The Design and Evaluation of an Online Classroom-Based Emotion Regulation Intervention for College Students

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Kelli Howard

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Dr. Patricia Frazier

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Dedication

I dedicate this dissertation to my coach, friend, and mentor, Dr. Ann Lebedeff. Thank you for knowing where I was headed before I did, and for sending me, upright, on my way.

Abstract

This study evaluated the effectiveness of a brief, web-based intervention on online college students' self-regulation (e.g., task value and effort regulation), perceived control, achievement emotions, and perceived stress using a quasi-experimental design. Consistent with research supporting the Control-Value Theory of Achievement Emotions (Pekrun, 2006), the intervention was designed to increase students' perceptions of academic control and task value, and was embedded directly into an academic environment. Students in two online psychology courses (n = 65) completed short measures of outcome variables weekly for 12 weeks, as well as four weeks of intervention content in weeks 5-8. Students (n = 256) in a third class completed weekly measures only and served as a comparison group. Results supported hypotheses of salutary intervention effects on perceived value and negative emotion (with small to medium within-group effects), but not perceived control, effort regulation, positive emotion, or perceived stress. Additionally, students' control and effort regulation scores showed small, positive correlations with course performance for intervention participants. These findings are discussed in the context of existing literature. Implications for teaching and counseling practice, as well as limitations and future directions, are also addressed.

Table of Contents

List of Tables

List of Figures

The Design and Evaluation of an Online Classroom-Based Emotion Regulation Intervention for College Students

In the search for what makes college students successful, the capacity for awareness and regulation of internal states has emerged as an important predictor of learning and development (Bembenutty, 2011). Students' ability to actively monitor and regulate thoughts, feelings, and behaviors in the service of learning goals – so-called self-regulation - is particularly important for classroom success (Bembenutty, 2011). College students with high levels of self-regulation set goals, engage in deep learning strategies, monitor and reflect on the extent to which they are achieving goals (i.e., metacognition), and adapt strategies to meet their goals (Boekaerts & Corno, 2005; Zusho & Edwards, 2011).

Meta-analytic research has shown small to moderate, positive relationships between self-regulation and student grade point averages (Richardson, Abraham, & Bond, 2011). Effort regulation, or students' levels of persistence and effort in the face of difficult academic emotions, had the strongest relationship of any self-regulation scale with academic performance (average $r = .32$). Similarly, self-regulatory strategies related to effort ($\rho = .28$) and persistence ($\rho = .27$) have shown moderate, positive relationships with learning in college student and adult samples (Sitzman & Ely, 2011).

Intervention research has illustrated the potential of programs designed to increase students' self-regulation capacities. For instance, a meta-analysis of 107 studies showed that training in self-regulation had small to moderate positive effects on college students' grade point averages ($r = .19$) and retention ($r = .29$) as well as use of self-regulatory strategies related to motivational ($r = .21$) and emotional ($r = .33$) control (Robbins, Oh,

Le, & Button, 2009). Path analyses suggested that these interventions had direct effects on performance and retention outcomes, as well as indirect effects through changes in motivational and emotional control that resulted from the training.

Self-Regulation in Online Learning Environments

Self-regulation may be particularly important for student success in online education, which is expanding at a rapid pace (Allen & Seaman, 2013). Dropout rates are as much as seven times higher in online courses compared to traditional, face-to-face settings (Ali & Leeds, 2009; Patterson & McFadden, 2009; see also Jaggers, Edgecombe, & Stacey, 2013; Xu & Jaggers, 2013). Research has suggested that self-regulation deficits may contribute to higher attrition in online classes (Allen & Seaman, 2013; Hart, 2012; Lehman & Conceicao, 2014). Additionally, online students' attempts as self-regulation may not be as effective as they would be in more traditional classroom environments. For example, a recent comparison of online and face-to-face students showed that, the more online students attempted to increase their interest and engagement in the course, the lower exam and final grades they received. No such tradeoff was found for face-to-face students (Sansone, Smith, Thoman, & MacNamara, 2012).

Lack of external self-regulation sources is one possible explanation for the demonstrated tradeoff between interest regulation and performance in online settings. That is, online students may not have as many structural and environmental cues that signal a need for self-regulation, which may impact their ability to work toward achievement outcomes effectively. Online students also lack the motivational enhancements that in-person peer interactions provide. As a result, they may experience greater feelings of isolation, boredom, anxiety, and other negative emotions, and

increased temptation to disengage from learning (Hart, 2012; Wosnitza & Volet, 2005; Zembylas, Theodorou, & Pavlakis, 2008). Finally, the time and space constraints of an in-person environment are not often present in online classrooms, leaving online students with greater opportunities to be distracted from the immediate learning environment. Such contextual influences suggest that online students may benefit from enhanced effort regulation skills.

The Importance of Emotional Self-Regulation

Researchers have suggested that the most successful self-regulation interventions target students' awareness of and responses to their emotional states, particularly as they relate to motivation, learning, and performance (Robbins et al., 2009). In a recent cross-sectional study of college students, greater emotion regulation was positively related to self-reported positive emotion, and negatively related to negative emotion and perceived stress, known correlates of learning and performance outcomes (Saklofske, Austin, Mastoras, Beaton, & Osborne, 2012). In longitudinal studies, the positive emotions of pride and enjoyment have predicted greater self-regulation among college students (Artino & Jones, 2012; Viliavicencio & Bernardo, 2013), and the decline of such emotions over time predicted similar declines in successful self-regulation and academic performance (Ahmed, van der Werf, Kuyper, & Minnaert, 2013). Conversely, negative emotions such as boredom, frustration, and anxiety have been linked with decreased self-regulation and lower academic performance in both cross-sectional and longitudinal studies (Ahmed, et al. 2013; Artino, 2009; Marchand & Guiterrez, 2012; Pekrun et al., 2010; Perry et al., 2001). See Appendix A for a detailed summary of research on achievement emotions and student success.

Evidence suggests that emotional experiences *outside* the classroom also have implications for student success. For example, in a recent survey of 74,438 two and four-year college students, respondents rated stress, anxiety, and/or depression as the three largest mental health factors impacting their academic performance (American College Health Association, 2015). Students' mental health concerns also were related to student persistence, such that students who met clinical criteria for depression were at greater risk of leaving college before graduating, even after controlling for prior academic performance (Eisenberg, Golberstein & Hunt, 2009). The costs of such concerns extend to institutions and society; by one estimate (Healthy Minds Network, 2013), colleges lose $2000, and society $4000, for every one student who leaves college due to depression.

Effort regulation, a behavioral facet of emotional self-regulation related to students' persistence in the face of negative emotions, may help explain the links between students' emotional experiences, mental health, and academic success. For example, a recent cross-sectional study of college students showed a moderate, positive relationship between effort regulation and GPA (average r = .39), and suggested that effort regulation partially mediated the relationship between self-efficacy and academic performance (Komarraju & Nadler, 2013). Students' self-reported effort regulation also had a small to moderate, negative relationship (average r = .30) with self-reported symptomology of Post-Traumatic Stress Disorder (PTSD) in a recent longitudinal study (Boyraz, Granda, Baker, Tidwell, & Waits, 2015). In this study, students who reported lower effort regulation and greater PTSD symptoms also reported lower GPA after the first year of college, and increased dropout by the second year. The authors suggested that interventions targeting effort regulation may help students more effectively cope with

academic stressors and emotions, particularly as they interact with broader mental health concerns.

Unfortunately, today's college students are reporting mental health concerns at unprecedented levels in frequency and severity (American College Health Association, 2015; Hunt & Eisenberg, 2010). Such trends are increasingly concerning for students, counselors, and administrators alike, as many campuses report inadequate levels of mental health staffing and resources (Watkins, Hunt, & Eisenberg, 2012). Many have called for alternative channels for mental health prevention and intervention (Eells, Marchell, Corson-Rikert, & Dittman, 2012; Love & Love, 2008). For example, online interventions are a brief, convenient, and cost-effective alternative to the in-person treatments that have traditionally served students in emotional distress. Research suggests that online interventions can be effective in both the prevention and treatment of students' emotional concerns (Davies, Morriss, & Glazebrook, 2014; Farrer et al., 2013), and that such interventions may be particularly attractive to college students for their discretion and convenience (Eisenberg, Golberstein, & Gollust, 2007). Additionally, online interventions are ideal for reaching the growing number of online students who often lack access to traditional on-campus resources and support programs (Bembenutty, 2013).

