A Web-Based Intervention with Email Support for Community College Students

A DISSERTATION
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

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August 2016

Acknowledgements

Writing a dissertation has felt similar to my hobby of long distance running. Both running and writing a dissertation have required patience, determination, and management of expectations. The process was grueling, but also rewarding. I could not have made it to the finish line without my team of coaches and supporters. In particular, I would like to thank my advisor, Dr. Pat Frazier, who has encouraged and supported me throughout every step of the run. Thanks for teaching, encouraging, and helping me overcome the barriers along the way. I would also like to thank my husband, Luke Meredith, for listening to my worries and believing in my strength. Luke, you deserve an honorary degree for all the unconditional love and support you have shown me over the past six years. I would also like to thank my family and friends, who have kept me balanced throughout the process.

Dedication

I dedicate my dissertation to my parents and grandparents, who have always supported my education. Thank you for instilling a love of critical thinking and learning.

Abstract

This study evaluated the efficacy of an online stress management program among community college students (N = 479). The online program was designed to increase present control, decrease mental health symptoms, and improve academic performance by means of an online mental health intervention (OMHI). Sections of a college readiness course (N = 28) at a community college were randomly assigned to one of three conditions: present control intervention (PCI), present control intervention with supportive messages (PCI + SM), or a comparison (COM) group. Participants in the PCI and PCI+ SM completed the same online intervention; however, the PCI+SM group received weekly supportive messages while completing the program. Participants were asked to complete self-report measures of present control, perceived stress, and mental health symptoms at pre-intervention, post-intervention, 3-week follow-up, and 6-week follow-up. Academic data for participants including official semester grade point averages (GPAs) and percentage of credits completed was obtained. Of the 479 participants, approximately 66% (n = 318) completed the post-intervention, 24% (n = 117) completed the 3-week follow-up, and 19% (n = 92) completed the 6-week follow-up surveys. All interactions between time and condition were non-significant suggesting that the three conditions were approximately equally effective for mental health outcomes. The between-group effect sizes comparing the PCI groups to the COM group for mental health outcomes from pre- to post-intervention were in the minimal to small range (d = -.08 to d = .14). Within-group effect sizes measuring change on mental health outcomes from pre- to post-intervention were also in the minimal to small range (d = -.15 to d = .26). There were no significant differences in academic outcomes between conditions, and the between-group effect sizes were in the minimal to small

range (d = -.17 to d = .02). Explanations for why the PCI conditions were not more effective are provided. In addition, limitations and future directions are discussed.

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Mental health problems and high stress levels are common among college students. More than a quarter of college students reported feeling unable to manage their stress during the past year (Boynton Health Service, 2013). Certain populations, such as community college students, have more risk factors for mental health concerns (Anders, Frazier, & Shallcross, 2012). This is problematic because stress puts students at-risk for engaging in unhealthy behaviors (Boynton Health Service, 2013) and encountering academic challenges (Eisenberg, Golberstein, & Gollust, 2007). Students can often obtain some mental health services on campus, but many universities and community colleges have limited services because of the high demand and limited resources (Watkins, Hunt & Eisenberg, 2012). Moreover, other college students with mental health concerns do not seek out help because of other barriers such as limited time and/or stigma related to counseling (Eisenberg et al., 2007). The development of online interventions may be one way to address these access issues. Not only does research indicate that online interventions are effective (e.g., Barak, Hen, Boniel-Nissim, & Shapira, 2008), but data also suggest that college students have routine access to the Internet, use the web to obtain health-related information, and have positive opinions of online interventions (Escoffery et al., 2005; Klein & Cook, 2010). Thus, stressed college students may be amenable to an online stress management program. This paper will first review the literature on college students' mental health, their help-seeking behavior, and the effectiveness of online mental health interventions (OMHI). Next, the development and effectiveness of an OMHI focused on increasing present control in community college students will be reviewed.

Prevalence of Mental Health Disorders and Stress in College Students

Many college students experience mental health difficulties and high levels of stress

while in college. In fact, college students report significantly higher levels of stress than the general population (Adlaf, Gliksman, Demers, & Newton-Taylor, 2001). In a large study of 11 two and four-year colleges, approximately 14% of college students reported having been diagnosed with a mental health disorder in the past year (Boynton Health Service, 2013). Another large-scale study of about 80,000 college students found that 51% of undergraduate women and 46% of undergraduate men reported experiencing "more than average" or "tremendous" stress in the past year (American College Health Association, 2014). Furthermore, over 85% of college students reported having felt overwhelmed by all that was expected of them at some point in the past year (American College Health Association, 2014). In addition, research suggests that certain subgroups of college students experience higher levels of stress. For example, female and full-time students report higher levels of stress than male and part-time students (Stallman, 2010). Thus, the vast majority of students have reported feeling overwhelmed at some point while in college.

Change in Mental Health Needs

Recently, there has been increased interest in college students' mental health because of the mounting evidence that students are more stressed than they were 30 years ago (Robotham & Julian, 2006; Sax, 1997, 2003). In surveys, most campus counseling center directors (95%) reported that their counseling centers have seen more clients with severe psychological issues in recent years (Gallagher, 2012; Gallagher, Gill, & Sysko, 2000). Furthermore, a review of documentation from college counseling centers suggested that the vast majority of client concerns, including stress, anxiety and depression, have become more prevalent over time (Benton, Robertson, Tseng, Newton, & Benton, 2003).

Several ideas have been proposed about why there is an increased prevalence of mental

health issues on campus. First, it could be that college students are facing more stressors and pressures than they have in the past. Second, college students could be more willing to report mental health issues in contemporary society (e.g., Hunt & Eisenberg, 2010). Third, it could be that more young adults with pre-existing mental health issues are enrolling in colleges in comparison to the past. Legislation such as the Americans with Disabilities Act of 1990 may allow for more students with mental health concerns to enter college and to receive accommodations in comparison to previous decades (Kadison & DiGeronimo, 2004).

Stressors Faced By College Students

College students report that many different factors contribute to their stress. Studies have suggested that academics, relationships, financial concerns, health issues, and daily hassles impact college students' stress levels (Abouserie, 1994; Frazier & Schauben, 1994; Larson, 2006; Perna, 2010; Phinney & Haas, 2003; Ross, Niebling, & Heckert, 1999). Furthermore, many college students experience traumatic events while enrolled in school. One study found that about one fifth of college students reported a potentially traumatic event during a two-month period (Frazier et al., 2009). The most common events included the unexpected loss of a friend or family member or a loved one surviving a life threatening illness (Frazier et al., 2009).

Certain populations might be particularly vulnerable to specific stressors. For example, medical students describe experiencing numerous academic stressors (e.g., Shah et al., 2009). First-generation college students report experiencing financial and domestic demands (Phinney & Haas, 2003), and nontraditional students often face stress balancing full-time jobs on top of other demands (Perna, 2010). Thus, specific populations experience unique challenges.

Outcomes Related to Stress in College Students

Individuals experience stress when they are threatened or perceive that they do not have

the resources or abilities to cope with environmental demands (Lazarus, 1971). Although stress is often perceived as an unpleasant experience, some level of stress is adaptive because it mobilizes individuals toward productive actions (Del Giudice, Ellis, & Shirtcliff, 2013). When stress becomes too persistent or severe, however, it is linked to a host of negative outcomes including poorer physical health, mental health, and decreased vocational and educational achievement.

Physically, there is mounting support that stress negatively impacts many different body systems (Folkman, 2010). Specifically, chronic stress has been shown to lead to dysregulation of the neural, cardiovascular, autonomic, immune and metabolic systems (McEwen, 2008). Experiencing prolonged periods of stress has been linked to the production of the stress hormone cortisol. Data have shown that increased production of cortisol can interfere with proper cell functioning, increasing the risk for medical problems such as heart attacks, decreased immune functioning and hypertension (American Institute of Stress, 2011).

Students who are stressed are more likely to engage in unhealthy behaviors. For instance, researchers have found that students who are more stressed tend to eat unhealthier foods, exercise less and sleep fewer hours each night (Hudd et al., 2000; Lund, Reider, Whiting, & Prichard, 2010; Weidner, Kohlmann, Dotzauer, & Burns, 1996). Furthermore, college students who experienced several mental health stressors in the past year smoked more cigarettes, used more marijuana and engaged in more high-risk behaviors compared to college students who reported fewer mental health stressors in the past year (Boynton Health Service, 2013). Therefore, stress appears to both indirectly and directly impact physical health.

Experiencing unmanageable stress is also associated with poorer mental health. In one study, college students who reported being more stressed tended to report lower overall life

satisfaction (Weinstein & Laverghetta, 2009). Further, those students who reported their stress to be unmanageable were about three times more likely to be diagnosed with an anxiety disorder or depression in the past year in comparison to students who reported their stress to be manageable (Boynton Health Service, 2013). Another study found that college students' who perceived having higher levels of stress were at greater risk for mental health issues (Bovier, Chamot, & Perneger, 2004). Recent longitudinal research has also suggested that how adults respond to daily stressors predicts subsequent mental health. Specifically, individuals who exhibited heightened affective reactivity in response to daily stressors were more likely to report a diagnosed affective disorder (e.g., depression, anxiety) ten years later (Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013). Thus, how people perceive and respond to stressful events can predict their mental health over time.

Experiencing higher levels of stress in college can also interfere with educational achievement. In a large-scale study, more than one-fourth of college students reported that stress had resulted in them dropping a course or other academic responsibility and/or receiving a lower grade on an important assignment or course (American College Health Association, 2014). Other studies have shown that students who reported higher levels of stress had lower GPAs and less intention to stay in college compared to students who reported less lowers of stress (Pritchard & Wilson, 2003; Stallman, 2010). In sum, high levels of stress can serve as a barrier to academic success.

Stressed individuals also report difficulty engaging in and maintaining romantic relationships. For example, individuals with mental health concerns reported less engagement in relationships (e.g., Salzer, 2012). Romantic partners also have reported withdrawing or becoming easily angry on stressful days (Schulz, Cowan, Cowan, & Brennan, 2004). Stress also impacts

sexual functioning in couples. Stressed romantic partners reported more sexual difficulties and decreased sexual activity in comparison to less stressed partners (Bodenmann, Ledermann, Blattner-Bolliger, & Galluzzo, 2006). Perhaps for these reasons, stress hinders overall relationship quality (Williams, 1995). More stressed partners reported lower levels of relationship quality and were at greater risk of breaking up (Bodenmann, 1997). Taken together, there is mounting data that experiencing high levels of stress impacts numerous aspects of our lives including how we connect and interact with other people.

Community Colleges

The stressors that community college students experience are similar to the stressors faced by students enrolled at four-year institutions. Nonetheless, some researchers have pointed to ways that the mental health needs of community college students differ from students enrolled at four-year institutions. Next, information and research will be presented about community college students, and how they differ from students enrolled at four-year institutions.

Community colleges, sometimes also called junior, technical, city or two-year colleges are a critical component of America's postsecondary educational system (American Association of Community College [AACC], 2016). The first community colleges were founded over a century ago to offer inexpensive higher educational programming within local communities (AACC, 2016). Since that time, community colleges have adopted a mission of providing inclusive and affordable educational programming for members of their surrounding communities (Vaughan, 2000). Community colleges across the country vary in terms of size and programming; however, most community colleges are public institutions that offer a range of academic, non-credit, enrichment and technical/vocational classes. Community colleges typically award associate degrees, certificates or diplomas to students meeting specific requirements

(AACC, 2016).

Since the 1970s, there has been tremendous growth in the number of community colleges across the United States, in part because of the increasing cost of four-year institutions (Zeidenberg, 2008). Most Americans can access a community college or a related branch/ extension center within a one-hour drive of their residence (AACC, 2016). The growth of community colleges is expected to continue: President Barack Obama established a goal of increasing the number of students with community college degrees by 2020 as part of his 21st-Century Initiative education agenda (AACC, 2016).

Community College Students

As of February 2016, there were 1,108 public, tribal, and independent community colleges in the United States (AACC, 2016). Approximately 7.3 million students were enrolled either full-time (38%) or part-time (62%) in a community college. Nearly half (45%) of current undergraduate students in the United States were enrolled at community colleges in Fall 2014 (National Center for Education Statistics [NCES], 2015a). Students enroll in community colleges for a wide range of reasons. About 60% of students enter community colleges with the goal of completing a degree or transferring to a four-year institution (Shulock & Moore, 2007). Some of these students are drawn to community colleges due to their affordability, convenience and unique job training opportunities (Cohen & Brawer, 1996). The average annual tuition/fees at a community college was $3430 in comparison to $9410 at a public, in state, four-year college in 2015(College Board, 2015). Other students, such as those who have a history of academic difficulties or limited English language abilities, attend community colleges because of their open-door admission policies and remedial courses (Grubb, 1999). One study found that more than 60% of community college students enrolled in at least one remedial course in comparison

to less than 30% of students at public four-year institutions (Bailey, Jenkins, & Leinbach, 2005).

Demographics of Community College Students

Recent demographic information suggests that community college students are a diverse group. More community college students were female (57%) than male (NCES, 2015a). Most community college students ranged in age from 18 to 39 years old, and the average age of a community college student was 28 years old (NCES, 2015b). According to NCES (2015a), just under half of community college students identify racially/ethnically as white/Caucasian (49%) with the rest identifying as Hispanic (22%), Black (14%), Asian/Pacific Islander (6%), Native American (1%), two or more races (3%), other/unknown (4%) and nonresident alien (1%).

Other significant demographic variables include that 36% of community college students are first generation college students, 17% are single parents, 7% are non-US citizens, 4% are veterans and 12% are students with disabilities (NCES, 2015b). The majority of community college students (72%) also apply for financial aid, and 58% of all community college students receive some form of assistance (NCES, 2015b). According to Mullin (2012), about 40% of undergraduate students who live in poverty attend a community college. In sum, there are greater proportions of racial/ethnic minorities, nontraditional, low income and first generation college students attending community colleges in comparison to four-year institutions (AACC, 2016; Byrd, 2005; Roueche & Roueche, 1993).

Success of Community College Students

Unfortunately, many community college students do not meet their educational objectives. Approximately half of community college students receive a degree and/or transfer to a four-year institution within a six-year period (Berkner, He, & Cataldi, 2002). Furthermore, about a fourth of students leave community colleges within the first year, and do not return to the

college within the subsequent two years (Horn, 2009).

One reason why community college students do not meet their educational objectives is because they are often managing multiple life roles simultaneously (Cohen & Brawer, 2003). Many community college students not only face demands as a student, but also as a parent, worker, or some other role (Coll, 1995; Miller, Pope, & Steinman, 2005). These lifestyle factors have been identified as non-academic factors for academic underachievement. For example, research has found that postponement of college after high school, part-time school enrollment, full-time work, financial independence, having dependents, single parenthood, and attending community college without a high school diploma are linked to academic difficulties (Coley, 2000; Mullin, 2012). It is unsurprising that community college students cannot always meet their educational objectives given how many responsibilities they are attempting to manage.

There is also some evidence that community college students have more risk factors for mental health problems, which also could directly or indirectly impact their educational achievement. One study found that community college students reported more lifetime stressors, more symptoms of Post Traumatic Stress Disorder (PTSD), lower life satisfaction, and poorer physical health in comparison to students at a four-year institution (Anders et al., 2012).

Student Services at Community Colleges

The impact of the growth of community colleges has been largely positive in terms of offering affordable educational programming to diverse populations. Nonetheless, community colleges have experienced financial stress due to increasing student enrollments and limited revenue sources (Zeidenberg, 2008). In comparison to four-year institutions, community colleges obtain little revenue from students' tuition and fees because these costs are purposely kept low (Zeidenberg, 2008). Consequently, many community college administrations are forced to make

tough decisions between raising students' tuition and fees and cutting educational programming and services (Zeidenberg, 2008).

For these reasons, many community colleges do not provide comprehensive counseling or psychiatric services. According to a recent survey, about a fourth of community colleges do not provide any type of mental health counseling services (Edwards, 2014). Further, only 14% of community colleges have psychiatric services available on campus in comparison to 57% of 4-year colleges (Gallagher, 2012). In sum, although many four-year colleges and universities are struggling to meet the increasing mental health needs of students, many community colleges simply do not have developed mental health resources to provide to their students. Providing comprehensive mental health services to students is a luxury that many community colleges cannot afford.

Many community college students have voiced an interest in having more student services available on campus. The vast majority of community college students reported that it would be "helpful" or "very helpful" to have personal counseling services available on campus (Bundy & Benshoff, 2000). Moreover, the limited research available suggests that funding student support services, such as personal counseling, is a worthwhile investment. One small-scale unpublished study found that 80% of community college students reported experiencing reductions in stress and improvements in academic performance as a result of using personal counseling services (Welsh, 2009). Another study found that first year community college students who used student support services (e.g., academic advising) were more likely to return for a second year of school (Fike & Fike, 2008). Thus, it appears that providing community college students with accessible counseling resources could result in large payoffs in terms of improving student mental health and school retention rates.

Importance of Mental Health Resources

Given that stress puts college students at risk for numerous deleterious outcomes, it is important that community colleges and four-year institutions have accessible mental health resources and that students use these resources. Unfortunately, community colleges and four-year institutions have shortages of mental health resources and students underutilize the resources that are available (Eisenberg et al. 2007; Gallagher, 2012; Gallagher et al., 2000). Research suggests that only 25% of college-aged individuals with a mental health disorder sought treatment in the year prior to the survey (Blanco et al., 2008). Another study found that less than 50% of college students with a diagnosis of major depression or an anxiety disorder sought treatment in the last year (Eisenberg et al., 2007). Furthermore, many college students who seek help for psychological concerns see a general medical practitioner rather than a mental health care specialist (Stallman, 2010).

Several explanations have been proposed regarding why college students underutilize mental health resources. In a large-scale study of mental health help-seeking behavior, college students indicated that skepticism regarding treatment effectiveness and perceiving that mental health concerns were not urgent were common barriers to treatment (Eisenberg, Hunt, Speer, & Zivin, 2011). Another study found that college students refrained from seeking mental health treatment due to busy schedules, limited hours of mental health services, stigma, lack of information regarding services, and the wait list for services (National Alliance on Mental Illness [NAMI], 2012).

Online Mental Health Interventions

Given the number of barriers to college students obtaining traditional, face-to-face counseling, there is a need for alternative and accessible mental health resources for students.

