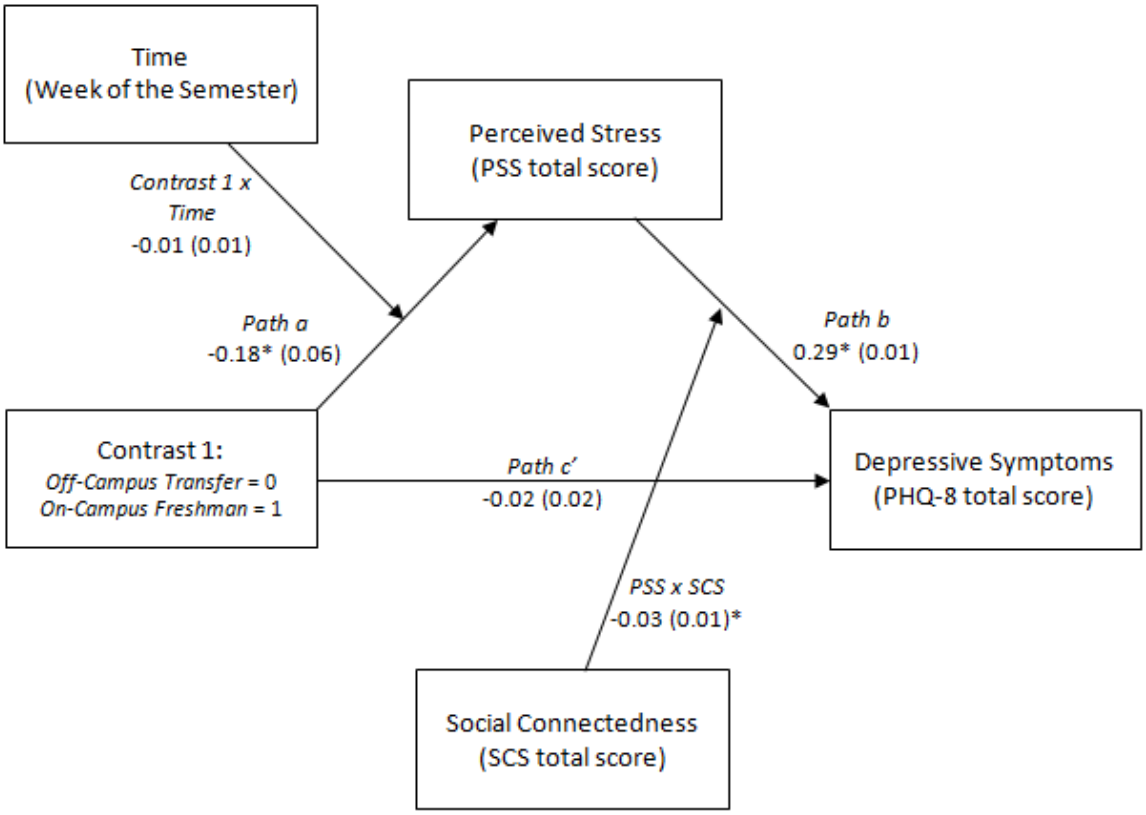


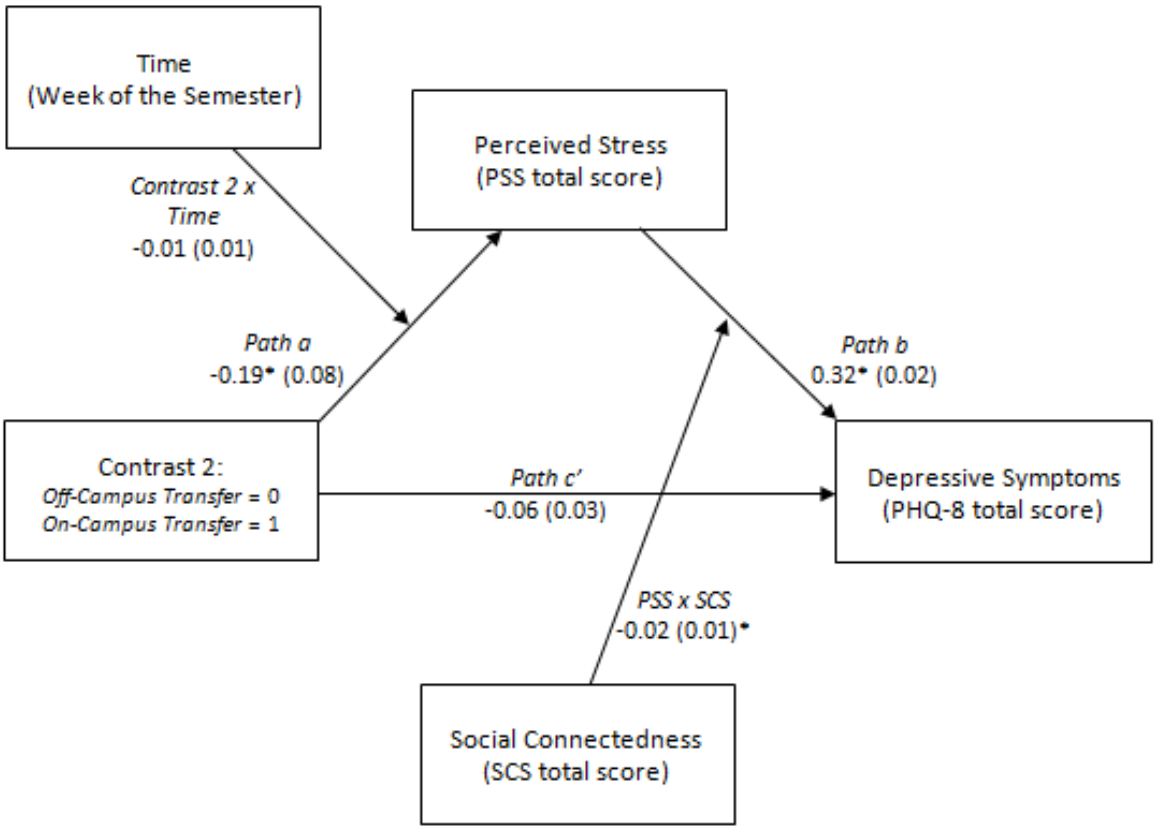
Figure 5.8. Study 3b: Moderated-Mediation Model with Differences between Off-Campus Transfer Students and Freshmen (Contrast 1) Mediated by Perceived Stress and Moderated by Social Connectedness & *Time*.



Indirect Effect (*ab*) of Contrast 1 on Symptoms (PHQ-8) through Stress (PSS) at Three Levels of Social Connectedness (SCS)

- At low levels of SCS (-1 SD): *b* = -0.06* (95% CI: -0.10, -0.03)
- At average levels of SCS (Mean): *b* = -0.05* (95% CI: -0.09, -0.02)
- At high levels of SCS (+1 SD): *b* = -0.04* (95% CI: -0.07, -0.02)

Figure 5.9. Study 3b: Moderated-Mediation Model with Differences between Off-Campus Transfer Students and On-Campus Transfer Students (Contrast 2) Mediated by Perceived Stress and Moderated by Social Connectedness & *Time*.



Indirect Effect (*ab*) of Contrast 2 on Symptoms (PHQ-8) through Stress (PSS) at Three Levels of Social Connectedness (SCS)

- At low levels of SCS (-1 SD): *b* = -0.07* (95% CI: -0.13, -0.01)
- At average levels of SCS (Mean): *b* = -0.06* (95% CI: -0.11, -0.01)
- At high levels of SCS (+ 1 SD): *b* = -0.05* (95% CI: -0.11, -0.01)

Indirect Effect (*ab*) of Contrast 2 on Symptoms (PHQ-8) through Stress (PSS) at Three Time Points

- At baseline (August): *b* = 0.09 (95% CI: -0.02, 0.20)
- At 2nd follow-up (October): *b* = -0.01 (95% CI: -0.06, 0.05)
- At 4th follow-up (December): *b* = -0.12* (95% CI: -0.21, -0.04)

CHAPTER 6

CONCLUDING COMMENTS

Summary of Dissertation Findings

The overarching goal of this dissertation was to evaluate whether or not students report increasing levels of depressive symptoms during the transition to college and to improve our understanding of the processes that contribute to the development of symptoms. When we began this research, we developed a conceptualization of how symptoms may develop during the college transition based on cognitive-behavioral and interpersonal theories of depression (see Chapter 1). Embedded within this conceptual framework are many hypotheses. Below, we list the major hypotheses (in italics) that we attempted to address in this dissertation and provide a brief summary of the outcomes.

The transition to college is a stressful time during which students are at increased risk depressive symptoms. Our findings were consistent with this hypothesis. Students in Study 1 tended to report increasing levels of both stress and depressive symptoms during their first semester. By the second month of the semester, mean levels of stress and symptoms across all students in the sample had increased significantly and symptom levels were highest at the end of the semester. Additionally, students reporting higher levels of symptoms endorsed more functional impairment throughout the semester.

Students who carry dispositional risk factors are more likely to use maladaptive coping strategies during the transition to college. Our findings from Study 2b were

consistent with this hypothesis. Students endorsing high levels of dysfunctional attitudes at the beginning of the semester reported more frequent avoidant behavior—and higher levels of stress—compared to those with healthier thinking styles.