A second advantage of online interventions is their potential to be integrated into academic settings, thereby targeting the emotional experiences most proximal to student learning and performance. Previous research with college students has linked completion of brief, classroom-based interventions with improved academic outcomes, such as performance and motivation (e.g. Cohen, Garcia, Apfel, & Master, 2006). Other brief

web-based interventions (e.g. Hintz, Frazier, & Meredith, 2015) have shown beneficial effects for students' self-reported anxiety, stress, and depression when offered as academic extra credit. These interventions have largely targeted students' appraisals of perceived value and perceived control, or the extent to which students' believe their academic efforts are both useful and within their present capacity. According to the Control-Value Theory of Achievement Emotions (Pekrun, 2006), interventions that target students' control and value appraisals are also likely to influence emotional experiences and self-regulatory efforts in the learning environment. In the next section, I outline the Control-Value Theory, focusing in particular on previous intervention research.

The Control-Value Theory

The Control-Value Theory has roots in well-supported cognitive models of emotion, which hold that emotions arise from a transaction between environmental features and the cognitive appraisals, or thoughts, a student has about those features (Lazarus & Folkman, 1984; Pekrun, 2006). In other words, appraisals about the learning environment are thought to be direct antecedents of achievement emotions, which in turn inform students' motivation, self-regulation, and learning outcomes. The theory identifies appraisals related to perceived control and perceived value as the primary antecedents of achievement emotions (Pekrun, 2006). That is, the extent to which students believe their actions directly impact achievement outcomes (perceived control) informs subsequent emotions, as do students' perceptions that achievement activities and outcomes are subjectively important (perceived value).

Perceived control appraisals and interventions. Research has generally supported the theoretical link between control appraisals and achievement emotions.

Specifically, individuals tend to report higher levels of positive emotion when they perceive themselves to have greater control over the outcomes of an achievement task (Fisher, Minbashian, Beckmann, & Wood, 2013; Frenzel, Pekrun, & Goetz, 2007; Goetz, Frenzel, Pekrun, Hall, & Ludtke, 2007; Goetz, Frenzel, Steoger, & Hall, 2010; Perry, Hladkyj, Pekrun, & Pelletier, 2001). Similarly, higher perceptions of control have shown moderate, negative correlations with self-reported negative achievement emotions, such as boredom, anger, frustration, and anxiety (Dettmers et al., 2012; Fisher et al., 2013; Pekrun et al., 2010). Studies of control and achievement emotions in online learning environments have also linked higher perceptions of control with greater reports of enjoyment and hope, and fewer reports of boredom, frustration, and anxiety (Artino, 2009; Artino & Jones, 2012; Butz, Stupinsky, & Pekrun, 2015; Marchand & Guiterrez, 2012).

Currently there are no empirical studies of the effectiveness of brief perceived control interventions for changing achievement-related emotions or self-regulation outcomes. However, such interventions have been found to affect students' emotional well-being and self-reported stress. For example, *Control Your Stress*, a one-hour online intervention intended to increase perceived control appraisals in college students, has shown success in several empirical studies. *Control Your Stress* is based on a temporal model of control, which distinguishes perceptions of control in the present moment from perceptions of past (e.g., What could I have done differently to prevent this?) and future (e.g., What can I do in the future to prevent this from happening again?) control (Frazier, Berman & Steward, 2001). Research has linked higher perceived present control with less emotional distress and better mental health, as well as more positive adjustment

trajectories, in college students (Frazier et al., 2011; Frazier et al., 2012; Hirai, Frazier, & Syed, 2014).

A series of randomized, controlled trials have supported the effectiveness of *Control Your Stress* for increasing perceptions of control, and decreasing emotional distress, in college students. In one study, students who completed *Control Your Stress* reported moderate to large increases in perceived control (within-group *d*s = .59-.66) and moderate decreases in anxiety, depression, and perceived stress three weeks after completing the intervention (Hintz, Frazier, & Meredith, 2015). Similar increases in perceived control, and small to moderate decreases in stress, depression, and anxiety, were found in a study of *Control Your Stress* with community college students (Frazier et al., 2015).

Another recent trial investigated the effectiveness of *Control Your Stress* as an extra credit opportunity integrated into an undergraduate Introductory Psychology course (Frazier et al., 2013; Nguyen-Feng et al., 2015). Results showed a preventative effect, such that students in the intervention condition showed no significant changes in stress, depression, or anxiety symptoms. However, students in the wait-list comparison group reported increases in stress symptoms and perceived stress, with between-group effect sizes ranging from $d = .22$ to $d = .31$. Thus, completing *Control Your Stress* appeared to buffer students from increased stress over the course of a semester. These results suggested the promise of *Control Your Stress* as a self-regulation tool that might help students make it through a difficult semester or course that might otherwise overwhelm them with emotional distress.

Perceived value appraisals and interventions. As with control appraisals, studies have shown a positive relationship between perceptions of value and participants' reports of positive emotion (Fisher et al., 2013). That is, the more participants perceived an achievement task to be personally important, the more often they reported feeling positive emotion related to the task, with correlations in the small to moderate range (Goetz et al., 2010). These relationships have also been found in online settings, such that higher perceptions of task value (i.e., the personal usefulness of an academic course or task) have predicted greater self-reported enjoyment, hope, self-regulation, and satisfaction related to a course (Artino, 2009; Artino & Jones, 2010; Butz, Stupinsky, & Pekrun, 2015; Kim & Frick, 2013; Marchand & Gutierrez, 2012).

With respect to negative achievement emotions in both face-to-face and online environments, research on the role of value appraisals has shown mixed results (Artino & Jones, 2012; Dettmers et al., 2011; Fisher et al., 2013). Across several studies, the only negative achievement emotion that has shown a consistent relationship with perceived value is boredom. Specifically, higher perceptions of value consistently predicted lower boredom in five separate studies (Pekrun et al., 2010), suggesting the particular relevance of value appraisals for this emotion. Boredom and enjoyment were also the only two emotions with stronger and more consistent relationships with value appraisals than with control appraisals (Pekrun et al., 2011).

As with brief control interventions, no empirical studies have explicitly examined the effectiveness of brief, value-related interventions within the framework of the Control-Value Theory and achievement emotions. However, several studies have demonstrated the effectiveness of brief values interventions in academic settings. First,

findings from social psychology and education research have shown that brief values interventions can effectively increase academic performance, particularly in students who identify as racial or ethnic minorities. In the most well-known demonstration of this effect (Cohen, Garcia, Apfel, & Master, 2009), African-American students who wrote briefly about personal values before a difficult assignment demonstrated significantly higher course performance and overall grade point averages than control participants at three-month follow-up, with large effect sizes (average d = .69-.76). Researchers have replicated these results in subsequent studies, lending strong support to the effectiveness of brief values interventions for improving academic performance (Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustowski, 2009; Miyake et al., 2010; Sherman et al., 2013).

Researchers also have tested brief interventions designed to enhance the utility value of an academic task, or the extent to which completing the task was relevant to some aspect of the student's future behavior. For example, completing brief writing assignments connecting course content to personal experiences has been linked to increased interest, motivation, and academic performance (though not perceived value) in college and high school students (Hullemann, Godes, Hendricks, & Harackiewicz, 2013; Hulleman & Harackiewiez, 2009). Additionally, receiving brief, online messages stating the personal and career benefits of course content was linked to increased student interest and engagement in another study (Sanson, Fraughton, Zachary, Butner, & Heiner, 2011), particularly when initial student interest in course material was low. These results underscore the promise of brief perceived value interventions, particularly in non-elective courses in which students may not have intrinsic interest or motivation.

The Current Study

Despite the demonstrated link between emotional self-regulation and student success, and the promise of control and value-based brief interventions for promoting student success, there is a lack of research on how such interventions affect students in the immediate academic environment. That is, no studies have examined intervention effects on the acute appraisals, emotions, and self-regulatory outcomes (e.g., control and value perceptions, achievement emotions, effort regulation) that students experience in real-time classroom environments. Additionally, few research studies have examined the impact of brief, online interventions specifically with online student populations or directly in online learning environments. Thus, the aim of the current study was to examine the effectiveness of an adapted version of a brief, online intervention, *Control Your Stress*, for appraisals, emotions, and self-regulation outcomes in an online academic setting, using the theoretical framework of the Control-Value Theory.