One innovative method for providing resources to college students is online interventions. Online mental health interventions (OMHI) are a diverse group of web-based programs designed to improve well-being and mental health. Depending on the specific definition being used, many different types of online programs could be considered an OHMI including therapist-delivered online therapy (e.g., eTherapy), smartphone applications and online support groups (see Barak & Grohol, 2011). However, this paper will focus on OHMI that are primarily self-guided, informational and/or interactive websites that are developed to help people improve their well-being. Often these OMHI deliver psychoeducation, cognitive or behavioral therapy (CBT) and/or solution-focused strategies through text, graphics, structured self-assessments, audio, video clips, case studies, games and cartoons (see Barak et al., 2008; Marks & Cavanagh, 2009). Some OHMIs require users to stick to a predetermined schedule of activities; however, more commonly users can complete online programs at their own pace.

OHMIs have many advantages that make them a promising alternative to face-to-face counseling services. First, web-based interventions are cost-effective because they can be relatively inexpensive to develop and implement, disseminated widely, and beneficial for users (e.g., McCrone et al., 2004). This is particularly helpful in environments, such as community colleges, where there is limited funding available for mental health services.

Second, OHMIs can be accessed whenever and wherever people have access to the Internet. This allows individuals with busy schedules and geographic barriers to access the resources at times that are convenient for them. The convenience of online interventions will likely meet the needs of community college students, who are often balancing multiple commitments including parenting and working.

A third strength of OHMIs is that they provide both flexibility and uniformity of delivery

(e.g., Neighbors et al., 2010). Online services are flexible in that they are typically self-directed and paced. These features are particularly helpful for college students who are second language learners because individuals can use online tools such as dictionaries to understand intervention content at their own pace. Yet, OHMI are also uniform in that typically all intervention content is available to users. Thus, even if users adopt a slower pace when using an OHMI, they can typically still receive all components of the intervention.

Furthermore, the anonymity of many online interventions is advantageous because some students refrain from seeking mental health services altogether due to the stigma associated with mental health issues. Online interventions appear to be attractive alternatives for individuals who report a stigma in getting mental health care (Klein & Cook, 2010). Young people report that online interventions are less stigmatizing than both phone counseling and face-to-face counseling (Kauer, Mangan, & Sanci, 2014). In sum, there are several positive features of online interventions that make them a good option for addressing the mental health needs of college students.

Besides these advantages, there are also data suggesting that people have positive attitudes toward these programs and that these programs are effective in treating a range of psychosocial problems (e.g., Griffiths, Christensen, Jorm, Evans, & Groves, 2004). Approximately 10% of adults have reported that are unwilling to try an online intervention and nearly a quarter of adults would prefer to use an online intervention than attend in-person therapy (Klein & Cook, 2010). A recent systematic review also found that young people found online mental health services to be satisfactory and would recommend these resources to their friends (Kauer et al., 2014).

One reason why individuals might have positive opinions of online interventions is that it

is becoming increasingly common for individuals to spend a substantial amount of time online and to use the Internet to find health-related information. Research has demonstrated that 90% of college students use the Internet daily and that 97% of college students have access to the Internet at their primary residence (Fortson, Scotti, Chen, Malone, & Del Ben, 2007; Kittinger, Correia, & Irons, 2012). Furthermore, many college students report that the Internet is an accessible and helpful way to learn about health-related issues (e.g., Escoffery et al., 2005; Hesse et al., 2005) despite that much of the information available on the web is of low quality (Reavley & Jorm, 2011). Estimates suggest that 80% of Internet users in developed countries have used the Internet to find health information on conditions, symptoms, diseases and treatments (Fox, 2008). Furthermore, more than one in five has used the Internet to find information about mental health concerns (Fox, 2008). Taken together, it is likely that college students will readily adopt OMHIs because it is normative to seek out health information online.

Effectiveness of Online Interventions

Even more importantly, OMHI are promising because substantial data suggest that they are effective in helping individuals with a range of mental health issues including traumatic stress conditions, anxiety and depression (e.g., Amstadter, Broman-Fulks, Zinzow, Ruggiero, & Cercone, 2009; Barak et al., 2008; Christensen, Batterham, & Calear, 2014). Some research also suggests that online interventions are as effective as in-person interventions (e.g., Cuijpers, Donker, van Straten, & Andersson, 2010; Christensen et al., 2014; van Straten, Cuijpers, & Smits, 2008).

In an early meta-analysis of 92 studies examining the efficacy of OMHIs, the authors found a mean weighted within-group effect size of d = .53 (Barak et al., 2008). In addition, several variables moderated the effectiveness of OMHI. First, more interactive programs tended

to be more effective than static websites. OMHIs fall along a continuum in terms of interactivity with static websites generally providing information in a text format and more interactive programs requiring users' participation in activities. Second, online interventions that employed a CBT approach (d = .83) were more effective than online interventions that employed a psychoeducational (d =. 47) or a behavioral approach (d = .23). Age of users also appeared to moderate intervention effectiveness. Individuals between the ages of 18-39 had larger post-intervention effect sizes than individuals younger than 18 or older than 39 years old. Moreover, online interventions appeared to be more effective for certain psychological issues. For example, the effect sizes were larger for anxiety disorders including posttraumatic stress disorder (PTSD) and panic disorder (d = .80) than for physiological disorders (d = .27) and weight loss (d = .17). This meta-analysis suggested that characteristics of online interventions and their users might impact the effectiveness of these interventions.

Since this meta-analysis, several other meta-analyses have been conducted examining the efficacy of OMHIs for specific psychological disorders. For example, Richards and Richardson (2012) conducted a meta-analysis of 19 randomized controlled trials (RCTs) of computer-based treatments for depression. Overall, the meta-analysis revealed a post-treatment pooled, between-group effect size of d = .56 in reduction of depression symptoms. This effect size was similar to the results of previous meta-analyses examining the efficacy of computer-based interventions for adults with depression (Andersson & Cuijpers, 2009; Griffiths & Christensen, 2006). Thus, the results of several meta-analyses provide converging evidence that OMHIs improve negative affect, and that effect sizes tend to fall in the moderate range. Furthermore, treatment gains appear to be sustained over time (e.g., Carlbring & Smit, 2008).

In an attempt to further understand under what circumstances and for whom OMHIs are

effective, Grist and Cavanagh (2013) conducted a meta-analysis of 49 studies examining what factors moderate the acceptability and clinical effectiveness of computer-based CBT programs. Many different person (e.g., demographic), problem (e.g., problem severity), provider (e.g., level of provided support) and computer program (e.g., intervention content) variables were included in this study. Inclusion criteria required participants to be adults (>16 years) and to have a common mental health problem. The intervention was required to be a self-help, CBT approach (e.g., Newman, Szkodny, Llera & Przeworski, 2011) and to be accessible through the Internet or a computer program. Furthermore, inclusion criteria also required the study to be a RCT and to collect and analyze quantitative data.

Consistent with the previous meta-analyses reviewed, the mean between-group effect size was moderate in magnitude (g = 0.77), with significant heterogeneity among the 49 studies. Two variables moderated treatment effectiveness: participant age and type of control condition included. First, participants who were younger benefitted more from the OHMIs in comparison to older participants. Second, the type of control or comparison condition included in the RCT (e.g., either inactive or active) moderated treatment effectiveness. Effect sizes were larger when the OMHI was compared to an inactive control condition (g = 1.11) rather than an active control condition (g = .40). Overall, this study suggested that OHMIs that have a CBT framework are effective in diverse circumstances. However, a major limitation of this study was that results were based on post-intervention data only. Thus, examining longer-term follow-up data may reveal additional moderating variables.

At this time, it is still unclear what ingredients are essential in making OMHIs work. However, scholars and researchers have weighed in on how to increase the effectiveness of OMHIs (e.g., Andersson, Calbring, Berger, Almlöv, & Cuijpers, 2009). One recommendation is

for users to be screened and deemed suitable for treatment, or for interventions to be tailored for individuals' needs. Users are more likely to benefit from a treatment that addresses their concerns. Second, Andersson and colleagues recommended that decisions about whether to include elements such as homework, graphics, and text should be considered thoughtfully. Depending on the goal of the OMHI, different pedagogical structure and content coverage may be appropriate. For example, it may be appropriate to make a preventive OMHI simpler and briefer than a program designed to improve a chronic and severe mental health problem. Third, it is recommended that interventions be accessible, well-organized and user-friendly. The final, and perhaps most important recommendation, is to provide some form of minimal support (e.g., phone calls, email messages) to users. A more detailed analysis of this last point will be covered in a more specific section later in this paper.

Online Mental Health Interventions (OMHI) for College Students

In recent years, there has been a rise in the number of online interventions developed for specific populations. Davies, Morriss, and Glazebrook (2014) conducted a systematic review and meta-analysis examining whether computer-delivered interventions can improve mental health symptoms in college students. The authors searched journal databases to identify RCT studies that employed a computer-delivered intervention to improve symptoms of depression, anxiety, distress and/or stress in college students. Seventeen trials were identified and included in the systematic review; however, only fourteen studies provided enough information to be included in the meta-analysis. The majority of the interventions were web-delivered interventions that employed a CBT approach (n = 9). Most interventions also used modules or sections to divide up intervention content into briefer sections, and these interventions ranged from having three to 13 modules (e.g., Arpin-Cribbie, Irvine, & Ritvo, 2012; Kanekar, Sharma, & Atri, 2009). The

average intervention took about six weeks to complete, and there were higher rates of engagement (e.g., less attrition) in briefer interventions.

Across the interventions, 1,795 participants were randomized and data from 1,480 were analyzed. In comparison to inactive control groups, participants who completed computer-delivered interventions reported improvements in terms of symptoms of anxiety (pooled standardized mean difference [SMD] SMD = −0.56), depression (SMD = −0.43), and stress (SMD = −0.73). However, computer delivered mental health interventions did not benefit participants more than active control groups (groups that are given activities that are designed to mimic the time and attention of an intervention) for symptoms of depression and anxiety. Participants who completed computer-delivered interventions reported similar levels of improvement for symptoms of anxiety (SMD = -0.18) and symptoms of depression (SMD = -0.28) as participants in active control conditions. This review provides some support that OMHIs can improve mental health symptoms for college students in comparison to treatment as usual. The authors of this paper noted that these results should be interpreted with caution because there was a considerable amount of skewed data and unpowered studies included in the analysis. Based on the high attrition rates observed across several samples, the authors recommended that researchers limit the amount of outcome data they collect in future RCTs. Participants may drop out of RCTs of online interventions prematurely because of response burden or the effort needed to complete a questionnaire (e.g., Rolstad, Alder, & Ryden, 2011).

Farrer and colleagues (2013) also systemically reviewed the efficacy of all technology-based interventions for mood issues within college/university settings. The authors identified RCT studies that examined the efficacy of a technology-based intervention among students between the ages of 18-25. All of the interventions included in the review were designed to

improve mood issues; interventions designed to improve substance abuse and eating disorder issues were excluded. Twenty-seven studies, which employed 51 technology-based interventions, were included in the review. The 51 interventions were diverse in form and content. For example, some of the interventions were Internet-based while others were audio or video-based interventions (e.g., relaxation training). Moreover, the length of the interventions varied: Some of the interventions could be completed within 15 minutes and others took several months. However, the most typical interventions were Internet-based, CBT programs that could be completed over the course of several weeks.

Overall, about half of the studies found at least one positive significant difference at post-intervention between participants in the technology-based intervention group and the comparison condition. About one third of studies found no significant effects for the technology-based intervention. Between-group effect sizes were calculated for the 18 of 51 interventions in which there were sufficient data available. For interventions targeting depression and anxiety (n = 8), the median effect size was g = 0.54 (range –0.07 to 3.04). The median effect size was larger (g = .84, range –0.07 to 2.66) for interventions targeting only anxiety symptoms (n = 10). Effect sizes could not be calculated for the interventions targeting stress because of insufficient data. The intervention length was not associated with treatment effectiveness; briefer interventions appeared to be as effective as longer interventions. However, the authors indicated that their findings should be interpreted with caution because methodological problems were apparent. Many studies failed to report sufficient information about randomization, did not specify a primary outcome, and did not conduct intent to treat (ITT) analyses.

Since these review articles have been published, three additional RCTs examining the efficacy of OMHI for mental health symptoms have been published. First, Musiat and colleagues

(2014) examined the efficacy of an OMHI aimed at reducing symptoms of common mental disorders such as depression and anxiety in European university students. A large group of participants were recruited online (n = 1,047) and randomized into either a CBT or an active control condition. Participants were also categorized as either being "low risk" or "high risk" for developing mental health disorders based on their personality traits at baseline. The CBT intervention, named PLUS (Personality and Living of University Students), consisted of five modules focusing on basic CBT principles, low self-esteem, trait anxiety and worry, perfectionism, and emotional dysregulation. Each of the modules took about 20-40 minutes to complete and participants could complete the modules in any order. The active control condition provided information to participants about practical and academic challenges. Approximately 20% of the sample was identified was being at high risk for developing a common mental health disorder. Attrition was high in the intervention and active control conditions. Across conditions, 50% of participants completed the 6-week follow-up and 38% completed the 12-week follow-up despite receiving a small financial incentive to complete the study. Within the intervention condition, 52% of participants completed the 6-week follow-up and 40% completed the 12-week follow-up. There were significant reductions in depression and anxiety at the 12-week follow-up for the participants in the high-risk group only. The between-group effect sizes for the high-risk sample at 12-week follow-up were d = .58 for depression symptoms and d = .42 for anxiety symptoms. The between-group effect sizes for the low-risk sample were not reported. In sum, the PLUS program appeared to moderately help college students at-risk for mental health issues, but many participants dropped out of the study prematurely.

Second, Sharry, Davidson, McLoughlin, and Doherty (2013) examined the efficacy of an OHMI aimed at improving symptoms of depression. Eighty European college students with at

least mild symptoms of depression took part in this study. Over the course of the 8-week program, participants completed self-report measures and self-paced through a 7-module online CBT and mindfulness-based intervention called Mind Balance. Each module was designed to focus on a particular topic (e.g., tracking thoughts) and contained components such as introductory quizzes, videos, informational content, interactive activities, personal stories and accounts from other clients, homework suggestions and summaries. To address issues related to participant compliance, each participant was also assigned to a therapist, who provided the participant with weekly reviews of his/her progress in the intervention. The online platform also allowed for the exchange of messages between the client and therapist and clients were encouraged to share their written exercises with their assigned therapist.

Results suggested that, among participants who completed the intervention (66%), there were statistically significantly decreases in self-reported depression levels with a large, within-group effect size (d =1.17). This effect size is promising and compares well to other OMHIs for depression (e.g., Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010). However, this study did not include a control group so it not known whether the Mind Balance program was the reason that participants' levels of depression decreased.

A third recent RCT examined whether an online program based on Acceptance and Commitment Therapy (ACT) called ACT on College Life (ACT- CL) could prevent the development of mental health problems in a college student population (Levin, Hayes, Pistorello & Seeley, 2016). Two hundred and thirty-four American undergraduate students who were required to be fluent in English and at least 18 years of age were randomized to either the ACT-CL program or mental health education (MHE) website. Participants in the ACT-CL condition completed a 3-week program that focused primarily on teaching users about acceptance and

values through various forms of multimedia. Participants in the MHE condition completed a 3-week program that focused on teaching users basic mental health information about depression and anxiety, and coping skills through text and illustrations. Participants self-reported mental health distress symptoms at pre-intervention, post-intervention, 1-month follow-up, and 3-month follow-up.

Results revealed that the MHE and ACT-CL program were largely equivalent both at post-intervention and follow-up in that there were no statistical differences between conditions. The within-group effect sizes from pre- to post-intervention for the MHE and ACT-CL groups were in the minimal to small range (*ds* = -.11 to -.04). Participants in the MHE condition reported greater levels of program satisfaction and were more likely to complete intervention tasks than the ACL-CL condition. Levin and colleagues hypothesized that, for ACL-CL to be more effective, it must be more engaging. The researchers suggested that perhaps the ACL-CL would be more effective if innovative ways of motivating and engaging users were included such as face-to-face meetings. They also suggested that including more aspects of the ACT model including mindfulness into the intervention may increase intervention effectiveness.

Stress Management Resources

OMHIs developed to improve college students' stress management may be particularly important because stress is common and related to other mental health disorders. Currently, only a handful of online interventions target college students' stress (and are reviewed later in this section). Nonetheless, a variety of other types of stress management programs have been developed and shown to be effective with a variety of audiences. For instance, in a meta-analysis of stress management interventions (*N* = 55) in occupational settings, Richardson and Rothstein (2008) found that stress management programs improved workers' stress levels with a medium

effect size (mean weighted between-group effect size of *d* = .53). The stress management interventions were coded and analyzed by theoretical approach including CBT, relaxation, organizational, multimodal, and alternative (e.g., journaling, exercising). Results suggested that the CBT (*d* = 1.17) and alternative interventions (*d* = .90) were the most effective modalities despite relaxation interventions being the most common (69% of studies). Moreover, adding more intervention modalities to a CBT intervention decreased intervention effectiveness, and interventions that lasted less than four weeks were more effective than longer interventions. Thus, it appears that brief and simple stress management programs can be very effective.

Regehr, Glancy, and Pitts (2013) conducted a meta-analysis examining the effectiveness of stress management programs of all modalities for university students. Twenty-four studies that included a CBT or mindfulness-based intervention and employed a RCT or a cohort quasi-experimental design were included in the study. Interventions varied in breadth, with most interventions lasting approximately 4-8 weeks. The results of this meta-analysis revealed that the CBT and mindfulness-based interventions were similarly effective. Participants in the CBT and mindfulness-based intervention conditions reported significant reductions in anxiety symptoms in comparison to control groups (SMD = -0.77). Secondary analysis also suggested that these interventions contributed to significant reductions in depression symptoms (SMD = -0.81) and levels of salivary cortisol (SMD = -0.52). This meta-analysis suggested that college students demonstrated improvements in mental health symptoms as a result of completing a stress management program.

In the past decade, there have also been a handful of online stress management programs developed specifically for college and university students. The most popular commercially available program is *MyStudentBody: Stress*. In this program, students are provided with a text-

based intervention that includes feedback and resources (e.g., relaxation exercises) based on their reported levels of stress, life events, daily hassles, coping style, and depression. One study evaluated the effectiveness of *MyStudentBody – Stress* for college students who were experiencing high levels of stress (Chiauzzi, Brevard, Thurn, Decembrele, & Lord, 2008). Participants were randomly assigned to *MyStudentBody –Stress*, an informational website regarding stress, or a control group. Unfortunately, the results did not support the effectiveness of this intervention. There were no significant between-group differences on primary outcome measures at posttest. Based on these findings, there appears to be a need for helpful, online stress management programs for college students.