Students who use maladaptive coping strategies (i.e., excessive avoidance) during the transition period experience higher levels of depressive symptoms. Our findings were mostly consistent with this hypothesis. In both studies 2a and 2b, students who were highly socially avoidant reported lower levels of social connectedness and higher levels of depressive symptoms compared to those reporting low levels of social avoidance. Students who reported high levels of procrastination (i.e., Task Avoidance) reported higher depressive symptoms than those reporting low levels of procrastination but only during times of high stress. Finally, students who avoided active problem solving efforts reported higher levels of depressive symptoms and this effect was particularly strong during times of low stress.

Social connectedness helps buffer against the negative impact of stress during the college transition. We found consistent support for this hypothesis in all three studies. The relationship between stress and depressive symptoms, although still present, was less strong when students reported a strong sense of connection to their peers and the campus community.

Transfer students are at increased risk for depression during the college transition because they experience more stress than freshmen and have more difficulty developing a sense of connection to their peers and the campus community. Based on our primary analyses in Study 3a, it initially seemed as though we had strong support for this hypothesis: transfer students reported consistently higher levels of depressive symptoms

than freshmen, and both perceived stress and social connectedness were mediators of this effect. However, our post-hoc analyses and the findings from Study 3b showed that a more nuanced interpretation was needed. Although they started the academic semesters with comparable levels of stress and depressive symptoms, on-campus and off-campus transfer students showed diverging symptom trajectories. In both studies 3a and 3b, on-campus transfer students ended the semester with symptom levels comparable to those of freshmen, whereas off-campus transfer students reported elevated levels of symptoms throughout the first semester. Our mediation models in Study 3b suggested that high stress and low social connectedness may help explain why off-campus transfer students had a more difficult time adjusting during the first semester.

Future Directions

It is our hope that the findings from this dissertation will prompt additional research into the development of depressive symptoms—and other mental health outcomes—during the college transition. It will be important to address the limitations of our studies and to expand on our research questions. Ultimately, we hope that such research will inform efforts on the part of both administrators and mental health professionals to promote well-being and prevent mental health problems during this difficult transition period.

APPENDIX

The Avoidant Behaviors Scale (15-Item Version)

Directions: Below is a list of behaviors that are common among college students. For each item, please indicate how frequently you behaved that way during the **LAST TWO WEEKS.** Please only think about how you behaved over the **LAST TWO WEEKS** and not about how you normally behave. You should not try to count the exact number of times the behavior happened; just approximate how frequently it occurred using the scale below.

1 = Not in the Last Two Weeks
2 = Rarely (once or twice)
3 = Fairly Often (several instances)
4 = Frequently (many instances)
5 = Very Frequently (on most days)

						TA	SA	PSA
1. **In the last two weeks**, I left an assignment until the last minute because it was unpleasant.	0	1	2	3	4			
2. In the last two weeks, I kept thinking about something bad that happened rather than doing something to make the situation better.	0	1	2	3	4			
3. In the last two weeks, I started getting work done much later in the day than planned.	0	1	2	3	4			
4. In the last two weeks, I worked extra hours to avoid interacting with someone.	0	1	2	3	4			

5. **<u>In the last two weeks</u>**, I regretted having put off something important.	0	1	2	3	4			
6. **<u>In the last two weeks</u>**, I tried my best not to think about a problem rather than trying to solve it.	0	1	2	3	4			
7. **<u>In the last two weeks</u>**, I let chores pile up rather than getting them done.	0	1	2	3	4			
8. **<u>In the last two weeks</u>**, I passed on an opportunity to meet new friends.	0	1	2	3	4			
9. **<u>In the last two weeks</u>**, I turned down an invitation because I was worried about interacting with others.	0	1	2	3	4			
10. **<u>In the last two weeks</u>**, I convinced myself that I could <u>NOT</u> make a bad situation better before even making a real effort.	0	1	2	3	4			
11. **<u>In the last two weeks</u>**, I felt I wasted too much time with aimless activities when there were important things to do.	0	1	2	3	4			
12. **<u>In the last two weeks</u>**, I just couldn't get started on my work.	0	1	2	3	4			
13. **<u>In the last two weeks</u>**, I made an excuse for why I couldn’t spend time with others.	0	1	2	3	4			
14. **<u>In the last two weeks</u>**, I stayed in my room to avoid spending time with roommates.	0	1	2	3	4			

15. <u>In the last two weeks</u>, I tried to convince myself a bad situation was OK when it really wasn't.	0	1	2	3	4			

Note. TA = Task Avoidance; SA = Social Avoidance; PSA = Problem Solving Avoidance.

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