We used a quasi-experimental design, in which students in two undergraduate psychology classes (Psychology of Stress and Trauma and Psychological Statistics) completed *Control Your Stress*, and students in a third class (Learning and Behavior) served as a comparison group and completed only study measures. Students in all three classes completed weekly assessment measures for 12 consecutive weeks of the semester (weeks 4 – 15). The purpose of such frequent, weekly assessment was to capture outcome change and variability over time that may be overlooked in more traditional pre-post study designs. For instance, there is evidence that students' achievement emotions tend to fluctuate naturally across the course of a semester, as one would expect with the cyclical nature of academic demands (e.g. Ahmed, van der Werf, Kuyper, & Minnaert, 2013). Recent research also has shown that not just specific emotions, but *variability* in those

emotions, is a significant predictor of well-being (Houben, Den Noortgate, & Kuppens, 2015). Thus, choosing to assess achievement emotions and related outcomes at only two or three time points, as is common in pre-post designs, may have suggested a misleading picture with respect to the nature of students' classroom experiences. For reference, Appendix D summarizes results of more traditional, pre-post analyses of the current data.

Control Your Stress was delivered in weeks 5-8 (weeks 9-12 of the semester) of the 12-week study period. The intervention involved a short (~5 minute) video about perceived control, viewed in the week following the first course exam, coupled with brief instruction in identifying and choosing personal values. Following the video, students completed four consecutive weeks of brief, weekly writing exercises on their perceptions of personal control and important values relative to their academic performance. The timeline of measurement and intervention is summarized in Table 1.

We examined the effects of the intervention on six outcomes over time: perceived control, task value, positive academic emotions, negative academic emotions, effort regulation, and perceived stress. Previous research has suggested that higher perceptions of control and value are linked with more positive emotions and successful self-regulation (e.g., Artino & Jones, 2010; Goetz et al., 2010), and that brief control interventions can effectively lower and/or prevent students' perceived stress (e.g., Hintz et al., 2015). Research has also shown that connecting course content to personal values can benefit academic outcomes (e.g., Cohen et al., 2009). Therefore, we expected that intervention participation would predict significant differences in the shape of the trajectories of all outcome variables across 12 weeks. Specifically, our hypotheses were that there would be significant differences in the slopes of outcome variables by

intervention group, such that students who received the intervention would show less steep increases in negative emotion and perceived stress and less steep decreases in perceived control, task value, positive emotion, and effort regulation over time, compared to students who did not receive the intervention. Additionally, we expected there to be significant, positive correlations between students' scores on perceived control, task value, positive emotion, effort regulation, and final course performance, and significant, negative correlations between scores on negative emotion, perceived stress, and final course performance.

Method

Participants

Eligible participants were full-time students at a large, Midwestern public university who were enrolled in one of three online, 15-week, three-credit undergraduate psychology courses: Psychology of Stress and Trauma, Introduction to Psychological Measurement and Data Analysis, and Learning and Behavior. Psychology of Stress and Trauma was a flipped course with a weekly discussion section whereas the other two courses were fully online. Though all three courses were intended primarily for students majoring in psychology, they were open to all undergraduate students at the university. Given the aim of investigating the intervention as a potential teaching and learning tool with a sample representative of typical classroom students, all full-time (>13 credits) enrolled students were eligible to participate. Limiting participation to full-time students lent additional internal validity by controlling for outcome effects better attributed to part-time student status.

We projected class enrollments of approximately 40 in the stress and trauma course, 45 in the statistics course, and 350 in the learning and behavior course. Though the literature on multilevel modeling does not specify minimum numbers of participants needed for adequate statistical power, these projected enrollments were consistent with two-level sample sizes that have demonstrated adequate power in previous computer simulation studies (e.g. DeJong, Moerbeek, & Van der Leeden, 2013). Additionally, the relatively frequent 12-week measurement schedule in the current study was chosen in light of consensus that more frequent assessment increases statistical power in longitudinal designs (Kreft & DeLeeuw, 1998).

Four hundred and forty students enrolled in at least one of the three courses, and were therefore recruited to participate in the study (N = 346 in Learning and Behavior, N = 51 in Stress and Trauma, and N = 43 in Statistics). Four hundred and nine (93%) of these students enrolled in the study by clicking on the study invitation and providing informed consent to participate. Of this group, 88 students (22%) were excluded from analyses because they withdrew from their respective course (n = 10), were enrolled in multiple courses involved in the study (n = 12), completed one or fewer weeks of measures (n = 60), or showed evidence of random responding, defined below (n = 6). Figure 1 summarizes enrollment and data analysis rates by class and intervention condition.

Data were analyzed for all students who completed two or more of the 12 weekly measures (n = 321), per recommendations in the literature (Nezlek, 2012). This included 65 students who received the intervention (n = 40 in Stress and Trauma and n = 25 in Statistics), and 256 students in Learning and Behavior, who received no intervention. Of

the 321 students, the majority identified as sophomores (17%), juniors (41%) or seniors (39%), and 76% of total students identified as female. There were no significant differences in demographics between participants in the three classes. Due to researcher error in data collection, specific age, racial, and ethnic demographic information was not available for students.

Intervention condition. The current version of *Control Your Stress* (Hintz et al., 2015) began with a five-minute video (taken from the full version of *Control Your Stress*) that featured a research expert explaining the concept of perceived present control. Immediately following the video, a written prompt directed students to type answers to the following questions: 1) What about your academic work (either in this class or other classes) is stressful for you?; 2) List the aspects of your stressors that you cannot control; 3) List the aspects of your stressors you can control and the actions you can take.

The second half of the current version of the *Control Your Stress* intervention prompted students to read a short script about values and to identify their own personal values with respect to the current course. The script and exercises were adapted from previous values interventions that have shown effectiveness in academic settings (Chase et al., 2013; Cohen et al., 2009; Hulleman et al., 2013). Students saw a list of sample values commonly related to success in academics (e.g., achievement, family, learning and mastery, career stability) and chose one or more values they believed to be personally important. An on-screen prompt then directed them to answer the following questions: 1) What personal values are most important to you? (taken from Cohen et al., 2006); 2) What is the potential relevance of success in this course to these values? (taken from Hulleman et al., 2013)

At the beginning of weeks 10-12, students in the intervention conditions completed written intervention exercises similar to those in week nine. Specifically, students were prompted to identify current aspects of their course workload that were stressful, elements that were either within or beyond their present control, and actions they could take to address or cope with these stressors. They were also asked to identify which of those controllable actions were congruent with the personal values identified in week nine.

No-intervention condition. Students in the no-intervention condition (i.e., all students in the Learning and Behavior course) were asked to complete brief weekly measures, identical to those completed by students in the intervention condition, in weeks 4-15 (with full measures in weeks 8 and 12). They did not complete exercises related to identifying stressors and/or values and steps for addressing them.

Procedure

All sampling and data collection procedures were approved by the University of Minnesota Institutional Review Board (IRB). Students were recruited for the study during the first day of their respective online course. In the course syllabus, accessed online as part of the first class activity, students saw a message detailing two options for a 15-point research-related course assignment. Option one involved completing weekly measures for the present study. Option two involved searching for popular media articles related to course concepts and answering questions about their relevance to the course. The two options required approximately the same amount of course time (45 to 60 minutes) and were both designed to fulfill the stated learning objectives of the assignment (e.g., engage with real-life examples of the theories and concepts of the course). The syllabus alerted

students that, should they choose option one, quantitative (i.e., weekly measures) and qualitative (i.e., answers from stress logs) data might be used anonymously in the current project. Thus, students who did not wish to consent to research participation had the option to complete assignment option number two. The syllabus detailed the nature and risks of study participation for students who chose option one.