More recently, three other online stress management programs have been developed for stressed undergraduate and graduate students. Cavanagh et al. (2013) examined whether a brief online mindfulness-based intervention improved college students' mental health in comparison to a wait-list control group. Participants randomly assigned to the mindfulness intervention were encouraged to listen to a 10-minute mindfulness audiotape daily for two weeks. Participants in the mindfulness condition reported significant improvements in perceived stress and negative affect at posttest (*d*s = .24 to .37). The between-group effect sizes (*d*s = .22 to 30) also suggested that the mindfulness condition was better in improving perceived stress and negative affect compared to the wait-list control condition. Additional research is needed on the feasibility and effectiveness of this self-guided intervention given the high attrition (48% did not complete posttest measures) and lack of follow-up data in this sample.

Day, McGrath and Wojtowicz (2013) evaluated the efficacy of an online, CBT intervention for undergraduate students struggling with stress, anxiety and/or depression. Sixty-six college students, who reported mild to moderate levels of stress, anxiety or depression,

volunteered to take part in this study and were randomly assigned to either the CBT intervention or a wait-list control condition. Participants assigned to the CBT intervention were asked to complete five modules that contained both psychoeducation and exercises. In these exercises, participants identified unrealistic cognitions and then challenged these thoughts. Program coaches also called or emailed the participants weekly to provide encouragement or advice for continuing to use the program. Participants who received the intervention reported significant reductions in anxiety, depression and stress in comparison to the wait-list control group with between-group effect sizes ranging from d = .34 to .64 at the 6-weeks post baseline assessment. However, only 61% of participants completed all five of the core modules.

Finally, Drozd et al. (2013) examined the effectiveness of an online, stress management program for social work graduate students. Two hundred and fifty nine participants were recruited on Facebook and were randomly assigned to either the Less Stress (LS) program or a wait-list control condition. The aims of the LS program were for participants to learn about stress, build awareness of sources of stress, and manage prolonged or high periods of stress. Participants in the stress intervention condition completed 13 sessions of the fully automated, intervention program over a four-week period. In each of the 13 sessions, participants received psychoeducation about a stress-related topic and were provided with techniques, exercises and homework assignments such as mindfulness exercises. Of the 126 participants randomly assigned to the LS condition, 92 of the participants (73%) initiated use of LS and 47 (39%) completed all 13 sessions. Participants completed an average of 6.82 sessions and spent an average of 66 minutes on the program.

Participants in the LS condition and wait-list control group demonstrated different developmental trajectories over the course of the study. Participants in the LS condition initially

reported higher stress levels, which subsequently decreased after the first month of the study. In contrast, participants in the wait-list control reported largely unchanged stress levels over the course of the study. Approximately 5% of the variation in stress levels could be accounted for by the treatment condition. Participants who completed the LS program significantly reduced their stress level from session 1 to session 13 with large effect sizes (d = 1.10); however, just over a third of participants completed the program. Mediation analyses suggested that increased mindfulness and decreased procrastination were linked to decreased stress levels.

Adherence and Dropout

As noted in many of the studies reviewed, one significant issue with OMHI is keeping users involved in the program. Many individuals start, but do not complete, an OMHI intervention (e.g., Hurling et al., 2007). Although adherence rates are particularly poor in open access online interventions, dropout rates from RCTs of online interventions are also frequently high (Christensen et al., 2009). Christensen and colleagues found that 1% to 50% of enrolled participants dropped out of RCTs of an online intervention. Analyses suggested that length of the intervention and the severity of the users' mental health concerns negatively impacted intervention adherence.

Several reasons have been proposed for why retention is low. Possible reasons include that OMHIs are too demanding, not tailored enough to the individual user, or not helpful. Participants may also receive alternative treatment, forget about the intervention, feel better or perceive that they are too busy (Helgadóttir, Menzies, Onslow, Packman, & O'Brian, 2009; Richards & Richardson, 2012; Warmerdam, van Straten, Twisk, Riper, & Cuijpers, 2008).

Gerhards and colleagues (2011) recently conducted semi-structured interviews with 18 participants (9% of the sample) who were randomly allocated to complete an OMHI. Interviews

were conducted to learn more about the patient experience and to determine what factors might lead patients to not begin or drop out from an online intervention. Of the 18 patients who completed the interviews, 8 completed the entire intervention, 3 never started the program, and 7 dropped out after having started the program. The participants selected to participate in the interviews were diverse in terms of socio-demographic variables.

An inductive content analysis in line with grounded theory was conducted. The researchers determined that there were numerous incentives and barriers for engaging in a CBT-based OMHI. Participants were more motivated to use the program if they perceived the content positively, self-identified with the intervention, experienced benefits as a result of the intervention use, wanted to contribute to research, and remained curious about the upcoming intervention components. Participants also commented on appreciating the convenience and anonymity of the interventions. They also appreciated having intervention components assigned at regular intervals so that they could get into a rhythm with using the intervention. Some participants also cited the advantage of being able to review previously posted intervention components.

Participants experienced barriers to using the program when they were not readily able to translate intervention content to their lives, ran into difficulties with using the computer, and felt socially unsupported while completing the program. Some aspects of the intervention, such as the mood diary and homework assignments, were controversial. Some participants nominated this feature as the most helpful part of the intervention, while others deemed this feature burdensome. The authors noted that nearly all participants voiced a preference or a need for receiving support while using the program, and that support might be particularly helpful for individuals with limited social support in their current environment. Many of the users stated that

they wanted to receive support while using the program because it would enhance their self-discipline in using the program.

Supportive Accountability

Given the poor adherence rates in OMHI, scholars have started to consider how interventions or their procedures can be modified to encourage more sustained use of online interventions. One of the common conclusions is that adherence to online interventions can be increased by providing users with some type of support. Based on recent studies conducted over the past decade, there appears to be good reason to provide support to OMHI users. Not only do OMHI users voice a preference for support, but there is also evidence that supported online interventions are more effective than unsupported online interventions (Andersson & Cuijpers, 2009; Richards & Richardson, 2012; Spek et al., 2007). In a meta-analysis, Spek and colleagues found that online mental health interventions that provided some form of support had larger effect sizes (d = 1.00) than unsupported online interventions (d = .24). Completion rates also were higher if users received either administrative support (e.g., reminder messages) or clinical support (e.g., feedback from a clinician) in comparison to standalone interventions (e.g., Richards & Richardson, 2012). The frequency and delivery of support also appeared to make a difference. One study found that participants benefitted more from scheduled supportive phone calls than from open invitations to call for support (Kenwright et al., 2005). Another study found that the effectiveness of OMHI for depression increased as more support was provided to users (Johansson, Johansson, & Andersson, 2012).

Recently, Mohr, Cuijpers, and Lehman (2011) have proposed a model of supportive coaching called “Supportive Accountability.” The basic idea is that users will increase adherence to online interventions if they perceive that they are accountable for their actions. Many factors

appear to impact the development and maintenance of accountability. First, users need to be connected to a human presence, and this presence must be perceived positively. If users can develop a reciprocal relationship with a coach who is perceived to be trustworthy, benevolent, and expert, then they might hold themselves accountable for their actions. Second, adherence will likely be enhanced if a coach discusses expectations, process-oriented goals, and accountability with the user at the outset of treatment. Not only should users understand what is expected of them, but they should also set personal goals at the start of treatment. Importantly, this collaborative coach/user relationship can be developed through a variety of communication channels including phone calls and email messages. Besides the relationship between the coach/user, it is also important for the intervention itself to be perceived as legitimate and credible. If the OMHI is perceived as illegitimate and phony, users may be likely to drop out of the online intervention. Thus, it is important that the presentation, website source and associated contributors (e.g., authors), and design characteristics all be carefully crafted.

Mohr and colleagues (2013) examined whether users benefitted more from a standalone OMHI than an OMHI that provided supportive coaching based on this model of Supportive Accountability. One hundred and one internal medicine patients, who met inclusion criteria for depression based on a telephone administered survey were randomly assigned into either: a) a standalone 12-week, CBT, online program called moodManager, b) moodManager with supportive coaching, or c) a 6-week wait-list control group. Depression symptoms were assessed over the telephone at baseline, and at 6-, 12- and 16- weeks post baseline. Participants received up to $100 for completion of the phone measures. Participants in the supportive coaching condition received weekly, brief (5-10 minutes) phone calls, in which the coaches used a manualized coaching protocol focused on: establishing a supportive relationship, setting and

reviewing login goals, positively reinforcing login and site use, encouraging use of moodManager when login goals were not met, and answering questions. Importantly, the coaches did not engage in any discussions regarding clinical issues. If participants brought up any personal issues, the coaches encouraged them to review the content available on the online intervention.

Participants who received supportive telecoaching while completing moodManager logged into the program more, used the program for longer periods of time, completed a greater number of lessons, and used more interactive tools available on the website. However, participants who received supportive coaching phone calls did not show greater reductions in depression scores at post-intervention. Participants in the standalone and supportive coaching conditions showed similar reductions in symptoms of depression over time. For instance, the between-group effect size for the standalone intervention compared to the supportive coaching intervention from pre- to 12-weeks was $d = .05$. Thus, these groups had similar effects.

There are a couple possible reasons why supportive coaching did not improve ratings of depression. One is that this study was underpowered; the small sample size may have limited the ability to detect significant differences between groups. Another possibility is that 12 weeks might have been too long of a period to keep individuals engaged. Finally, it may also be that supportive coaching would have been more effective if it also included therapeutic/clinical support. In conclusion, this study demonstrated that supportive accountability appeared to foster adherence to online interventions. However, the type of contact may need to be modified to improve clinical outcomes.

Is More Support Always Better?

Although most of the available evidence suggests that participants benefit from receiving

support, a recent, systematic review brings into question whether supported interventions are necessarily better than standalone interventions. In a systematic review and meta-analysis, Grist and Cavanaugh (2013) categorized 49 RCTs based on the level of therapist support/involvement and examined whether level of support moderated treatment effectiveness. The 49 studies were categorized into four levels of support that had been previously developed and used in the self-help literature (Newman et al., 2011). These four categories included (1) self-administered (SA; therapist not involved at all or only involved for assessment purposes), (2) predominantly self-help (PSH; therapist engages in periodic check-ins with clients or teaches therapeutic rationale and/or how to use the self-help tool, (3) minimal-contact therapy (MC; therapist is actively involved in the application of a specific therapy for 90 minutes or less across encounters), and (4) predominantly therapist-administered treatments (TA; therapists have regular and unlimited contact with clients; however, treatment involves client use of a self-help tool). Studies coded as predominantly therapist-administered treatments were excluded from analysis because this level of support was basically akin to individual therapy.

Results revealed that, contrary to expectations, the level of support/involvement did not moderate treatment effectiveness. The three types of interventions showed approximately equivalent results. One explanation for this finding is that too much clinical support could interfere with participants' sense of mastery or control over their problems (e.g., Knowles et al. 2014). Therefore, more support is not necessarily better; however, it is unclear for whom and under what conditions providing clinical support improves outcomes. Grist and Cavanaugh (2013) cautioned that these results should be interpreted with caution because the sample size was small, and there was significant heterogeneity between studies.

How to Provide Support Effectively

Besides the question of whether to provide support to users, it is also important to consider what aspects of support are helpful for users. A group of researchers recently examined whether the content of a supportive message impacts the effectiveness of an online intervention (Paxling et al., 2013). To address this question, Paxling and colleagues examined the content of 490 emails sent to 44 participants in a CBT, OMHI for generalized anxiety.

In this study, three graduate student counselors sent regular emails to intervention users about their homework assignments. In these emails, the therapists typically provided feedback to users about their homework and answered any questions. The therapists were instructed that their supportive messages should foster adherence to the online intervention, answer users' questions, and give recommendations about how the users can use the skills. The therapists were given weekly clinical supervision by an experienced psychotherapist, but no therapist manual was used to inform the supportive messages.

To determine whether the content of the emails impacted the effectiveness of online interventions, 490 emails written by the therapists were coded and content analyzed. This process revealed that therapists used eight different strategies in their emails. These strategies included deadline flexibility, task reinforcement, alliance bolstering, task prompting, psychoeducation, self-disclosure, self-efficacy shaping and empathetic utterance. The most commonly used email strategies were task reinforcement and self-efficacy shaping; the therapists most commonly provided positive reinforcement when users completed intervention tasks and applied the intervention strategies to their lives.

Statistical analyses were then done to determine whether there were significant relationships between the strategies used by the therapists and intervention adherence and effectiveness. In terms of intervention adherence, significant correlations were found for task

reinforcement, task prompting, self-efficacy shaping and empathetic utterance. Participants completed more modules when these four email strategies were used. In terms of intervention effectiveness, significant correlations were found for deadline flexibility and task reinforcement. Specifically, the more lenient therapists were about due dates, the less users tended to benefit from the intervention. Moreover, the more therapists commented on users completing the assignment in a complimentary way (e.g., Well done!), the more effective the online mental health intervention tended to be.

It is important to note that there are several limitations to this study. First, all users in this study were using an OMHI to alleviate symptoms of anxiety. Because of this, it is unclear whether individuals with other mental health issues (e.g., stress, depression) would benefit from the same type of email messages. Second, this analysis looked at the behaviors of only three therapists who helped to develop the online intervention. Future research should look at a more diverse group of therapists. Third, this study was correlational, so one cannot conclude that these email strategies was causally linked to the study outcomes. Finally, the authors only examined strategies used by the therapists without considering what type of email message was sent by the user. It may be that what email strategies are most helpful depends on the reciprocal messages or back-and-forth between the two individuals. Nonetheless, this study suggests that the content of email messages may impact the effectiveness of the supportive messages.

Two other studies also provide evidence that the use of personalized messages impact treatment effectiveness. First, Finitsis, Pellowski, and Johnson (2014) conducted a meta-analysis of eight studies and nine interventions of participants who were diagnosed with HIV and received messages while taking Antiretroviral Therapy. Results revealed that participants who received text-based messages demonstrated greater adherence to their medication regimen in

comparison to those in control conditions who did not receive any technology-based support. Additional analyses suggested that the impact of the text messages was greater when the messages were sent less regularly than daily, were provided during the active phases of treatment, allowed for bidirectional communication and contained personalized message content. These results suggested that the procedures and the content of personalized messages impact treatment effectiveness.

In a second study, the effectiveness of an online weight loss program that provided users with either 1) weekly personalized messages from a weight loss coach or 2) computer-automated messages about food/exercise diaries were compared (Tate, Jackvony & Wing, 2006). The weight loss coaches did not adopt a specific structure; the coaches were encouraged to use their clinical judgment in responding to participants. Analysis of their messages suggested that the coaches often commented on things like progressing toward goals, overcoming barriers, and increasing motivation. Results indicated that individuals in the two conditions lost similar amounts of weight at 3-month follow-up. However, the participants who received personalized messages from a weight loss coach lost significantly more weight than those who received computer-tailored feedback at 6 months. This study once again demonstrated that personalizing messages to users may impact treatment efficacy.

Taken together, the research reviewed in this section has suggested that providing some type of support to users may improve both adherence and clinical outcomes. Moreover, how the support is delivered and what is said to users may also impact outcomes. Thus, the delivery of support appears to be an important component to consider when designing an OMHI.

Improving Online Interventions

Besides making deliberate attempts to provide support to OMHI users, there are other

ways to improve the quality of an OMHI. Many web pages have information that is incomplete, misleading or inaccurate (Abbott, 2000; Kisely, Ong, & Takyar, 2003; Silberg, Lundberg, & Musacchio, 1997). Therefore, interventions can be improved if they consider how to enhance accountability, presentation/design, readability, accuracy and technical criteria (Eysenbach, Powell, Kuss, & Sa, 2002; Kisely et al., 2003). Moreover, the Health On the Net (HON) Foundation offers a code of conduct (HONcode) and a certification process to encourage web developers to uphold basic ethical standards in the presentation of health information (HON, 2016).

Websites that are rated as high on accountability tend to do things such as credit authors, provide author affiliation, provide references and indicate when the site was last modified (Silberg et al., 1997). Silberg and colleagues created a 9-point scale to measure the accountability of the website based on these characteristics. In terms of presentation/design, websites that are rated highly keep the text brief and use headings to distill key information (Morkes & Nielson, 1997). Use of non-text elements such as graphics and designs are encouraged; however, these images should be paired with text to increase their meaning. Usability testing has revealed that university students are sensitive to stylistic aspects of online interventions (e.g., Currie, McGrath, & Day, 2010). It is also recommended that the reading level of an online intervention be at a maximum of an eighth grade reading level (Kisely et al., 2003). In terms of accuracy, it is recommended that the online mental health resources be based on the scientific literature.

A recent qualitative, meta-synthesis and review of the user experience of computer-based interventions for depression and anxiety ($N = 8$) also provided some hints about how to further improve online interventions (Knowles et al., 2014). One of the key findings was that users want

an OMHI to be relevant and sensitive to their needs. For example, participants had positive impressions of the OMHI if the program used their name or inquired about issues that they had previously discussed on the OMHI (Farzanfar, Frishkopf, Friedman, & Ludena, 2007). Several users also reported that they wanted the OMHI to be more "human" and to show compassion and concern for their issues (Farzanfar et al., 2007). Users reported having negative opinions of the OMHI if the intervention content was not relevant to their lives or their issues (e.g., Gerhards et al., 2011). In sum, users appear more likely to use an OMHI if they can self-identify with the program. Scholars have commented that adapting intervention content based on diagnosis alone is not sufficient (e.g., Palmqvist, Carlbring, & Andersson, 2007). For example, some online interventions are adapted based on users' presenting complaints or gender (e.g., Currie et al., 2010). Thus, adapting or tailoring the intervention to individuals' preferences and needs might improve the clinical effectiveness of the program.

Summary of Reviewed Research

Thus far, research on the prevalence and effects of college student stress and the effectiveness of online intervention has been reviewed. Despite the high levels of stress among undergraduate students and the effectiveness of online interventions in other populations (e.g., Barak et al., 2008), few online stress management programs have been developed for college students. Furthermore, community college students appear to have more risk factors for mental health difficulties than college students at four-year institutions, and often have fewer mental health resources available to them. Thus, community college students might have even greater needs for convenient and accessible mental health resources. In the next section, the development and evaluation of our present control intervention for stress management will be described. Subsequently, a new study of our present control intervention that takes into account

clinical support and best practices will be presented.

Theoretical Rationale for Our Intervention

Our stress management program was developed based on the temporal model of control, which distinguishes among past, present, and future control (Frazier, Berman, & Steward, 2001). Individuals high in past control focus on thoughts, feelings and behaviors that are related to a past event (e.g., Did I have control over the occurrence of this stressful event?). In contrast, individuals high in present control focus on current thoughts, feelings and behavior (e.g., Do I have control over how I deal with this event in the present?). Finally, individuals high in future control focus on preventing the future occurrence of stressful events (e.g., Can I prevent this stressful event from happening again?).

There are significant differences in the relations among past, present and future control and mental health outcomes (e.g., Frazier et al., 2011; Frazier et al., 2012). Present control is the only control construct that consistently predicts positive mental health and life functioning outcomes. For example, sexual assault survivors who reported greater levels of present control (i.e., control over the recovery process) had better mental health outcomes and engaged in more adaptive coping strategies (Frazier, Mortensen, & Steward, 2005). Present control was also associated with lower levels of general distress, event-specific distress, and binge drinking (Frazier et al., 2011) and greater levels of physical health and life satisfaction (Frazier et al., 2012). These associations remained significant after controlling for other mental health variables including general control beliefs, coping strategies, social support, and neuroticism (Frazier et al., 2011; Frazier et al., 2012). A recent study conducted on international students' adjustment to a large, Midwestern university found that perceived control over academic stress was the best predictor of lowered acculturative stress and psychological adjustment (Hirai, Frazier, & Syed,

2015). Thus, present control appears to predict adaptive functioning in diverse populations.

In contrast, past control is associated with more distress and poorer adjustment following stressful and traumatic events (Frazier et al., 2011). In a longitudinal study of female sexual assault survivors, past control including both personal past (e.g., behavioral self-blame) and vicarious past (e.g., rapist blame) control, was associated with higher levels of distress (Frazier, 2003). Another study of sexual assault survivors found that individuals that were higher in past control tended to use maladaptive coping strategies such as social withdrawal, which was related to increased distress (Frazier et al., 2005). More recently, a measure developed to assess the temporal model of control revealed that past control was significantly related to higher levels of distress including post traumatic stress disorder (PTSD), depression, anxiety and stress symptoms (Frazier et al., 2011; Frazier et al., 2012). Past control has also been associated with poorer physical health and lower levels of life satisfaction (e.g., Frazier et al., 2012).

There are inconsistent relations between perceived future control and mental health outcomes. In some studies, future control has not significantly predicted mental health (Frazier, 2003). In other studies, future control has significantly predicted more distress (Frazier & Schauben,1994). However, future control appears to be more adaptive when stressors are objectively controllable in comparison to when stressors are uncontrollable (Frazier & Caston, 2014).

Overview of Present Control Intervention Studies

Our online intervention targets one specific stress management skill - namely, perceived control over stressful events. It teaches students to distinguish between what they can and cannot control with regard to current stressors, and to shift their attention toward what they can control (i.e., present control).

Two pilot studies initially were conducted to test the feasibility of developing and disseminating an online present control intervention (PCI). Through conducting the pilot studies, we hoped a) to determine whether this online program could increase present control and b) to gather users' opinions about the intervention. We hypothesized that individuals randomized to the PCI group would demonstrate greater increases in present control than participants randomized to a stress-information only group. Results supported our hypothesis. In the PCI group, there was a medium, within-group effect (d =. 56) for increases in present control using the Perceived Control Over Stressful Events Scale (PCOSES; Frazier et al., 2011). Participants in the stress-information only condition reported unchanged levels of present control (d = .05). Participants also provided positive feedback about the intervention. Users stated that their favorite parts of the intervention included expert videos, video content and exercises. In sum, these results indicated that present control could be increased (at least in the short-term) from a brief online intervention and that students responded favorably to the intervention.

Following the first pilot study, we refined our PCI based on the feedback provided by the participants. In the second iteration, we created four, brief (10-12 minute) modules that followed a consistent format. Each module began with a video of an expert providing education about a specific topic. Next participants watched a video of a group discussion in which our expert facilitated the learning of a group of undergraduates. Finally, participants completed an exercise in which they applied the intervention content to their lives.

In the second pilot study, our goals were to determine whether 1) the changes made to the PCI improved the effectiveness of the intervention and 2) the PCI could improve mood in addition to present control. In this second pilot study, all participants completed the PCI; there

was no comparison condition. We hypothesized that participants would report improvements in both a) present control and b) mood. Results supported both hypotheses. Participants reported medium to large within-group effect sizes for present control (*d* =. 74) and small to medium effects for positive and negative affect (*ds* = .35 to -.39), respectively. This second pilot study provided additional support that our PCI could not only increase levels of present control, but also improve mental health. Furthermore, the changes made to our intervention appeared beneficial because participants reported larger changes in present control in our second study (*d* =. 74) than in the initial pilot study (*d* =. 56).

Following the two pilot studies, we conducted the first large scale, RCT (Study 1) of the PCI (see Table 1 for a brief summary of the RCT's conducted to date; Hintz, Frazier & Meredith, 2014). College students from the same large, public institution as the pilot studies were invited to participate in an online, stress study. Participants were primarily Caucasian, female students, who were mostly between the age of 18 and 21 years old. Interested participants were excluded from the study if they were high on present control (>3) at the pretest. Eligible participants were randomly assigned to the present control intervention (*n* = 77), the present control intervention with feedback on their stress logs (*n* = 79), or a stress-information only comparison group (*n* = 77), which only completed the first module of the intervention.

In both PCI groups, the participants completed four modules, which included videos of an expert talking about research on stress and perceived control, videos containing information from other students regarding the stressors in their lives, and online exercises about present control. In the first module, participants learned about common college student stressors and outcomes. In the second module, participants learned about the temporal model of control (e.g., past, present, future control) and the positive outcomes associated with present control. In the

third module, participants learned about pitfalls or problems with implementing present control. In the fourth and final module, participants reviewed techniques to help them to continue implementing present control. In between Module 3 and Module 4, participants also completed stress logs in which they wrote about what was stressful in their lives, what they had control over, and what actions they could take regarding the controllable aspects of their stressors. In total, the PCI took participants about an hour to complete spread over several weeks. Participants were sent regular administrative emails, which served to remind them of intervention tasks and deadlines.

We hypothesized that both PCI groups would demonstrate greater improvement on mental health outcomes and present control relative to the information-only group. We also expected that the present control with feedback condition would outperform the present control without feedback condition because previous research has shown that feedback has a small, positive impact on online intervention effectiveness (Riper et al., 2009).

Overall, the vast majority of participants (84%) completed the study. Consistent with our hypothesis, the PCI groups reported greater reductions in perceived stress, anxiety symptoms, depression symptoms, and stress symptoms and greater increases in present control relative to the stress-information group at the posttest and 3-week follow-up. The between-group effect sizes at posttest on various mental health outcomes ranged from d = .18 to .39, with an average effect size of d = .30. At the 3-week follow-up, the between group effect sizes ranged from d = .14 to .52, with an average effect size of d = .35. Thus, the PCI had a slightly greater impact over time. The stress-information only group reported little change (within group d = .10). The effect sizes of mental health outcomes between the PCI and PCI with feedback group were small (d's = .06 to .21), but favored the PCI with feedback. In summary, our first, large-scale, RCT provided

support that our PCI was effective at increasing college students' present control and decreasing negative affect and perceived stress.

Following Study 1, a second RCT (Study 2) was conducted at the same community college where the proposed study will be conducted (Frazier et al., 2014). Compared to the prior study, this sample contained more non-traditional college students (e.g., older students), who may have experienced more lifetime stressors (Anders et al., 2012). Generally speaking, the procedures used in Studies 1 and 2 were similar, but there were a few important differences. First, all interested students in general psychology courses were eligible to participate, regardless of their level of present control at the outset of the study. Second, there was only one PCI group, which did not receive feedback regarding their completed exercises and stress logs. Third, the content of the intervention was modified slightly based on participants' feedback and suggestions.

In Study 2, participants were randomly assigned the PCI (n = 92) or to the stress-information only group (n = 102). The majority of participants completed both the initial posttest (87%) and 3-week follow-up (71%). Consistent with hypotheses, there were significant differences between the PCI and comparison group at posttest on all outcome measures with effect sizes similar to those found in the initial RCT. However, at the 3-week follow-up, there were only significant between-group differences on measures of present control and perceived stress.

It is not entirely clear why the present control intervention was less effective in Study 2 relative to Study 1. One possibility is that many participants had little to gain from the intervention because they were already high in present control when they started the study. Indeed, 44% of the participants in this study already scored high (>3) on present control at the

pretest. We also gathered feedback from participants regarding how this program could be improved. Numerous suggestions were made; however, some common suggestions included that the timeline for completing the study should be extended, that the stress logs should be less repetitive, and that participants should have an opportunity to interact with another person while completing the program.

Based on the recommendations provided by participants in Study 2, we conducted another RCT with students at the same local community college (Study 3). The procedures used in Study 3 were relatively similar to the previous studies; however, participants were given more time to complete intervention activities and new stress logs/exercises were created. These changes were made to address participants' concerns about the deadlines being too restrictive and the stress logs being too repetitive. We hypothesized that if participants were given additional strategies to manage their stress, then they might demonstrate greater improvements in mental health symptoms.

In Study 3, community college students were randomized into three conditions: regular stress logs (n = 70), enhanced stress logs (n = 70) or mindfulness exercises (n = 73). There were no inclusion or exclusion criteria. Participants in all three of the intervention conditions completed the identical four modules used in previous studies. However, the three intervention conditions differed in that they were asked to complete different stress log/exercises in the final phases of the intervention. Participants in the regular stress log condition received the same stress logs provided in previous studies. In these stress logs, participants wrote about what was stressful in their lives, what they do and do not have control over, and what actions they can take regarding the controllable aspects of their stressors. Participants in the enhanced stress log condition completed similar logs to the first group, but they were also asked to prioritize and

schedule the actions that they planned to take. This stress log was adapted from an approach used by Solie (2013). Finally, participants in the mindfulness condition listened to brief (~10 minute) mindfulness audio podcasts that were designed to bring participants' attention to the present moment. They also completed brief logs, so that they could document completion of the mindfulness exercises.

Across conditions, participants reported significant increases in present control over time. The mean within-group effect size for present control was d = .36 at posttest and d = .54 at follow-up. Moreover, all three conditions demonstrated improvements in mental health outcomes. Across conditions, the average within-group effect size for the primary mental health outcomes was d = -.45. Within-group effect sizes were slightly larger in the enhanced stress log group (d = -.51) and mindfulness group (d = -.47) than in the regular stress log group (d = -.38) at 3-week follow-up. However, more participants dropped out of the enhanced stress log group (34%) and mindfulness group (38%) than the original stress log group (23%). In sum, although the within-group effect sizes were larger in the two new conditions, more participants dropped out of these conditions. There appears to be a tradeoff between giving students additional stress management skills and their likelihood of completing the intervention.

To test the efficacy of our new intervention conditions within a large, public university, Study 4 was conducted. In the first wave of this study, participants (N = 512) were randomized (in a 2:1 ratio) to the standard PCI condition (n = 335; designated group 1A) or a wait-list condition (n =172; designated group 1B). The vast majority of participants across conditions (86%) completed posttest measures, and participants in the PCI group reported significant decreases in perceived stress and stress symptoms in comparison to the wait-list control group.

After this first wave of the study was completed (10 weeks later), participants in the wait-

list group (1B) were randomized to one of three conditions also used in Study 3: regular stress logs (1B-PCI; *n* = 36), enhanced stress logs (1B-ESL; *n* = 35), and mindfulness (1B-MF; *n* = 37). A second cohort of students (*n* = 200) was also recruited and randomized to the same three conditions at this time (2-PCI, *n* = 65; 2-ESL, *n* = 69; 2-MF, *n* = 66). Because the three conditions were identical across these studies (1B and 2; *N* = 308), they were evaluated together.

Overall, the regular stress log group had an average within-group effect size of *d* = -.07, the enhanced stress log group had an average within group effect size of *d* = -.33, and the mindfulness group had an average within-group effect size of *d* = -.31 at post-intervention on the outcome measures assessed, which was a broader range than in previous studies (i.e., depression, anxiety, stress, perceived stress, positive affect, negative affect and worry). These results supported that our new intervention conditions improved clinical outcomes in comparison to the basic present control intervention. Importantly, these effect sizes were lower in magnitude in comparison to Study 1. This study allowed all participants to use the intervention, even if they began with high levels of present control and low levels of mental health symptoms. Thus, many participants were already doing well and had little room to benefit from the intervention.

In support of that hypothesis, moderation analyses suggested that certain subgroups benefitted more from our intervention than others. For example, individuals with a history of intimate partner violence (IPV) tended to benefit more from our PCI than participants without a history of IPV (Nguyen-Feng et al., 2015; Ngyuen-Feng et al., 2016). Ngyuen-Feng and colleagues (2015) found that among participants who completed our PCI, those with an IPV history experienced greater improvements in distress (mean between-group *d* = .44) compared to those without an IPV history (mean between-group *d* = .10). A second study showed that the within-group effect sizes were slightly higher for the IPV group (*d* = -.37) than the no-IPV group

(*d* = -.27) for the two intervention conditions that focused on present control (Nguyen-Feng et al., 2016).

In our next study (Study 5; Greer, 2015), we examined whether our PCI was more effective than either a) a pure mindfulness OMHI or b) online psychoeducational materials. In this study, 365 undergraduate students at a large public university were recruited to participate in a study about stress management in exchange for extra credit. All students in introductory psychology were eligible to participate, regardless of their level of present control at the outset of the study. After completing the pre-intervention survey about mental health symptoms, participants were randomly assigned to one of three OMHI conditions: PCI (*n* = 121), mindfulness (*n* = 122), or psychoeducation (*n* = 122).

Participants in the PCI condition were given information about stress and present control, and were asked to complete exercises about present control and mindfulness activities (similar to the mindfulness condition in Study 3 and the1B/2-MF condition in Study 4). Participants in the mindfulness condition only were provided with information about mindfulness and were asked to complete brief, guided meditation exercises. Participants in the psychoeducation condition were sent links to two psychoeducational handouts every week that were on a website developed by the student mental health center on campus. The handouts dealt with topics such as stress management tips, controlled breathing exercises, and time management skills.

After the 4-week intervention period, participants immediately completed a post-intervention survey and two follow-up surveys at 2-3 and 4-5 weeks post-intervention. The vast majority of the sample (90%) completed the pretest and made up the intent to treat (ITT) sample. Linear mixed modeling was conducted to assess change between groups over time. Overall, participants in all three groups reported significant decreases in all five primary outcomes from

pretest to the 4-5 weeks follow-up (within group *d's* = -.15 to -.56). However, the time by intervention group interactions were not significant suggesting that the three interventions were equally effective.

The benefits reported by the participants in the psychoeducation group were initially quite surprising. We expected that participants receiving the present control and mindfulness OMHI would benefit more than those receiving online psychoeducational materials. However, at the post-intervention survey, qualitative data were collected about what each user found helpful about their assigned intervention. Several participants who received links to the handouts commented that the tips on the handouts were helpful, and were tips that they were willing to try. In contrast to the mindfulness condition that focused on developing one specific skill, many participants in the psychoeducation group appeared to feel empowered by learning a diverse range of stress management skills. Thus, our PCI may be further improved if users can receive more information about topics relevant to their concerns.

In sum, the results of Study 5 are promising for the development of our PCI. Not only did the use of the PCI result in small-to-moderate within-group effect sizes at post-intervention, but participants continued to show benefits in their mental health in the weeks that followed. In addition, the unexpected gains in the psychoeducation group suggested that the inclusion of other relevant and cost-effective stress management tools within our PCI might improve the efficacy and acceptability of our program.

Based on the limited counseling services available at community colleges and the established effectiveness of our program with Normandale Community College (NCC) students (see Table 1), NCC administrators were interested in determining whether our stress management program could improve mental health outcomes in the context of a college

readiness course, NCC 1000. Students eligible for NCC 1000, Paths to College Success, have not demonstrated college-level proficiency in at least one of the following subjects: English, reading, or math.

Currently, NCC 1000 teaches students a range of academic skills (e.g., organizational strategies) with the goal of increasing students' achievement motivation and academic confidence; however, stress management skills have not been included as a core component of the curriculum. Perhaps the inclusion our stress management program as an additional option would increase the effectiveness of NCC 1000 because students would be better able to implement the academic strategies taught in this course if they can better manage stress.

In Spring 2014, a pilot study (Study 6) was conducted to assess the feasibility and effectiveness of our present control online intervention with community college students enrolled in NCC 1000. This study differed from prior studies done at NCC because we are examining whether our PCI will benefit students who have been identified as being at risk in terms of college achievement and graduation because of their low standardized test scores upon admission to NCC.

In the pilot study, approximately 200 students enrolled in NCC 1000 heard about the opportunity to participate in a stress management study in exchange for extra credit. Of the students who heard about the opportunity, 115 signed up to begin the study and were sent the link to the initial survey. Unfortunately, only 44 participants completed the initial survey and were subsequently randomly assigned to one of four groups. Therefore, each group contained about 11 participants.

Three of the four groups were considered active PCI conditions and one group served as an active comparison group. Participants in the three PCI conditions were asked to review the

same information on stress and present control, but their assigned stress logs differed in terms of what coping skills they highlighted (e.g., mindfulness exercises, scheduling due dates for personal tasks/goals). These three PCI conditions mirrored what was given to participants in Studies 3 and 4. Having three PCIs allowed for an examination of what coping skills NCC 1000 students benefitted the most from practicing in addition to learning about present control. The active comparison group condition was identical to the psychoeducational condition used in Study 5. Hypotheses included that participants in the three PCI conditions would demonstrate greater improvements in mental health outcomes than participants in the psychoeducation comparison condition. (This pilot study was begun before the results of Study 5 were available). No hypotheses were made regarding which of the three PCI conditions would show the greatest benefit on mental health outcomes.

The procedure used in this study was similar to previous studies. Participants were guided through their intervention condition through being sent a series of links. The links were sent to participants based on a predetermined schedule. All participants were asked to do one activity per week for a period of 8 weeks. Reminder emails were sent if participants did not complete intervention components by a specified due date. Immediately following completing all intervention components, participants completed a post-intervention survey. Participants were then given a 3-week break prior to being asked to complete a final, follow-up survey. In these surveys, participants completed self-report measures of mental health outcomes including perceived control, depression, anxiety, stress, perceived stress and irritability.

Results revealed that participant adherence was a significant problem. Of the 44 participants who started the intervention, 33% (15 participants) completed the post-test and 27% (12 participants) completed the follow-up. More participants in the basic stress log (36%),

mindfulness (36%), and psychoeducation comparison (45%) conditions completed the post-test than participants in the enhanced stress log (18%) condition. More participants completed the conditions that appeared to be briefer and simpler to complete.