In the intervention condition, the intervention phase of the study began in week nine, following the first exam. Upon receiving the grade on their first exam, students saw an invitation to complete an exercise that may help them continue to succeed (or to do better) on the next exam. The invitation linked to a video on perceived control and information on personal values, followed by written exercises about intervention content. For the remainder of the intervention phase (weeks 10-12), students completed only the written exercises immediately upon logging in to view the course module (e.g., online lectures and assignments) assigned for that week. Following completion of the module, screen prompts directed students to complete study measures. Students had four days to access and complete the written intervention exercises, course module, and measures. They were free to complete all at their own pace within that time frame; however, study measures in a given week were not visible to students until they had completed the corresponding intervention exercises and course modules. Completion tracking features on the intervention and data collection platforms (Moodle and Qualtrics, respectively) allowed researchers to confirm that students accessed the course modules, intervention content, and weekly measures at the reported time.

Measures

Measures of dependent variables are summarized in Table 3. Participating students completed short (1-2 item) measures of perceived control, perceived value, achievement emotions, effort regulation, and perceived stress for 12 weeks during the 15-week academic semester. Consistent with previous recommendations (Borckardt, 2008), students also completed full measures of these dependent variables pre and post-intervention, at weeks eight and 12. Although the current analyses focus primarily on the brief, weekly measures, we assessed the reliability of brief measures by comparing full measure correlations at pre/post (weeks 5 and 8), with brief measure correlations spanning an identical time frame (weeks 5 and 8. All data collection took place over the internet, using IRB-approved secure procedures.

Perceived control. We assessed perceived control over academic performance using the 8-item Academic Control Scale (Perry, Hladkych, Pekrun, & Pelletier, 2001). Students rated from 1 (*strongly disagree*) to 5 (*strongly agree*) the extent to which they perceived themselves to have control over their academic success (e.g., "I have a great deal of control over my performance in this course"). Studies using the Academic Control Scale with college students have shown evidence of score reliability (α = .80; Perry et al., 2001) and construct validity (Perry, Hladkych, Pekrun, & Clifton, & Chipperfield, 2005). Alphas in the current sample were .86 and .82 at weeks 8 and 12, respectively. For the weekly, brief assessments of perceived control, we used the two items from the scale with the highest item-total correlations in the Perry et al. (2001) study ("There is little I can do about my performance in college" and "My grades are basically determined by things that are beyond my control and there is little I can do to change that"). Test-retest reliability for the brief measures showed moderate correlations between scores at weeks 5

and 8 (r = .47), which were lower than the test-retest reliability for the full measure (r = .62).

Perceived value. Perceived value was measured using the 6-item Task Value scale of the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991). Students rated, on a scale of 1 (*not at all true of me*) to 7 (*very true of me*), the extent to which the course material was interesting, useful, or important (e.g., "I think the course material in this class is useful for me to learn"). Higher scores indicated greater perceived value of the course content. Scores on the task value scale have shown evidence of reliability (average α = .90) and validity in previous samples with undergraduate students (Duncan & McKeachie, 2005). Alphas in the current sample at weeks 8 and 12 were .93 and .94, respectively. Because the goal of the intervention was to connect course content with students' important personal values, the weekly, one-item measure of task value directly targeted perceived task importance (e.g., "It is important for me to learn the course material in this course"). Test-retest reliability for the brief measures showed low to moderate correlations between scores at weeks 5 and 8 (r = .54), which were lower than the test-retest reliability for the full measure (r = .67).

Achievement emotions. Students' emotions toward their respective course were measured using the 8-item course-related subscale of the Achievement Emotions Questionnaire (AEQ; Pekrun, Goetz, Frenzel, Barchfield, & Perry, 2011), a common measure of achievement emotions. Students rated from 1 (*completely disagree*) to 5 (*completely agree*) the extent to which they currently felt eight specific emotions toward their course. With the exception of students in the no-intervention group in week 12

(achievement emotions were inadvertently left out of measures in this week), students reported on all eight emotions during all 12 weeks of the study. Students' aggregate negative emotions were measured by averaging self-reported frustration, boredom, hopelessness, shame, and anxiety. Similarly, we calculated students' aggregate positive emotion by averaging self-reported scores on the hope, pride, and enjoyment subscales. Scores on the AEQ have shown evidence of reliability (average $\alpha = .86$) and validity in previous samples of college students (Pekrun et al., 2011). Alphas for positive emotions in the current sample at weeks 8 and 12 were .83 and .89, respectively. Alphas for negative emotions were .84 and .89 at weeks 8 and 12. Test-retest reliability for the brief measures showed low to moderate correlations between scores at weeks 5 and 8 ($r = .17$, .16) for both positive and negative emotions, respectively. The test-retest reliability for the full measure was $r = .35$ and .43, respectively.

Effort regulation. We used the four-item effort regulation subscale of the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991) to assess students' effort regulation. Students rated, from 1 (*not at all true of me*) to 7 (*very true of me*), the extent to which they felt motivated to persist and put in effort in the course. Higher scores on the subscale were evidence of greater effort (e.g., "I work hard to do well in this course, even if I do not like what we are learning"). Scores on this subscale have shown marginal reliability ($\alpha = .69$) in previous studies with college students in academic settings (Duncan & McKeachie, 2005; Pintrich, Smith, Garcia, & McKeachie, 1993). Alphas in the current sample at both weeks 8 and 12 were .76. Given the expectation of the intervention to increase students' effort in the face of negative, deactivating emotions, the item with the highest face validity (as assessed by four

members of the research team: "Even when course materials are dull or uninteresting, I manage to keep working until I finish") was used for the weekly one-item assessments. Test-retest reliability for the brief measures showed low correlations between scores at weeks 5 and 8 (r = .37), which were lower than the test-retest reliability for the full measure (r = .54).

Perceived stress. General perceptions of stress were measured using the 10-item Perceived Stress Scale (Cohen, 1983). Students rated, from 0 (*never*) to 4 (*very often*), the extent to which they experienced distressing feelings or thoughts related to stressors in the previous week (e.g., "In the last week, how often have you been upset because of something that happened very unexpectedly?"). Scores on the Perceived Stress Scale have shown evidence of reliability (α = .89) and convergent and discriminant validity in studies with college students (e.g., Roberti, Harrington, & Storch, 2006). Alphas in the current sample at both weeks 8 and 12 were .88. For the brief, weekly assessment of perceived stress, we used the two items with the strongest face validity (as assessed by the research team) and highest correlations with self-efficacy and helplessness, respectively (e.g., "In the last week, how often have you felt nervous and stressed?" and "In the last week, how often have you felt you could not cope with all you had to do?"). Test-retest reliability for the brief measures showed low to moderate correlations between scores at weeks 5 and 8 (r = .40), which were lower than the test-retest reliability for the full measure (r = .58).

Academic performance. Academic performance was measured using students' final course grades. Final grades were a continuous variable, defined as students' percentage of total course points earned.

Results

Analytic Strategy

We used multilevel modeling (MLM), with full information maximum likelihood estimation, to investigate the effects of the intervention on outcome variables over time. A primary advantage of MLM in longitudinal studies is the ability to account for data at multiple "levels." For example, in the current study, MLM allowed for simultaneous identification of within-person (e.g., effects of time, a level-one variable) and between-person (e.g., effects of intervention, a level-two variable) contributions to outcome variance. Additionally, accounting for data at multiple levels allows researchers to examine predictors of both the level *and* trajectory of a particular dependent variable across time. For instance, though our hypotheses concerned slopes, or average changes across 12 weeks, multi-level analyses of intercepts allowed us to make certain that intervention and control participants began the study reporting similar levels of outcome variables.

A second advantage of MLM in longitudinal studies is the ability to account for missing data and/or for participants with varying numbers of completed assessments. Using recommended procedures for longitudinal analyses (e.g., Black, Harel, & Matthews, 2012), we analyzed patterns of missing data in the current study. Analyses at pre and post-intervention (weeks 8 and 12) revealed no significant differences on full measures of any outcome variables between completers and non-completers at those time points. Together with recommended visual and quantitative analyses (e.g., SPSS missing data exploration, a non-significant Little's Test; Singer & Willett, 2003), these results

showed no evidence that the data in the current study were not missing at random (MAR), a valid condition for the use of multilevel analyses.