Due to the very small number of participants per condition, between groups comparisons were not conducted. However, participants reported reductions in stress and negative affect at post-intervention and follow-up, with small to medium effect sizes. The active PCI groups (d = -.82) had larger within-group effect sizes at posttest than the psychoeducation group (d = -.14). However, the within-group effect sizes were more similar between the PCI groups (d = -.26) and psychoeducation group (d = -.16) at follow-up. Across conditions, the feedback gathered from participants was generally positive. Most participants said that they would recommend the program to friends, and many would complete it without getting extra credit. All participants said that the intervention would be improved if they received some type of support while completing the intervention. They also reported that they benefitted the most from hearing other students' examples.

A survey was also sent to students enrolled in NCC 1000 who chose not to participate in the study. Feedback surveys suggested that the biggest reasons that NCC 1000 students did not participate were that they were too busy/stressed, did not know about the study and did not check their email regularly. Conducting this pilot study was very beneficial in terms of identifying obstacles in implementing a stress management program within a college success course. First, many participants expressed interest in completing the online stress management program, but did not complete the initial survey. It might be that this initial survey was too arduous and led participants to question how the intervention would help them. Second, many participants dropped out of the study from pre-intervention to post-intervention. It may be that some

participants dropped out of the intervention prematurely because the information was not relevant to them or they needed some type of support to be kept accountable. Third, more participants dropped out of the PCI conditions that were more time-intensive. More participants might complete a stress management intervention that was more brief, streamlined and personalized.

Based on these observations and findings, changes were made for the full-scale intervention that was conducted during the Fall 2014 semester. First, either the lead investigator or another member of the research team attended each of the NCC 1000 classes, and provided a rationale about how the program could help them. Second, the participants were informed that the first step was an initial assessment survey, which was separate from the intervention itself. Third, the assessment survey was modified to include fewer items, so that participants' initial experience completing the assessment was less intensive. Fourth, the intervention was modified to include other stress management tips besides present control. All participants receiving the present control intervention learned about present control and other relevant stress management topics (e.g., sleep hygiene, deep breathing exercises). Thus, this version of our online present control intervention included a greater variety of stress management topics. Finally, email support was given to one condition to examine whether providing users with supportive messages could improve adherence and clinical outcomes.

Purpose of the Dissertation Study

The purpose of this study was to investigate the effects of a modified present control OMHI. The expectation was that our updated PCI would increase levels of present control, decrease mental health symptoms, and improve academic performance within an at-risk community college student sample. We also expected that those users who received supportive

messages would show greater reductions in mental health symptoms and improved rates of intervention adherence relative to those who did not receive supportive messages.

This study differed from previous studies we have conducted at the local community college (see Studies 2, 3, & 6) because one intervention condition received supportive messages. This allowed for an examination of the impact of personalized content and supportive messages. Present control, perceived stress, depression, generalized anxiety, social anxiety, academic distress, eating concerns, hostility, and alcohol abuse were assessed at pre-intervention, post-intervention, 3-week follow-up, and 6-week follow-up. Academic data including grade point average (GPA), and number of credits attempted and achieved were also collected. Quantitative analyses were conducted to examine between-group differences.

This study contributed to the existing OMHI literature on stress management interventions for students in several ways.

1. Assessed mental health symptoms and academic performance within an at-risk community college student population
2. Examined the effectiveness of a modified present control OMHI within an at-risk population
3. Examined the impact of supportive messages within an OMHI
4. Included official academic data and a broader range of mental health outcome measures that were developed specifically for college students
5. Contributed to literature on effectiveness of online interventions

Method

Overview

This intervention sought to increase present control, decrease mental health symptoms, and improve academic performance by means of an OMHI that contained videos, narrated presentations, information and exercises. Students in each class were assigned to one of three conditions: present control intervention (PCI), present control intervention with supportive messages (PCI + SM), or a comparison (COM) group. The first two groups were active intervention groups. The difference between the active interaction groups is that the PCI+SM group received supportive email messages after completing the intervention activities. The COM group was asked to complete brief writing prompts about their stress and college experience so far (e.g., What is your favorite part of NCC?). Participants were asked to complete measures of present control, perceived stress, and mental health symptoms at pre-intervention, post-intervention, 3-week follow-up, and 6-week follow-up. Academic data were obtained from NCC's registrar office after the Spring 2015 semester.

Participants

We estimated that approximately 75% of students enrolled in a college readiness class during the fall semester would participate in the study (N = ~520). A priori power analyses suggested that, with this sample size, a between-group effect size of approximately d = .14 could be detected at a significance level of .05, and power of .80.

Participants were students in a college readiness class, NCC 1000, at a midsize Midwestern community college. Inclusion criteria required participants to be enrolled in NCC 1000 and to have regular access to the Internet. There were no exclusion criteria. Participants received course credit in NCC 1000 in exchange for their participation. Participants had the option of completing an alternative class assignment (e.g., essay or speech on stress) if they did not want to participate in this study. Five hundred and twenty-six participants completed the

initial pretest survey during the first or second week of the semester. Of this group, 47 participants were excluded from analyses because they were later determined to not be students in the college readiness class (n = 3), began the study late because of attendance issues (n = 2), showed evidence of careless responding (n = 36), had outlying scores on measures (n = 1), or completed the T2 assessment survey, but not more than one intervention or comparison condition task (n = 5). More information is provided in the Results section.

Participants who dropped out of the study (e.g., stopped completing tasks and did not complete the T2 assessment survey) were kept in the sample. Of the 479 participants who were included in the analyses, 173 (36%) were in a class that was randomly assigned to the PCI condition, 161 (34%) were in a class randomly assigned to the PCI+ SM condition and 145 (30%) were in a class randomly assigned to the COM condition. See Figure 1 for complete information about participant attrition over time.

Of the 479 participants, just over half identified as male (54%) and most were first year students (93%). Most participants were between the ages of 18-21 years old (78%). The racial/ethnic make-up of the sample was 43% European American/White, 21% African American/Black, 16% Hispanic/Latino, 13% Asian/Asian American, 2% Middle Eastern/Arab American, .4% Native American and 4% other. Only 3% of the sample identified as International students. Most participants reported working either full or part-time jobs (76%) with 19% working full-time jobs. The average number hours worked per week was 20.31. Participants also reported the highest level of education completed by a parent or guardian. Nearly half (46%) of participants reported that the highest level of education completed by a parent or guardian was a high school degree or less. About a third of participants reported that a parent or guardian received a college diploma or higher.

Group differences were examined with regard to sex, age, and race/ethnicity. The only significant group difference was for race/ethnicity, $F(2,468) = 3.99$, $p = .02$. A bonferroni post-hoc test revealed there were significant differences in race/ethnicity between the PCI condition and the COM condition. A comparison of column proportions revealed that the only significant difference was that there were more European American/White participants in the PCI group (50%) than in the COM group (34%).

Of the 479 participants, approximately 66% ($n = 318$) completed the post-intervention survey, 24% ($n = 117$) completed the 3-week follow-up survey, and 19% ($n = 92$) completed the 6-week follow-up survey. Rates of completion were largely consistent across conditions for the post-intervention, and 3- and 6 week follow-ups. For example, approximately 64% of participants in the PCI condition, 70% of the participants in the PCI+SM condition and 65% of participants in the COM condition completed the post-intervention survey (see Figure 1 for 3-week follow-up and 6-week follow-up completion rates by condition). Participants who completed the post-intervention survey (e.g., completers) reported lower levels of perceived stress symptoms (M = 1.69, SD = .66) on the pre-intervention survey ($d = -.48$) compared to participants who did not complete (e.g., noncompleters) the post-intervention survey (M = 1.82, SD = .63), $t(473) = 2.13$, $p = .03$. There was also trend that completers reported lower levels (d = -.18) of mental health symptoms (M = .93, SD = .54) on the pre-intervention survey in comparison to noncompleters (M = 1.03, SD = .58), t (472) = 1.81, p =.07. There were no systematic differences between those that completed the pre-intervention survey and those that did not on levels of present control.

Intervention Conditions

Present control intervention (PCI). Participants in the PCI condition were asked to complete three modules and two stress logs. The PCI was expected to take 60 minutes spread over several weeks. The PCI was designed to be brief because previous research has found that brief interventions (typically 4-8 weeks) are as effective as lengthier interventions (Davies et al., 2014; Farrer et al., 2013). The three modules and stress logs were largely consistent with previous iterations of our intervention (e.g., Hintz et al., 2014; Frazier et al., 2014). The only change was that a stress management tip (e.g., sleep hygiene, deep breathing exercises) was added to the end of each module and stress log. Altogether, participants received five unique stress management tips across the five activities. The modules consisted of a video of an expert (a tenured professor) who provided education about a specific topic, a narrated video presentation with quotes from past intervention participants related to the module topic, an application exercise, and a suggested stress management skill. Although the three modules consisted of a similar format, the three modules had different foci. Module 1 contained information about common college student stressors and their effects; Module 2 defined past, present, and future control; and Module 3 provided examples and exercises about how to apply the concept of present control to aspects of stressors that are controllable, and how to let go of aspects of stressors that are uncontrollable. After completing the three modules, participants completed two stress logs. On the stress logs, participants answered questions about the current stressors in their lives and practiced applying present control to their current stressors. See Appendix A for two screen shots of PCI intervention components.

Present control intervention with supportive messages (PCI + SM). Participants in the PCI + SM condition were asked to complete the same three modules and two stress log activities, but they also received supportive messages by this author within 48 hours of

completing intervention components. The messages were designed to contain elements of support that have been shown to be effective in previous research studies (Mohr et al., 2013; Paxling et al., 2013). The feedback was designed to provide encouragement to users for completing a component (e.g., Great job on that first exercise!), demonstrate empathy for their stressors (e.g., I can see how finding time for your friends is tough given all that you have going on), remind users of how this program might allow them to achieve a personal goal (e.g., If you can apply present control to how you approach your classes, you might do better on your next Chem exam) and encourage them to do the next intervention step (e.g., Remember to try out one new sleep hygiene skill by next Sunday (10/19) night). See Appendix B for two example supportive messages.

Comparison condition (COM). A COM group was designed as an active control group. An active control group was included to control for expectancy effects. Participants in the COM condition were asked to complete five brief writing prompts to mimic the time spent in the PCI groups. In the first two writing tasks, participants answered open-ended questions about what has been stressing them out recently and how stress has impacted various aspects of their lives. In the last three tasks, participants answered open-ended questions about their experiences at NCC including their perceptions of their classes and teachers. Participants in the COM condition did not receive any information about perceived control or any other skills for managing stress. See Appendix C for two screen shots of COM condition components.

Procedure

Participants were recruited through their NCC 1000: Paths to College Success classes. Potential participants heard about the research opportunity in class during the second week of school from a member of the research team. Students were informed that completing this study

was one way to meet a course requirement in NCC 1000. If students did not participate in this study, they were required to do an oral presentation or written assignment about stress. Approximately 10 students opted to complete one of these alternative assignments. All potential participants were given a chance to ask questions of the research team member, to read over and complete a consent form, and to complete a paper copy of the pre-intervention assessment. The pre-intervention assessment asked participants to complete demographic items (e.g., gender, age, race/ethnicity status) and items about present control, perceived stress, and mental health symptoms (see Measures section).

Participants were assigned to one of three conditions based on their membership in an NCC 1000 class. The NCC 1000 class sections were randomly assigned to one of the three sections. Randomization by class rather than student was completed to simplify the process for instructors. Participants were not told about their assigned condition. All participants were notified that all assigned tasks would be delivered by email. The post-intervention and follow-up assessment surveys were emailed to students so they could complete the measures outside of class time. Thus, the pre-intervention survey was completed by hand during class time and the three other assessment surveys were sent to participants over email.

Participants were asked to complete the post-intervention survey that contained the same items as the pre-intervention survey and some questions about their experience with the program. Participants were also sent two optional follow-up surveys three and six weeks following the post-intervention survey. All questions were asked regarding the participants' last 7 days. The follow-up surveys did not count toward their grade on the assignment, but participants were provided with a $5 Amazon gift card for each follow-up survey they completed. In total, this intervention consisted of 9 time points (5 intervention activities and 4 assessment surveys).

Instructors were sent a list of students who participated in the study and were told what percentage of the study they completed.

Measures

Present control. Perceived present control (PCC) was assessed using the present control subscale of the Perceived Control over Stressful Events Scale (PCOSES; Frazier et al., 2011). Participants rated the eight items (e.g., "I have control over how I think about the situation") on a 4-point scale (1 = *strongly disagree* to 4 = *strongly agree*). Previous studies with undergraduate samples have provided evidence for reliability and validity of subscale scores (Frazier et al., 2011; Frazier et al., 2012). Alphas ranged from .74 to .79 across the four time points.

Perceived stress. Perceived stress was assessed using the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). This scale has 10 items (e.g., "How often have you felt nervous or stressed?" and participants rated items on a 5-point scale (0 = *never* to 4 = *very often*). The reliability and validity of PSS scores in college student samples have been demonstrated (Cohen et al., 1983). Alphas ranged from .69 to .85 across the four time points.

Mental health symptoms. Mental health symptoms were assessed using the Counseling Center Assessment of Psychological Symptoms (CCAPS-34; Locke et al., 2012). The measure has 34 items that form eight subscales including depression, generalized anxiety, social anxiety, academic distress, eating concerns, hostility, alcohol abuse, and a distress index. An example item from the generalized anxiety subscale was: "My heart races for no good reason." Participants rated items on a 5-point scale (0 = *not at all like me* to 4 = *extremely like me*). The CCAPS was developed to measure college student mental health specifically, and the reliability and validity of scores have been established (Locke et al., 2012). Full-scale alphas ranged from .91 to .94 in the four samples. Subscale alphas ranged from .73 to .94 across the four time points.

Intervention feedback. At the post-intervention assessment, participants in the active intervention conditions were asked to rate the helpfulness on a 5-point scale *(1 = Not at all helpful, 5 = Very helpful)* of the different intervention components (i.e., expert videos, videos with examples from other students, module exercises, stress management tips, supportive messages, stress logs). Participants in the active intervention conditions were also asked to rate on a 5-point scale (1 = *Not at all to 5 = Very much*) how much they had applied the information to their lives and whether they would complete the program if they were not receiving class credit for their participation. Participants in all three conditions were asked to provide qualitative feedback about the program (not reported here), and to rate the overall helpfulness of their assigned condition at post-intervention.

Academic data. Following completion of the study, the NCC registrar provided participants' official academic data. Academic data provided included participants Fall 2014 and Spring 2015 GPAs, and the number of credits participants registered for and earned during the Fall 2014 and Spring 2015 semesters (students must receive a D or better to earn course credit). This allowed for the computation of what percentage of courses registered for were completed.

Planned Analyses and Hypotheses

The primary analyses were conducted with the completer sample[1]. To examine whether the PCI and PCI + SM conditions were more effective in increasing present control and decreasing perceived stress and mental health symptoms relative to the COM condition, Analyses of Covariance (ANCOVAs) were conducted at post-intervention, 3-week follow-up, and 6-week follow-up controlling for pre-intervention scores.[2] To examine whether PCI and

[1] Multiple imputation analyses were conducted at a later point (see page 84).
[2] HLM was not conducted due to the limited sample size (see page 85).

PCI+SM conditions were more effective in improving academic variables compared to the COM condition, Analyses of Variance (ANOVAs) were conducted. The omnibus F test for the ANCOVAs was used to assess between group differences in present control, perceived stress, and mental health symptoms (using pre-intervention outcomes as covariates). Planned simple contrasts were conducted to compare the intervention groups to the comparison group. Within-group effect sizes (*d*'s) for the mental health outcomes were calculated by subtracting the post-intervention, 3-week follow-up, and 6-week follow-up scale means from the pre-intervention scores and then dividing this difference by the standard deviation of the measure in the relevant group at baseline. Between-group differences for the mental health outcomes were calculated by subtracting the within-group effect size of the comparison condition from within-group effect sizes of the active PCIs (Morris & DeShon, 2002). Between-group differences for academic outcomes were calculated by subtracting the mean score for the COM group from the mean score of the PCI conditions and then dividing this difference by the average standard deviation across all three groups.

Hypotheses

1. Both intervention groups (PCI & PCI+ SM) will have higher levels of present control, lower levels of perceived stress and mental health symptoms, and higher levels of academic achievement than the COM condition at post-intervention and at 3- and 6-week follow-ups.
2. The PCI + SM condition will demonstrate higher levels of present control, lower levels of perceived stress and mental health symptoms, and higher levels of academic achievement than the PCI and COM conditions at post-intervention and at 3- and 6-week follow-ups.

3. The PCI + SM condition will complete more of the intervention activities and will complete the activities more quickly than the PCI and COM conditions.

Results

Preliminary Analyses

Complete information about participant attrition is reported in Figure 1. Boxplots were examined for all outcome measures and Grubb's test was run to identify outlier scores. Through these methods, one participant was identified as having extreme scores on two or more scales ($Z > 4.0$). This participant was excluded from further analyses. Three others participants were identified as being possible outliers based on their extreme ($Z > 4.0$) scores on a single scale. However, their data appeared valid so they were left in the sample and correction procedures (e.g., windsorizing) were not used. Careless responders were identified through two methods. First, the number of instructed response questions (e.g., Please respond with "Strongly Disagree" to this question) that were answered incorrectly was counted. Twenty participants who got two or more of the eight instructed response questions wrong were eliminated from the sample. Second, I examined participants' response to the question, "Please respond: In your honest opinion, should we use your data?" Sixteen participants who told us to not use their data and who got at least one instructed response question wrong were eliminated from this sample. Of note, participants were only asked whether their data were valid at the post-intervention survey.

The correlation matrix and descriptive statistics for the pretest measures are presented in Table 2. Correlations among the three primary outcome measures (PSS, PPC, and CCAPS) ranged from -.53 to .66 at the pre-intervention survey. As expected, higher perceived stress was associated with reporting more distress on the CCAPS and higher present control was associated with less stress and distress.

Intervention Effects on Present Control

An initial ANOVA analysis indicated that present control scores did not differ between groups at pre-intervention, $F(2,474) = .60$, $p = .55$. To examine whether the PCI or the PCI + SM conditions were more effective in increasing present control relative to the COM condition, three separate Analyses of Covariance (ANCOVAs) were conducted with present control scores at post-intervention, 3-week follow-up, and 6-week follow-up controlling for pre-intervention scores. Planned simple contrasts comparing each intervention condition to the COM condition were also conducted. Means, standard deviations, and ANCOVA results are presented in Table 3. The omnibus F tests for the ANCOVAs assessing between group differences in present control (using present control scores at T1 as a covariate) were not significant at post-intervention, 3-week follow-up or 6-week follow-up. The simple contrasts comparing each intervention condition to the COM condition did not reveal significant results at post-intervention, 3-week follow-up, or 6-week follow-up. See Tables 7 and 8 for within- and between- group effect sizes. The mean within- and between- group effect sizes were in the mimimal to small range with a slight advantage for the PCI conditions (mean within-group $d = 0.00$ indicating no change on average) relative to the COM condition (mean within-group $d = -.22$ indicating decreases in present control on average) across time points (between group $d = .22$). This suggested that participants in the PCI conditions had unchanged levels of present control over time, and the participants in the COM condition had reductions in present control over time. The nonsignificant differences between conditions and small effect sizes did not provide support for the first and second hypotheses.