To test for the effects of intervention condition on dependent variables over time, we specified a two-level linear model, with time as the within-person (i.e., level 1) and intervention condition as the between-person (i.e., level 2) predictor variables. Given no previous theoretical or empirical reason to suggest otherwise, along with no evidence in improved fit when a quadratic term was added, the final models were linear in shape. We designated both fixed and random effects for dependent variables in the model. Fixed effects refer to variability between individuals as a result of a membership in a specific level-two (i.e. "fixed") variable (such as intervention condition). Conversely, random effects refer to variability in outcomes as a result of intra-individual (i.e., within-person or level one) differences across time. Thus, specifying both fixed and random effects allowed for examination of variability in outcome variables both between and within-participants. The presence of significant intervention*time interactions suggested effects of intervention participation on dependent variables, such that outcome rates of change across time differed with respect to treatment condition.

Preliminary Analyses

Per student, the average number of weekly measures completed was 8/12, or 67%. Per week, the average rate of completion was 77% (n = 248), meaning that in any given week 77% of the students completed measures. Average weekly participation rates ranged from 60% (week 1) to 84% (weeks 8 and 11). Students in the stress course had the highest average participation rate (n = 34; 85%), followed by students in Learning and Behavior (n = 248; 77%) and Statistics (n = 17; 66%). There were no differences in

average completion rates between students who received the intervention (78%) and students who did not (77%). Table 2 summarizes measure completion rates, by student and class, across 12 weeks.

Prior to testing intervention effects, we cleaned the data using suggested guidelines for longitudinal analyses (e.g., McCabe, Mack & Fleeson, 2012; Singer & Willet, 2003). Careless responders, defined as participants who provided identical responses to each item on two or more of the full outcome measures, were removed from analyses, per literature on detecting random responding in survey data (e.g., Meade & Craig, 2012). We also removed participants who completed fewer than two assessments, consistent with recommendations that participants have a minimum of two level-one occurrences (Nezlek, 2012). The remaining participants' data were then organized in a person-level dataset (see Singer & Willet, 2003, for full description).

Following data cleaning, we explored the distributions and ranges of all variables. Visual analyses (e.g., histograms) suggested that students' scores on control, task value, and effort regulation were slightly negatively skewed, and scores on negative emotion were slightly positively skewed. We also compared quantitative indicators of skewness on the full measures (weeks 8 and 12) with those on the brief measures at week 14 (chosen because it was the week with the highest participant response rate of 84%). These indicators of skewness were similar, and well within the recommended range (e.g. +-2; George & Mallery, 2010) for inclusion of these variables in final analyses. Additionally, outliers (defined as values more than 1.5 times the interquartile range) were detected for control (n = 8) and negative emotion (n = 3). However, these values were left

in the final dataset after visual inspection (e.g., Q-Q plots) suggested they were consistent with the range of observed, reasonable scores for participants.

We calculated descriptive statistics (see Table 4 for means and standard deviations) for intervention and non-intervention participants at each time point. Additionally, we compared average trajectory and level of outcomes for participants in the two intervention classes (i.e., Stress vs. Statistics) by running two-level models on all dependent variables, with class as a level-2 predictor. Results showed no differences in trajectory slopes between the two groups; that is, students in both intervention classes reported similar rates of change on all variables across the 12 weeks. However, differences emerged in starting levels (i.e. intercepts) of three variables, with students in the statistics course reporting significantly higher negative emotion, $t(68) = 3.14$, $p < .001$, and significantly lower positive emotion, $t(64) = -2.32$, $p = .02$ and effort regulation, $t(66) = -2.56$, $p = .01$, than students in the stress course at week 4.

As a recommended first step in multilevel analyses (Singer & Willett, 2003), we ran two unconditional models for each dependent variable. First, in the unconditional means models, we examined participants' average levels (i.e., intercepts) of each dependent variable, aggregated across 12 weeks (weeks 4-15). Second, the unconditional growth models included an additional predictor of linear time, allowing for examination of average level and slope of dependent variable change across 12 weeks. Accounting for time explained only 13% of the variability between participants, suggesting that additional predictors would increase model fit. Thus, intervention condition was added as a level-2 (between-person) predictor, allowing for hypothesis testing related to intervention effects.

Intervention Effects on Outcome Variables

Multilevel models were run to assess whether students in the intervention classes demonstrated significantly different intercepts (i.e., starting values) and rates of change on outcome measures relative to students in the comparison class. With the exception of effort regulation, there were no significant effects of intervention on intercepts, suggesting that average starting levels for students in both conditions were similar. Table 5 provides summaries of multilevel modeling analyses. See Appendix D for results of more traditional, pre-post analyses of the current data.

Perceived control. Results indicated a significant average decline in perceived control over time for all participants, $t(283) = -2.74$, $p < .05$. The time by intervention interaction was not significant, such that there was no difference in trajectories of control scores between participants in the two conditions across time, $t(277) = -.55$, $p = .58$. Within-group analyses revealed small to moderate declines in perceived control ($d = -.36$) for students who completed the intervention, and small declines for students who did not receive the intervention ($d = -.16$).

Perceived task value. There was a significant average decline in perceived task value over time for all participants, $t(295) = -7.15$, $p < .001$. There was also a significant time by intervention interaction for task value, $t(289) = 2.01$, $p = .05$. Although participants in both groups declined in self-reported task value on average over 12 weeks, students who did not receive the intervention reported sharper declines (within-group $d = -.64$) than intervention participants (within-group $d = -.16$; between group $d = .48$). In other words, the intervention appeared to serve a preventative function, in that it was associated with only small declines in the extent to which students saw course content as useful across the semester. Those who did not receive the intervention, on the other hand,

reported moderate declines. Figure 2 shows the average trajectories of perceived task value for participants by intervention group across time.

Positive emotion. Positive emotion also significantly declined over time across participants, $t(305) = -6.96$, $p < .001$. The time by intervention interaction was not significant, $t(292) = .58$, $p = .56$, such that participants in the two conditions did not differ in average trajectories of positive emotion over time. Within-group analyses showed small declines in positive emotion across 12 weeks for intervention participants ($d = -.34$), and moderate declines for students who did not receive the intervention ($d = -.67$). With respect to specific positive emotions, there were significant differences in trajectories of enjoyment across conditions, $t(289) = 2.23$, $p < .05$. Students in the intervention condition showed much smaller declines in enjoyment (within-group $d = -.18$) across 12 weeks than students who did not receive the intervention (within-group $d = -.75$; between-group $d = .57$). Figure 3 shows the average trajectories of enjoyment of participants by intervention group across time.

Negative emotion. Results indicated a significant average increase in negative emotion over time for all participants, $t(301) = 7.17$, $p < .001$. The time by intervention interaction was marginally significant, such that there was a difference in average negative emotion trajectories between participants in the intervention and no-intervention groups across time, $t(288) = -1.82$, $p = .07$. Within-group effect sizes showed small increases in negative emotion across time for intervention participants ($d = .20$), and moderate increases for students who did not complete the intervention ($d = .64$; between group $d = .44$). There were significant differences in the specific trajectories of embarrassment, $t(287) = -2.10$, $p < .05$, and boredom, $t(274) = -2.6$, $p < .01$. Students

who did not receive the intervention reported sharper increases in embarrassment (within-group d = .44) and boredom (within-group d = .53), compared to students who completed the intervention (within group d's = .25 and .05, respectively). Figures 4 and 5 show the average trajectories of participants' embarrassment and boredom by intervention group across time.

Effort regulation. There was no significant change in effort regulation across time for all participants, $t(276) = -.76$, $p = .45$. The time by intervention interaction also was not significant, $t(272) = .25$, $p = .80$, suggesting that there were no differences in average effort regulation trajectories between intervention and no-intervention participants across time. Within-group analyses showed that students in both the intervention (within-group d = -.05) and no-intervention conditions (within-group d = -.06) showed very small declines in effort regulation from week 4 to week 12.

Perceived stress. On average, perceived stress decreased over time for all participants, $t(289) = -2.79$, $p < .05$. There was a significant time by intervention interaction in perceived stress; however, it was in the opposite direction from proposed hypotheses, $t(284) = 2.53$, $p < .01$. Specifically, students who received the intervention reported larger increases in perceived stress (within-group d = .35) across time, compared to students who did not complete the intervention (within-group d = .06)[1]. Figure 6 shows the average stress trajectories of participants by intervention group across time.

Academic performance. Results of bivariate correlation analyses indicated no relationships between academic performance and brief measures of perceived task value (r = .07, p = .71), positive emotion (r = .07, p = .64), negative emotion (r = -.09, p = .57),

1 Within-group d's were calculated using first and last time points only; therefore change appears positive despite longitudinal results modelling a negative slope.

or perceived stress (r = -.07, p = .61). Small to moderate positive relationships were found between academic performance and perceived control (r = .24, p = .09) and effort regulation (r = .29, p = .10).