Intervention Effects on Perceived Stress Symptoms

An initial ANOVA analysis indicated that perceived stress symptoms scores did not differ between groups at pre-intervention, $F(2,472) = .86$, $p = .42$. Separate ANCOVAs were then conducted to measure group differences at post-intervention, 3-week follow-up, and 6-week follow-up in perceived stress with pre-intervention scores on this measure included as a covariate. The omnibus F tests for the ANCOVAs assessing between group differences in perceived stress symptoms were not significant (See Table 4). The simple contrasts comparing each intervention condition to the COM condition did not reveal significant differences at post-intervention, 3-week follow-up, and 6-week follow-up. See Tables 7 and 8 for within- and between-group effect sizes. The within- and between- group effect sizes suggested that the PCI condition was most effective; however, all effect sizes were in the minimal to small range. Thus, all conditions demonstrated increases in perceived stress symptoms over time; however, the PCI condition experienced the smallest increase in perceived stress symptoms. Overall, the nonsigificant differences and small effect sizes did not provide support for the first and second hypotheses.

Intervention Effects on Mental Health Symptoms

An initial ANOVA analysis indicated that mental health symptoms did not differ between groups at pre-intervention, $F(2,471) = .33$, $p = .72$. ANCOVAs were conducted to measure group differences at post-intervention, 3-week follow-up, and 6-week follow-up for the CCAPS-34 measure with pre-intervention scores on this measure included as a covariate. The omnibus F tests for the ANCOVAs assessing between group differences in mental health symptoms were not significant (See Table 5). The simple contrasts comparing each intervention condition to the COM condition did not reveal significant results at post-intervention, 3-week follow-up, or 6-week follow-up. See Tables 7 and 8 for within- and between- group effect sizes. These effect

sizes suggest that participants in the PCI conditions experienced minimal reductions in mental health symptoms compared to the COM condition. Overall, the nonsignificant differences and small effect sizes did not provide support for our first and second hypotheses.

Intervention Effects on Generalized Anxiety Symptoms

Additional analyses were conducted on select CCAPS subscales including generalized anxiety, academic distress, and a distress index. These subscales were chosen because it was anticipated that participants might experience positive changes on measures of generalized anxiety, academic distress and distress symptoms as a result of completing a PCI. The distress index contained items from all subscales except the eating and alcohol subscales. An initial ANOVA analysis indicated that generalized anxiety symptoms did not differ between groups at pre-intervention, $F(2, 473) = .30$, $p = .74$. ANCOVAs were conducted to measure group differences at post-intervention, 3-week follow-up, and 6-week follow-up for generalized anxiety symptoms with pre-intervention scores on this measure included as a covariate. The omnibus F tests for the ANCOVAs assessing between group differences in generalized anxiety were not significant at post-intervention, $F(2, 310) = .38$, $p = .68$, 3-week follow-up, $F(2, 111) = .69$, $p = .51$, or 6-week follow-up, $F(2, 88) = .69$, $p = .51$. Simple contrasts comparing each intervention condition to the COM condition did not reveal significant results at post-intervention, 3-week follow-up, and 6-week follow-up. In sum, participants in the PCI conditions did not appear to have fewer generalized anxiety symptoms than participants in the COM condition.

Intervention Effects on Academic Distress

An initial ANOVA analysis indicated that academic distress symptoms did not differ between groups at pre-intervention, $F(2, 470) = .14$, $p = .87$. ANCOVAs were conducted to measure group differences at post-intervention, 3-week follow-up, and 6-week follow-up for

academic distress symptoms with pre-intervention scores on this measure included as a covariate. The omnibus F tests for the ANCOVAs assessing between group differences in academic distress symptoms were not significant at post-intervention, $F(2, 311) = 2.02$, $p = .14$, 3-week follow-up, $F(2, 111) = .61$, $p = .55$, or 6-week follow-up, $F(2, 88) = .26$, $p = .77$. Simple contrasts comparing each intervention condition to the COM condition did not reveal significant results at post-intervention, 3-week follow-up, or 6-week follow-up. In sum, participants in a PCI condition did not appear to benefit more in terms of academic distress symptoms compared to participants in the COM condition.

Intervention Effects on Distress Symptoms

An initial ANOVA analysis indicated that distress symptoms did not differ between groups at pre-intervention, $F(2, 471) = .41$, $p = .66$. ANCOVAs were conducted to measure group differences at post-intervention, 3-week follow-up, and 6-week follow-up for distress symptoms with pre-intervention scores on this measure included as a covariate. The omnibus F tests for the ANCOVAs assessing between group differences in distress were not significant at post-intervention, $F(2, 309) = .37$ $p = .69$, 3-week follow-up, $F(2, 110) = .46$, $p = .63$, or 6-week follow-up, $F(2, 88) = .10$, $p = .91$. Simple contrasts comparing each intervention condition to the COM condition did not reveal significant differences at post-intervention, 3-week follow-up, or 6-week follow-up. In sum, participants who received a PCI condition did not appear to benefit more than those participants in the COM condition.

Intervention Effects on Academic Performance

ANOVAs were run to examine whether participants in the PCI conditions had higher GPAs than the COM group during the Fall 2014 and Spring 2015 semesters. ANOVAs were also run to examine whether participants in the PCI conditions completed a greater percentage of the

credits that they registered for during the Fall 2014 and Spring 2015 semesters relative to the COM group. For the completer sample, ANOVAs revealed no significant differences in GPA or percentage of credits completed between conditions. Participants across conditions had similar GPAs and completed a similar percentage of their registered credits the Fall 2014 and Spring 2015 semesters, and the between-group effect sizes across the four academic outcomes were in the minimal to small range (d = -.17 to d = .02). See Tables 2 and 10 to see the descriptives of the academic outcomes, and correlations between academic outcomes and mental health symptoms at T1 and T2. See Table 6 to see the academic outcomes in the completer sample.

Adherence to Condition Tasks

A one-way ANOVA was run to examine whether participants in the PCI + SM condition completed more intervention components and procrastinated less on completing assignments in comparison to the participants in the PCI and COM conditions. There was a trend that number of tasks completed varied by condition, $F(2, 475) = 2.38$ p = .09. Participants in the PCI +SM condition completed more tasks than those in the PCI (d = .23) and COM (d = .19) conditions; however, these differences were not significant. There was also a trend for completion time of tasks to vary by condition, $F(2, 405) = 2.52$, p = .08. Participants in the COM condition took fewer days to complete assignments relative to the PCI (d = -.25) and PCI + SM (d = -.24) conditions. See Table 10 for adherence rates by condition. Overall, there was some support that participants in the PCI + SM condition were more compliant than the participants in the PCI and COM conditions. However, they also tended to procrastinate more on assignments relative to the COM condition. Even though we hoped that greater intervention adherence would be linked with better becomes, that was not the case in this sample. The data demonstrated that number of activities completed was not linked to greater changes in present control, $r(316) = .08$, p = .18,

perceived stress, $r(313) = -.09$, $p = .13$, or mental health symptoms, $r(309) = .40$, $p = .49$ from pre-intervention to post-intervention.

Intervention Feedback

All participants were asked to rate the global helpfulness of their assigned online program on a 5-point scale at T2. Participants in the PCI groups also rated the helpfulness of expert videos, student videos, module exercises, stress logs and stress management tips. In addition, participants in the active present control intervention conditions were asked how much they applied the intervention information to their lives and whether they would complete the program if they were not receiving class credit. Participants in the PCI +SM group also rated the helpfulness of the supportive messages (see Table 9 for the complete ratings of intervention components by group).

Participants in the PCI + SM condition (M = 3.92, SD = 1.04) and in the PCI condition (M = 3.78, SD = .93) rated their assigned online program to be more helpful than the COM condition (M = 3.38, SD = 1.23), $F(2, 308) = 7.19$, $p = .001$. The between-group effect sizes comparing the PCI and PCI+ SM condition to the COM condition were in the small to medium range (*d*s = .39 -.50). In the two active intervention groups, ratings of the helpfulness of the intervention components were consistently moderate to high (M's = 3.23 to 3.90). Participants rated the expert videos as least helpful (M's = 3.23 to 3.27), and rated the supportive messages (in the PCI + SM condition only) most positively (M = 3.90, SD = 1.21). Approximately 84% rated the emails to be at least somewhat helpful.

Overall, participants in the PCI + SM condition (M = 3.81, SD = .97) and the PCI condition (M = 3.58, SD = .89) indicated that they had generally applied the content of the intervention conditions to their lives. Approximately 89% of the participants in a PCI condition

said that they had at least somewhat applied the intervention content to their lives. Participants in the COM group were not asked how much they had applied their intervention content to their lives. Moreover, 70% of the participants in a PCI condition indicated that they would have completed the online program even if they were not getting class credit for their participation. However, only 47% of the sample responded to this question so this statistic is likely inflated.

Why Didn't the Present Control Intervention Work?

Unfortunately, the two active present control interventions did not work as intended. Participants who received a PCI did not experience greater improvements in present control, perceived stress or mental health symptoms relative to participants in the COM group. In the following section, I propose and test explanations about why the present control interventions were not as effective as they have been in previous studies (e.g., Hintz et al., 2014).

Testing Explanations for Lack of Efficacy

Participants were not motivated. One possible reason for why the present control interventions were not beneficial for students is because students viewed the program as an assignment to complete. As such, some participants may have viewed the present control interventions as an irritating assignment rather than a helpful tool. Although I did not directly measure participants' motivation for an OMHI, I reasoned that if participants were not motivated to learn from the program, then they would be unlikely to apply the intervention content to their daily stressors.

To test this idea, I first examined whether the ratings of intervention application to daily life were lower in this study compared to Study 3 conducted at NCC. Results revealed that the mean intervention application ratings were actually higher (d = .25) in this population (M = 3.70, SD = .94) compared to NCC participants in Study 3 (M = 3.47, SD = .93). Next, I correlated the

ratings of intervention application with change scores from T1 to T2 for mental health outcomes. Participants in the COM condition were not asked about how much they applied the intervention content to their lives. There were no significant correlations between ratings of intervention application and change scores on the mental health outcomes; however, there was a trend that those who applied the intervention more to their lives had greater reductions in perceived stress, $r(221) = -.11$, $p = .10$. Finally, I also looked at whether ratings of intervention application correlated with academic outcomes. There were no significant correlations or trends between intervention application ratings and academic outcomes in either the Fall 2014 or Spring 2015 semester.

A related, second hypothesis was that participants did not benefit from PCI conditions because they did not complete the assignments or completed them at the last minute. To test this idea, I examined whether the number of tasks/modules completed, and the length of time it took participants to complete tasks/modules, correlated with mental health and academic outcomes for the PCI conditions only.

With regard to mental health outcomes, the number of tasks/modules completed did not correlate with pre to post-intervention change scores on the measures of perceived stress, $r(220) = -.05$, $p = .47$, perceived control, $r(223) = .06$, $p = .36$, or mental health symptoms, $r(220) = -.09$. $p = .20$. The number of days to complete a module/task also did not correlate with change scores for perceived stress, $r(217) = .04$, $p = .58$, perceived control, $r(220) = -.02$, $p = .73$, or mental health symptoms, $r(217) = .07$, $p = .49$. Therefore, these analyses did not suggest a relationship between greater intervention compliance and improved mental health outcomes.

With regard to academic outcomes, the number of tasks/modules completed did correlate with Fall 2014 GPA, $r(222) = .24$, $p = .001$, Spring 2015 GPA, $r(185) = .22$, $p = .002$, percentage

of Fall 2014 credits completed, $r(223) = .28$, $p = .001$, and percentage of Spring 2015 credits completed, $r(196) = .19$, $p = .01$. The number of days to complete a module/task was negatively correlated with Fall 2014 GPA, $r(219) = -.24$, $p = .001$, Spring 2015 GPA, $r(182) = -.20$, $p = .01$, percentage of Fall 2014 credits completed, $r(220) = -.27$, $p = .001$, and percentage of Spring 2015 credits completed, $r(193) = -.14$, $p = .05$. Overall, these analyses suggest that participants who showed greater intervention compliance tend to have better academic performance.

Another related, third hypothesis is that participants did not benefit from the PCI because they did not put much effort into completing the assignments. Participants may have rushed through their assigned task and wrote very little. Therefore, my hypothesis was that participants who wrote more words would experience greater benefits from their assigned condition. To test this hypothesis, correlations were calculated with average word count and primary outcomes for the PCI conditions only. The average word count was calculated by totaling the words that participants wrote on all open-ended questions on all module exercises and stress logs and dividing this by the number of modules that they completed.

Results partially supported this hypothesis for mental health outcomes. In the PCI conditions, the correlation between change in perceived stress and word count was significant, $r(218) = -.18$, $p = .01$. Participants who wrote more tended to experience more reductions in perceived stress. There was a trend that participants who wrote more also experienced greater increases in perceived control scores, $r(221) = .11$, $p = .10$. The relationship between word count and reductions in health symptoms was not significant, $r(218) = -.08$, $p = .23$.

Results generally supported the hypotheses for academic outcomes. Across all three conditions, several of the correlations between average word count and academic outcomes were significant. Specifically, the relationships between average word count and Fall 2014 GPA,

r(220) = .22, p = .001, Spring 2015 GPA, *r(*184) = .22, p = .002, percentage of Fall 2014 credits completed, *r*(221) = .15, p =.03, and percentage of Spring 2015 credits completed were significant, *r*(195) = .16, p = .03. Thus, there was some evidence that writing more was linked to greater gains from the PCI conditions.

Participants did not perceive program to be helpful. A fourth possible reason why participants might not have benefitted from the PCIs is that they did not find the program to be helpful. To test this whether those who found it more helpful changed more, I correlated helpfulness ratings at T2 with change scores from T1 to T3 on perceived control, perceived stress, and mental health symptoms for participants in the PCI conditions. Higher endorsements of helpfulness at T2 were linked to greater decreases in mental health symptoms from T1 to T3, *r*(71) = -.53, p = .001. The correlation between helpfulness ratings at T2 and change in present control, *r*(69) = -.04, p = .77, and perceived stress, *r*(68) = -.07, p = .55 from T1 to T3 were not significant.

I also looked at the correlations between helpfulness ratings at T2 and academic outcomes for participants in the PCI conditions. There was a significant correlation between helpfulness ratings and Spring 2015 GPA, *r*(183) = .18, p = .02. There was also a trend between helpfulness ratings and percentage of credits completed in Spring 2015, *r*(193) = .14, p = .06. There were no significant correlations between helpfulness ratings and Fall 2014 academic data. Thus, there was some evidence that participants who rated the intervention as more helpful benefitted more from the program. On average, participants rated the active present control interventions highly in terms of helpfulness (means = 3.78 – 3.92 on a 5-point scale). We do not have data on this question from other studies.

Little room for improvement. A fifth hypothesis was that the present control

interventions did not benefit participants at post-intervention because participants were not stressed and had little room to improve. To test this hypothesis, I ran ANCOVAs and examined the interaction between condition and pretest perceived stress scores for the primary outcome measures across the three conditions. The interactions between PSS initial score and condition were not significant for perceived stress, $F(2, 308) = .64$, p =.39, present control, $F(2, 309) = .34$, p = .71, or mental health symptoms, $F(2, 307) = 1.05$, p = .35. The interactions between PSS initial score and condition were also not significant for Fall 2014 GPA, $F(2, 308) = .42$, p = .66, Spring 2015 GPA, $F(2,258) = .34$, p = .71, percentage of credits completed in Fall 2014, $F(2, 309) = .86$, p = .43, and percentage of credits completed in Spring 2014, $F(2, 270) = .51$, p = .60. Thus, results did not support the hypothesis that participants who were initially more stressed benefitted from more from a PCI condition than the COM group.

A related sixth hypothesis was that the present control interventions did not work because participants were already high in present control. To test this hypothesis, I ran ANCOVAs and examined the interaction between condition and initial present control score for the primary outcome measures across the three conditions. The interactions between PPC initial score and condition were not significant for perceived stress, $F(2, 310) = .64$, p = .53, present control, $F(2, 311) = 2.19$, p = .11, or mental health symptoms, $F(2, 309) = 1.87$, p = .16. The interactions between PPC initial score and condition were also not significant for Fall 2014 GPA, $F(2, 310) = .26$, p = .78, Spring 2015 GPA, $F(2,261) = .31$, p = .74, percentage of credits completed in Fall 2014, $F(2, 311) = .34$, p = .71, and percentage of credits completed in Spring 2015, $F(2, 273) = .35$, p = .70. Thus, results did not support the hypothesis that participants who initially had lower levels of perceived control benefitted more from a PCI condition than the COM group..

Demographic differences. A seventh hypothesis was that the efficacy of the intervention

was underestimated because there were gender differences in response to the PCI. Previous studies on our PCI have demonstrated that women benefit more from our PCI intervention than do men (Bermingham et al., 2013). My hypothesis was that women would show a greater response to the PCI intervention than men. ANCOVAs were conducted for mental health and academic outcomes with gender and condition as fixed factors and initial scores as covariates for the mental health analyses only. Results revealed that the interaction between gender and condition was not significant for perceived stress, $F(2, 306) = .51$, $p = .60$, present control, $F(2,309) = 1.41$, $p = .25$, or mental health symptoms at post-intervention, $F(2,305) = .48$, $p = .62$. The interaction between gender and condition was also not significant for Fall 2014 GPA, $F(2, 308) = 1.63$, $p = .20$, Spring 2015 GPA, $F(2, 260) = .94$, $p = .39$, percentage of credits completed in Fall 2014, $F(2, 311) = .68$, $p = .50$, and percentage of credits completed in Spring 2015, $F(2,272) = 1.60$, $p = .21$. Thus, results did not suggest that there were gender differences in response to the PCI conditions.