Discussion

The aim of the current study was to investigate the effects of a brief, web-based intervention on online psychology students' perceived control, task value, academic emotions, effort regulation, and perceived stress. Because we investigated the intervention in a real-time academic environment (e.g., as students were engaging in online course assignments), external validity was a notable strength of this study. This study was also the first to examine brief intervention effects on online student outcomes using frequent, longitudinal assessment methods, lending depth of understanding to educational experiences in online environments. Results showed the intervention to have salutary effects on some, but not all, of these variables, and that the effects were largely preventative. In the following discussion, we will describe these results in the context of previous research findings. We will also discuss limitations and implications of the current study, particularly as they relate to future research and/or counseling and teaching practice. Finally, we will suggest future avenues for research that build upon the current results.

Intervention Effects on Dependent Variables

The current results supported our hypotheses of intervention effects on task value. Specifically, the intervention showed salutary effects on the extent to which students perceived course material as useful across 12 weeks, with within-intervention group effect sizes in the small to moderate range. These effects appear to be preventative, such

that even though the average student's perceptions of task value declined across time, this change was smaller in magnitude, and happened much more gradually, for students who received the intervention. Though previous research has shown brief values interventions to have little effect on the perceived value of course material, the same interventions have been shown to increase student interest, motivation, and engagement, constructs that have shown moderate, positive relationships to task value (Hulleman et al., 2009; Sansone et al., 2011). Thus, it is possible that the effects of the current intervention on task value reflect changes in interest or motivation, in addition to perceived usefulness.

Results did not support our hypothesis of salutary intervention effects on perceived control. This is surprising, given the moderate to large increases in perceived control that have been shown in previous evaluations of the *Control Your Stress* intervention that informed the current study (e.g., Hintz et al., 2015). However, these previous studies have assessed control using a measure of present control over more global stressful events (Perceived Control Over Stressful Events Scale; Frazier et al., 2011). Similarly, previous versions of *Control Your Stress* have targeted stressors in and beyond the academic realm, such as interpersonal or financial stressors. Given the aim of the current study to address stressors specific to academic work, our intervention and measures were tailored to perceived academic control (Perry et al., 2001). Consequently, we may not have captured more global changes in control outside the academic domain, as was the case in previous studies. Additionally, students in the current study completed both the intervention and measures of perceived control while situated in real-time academic environments. As a result, they may have been experiencing acute stress or perceived demands that outweighed the immediate benefits of a brief intervention.

With regard to academic emotions, the current results showed mixed support for our hypotheses. Specifically, results showed salutary intervention effects on negative emotions, such that students who received the intervention showed only small increases in negative emotion (within group d = .20) compared to moderate increases (d = .64) for students who did not receive the intervention. No such differences were found for positive emotions across the 12 weeks. Consideration of individual positive and negative emotions may explain these contrasting results, in that the intervention did show effects on students' boredom and enjoyment. These two emotions have shown the strongest and most consistent relationships to the perceived value of course work in previous studies of academic emotion (Pekrun et al., 2010; Pekrun et al., 2011). Given the current finding of intervention effects on students' perceived value, it follows that such salutary effects might extend to boredom and enjoyment, but not other academic emotions.

Results did not support our hypothesis of intervention effects on effort regulation. One possible explanation is that, unlike other dependent variables in this study, average effort regulation did not change significantly (average d = -.05 for all students) over the course of the 12 weeks. There also were no differences in slopes of effort regulation scores between students in the two intervention classes. Thus, there may not have been sufficient change in trajectories over time for intervention condition to be a significant predictor. Alternatively, group differences in initial levels of effort regulation might explain this, given that students in the statistics course reported significantly lower initial levels of effort regulation compared to other students who received the intervention, potentially negating effects. Finally, though previous studies have shown a positive relationship between effort regulation and student success (e.g. Boyraz et al., 2015), no

researchers have explicitly examined brief intervention impacts on effort regulation. Thus, it is possible that our intervention content did not adequately target this for students.

Our hypothesis of intervention effects on perceived stress levels was not supported. In fact, results showed that students who received the intervention increased significantly more sharply in stress levels across the study period compared to students in the control group. This finding was surprising, given several previous studies that have linked *Control Your Stress* to reduced stress levels across time (e.g., Hintz et al., 2015), or have suggested a preventative function of the intervention on stress (Frazier et al., 2013). At the same time, prior studies have suggested that increasing the perceived value of a given task may increase negative and/or distressing emotions related to task completion (Fisher et al., 2013). It is possible, then, that completing *Control Your Stress* increased students' distress related to academic responsibilities, by way of increased perceptions in task value.

Finally, students' academic performance was largely uncorrelated with students' scores on outcome variables immediately following the intervention. The two exceptions were scores on perceived control and effort regulation, which showed small to moderate positive relationships with academic performance. These results are consistent with previous research showing both control and effort regulation to have small, positive relationships with academic performance, as measured by student GPA (e.g., Abraham, Richardson, & Bond, 2010). Unfortunately, the intervention did not have salutary effects on either perceived control or effort regulation.

Limitations

The quasi-experimental design of the current study allowed for real-time assessment of students' classroom experiences and lent external validity to results. However, such a design also limited internal validity, in that it did not meet the standards of randomization and control (e.g. RCTs) typical of more rigorous intervention studies. For example, it is possible that students who enrolled in the Stress and Trauma course had qualitatively different experiences with stress and coping concepts than students who enrolled in the Learning and Behavior course, contributing to between-group differences in outcomes. For example, students may have self-selectively enrolled in Stress and Trauma due to previous personal experiences with stressful or traumatic events not shared by students in other classes. Similarly, the course content of Stress and Trauma may have activated personal reactions that impacted students' academic emotions and stress levels. The fact that the Stress and Trauma course also contained a weekly, in-person course meeting (i.e., the "flipped" nature of the online course) also may have contributed to differences in course experiences across classes. Though we attempted to control for these factors by demonstrating equivalency between the three classes on known variables pre and post-intervention, we could not anticipate or measure all possible latent variable effects. Thus, randomizing students to intervention conditions within courses would have resulted in a more controlled, internally valid design.

Similarly, the current sample size precluded statistical analyses of potential teacher and/or classroom effects on dependent variables. In other words, the inability to control for differences in outcome that were the result of classroom-specific variables or experiences was a notable limitation of the current study. Such analyses would be possible by adding classroom to the current multi-level models as a level-three variable.

However, the current study did not have enough participants and classrooms to meet the suggested sample sizes for such analyses, limiting our ability to control for these effects. In addition to small sample size, unequal cell sizes also limited study power and increased the possibility of statistical error, possibly precluding identification of differences between students in the two classes that received the intervention and between the intervention and no-intervention classes.

Demographic homogeneity was also a notable limitation of the current study. Specifically, the undergraduate psychology student pool that comprised our sample was largely female and White, and researcher error did not allow for detailed demographic information to be collected. Thus, our results may not adequately capture the academic and emotional experiences of non-majority students at the university, let alone at institutions that serve a broader variety of students and/or represent diverse educational contexts. Future research of this kind ought to reach beyond undergraduate psychology student samples in an effort to hear from students who more accurately represent the diversity in American higher education.

The adapted nature of the current intervention also was a limitation of this study. Specifically, using only one module (of four) from the original version of *Control Your Stress* did not ensure that potentially effective components of the original version were implemented. Similarly, the stress logs and written exercises adapted from the original version were changed slightly to reflect a more specific, academic-related stress (compared to general stressors in the original version). A more ideal adaptation study would have compared the current, adapted version to the original version of *Control Your Stress* to identify salutary effects of the academically-focused version.

Additionally, the current study included two variables that may not have been amenable to intervention change. First, the relatively stable nature of effort regulation across time for all participants suggests that this variable might reflect more stable, trait-level characteristics, compared to more state-dependent variables such as perceived stress. Similarly, participants in the current study had high levels of perceived control at study start. Thus, attempting to measure change in these variables due to the intervention may not have been possible, as ceiling effects may have mitigated any expected change. Previous studies have shown intervention changes in stress and control for students who begin the study with greater distress or lower perceived control (e.g. Hintz, Frazier, & Meredith, 2015).