We also looked at whether there might be racial/ethnic differences in response to the PCI conditions. There were no hypotheses made that certain racial/ethnic groups would experience greater benefit from the PCI. ANCOVAs were conducted for mental health and academic outcomes with race/ethnicity and condition as fixed factors and initial scores as covariates for the mental health analyses.. Results revealed that the interaction between race/ethnicity and condition was not significant for perceived stress, $F(10, 289) = .91$, $p = .52$, present control, $F(10, 292) = .85$, $p = .59$, or mental health symptoms at post-intervention, $F(9,289) = .97$, $p = .47$. The interaction between ethnicity and condition was also not significant for Fall 2014 GPA, $F(10, 293) = .90$, $p = .54$, Spring 2015 GPA, $F(10, 243) = .74$, $p = .69$, percentage of credits completed in Fall 2014, $F(10, 294) = .34$, $p = .97$, and percentage of credits completed in Spring

2015, $F(10, ,255) = .73$, $p = .70$. In sum, neither the gender by condition interactions nor the race/ethnicity by condition interactions were significant for any of the primary outcomes.

Dropout impacted results. An eighth hypothesis was that conducting analyses of completer participants only did not accurately depict differences between groups. Participants may have differentially dropped out of conditions making it important to analyze the intent to treat (ITT) sample (i.e., everyone who completed the pretest). My hypothesis was that participants in the PCI conditions would show significantly more improvement on present control, perceived stress, and mental health symptoms relative to the COM group in the ITT sample.

To test this hypothesis, a new data set was created after imputing scores for the missing participants. Values were imputed five times and then ANOVAS were run on each of the five imputed data sets for perceived stress, present control, and mental health symptoms at pre-intervention, post-intervention, 3-week follow-up, and 6-week follow-up. Results revealed that there were no significant differences ($p < .05$) between groups in the five imputed datasets.

I also looked at whether participants in the PCI conditions would show significantly more improvement on academic outcomes relative to the COM group in the ITT sample. Results revealed that there were no significant differences in academic outcomes in the ITT group. Thus, there was no evidence that the PCI conditions showed improved results in the ITT sample.

I also conducted repeated measures ANOVAs for present control, perceived stress, and mental health symptoms to examine only the participants who completed all four assessment time points ($n = 64$) across the three conditions. My hypothesis was that participants who showed the commitment to complete all assessments might be most likely to benefit from the PCI. Results did not support this hypothesis. There were not significant time by condition

interactions for present control, $F(6,183) = .14$, $p = .96$, perceived stress symptoms, $F(6,177) = .51$, $p = .80$, or mental health symptoms, $F(6, 177) = .26$, $p = .96$. There is therefore additional evidence that dropout did not impact results.

Teacher and Class Effects

It is possible that the PCI was not effective because of teacher and class effects. For example, it is possible that individuals' scores on measures changed over time because of factors related to their class or teacher. I hoped to use hierarchical linear modeling (HLM) to determine whether there were class or instructor effects. However, my sample size was underpowered for this type of analysis. According to Snijders (2005), statistical power for multilevel models depends on the total sample size for each level. Maas and Hox (2005) suggested that a small sample size ($N < 50$) at level two (e.g., class) can lead to biased estimations. My sample contained 479 individuals. These 479 individuals were nested within 28 classes, which were then nested within 11 instructors. Three of these instructors had only one class containing less than 20 participants. In sum, I did not have enough classes or instructors to test for these effects. However, teacher and class effects were unlikely in this sample because of the standardization of the curriculum. All NCC 1000 classes followed the same course syllabus and used the same textbook and intervention was not administered by the teachers. Because of the efforts to make the course consistent for all students, it is unlikely that the PCI intervention was ineffective due to teacher or class effects.

Discussion

The purpose of this study was to investigate the efficacy of a modified present control OMHI in a community college environment. The expectation was that our updated present control OMHI would increase levels of present control, decrease mental health symptoms, and

improve academic performance within an at-risk community college student sample. We also expected that providing supportive messages to users would improve the effectiveness of our PCI in this sample. Outcomes were assessed at pre-intervention, post-intervention, 3-week follow-up, and 6-week follow-up. Key findings, lessons learned, limitations, and future directions are discussed below.

Intervention Effects on Present Control

Results from this study did not support our hypothesis that participants in the PCI conditions would demonstrate increased levels of present control relative to participants in the COM group at post-intervention, and at the 3- and 6-week follow-ups. Moreover, results did not support our hypothesis that the PCI+SM condition would increase present control more than the PCI condition. There were no significant differences in levels of present control between the three groups. The mean between-group effect size for present control in the two PCI conditions compared to the COM condition at post-intervention was in the small range (d = .22). It is surprising that our PCI conditions did not have a greater impact on levels of perceived control. The primary goal of the PCI interventions was to increase present control, and previous studies of our PCI with college students showed increased levels of present control (ds= .58 to .69), with medium to large effects (Frazier et al., 2014; Hintz et al., 2014). The qualitative data gathered at post-intervention suggested that many of the participants may not have received some of the core messages about present control. This could explain why the PCI conditions were not more effective.

Intervention Effects on Perceived Stress and Mental Health Symptoms

Results from this study also did not support the hypothesis that participants in the PCI conditions would experience decreased levels of perceived stress and mental health symptoms

compared to the COM condition at post-intervention and at 3- and 6-week follow-ups. Participants in the PCI +SM condition also did not experience greater reductions in stress and mental health symptoms compared to participants in the PCI condition. There were no significant differences in perceived stress and mental health symptoms between the three conditions at any time point. The mean between-group effect sizes for perceived stress symptoms (d = -.11) and mental health symptoms (d = -.12) in the two PCI conditions at post-intervention compared to the COM group were in the minimal to small range. These between-group effect sizes were smaller than the effect sizes (ds = -.32 to -.35) found in the first two RCTs of the PCI (Frazier et al., 2014; Hintz et al., 2014). Given that present control levels did not change in the PCI conditions, it is unsurprising that perceived stress and mental health symptoms did not change either. Many studies have demonstrated an inverse relationship between present control and distress (e.g., Frazier et al., 2011; Frazier et al., 2012), and mediation analyses have suggested that our PCI improves mental health by increasing levels of present control (Hintz et al., 2014; Nguyen-Feng et al., 2015).

Intervention Effects on Academic Achievement

Results from the study also did not support our first and second hypothesis that our PCI conditions would improve academic performance more than the COM condition. All participants in the ITT and completer samples had similar GPAs and credit completion rates during the semester that they completed their assigned condition (Fall 2014) as well as the subsequent semester. However, results did suggest that participants in the PCI conditions who completed more intervention tasks, and completed tasks more promptly, had better academic outcomes. Thus, participants seemed to benefit more from PCI conditions when they showed evidence of engagement with the intervention.

Completion Rates

Results from this study somewhat supported our third hypothesis that participants in the PCI + SM condition would demonstrate greater adherence than participants in the PCI and COM conditions. We expected that participants in the PCI + SM condition would complete more intervention activities, and complete assigned tasks more quickly than participants in the PCI and COM conditions. There was a trend for participants in the PCI + SM condition to complete more tasks than participants in other conditions. However, participants in the PCI + SM condition were also slower than participants in the COM condition in completing tasks. Participants in the COM condition may have completed tasks more quickly because there were fewer steps (e.g., no video clips to watch) in completing their assigned intervention task.

Overall, completion rates in this study were variable. At post-intervention, the majority of participants (66%) completed the assessment survey. This level of adherence is largely consistent with other recent studies of OMHIs for college students (e.g., 66%, Sharry et al., 2013) although it is below what we found in our first two RCTs of the PCI (e.g., 84-87%; Frazier et al., 2014; Hintz et al., 2014). Participant adherence also dropped over the course of the study. Less than a fourth of participants completed the 3-week (24%) and 6-week (19%) follow-up surveys. This is disappointing because Hintz and colleagues had 87% of participants who started the PCI complete the 3-week follow-up survey. The completion rates likely dropped over time because participants did not receive course credit for completing the follow-up surveys. Participants were offered a $5 gift card for completing each follow-up survey; however, this incentive did not appear to work as intended. The high dropout rate at follow-up is disappointing because our initial RCT of the PCI demonstrated larger within- and between-group effect sizes at the follow-up assessments compared to post-intervention (e.g., Hintz et al., 2014). It could be that

participants in this sample benefitted more from the PCI conditions over time, but this effect could not be assessed because of the high dropout rate.

Comparing the PCI with other OMHIs

The PCI conditions were less effective in this sample compared to our initial studies of our PCI (e.g., Frazier et al., 2014; Hintz et al., 2014). Moreover, previous meta-analyses of OMHIs for wide ranging audiences have demonstrated significant decreases in mental health symptoms with medium, between- and within-group effect sizes (Barak et al., 2008; Richards and Richardson, 2012). It is surprising that our PCI conditions did not improve mental health more because our PCI was developed to be an interactive stress management program based on behavioral principles. We anticipated that our modified PCI would be better than the average OMHI because Barak and colleagues (2008) found that more interactive and CBT-based programs tended to be more effective than average. Yet, this study included an active control condition (a group given activities that are designed to mimic the time and attention of an intervention), and previous studies have found small or minimal between-group effect sizes when OMHIs were compared to an active control group (e.g., Davies, Morriss, and Glazebrook, 2014; Grist & Cavanagh, 2013; Levin et al., 2016; Newman et al., 2011). The COM group included in this study involved writing about recent stressors and aspects of NCC, and this condition may have been more helpful than we anticipated. Based on qualitative data, some participants in the COM condition gained self-awareness about their stress through the writing prompts. The PCI conditions were rated as more helpful than the COM group (*d*s = .39 -.50), but only with small to medium between-group effects. Moreover, this study was offered to all students in NCC 1000 as a universal preventative intervention and a recent meta-analysis found that interventions offered to all students are less effective than interventions that are offered to

students who are endorsing mild to moderate clinical symptoms (Conley, Durlak, Shapiro, Kirsch & Zahniser, 2016).

Why Didn't The PCI Conditions Work?

It is unclear why the modified PCI conditions were less effective than we anticipated. Eight hypotheses were tested empirically, but no explanation was conclusive. Some of the hypotheses about why the PCI conditions did not work as intended included that participants were not motivated, did not perceive the program to be helpful, and/or had little room for improvement. Likely, several reasons may be contributing to why the PCI conditions were less effective in this sample. There may also be reasons that were difficult to assess such as that participants' low reading and writing abilities impacted intervention effectiveness, there were teacher and class effects, and the method for completing assessment surveys impacted results. Perhaps most likely is that participants completed the OMHI primarily as a way to meet a course requirement. Although students in NCC 1000 were not mandated to complete this study, the vast majority of NCC 1000 students (98%) opted to complete this study rather than to write an essay or deliver a speech about stress. Likely, many of the participants were not motivated to improve their mental health. Students in this mandated class may also encounter stereotypes about their academic skills and potential, which may inhibit their engagement and performance in class activities (Newman, Keough, & Lee, 2009).

There is some indirect evidence that motivated participants benefitted more from the PCI. Specifically, there were significant correlations between word count and decreases in perceived stress, and between word count and academic outcomes. Participants who wrote more words in the assigned intervention activities experienced greater reductions in perceived stress from pre-intervention to post-intervention and had better academic outcomes. There was also evidence

that participants who were more compliant with intervention activities had better academic outcomes. Thus, encouraging attentive use of the intervention may boost intervention effectiveness. Moreover, in previous studies, students have completed our PCI in exchange for extra credit rather than course credit. Thus, a different population of students, who were likely more motivated, may have completed our PCI in past studies.

The timing of this study could also explain why the PCI conditions were not more effective. The vast majority of participants in this sample were first year students, who were in their second week of college when the study began. Likely, students were not ready for a stress management intervention because they were still transitioning to college and learning about the academic demands. Students may have benefitted from learning about what is and what is not in their control once they had a better understanding of college procedures and demands. Moreover, the most distressed participants at the outset of this study were less likely to complete their assigned intervention. Thus, those who needed some type of mental health intervention did not adhere to our study. It is impossible to know if our PCI would have been helpful since they tended to dropped out prematurely.

The reading and writing demands of this study may have also impacted the results. Students are mandated to take NCC 1000 when their standardized test scores suggest that they are not college ready in the areas of writing, reading, and/or math. If students are not very comfortable or confident with reading or writing, our intervention and the outcome surveys may have felt draining or overwhelming. In addition, some of our outcome measures (e.g., PPC) contained reverse coded items (e.g., My reaction to the situation is not under my control) that can be difficult to comprehend. Thus, the writing and reading demands of the interventions may have made them less appropriate for this sample.

The inclusion of stress management tips may have also reduced the effectiveness of the PCI. Stress management tips were added to the PCI after the pilot study (Study 6) because many participants stated that the PCI was too repetitive. We thought it would be helpful to include some additional stress management tools (e.g., deep breathing, sleep hygiene); however, it is possible that these tips distracted participants from our primary message about present control. Adding stress management tips to the PCI might have been particularly unnecessary in the context of a college readiness course, which is already teaching students other academic success skills. In a meta-analysis of stress management interventions, Richardson and Rothstein (2008) found that adding more modalities to a CBT intervention decreased intervention effectiveness. Thus, our basic intervention that focused solely on present control may have been more effective even if it was repetitive.

How participants completed the measures may have also impacted the results. Participants completed the pre-intervention survey by hand during class. Participants completed the post-intervention and follow-up surveys online at a time that was convenient for them. The study was intentionally designed this way to encourage participation and to simplify the research process for NCC 1000 instructors. However, the classroom environment may have been a barrier in getting accurate data. Participants sat in close proximity to each other while completing the pre-intervention survey. Some participants chatted and looked at each other's responses while completing the pre-intervention survey. Because of these factors, participants may have denied problems and symptoms on the pre-intervention survey because of social desirability factors.

Overall, the perceptions of the PCI conditions were positive, and do not explain the limited effectiveness of the intervention. Of the PCI participants who completed the post-intervention survey, approximately 89% of participants said that they had at least somewhat

applied the intervention content to their lives, and 70% said that they would have completed the online program even if they were not getting class credit for their participation. In addition, participants in this sample reported that they applied intervention content more to their lives (d = .25) than did participants in previous studies (Study 3). Thus, the PCI conditions were perceived positively even if they did not increase present control and decrease mental health and perceived stress symptoms.

Why Didn't the Supportive Messages Work?

We also hypothesized that the PCI + SM condition would have slightly larger gains in present control, slightly larger decreases in stress-related mental health outcomes, and greater adherence compared to the PCI and COM conditions. These predictions were based on previous research which has suggested that supported online interventions are more effective than unsupported interventions (Andersson & Cuijpers, 2009; Richards & Richardson, 2012; Spek et al., 2007).

Contrary to hypotheses, there was no evidence that providing supportive messages improved the effectiveness of PCI conditions. Perhaps this is because all users received some type of support while completing their assigned tasks. Specifically, users in all conditions received administrative messages that provided links to the new intervention components and reminders about intervention deadlines. In addition, some of the administrative emails provided positive reinforcement (Good job completing the first activity!) that has been previously shown to increase intervention effectiveness (Paxling et al., 2013). The findings of this study are consistent with a previous meta-analyses which found that providing more support does not always necessarily improve the effectiveness of OMHIs (Newman et al., 2011).

Lessons Learned

From this study, several lessons were learned about implementing an OMHI within a school based context. First, it is difficult to run an efficacy study because there are factors that cannot be tightly controlled. For instance, participants in this study had a different number of classmates, different instructors, and took NCC 1000 for different lengths of time. It is unknown how these and other subtle differences could have impacted the results. A second lesson learned was that having participants complete the pre-intervention survey in class may have led to an underreporting of symptoms. In school-based designs, researchers are likely to face trade-offs between designing tasks that will be easy for participants to complete, and tasks that will produce high high quality data. A final lesson learned is that it is difficult to implement a study off-site. Besides going to NCC for the initial recruiting process, none of the research staff was present on the NCC campus for the remainder of the study. This makes it difficult for researchers to assess what environmental factors could be impacting the study results, and speaks to the importance of adding on-site research collaborators. For all of these reasons, in a school-based environment, researchers are more likely to gain information about an intervention's effectiveness rather than efficacy.

Limitations

This study had several limitations that should be examined in future research. First, the sample consisted of community college students enrolled in a mandatory college readiness class. The generalizability is limited because students taking NCC 1000 are not necessarily representative of all community college students. Second, participation was highly incentivized in this study by offering course credit in exchange for participation. It would be helpful to examine the effectiveness of the PCI conditions with community college students who completed the PCI voluntarily or with minimal incentives. Third, outcomes were assessed through academic

performance and self-report measures. Additional research should look at whether the PCI conditions lead to functional changes in other areas such health behaviors (e.g., sleep, exercise) and help-seeking behaviors (e.g., therapy appointments). A fourth limitation is that participants who completed the post-intervention survey reported better initial mental health compared to participants who dropped out by post-intervention. This is problematic because those who had the most to gain from the intervention were more likely to dropout. Future research should examine how to keep distressed participants invested in the intervention. A fifth limitation is that mediators were not assessed in this study. Mediators could not be assessed because there were not significant changes in present control in this study, and other mediators were not assessed. Future research should examine additional mechanisms of change for OMHI users. A sixth limitation is that participant adherence dropped significantly over time so that long-term effects could not be accurately assessed. Future research should examine whether participants experience gains from the PCI conditions that are sustained over time. A final limitation is that little information is known about the participants beyond basic demographics. Future research should gather more in-depth information about participants such as their academic self-efficacy and self-identifications. If students identify with being in a stigmatized academic group because of their provisional student status, then their performance, engagement, and self-esteem could be affected.

Future Directions

Although our PCI conditions were not effective in this study, it is still worthwhile to consider how the PCI conditions could be modified to help community college students. Because mental health problems are common for college students and community colleges often provide limited mental health services (e.g., American College Health Association, 2014; Edwards,

2014), it is essential to develop accessible and cost-effective mental health services for community college students. Given that college students have routine access to the Internet, use the web to obtain health-related information, and have positive opinions of online interventions (Escoffery et al., 2005; Klein & Cook, 2010), OMHIs or smartphone applications remain a logical and cost-effective way to deliver mental health resources to college students.

Because many community college students juggle multiple life roles simultaneously (Cohen & Brawer, 2003), it would be worthwhile to explore how the PCI conditions could be modified to meet community college students' unique needs. Recruiting a diverse group of community college students to build or provide feedback on the PCI could result in a more culturally sensitive intervention. Previous research has demonstrated that OMHI users tend to prefer products that are tailored for them specifically (e.g., Andersson et al., 2009).

Examining how to best disseminate our PCI is also an important question. From this study, we have gathered that broadly disseminating our intervention within the context of a college readiness class is not effective. Additional research is needed to determine under what conditions our PCI is effective. Likely, participants need to have at least some level of motivation to do the intervention to benefit from the PCI. Working with health services on-campus to offer the PCI to students who want to improve their mental health may be fruitful.