Finally, there were potential limitations associated with the timeline and design of the intervention and weekly measures. First, asking students to complete course modules and other assignments after viewing intervention content, but before completing weekly measures, may have mitigated immediate benefits of the intervention. Second, the current outcome measures asked students to self-report with respect to their current online course, a more specific reference than the more global academic distress targeted in the intervention. It is possible that more robust intervention effects would have been found had weekly measures aligned with intervention content in scope. Third, not including motivation, a known correlate of self-regulation and achievement emotion outcomes, was a limitation of this study. Finally, using just one item to measure outcome variables may have impacted the reliability of scores on the measures. Though many previous studies have assessed items using frequent, brief (one or two-item) measures, there is growing consensus that assessing variables with at least two items is ideal for such longitudinal

designs (Lane & Shrout, 2011). Thus, our attempt at measure brevity, despite likely contributing to high completion rates, was reflected in lower reliability, and may have negatively impacted the consistency of student responses over time.

Implications for Counseling Practice

Our project builds on a growing body of research linking control and value interventions to student well-being and success (Chase et al., 2013; Hintz et al., 2015). Given that stress and related mental health concerns are increasing in frequency and severity among students (e.g., Hunt & Eisenberg, 2010), there is a demonstrated need for innovative and cost-effective means of targeting stress and well-being. Specifically, our intervention focused on general emotional regulation processes commonly targeted in counseling practice, underscoring its dissemination potential as an adjunct to more traditional forms of mental health treatment. Given that virtually all students experience negative emotions, our intervention has the potential to reach anyone for whom those emotions impact motivation, engagement, and performance, potentially reducing the demand for in-person counseling services on campus. Such benefits would be especially helpful for students in online classes, given demonstrated barriers to motivation and engagement in online academic environments (e.g., Lehman & Conceicao, 2014).

Additionally, the current study was the first to assess students' self-regulation, academic emotions, and well-being at weekly intervals across a semester. Though not the primary outcome of interest, it is worth noting that all students, regardless of intervention, appeared to "get worse" over time, in that they reported increases in negative emotions, and decreases in perceived value, control, and positive emotions, as the semester progressed. Such a finding has implications for the timing and dosage of student success

interventions. For example, instructors may consider prioritizing activities that facilitate interest in and engagement toward the end of the semester, when such student outcomes may be at their lowest. Similarly, counseling and mental health staff might consider extra outreach and/or online interventions at times of the semester that students particularly struggle, such as before final exams. Counseling process and outcome researchers can contribute to these efforts by continuing to investigate the impact of brief, online interventions in academic settings, on a wide variety of outcomes.

Finally, the results of the current study support previous research suggesting that helping students identify and connect with personal values can have salutary effects on academic outcomes. Given the brief nature of these values interventions, instructors might consider instructional strategies that prompt students to connect with values throughout the span of an academic course. For example, instructors could specify learning outcomes that encourage students to connect course material to personal values. Brief, reflective writing assignments (e.g. "Exam Wrappers;" Lovett, 2013) that include values-related prompts might also help students identify strategies for academic success that are in the service of personal values and goals.

Future Directions

The current results suggest a number of future research directions. First, the finding of significant between-person variability in perceived control, task value, academic emotions, effort regulation, and stress offers opportunities to investigate additional predictor variables, over and above intervention participation. Identification of additional variance predictors would allow for more refined models that illuminate relationships between students' self-regulation, academic emotions, and well-being.

Similarly, within-person variability might be investigated as a predictor of these and other outcomes (such as academic performance), such that students who fluctuate more widely across time points might show different tendencies toward self-regulation and success than students who remain more stable across the course of a semester. Such research would be commensurate with more general findings from emotional research, suggesting that emotional variability is a salient predictor of well-being (Houben, Noortgate, & Kuppens, 2015).

Second, using a variety of research methods and designs to examine student experience with brief interventions would be a welcome addition to the literature. For instance, mixed methods investigations of students' written intervention responses might advance understanding of who benefits, in which ways, from brief interventions. Similarly, these content analyses might help researchers identify intervention content that is most salient for students, or lend insight to their stressors or emotions most in need of attention. This information would help in the refinement and design of future classroom interventions.

Finally, researchers ought to continue investigating brief well-being interventions in college classrooms, using additional randomization and control methods common to RCTs in other settings. For instance, randomization of students from the same course into intervention or control groups would control for potential between-classroom effects in the current study. Similarly, comparing *Control Your Stress* to other brief academic or well-being interventions alone, rather than to a no-intervention group, would allow researchers to identify the relative efficacy of different interventions, including the utility of targeting holistic student well-being and success, as in the current study. Given

demonstrated effects of other brief interventions on academic performance (e.g., Cohen et al., 2009), including additional or more frequent indicators of academic performance (e.g., exam scores, performance improvement over time) as outcome variables in these studies would also be a welcome step.