Finally, how to best support users completing an OMHI is also an unanswered and important question. Users completing standalone interventions often report interest in having a coach or advisor help them through the program. Yet, providing support is costly, and often does not dramatically improve outcomes (e.g., Hintz et al., 2014). Examining the components of Mohr's "Supportive Accountability" (Mohr et al., 2011) model may provide clues into what aspects of support keep users invested and benefitting from an OMHI. Although this study

included some aspects of Mohr's model (e.g., coach that is warm), many were not (e.g., setting up process goals). Including more elements of the Supportive Accountability model could improve intervention effectiveness.

Table 1

Summary of PCI Efficacy Studies

Study Number	Sample	Inclusion/Exclusion Criteria	Conditions	Comparison	Key Results
1 (Hintz et al., 2014)	233 university students	Psychology student; average PPC score < 3	Present control intervention (PCI), PCI + support, stress-info only	Stress-info only	Average (Ave) between-group effect size (BG-ES) at posttest (PT) = .30, Ave BG-ES at follow-up (FU) = .35
2 (Frazier et al., 2014)	257 community college students	Psychology student	Present control intervention (PCI), stress-info only	Stress-info only	Ave BG-ES at PT = .35, Aver BG-ES at FU = .12
3	213 community college students	Psychology student	PCI, PCI + enhanced logs (EL), PCI + mindfulness (MF)	None	Across conditions, ave within-group effect size (WG-ES) at PT = -.34 and = -.45
4 (Nguyen-Feng et al., 2015; Nguyen-Feng et al., 2016)	512 university students	Psychology student	Multi-phase study – see text	Phase 1: Wait-list, Phase 2: None	More detailed stress logs were more effective, but also led to higher dropout

5 (Greer, 2015)	365 university students	Psychology student	PCI + MF, MF alone, psychoeducation (PsyEd	PsyEd	PCI + MF, MF, and PsyEd were equally effective
6	44 community college students	College readiness course student	PCI, PCI + EL, PCI + MF, PsyEd	PsyEd	WG-ES = -.26 for active intervention groups and -.16 for PsyEd at FU

Table 2

Correlations Between T1 Mental Health and Academic Outcomes

Measure		*2*	*3*	*4*	*5*	*6*	*7*	Descriptives
1.	PPC.T1	*-.66***	*-.53***	*.01*	*.05*	*.04*	*.05*	M = 3.15 SD = .51
2.	PSS.T1	-	*.66***	*-.10**	*-.09*	*-.16***	*-.12**	M = 2.73 SD = .65
3.	CCAPS.T1	-	-	*-.12**	*-.06*	*.14***	*-.13**	M = .96 SD = .56
4.	Fall 2014 GPA	-	-	-	*.49***	*.79***	*.46***	M = 2.29 SD = 1.26
5.	Spring 2015 GPA	-	-	-	-	*.40***	*.82***	M = 2.08 SD = 1.19
6.	Percentage Fall 2014 Credits Earned	-	-	-	-	-	*.46***	M =71% SD = 37%
7.	Percentage Spring 2015 Credits Earned	-	-	-	-	-	-	M = 67% SD = 38%

*Note. Ns = 361 – 474, *p<.05, **p<. 01*

Table 3

Between-group Differences in Present Control at T2, T3, and T4

	PCI	**PCI + SM**	**COM**			
T2	*n* = 111	*n* = 113	*n* = 93			
	M(SD)	M(SD)	M(SD)	F	df	p
	3.19 (.50)	3.11(.54)	3.11(.54)	.53	2, 313	.59
	PCI	**PCI + SM**	**COM**			
T3	*n* = 44	*n* = 35	*n* = 38			
	M(SD)	M(SD)	M(SD)	F	df	p
	3.28(.50)	3.10(.40)	3.10 (.51)	1.55	2, 113	.22
	PCI	**PCI + SM**	**COM**			
T4	*n* = 36	*n* = 26	*n* = 30			
	M(SD)	M(SD)	M(SD)	F	df	P
	3.15(.51)	2.90(.36)	3.13(.56)	2.04	2, 88	.14

Note. PCI = Present Control Intervention, PCI + SM = Present Control Intervention plus Support, COM = Comparison, M = mean, SD = standard deviation, T2 = post-intervention, T3 = 3-week follow-up, T4 = 6-week follow-up

Table 4

Between-group Differences in PSS-10 at T2, T3 and T4

	PCI	**PCI + SM**	**COM**			
T2	*n* = 110	*n* = 111	*n* = 93			
	M(SD)	M(SD)	M(SD)	F	df	p
	1.80(.60)	1.89(.64)	1.81(.64)	.60	2, 310	.55
	PCI	**PCI + SM**	**COM**			
T3	*n* = 44	*n* = 34	*n* = 37			
	M(SD)	M(SD)	M(SD)	F	df	p
	1.70(.66)	2.03(.61)	1.87 (.68)	.82	2, 111	.44
	PCI	**PCI + SM**	**COM**			
T4	*n* = 36	*n* = 26	*n* = 29			
	M(SD)	M(SD)	M(SD)	F	df	p
	1.71(.56)	2.04(.53)	1.83 (.58)	2.24	2, 87	.11

Note. PCI = Present Control Intervention, PCI + SM = Present Control Intervention plus Support, COM = Comparison, M = mean, SD = standard deviation, T2 = post-intervention, T3 = 3-week follow-up, T4 = 6-week follow-up

Table 5

Between-group Differences in CCAPS-34 at T2, T3, and T4

	PCI	**PCI + SM**	**COM**			
T2	*n* = 110	*n* = 111	*n* = 92			
	M(SD)	M(SD)	M(SD)	F	df	p
	.94(.60)	.98(.57)	.93(.60)	.30	2, 309	.74
	PCI	**PCI + SM**	**COM**			
T3	*n* = 44	*n* = 33	*n* = 37			
	M(SD)	M(SD)	M(SD)	F	df	p
	.88(.58)	1.05(.61)	1.12(.81)	1.23	2, 110	.30
	PCI	**PCI + SM**	**COM**			
T4	*n* = 36	*n* = 26	*n* = 30			
	M(SD)	M(SD)	M(SD)	F	df	p
	.83(.56)	.84(.57)	.87(.68)	.01	2, 88	.99

Note. PCI = Present Control Intervention, PCI + SM = Present Control Intervention plus Support, COM = Comparison, M = mean, SD = standard deviation, T2 = post-intervention, T3 = 3-week follow-up, T4 = 6-week follow-up

Table 6

Academic Achievement in Completer Sample

	PCI	**PCI + SM**	**COM**			
Fall 2014 GPA	*n* = 110	*n* = 113	*n* = 94			
	M(SD)	M(SD)	M(SD)	F	df	p
	2.63(1.13)	2.69(1.10)	2.61(1.10)	.16	2, 314	.85

	PCI	**PCI + SM**	**COM**			
Spring 2015 GPA	*n* = 92	*n* = 94	*n* = 81			
	M(SD)	M(SD)	M(SD)	F	df	p
	2.19(.58)	2.38(.61)	2.36(.81)	.87	2, 264	.42

	PCI	**PCI + SM**	**COM**			
Fall 2014 Credits Complete	*n* = 111	*n* = 113	*n* = 94			
	M	M	M	F	df	p
	85%	84%	81%	.56	2, 315	.57

	PCI	**PCI + SM**	**COM**			
Spring 2015 Credits Complete	*n* = 97	*n* = 100	*n* = 82			
	M	M	M	F	df	p
	71%	75%	77%	.56	2, 276	.57

Table 7

Within-Group Effect Sizes (Cohen's d)

		Within Group ds			
Variable	**Group**	**T1 - T2**	**T1-T3**	**T1-T4**	**Average**
Present Control					
	PCI	-.06	0.06	.12	.04
	PCI+SM	-.01	0.21	-.31	-.04
	COM	-.15	-.38	-.13	-.22
Perceived Stress					
	PCI	.17	.10	-.07	.07
	PCI+SM	.26	.08	.28	.21
	COM	.25	.26	.25	.25
CCAPS-34					
	PCI	.01	.04	-.28	-.08
	PCI+SM	.07	.00	-.25	-.06
	COM	.06	.22	-.17	.04

Note. PCI = Present Control Intervention, PCI + SM = Present Control Intervention plus Support, COM = Comparison. T1 = Pre-intervention, T2 = Post-intervention, T3 = 3-week follow-up, and T4 = 6-week follow-up. For present control, a positive d indicates a better outcome. For perceived stress and mental health symptoms, a negative d indicates a better outcome.

Table 8

Between-Group Effect Sizes (Cohen's d)

		Between-Group *d*s			
Variable	**Group**	**T1 -T2**	**T1 - T3**	**T1 - T4**	**Average**
Present Control					
	PCI vs. COM	.09	.44	.25	.26
	PCI+SM vs. COM	.14	.59	-.18	.18
Perceived Stress					
	PCI vs. COM	-.08	-.16	-.32	-.19
	PCI+SM vs. COM	.01	-.16	.03	-.04
CCAPS-34					
	PCI vs. COM	-.05	-.18	-.11	-.11
	PCI+SM vs. COM	.01	-.22	-.08	-.10

Note. PCI = Present Control Intervention, PCI + SM = Present Control Intervention plus Support, COM = Comparison. T1 = Pre-intervention, T2 = Post-intervention, T3 = 3-week follow-up, and T4 = 6-week follow-up. Between-Group *ds* refer to the listed PCI conditions compared to the COM conditions. Positive d's indicate that the listed PCI group had greater increases in the variable compared to the COM group. Negative d's indicate that the listed PCI group had greater decreases than the COM group.

Table 9

Ratings of Intervention Components at Post-intervention

	PCI *n* = 109-111	PCI + SM *n* = 110-113
Expert videos	3.23 (1.15)	3.27 (1.18)
Student videos	3.46 (1.19)	3.65 (1.25)
Module exercises	3.66 (1.18)	3.78 (1.15)
Stress logs	3.34 (1.28)	3.51 (1.22)
Stress tips	3.83 (1.19)	3.88 (1.14)
Supportive messages	-	3.90 (1.21)

Table 10

Adherence by Condition

	PCI	**PCI + SM**	**COM**
	n = 173	*n* = 160	*n* = 145
	M(SD)	M(SD)	M(SD)
Tasks completed out of 5	3.53 (1.85)	3.93(1.56)	3.60(1.92)

	PCI	**PCI + SM**	**COM**
	n = 144	*n* = 146	*n* = 118
	M(SD)	M(SD)	M(SD)
Number of days to complete	4.35(3.26)	4.30(2.97)	3.57(3.04)

Note. PCI = Present Control Intervention,
PCI + SM = Present Control Intervention plus Support,
COM = Comparison, M = mean, SD = standard deviation

Table 11

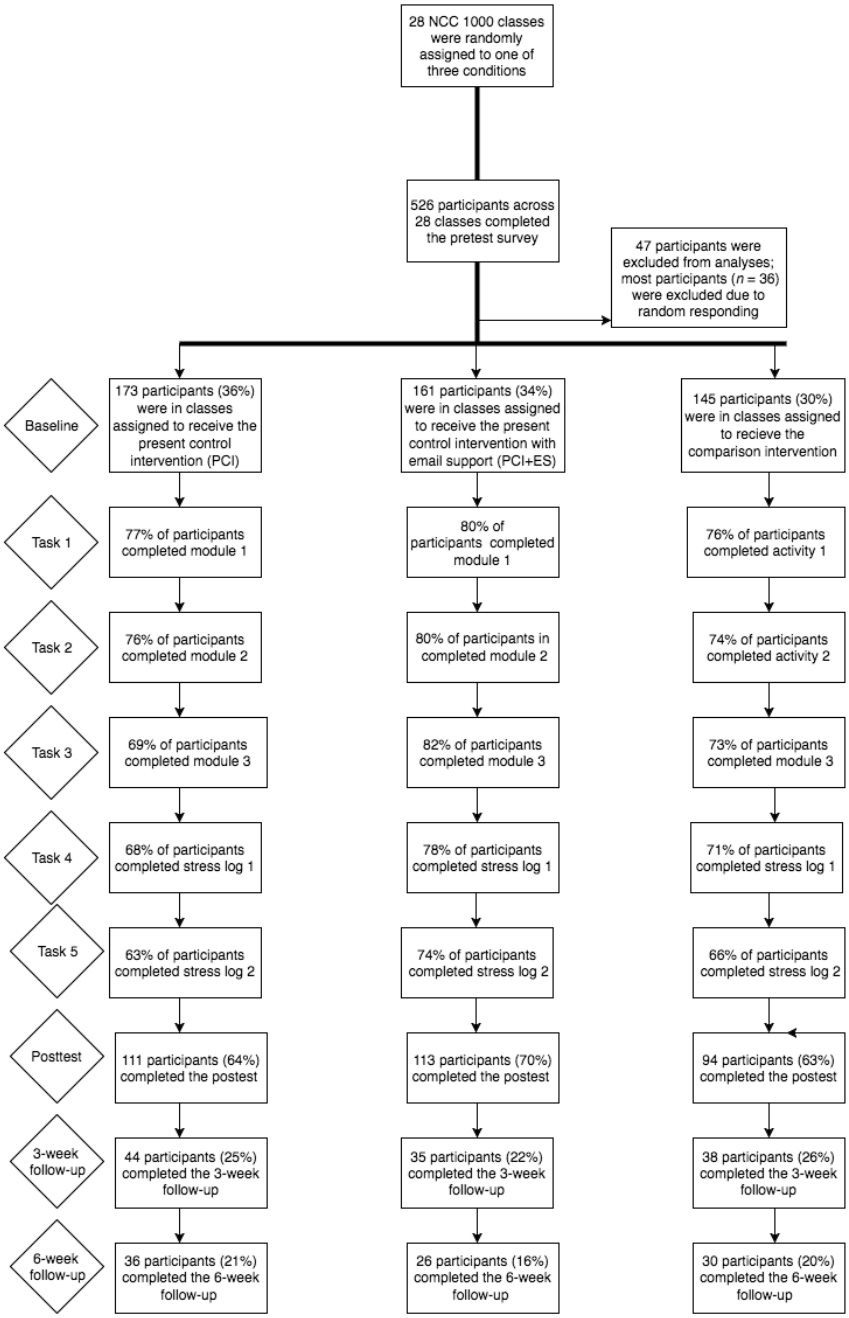
Correlations Between T2 Mental Health and Academic Outcomes

Measure		*2*	*3*	*4*	*5*	*6*	*7*	Descriptives
1.	PPC.T2	*-.61***	*-.49***	*.11**	*.21***	*.10*	*.22***	M = 3.13 SD = .53
2.	PSS.T2	-	*.67***	*-.15**	*-.14**	*-.15***	*-.16***	M = 2.84 SD = .62
3.	CCAPS.T2	-	-	*-.16***	*-.11*	*-.20***	*-.14**	M = .96 SD = .59
4.	Fall 2014 GPA	-	-	-	*.49***	*.79***	*.46***	M = 2.29 SD = 1.26
5.	Spring 2015 GPA	-	-	-	-	*.40***	*.82***	M = 2.08 SD = 1.19
6.	Percentage Fall 2014 Credits Earned	-	-	-	-	-	*.46***	M =71% SD = 37%
7.	Percentage Spring 2015 Credits Earned	-	-	-	-	-	-	M = 67% SD = 38%

*Note. Ns = 265 – 318, *p<.05, **p<. 01*

Figure 1

Participant Attrition Over Time



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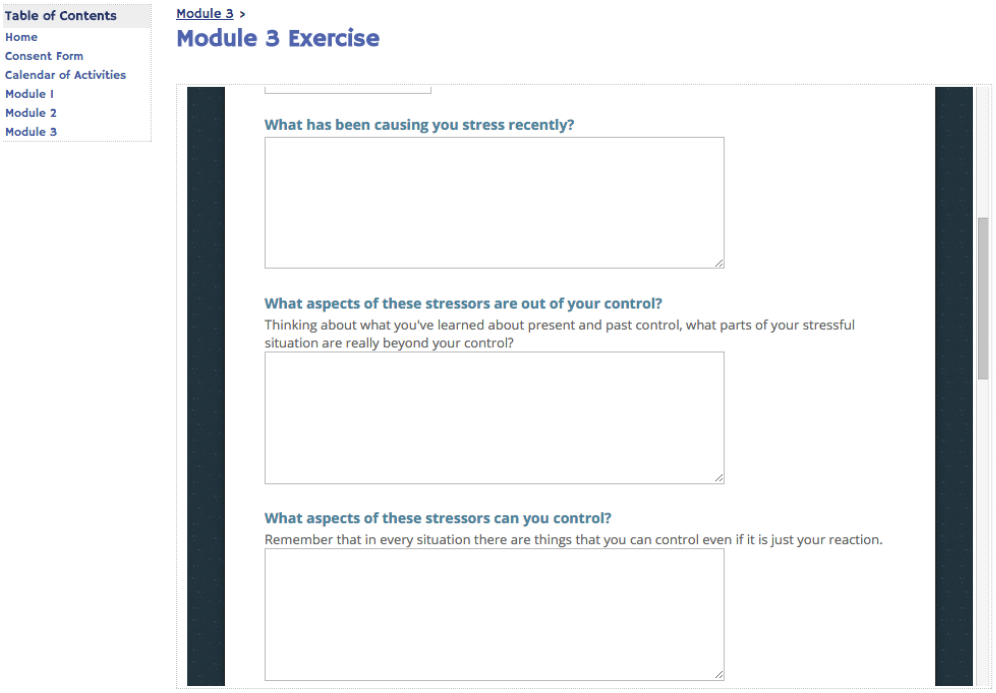
Appendix A

Screen Shots of PCI Groups



Appendix B

Example Supportive Messages

Hi John,

Nice job completing Module 1.

It sounds like you have stress in a number of different areas of your life. It sounds stressful to be adjusting to college, being on your own, and to be parenting a 3 year old. If there are times in which you feel particularly stressed, I would encourage you to practice the deep-breathing exercises presented at the end of Module 1. It is a quick and easy way to feel a bit more relaxed.

After completing each of the five exercises, I will be sending you a brief email response. There is no need to respond to these messages; they are just designed to provide some encouragement. I hope you have a good start to your week.

Best wishes, Liza

Hey Josh,

Congrats on finishing Module 2.

You did a great job the present control exercise. You are right, you do not have control over how much homework is given to you. You do have control of how much homework you do, and when you do it. I think your idea of working out and just getting stuff done is a great strategy.

I hope your week goes well. Look for Module 3 coming out on 9/28. Remember, if you can use the breathing exercise and do some brief, enjoyable activities during the week, you will likely feel less stressed. I also encourage you to let go of the aspects of your stressors that you cannot control.

Best wishes,

Liza

Appendix C

Screen Shots of COM Group