Figures and Tables

Figure 1. Participant Recruitment and Attrition

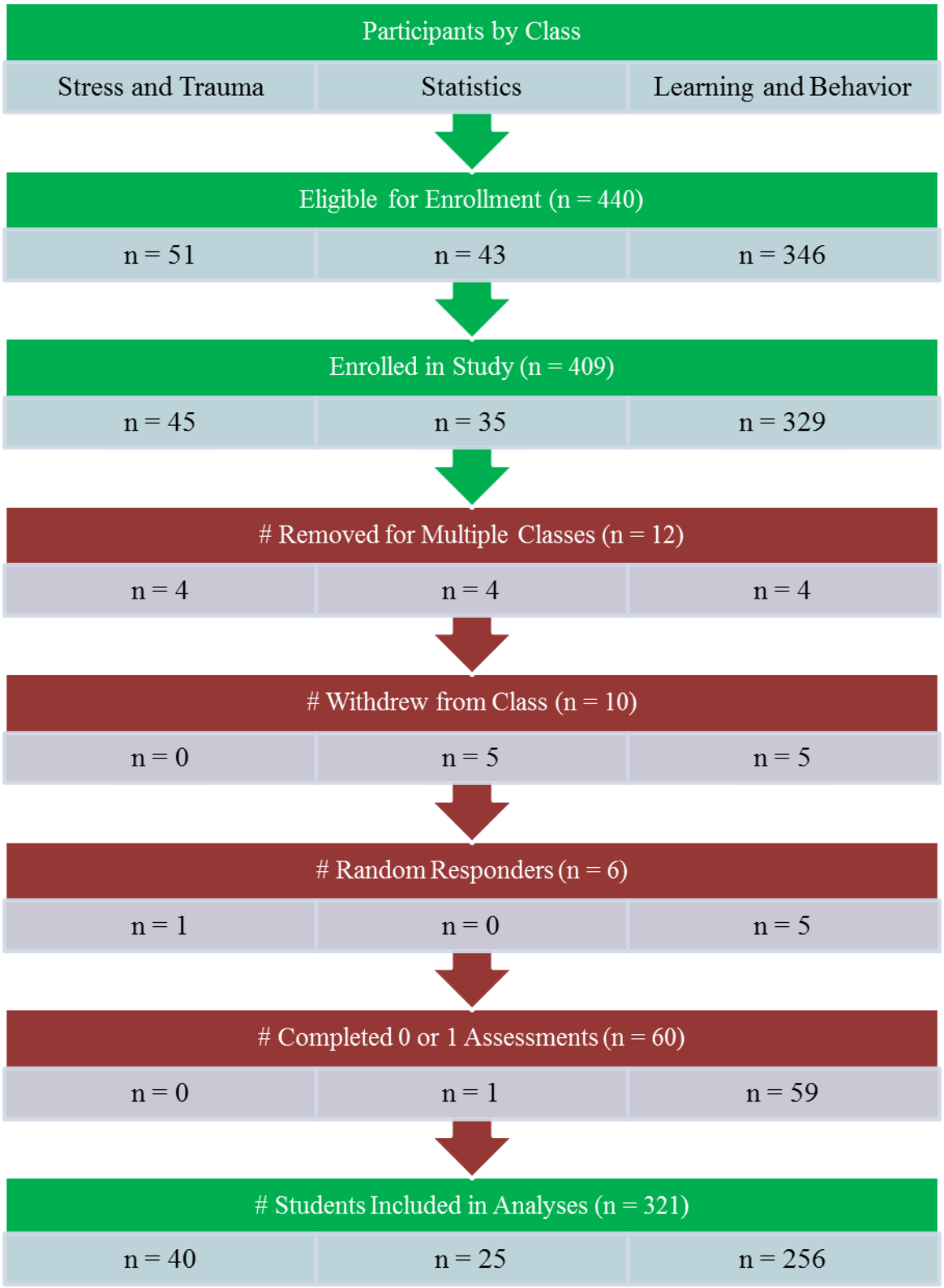


Table 1: Timeline of Intervention and Measures

Intervention Group					
BASELINE		TREATMENT			FOLLOWUP
Weeks 4-7	Week 8	Week 9	Weeks 10-11	Week 12	Weeks 13-15
No intervention	No intervention	Video about present control Introduction to personal values[2] Questions about present control and values	Questions about present control and values[3]	Questions about present control and values[3]	No intervention
Brief Measures[1]	Full Measures	Brief Measures[1]	Brief Measures[1]	Full Measures	Brief Measures
No- Intervention Group					
BASELINE		TREATMENT			FOLLOWUP
Weeks 4-7	Week 8	Week 9	Weeks 10-11	Week 12	Weeks 13-15
No intervention	No intervention	No intervention	No intervention	No intervention	No intervention
Brief Measures[1]	Full Measures	Brief Measures[1]	Brief Measures[1]	Full Measures	Brief Measures

[1]See table 3 for measures and items
[2]See Appendix B for values intervention
[3]See Appendix C for weekly control and values questions

Table 2. Participant Completion Rates by Student and Week

Week	Intervention				No Intervention		Total	
	Stress and Trauma n = 40		Statistics n = 25		Learning and Behavior n = 256		N = 321	
4	n = 35	87.5%	n = 14	56.0%	n = 142	55.5%	n = 191	59.5%
5	n = 37	92.5%	n = 14	56.0%	n = 192	75.0%	n = 243	75.7%
6	n = 35	87.5%	n = 15	60.0%	n = 183	71.5%	n = 233	72.6%
7	n = 37	92.5%	n = 20	80.0%	n = 198	77.3%	n = 255	79.4%
8	n = 36	90.0%	n = 16	64.0%	n = 195	76.2%	n = 247	76.9%
9	n = 36	90.0%	n = 16	64.0%	n = 209	81.6%	n = 261	81.3%
10	n = 31	77.5%	n = 16	64.0%	n = 209	81.6%	n = 256	79.8%
11	n = 37	92.5%	n = 19	76.0%	n = 213	83.2%	n = 269	83.8%
12	n = 35	87.5%	n = 15	60.0%	n = 206	80.5%	n = 256	79.8%
13	n = 23	57.5%	n = 15	60.0%	n = 196	76.6%	n = 234	72.9%
14	n = 38	95.0%	n = 18	72.0%	n = 214	83.6%	n = 270	84.1%
15	n = 27	67.5%	n = 21	84.0%	n = 214	83.6%	n = 262	81.6%
Average	n = 34	84.8%	n = 17	66%	n = 198	77%	n = 248	77%
Number and Percent of Measures Completed, per Student								
	N	%						
Median	9	75%						
Mean	8	67%						
Low	2	17%						
High	11	92%						

Table 3: Measures of Dependent Variables

Perceived Control (Perry, 2001)	Task Value (Pintrich et al., 2001)	Achievement Emotions Pekrun et al. (2011)	Effort Regulation (Pintrich et al., 2001)	Perceived stress (Cohen, 1983)
The more effort I put into my courses, the better I do in them. I have a great deal of control over my performance in my psychology course.[2] No matter what I do, I can't seem to do well in my courses.[1] I see myself as largely responsible for my performance throughout my college career. How well I do in my courses is often the "luck of the draw."[1] There is little I can do about my performance in college.[1,2] When I do poorly in a course, it is usually because I haven't given it my best effort. My grades are basically determined by things that are beyond my control and there is little I can do to change that.*	I think I will be able to use what I learn in this course in other courses. It is important for me to learn the course material in this class.[2] I am very interested in the content area of this course. I think the course material in this class is useful for me to learn. I like the subject matter of this course. Understanding the subject matter of this course is very important to me	I enjoy being in this class.[2] I feel confident when I go to class.[2] I am proud of myself in this class.[2] I am angry when I am in this class.[2] Thinking about class makes me feel uneasy.[2] I get embarrassed in this class.[2] I feel hopeless in this class.[2] I get bored in this class.[2]	I often feel so lazy or bored when I study for this class that I quite before I finish what I planned to do.[1] I work hard to do well in this class even if I don't like what we are doing. When course work is difficult, I either give up or only study the easy parts.[1] Even when course materials are dull and uninteresting, I manage to keep working until I finish.	In the last week, how often have you been upset because of something that happened unexpectedly? In the last week, how often have you felt that you were unable to control the important things in your life? In the last week, how often have you felt nervous and stressed?[2] In the last week, how often have you felt confident about your ability to handle your personal problems? In the last week, how often have you felt that things were going your way? In the last week, how often have you found that you could not cope with all the things that you had to do?[2] In the last week, how often have you been able to control irritations in your life? In the last week, how often have you felt that you were on top of things? In the last week, how often have you been angered because of things that were outside of your control? In the last month, how often have you felt difficulties were piling up so high that you could not overcome?

[1]Reverse scored-items [2]Items used in the brief, weekly measures

Table 4. Descriptive Statistics by Intervention and Week

Control

Week		4	5	6	7	8	9	10	11	12	13	14	15
	Mean	4.41	4.36	4.37	4.39	4.33	4.37	4.39	4.31	4.25	4.28	4.29	4.29
	N	142	192	183	198	195	209	209	213	206	196	214	214
No intervention	SD	0.77	0.72	0.78	0.75	0.79	0.77	0.80	0.89	0.85	0.87	0.96	0.92
	Mean	4.51	4.44	4.36	4.40	4.42	4.39	4.53	4.34	4.24	4.28	4.33	4.28
	N	49	51	50	57	52	52	47	56	50	38	56	48
Intervention	SD	0.63	0.66	0.80	0.78	0.75	0.76	0.69	0.85	0.76	0.98	0.83	0.88
	Mean	4.44	4.37	4.37	4.39	4.35	4.37	4.42	4.32	4.25	4.28	4.30	4.29
	N	191	243	233	255	247	261	256	269	256	234	270	262
Total	SD	0.74	0.70	0.78	0.76	0.78	0.76	0.78	0.88	0.84	0.89	0.93	0.91

Task Value

Week		4	5	6	7	8	9	10	11	12	13	14	15
	Mean	5.65	5.51	5.38	5.21	5.22	5.15	5.12	5.38	4.92	4.98	4.97	4.91
	N	142	192	183	198	195	209	209	213	206	196	214	214
No intervention	SD	1.15	1.21	1.28	1.30	1.35	1.31	1.32	1.37	1.41	1.41	1.44	1.44
	Mean	5.55	5.45	5.32	4.95	5.17	5.08	5.34	5.09	4.96	5.32	5.18	5.31
	N	49	51	50	57	52	52	47	56	50	38	56	48
Intervention	SD	1.58	1.47	1.43	1.57	1.67	1.57	1.63	1.69	1.68	1.68	1.77	1.61
	Mean	5.63	5.50	5.37	5.15	5.21	5.13	5.16	5.32	4.93	5.03	5.01	4.98
	N	191	243	233	255	247	261	256	269	256	234	270	262
Total	SD	1.27	1.26	1.31	1.37	1.42	1.36	1.38	1.44	1.46	1.46	1.51	1.48

Positive Emotion

Week		4	5	6	7	8	9	10	11	12	13	14	15
	Mean	3.60	3.52	3.39	3.27	3.29	3.22	3.28	3.13	[1]	3.20	3.12	3.07
	N	142	192	183	198	196	209	209	213	[1]	196	214	214
No intervention	SD	0.77	0.73	0.85	0.85	0.84	0.88	0.83	0.87	[1]	0.86	0.95	0.95
	Mean	3.65	3.65	3.53	3.47	3.51	3.38	3.38	3.33	3.39	3.48	3.33	3.35
	N	49	51	50	57	52	52	47	56	50	38	56	48
Intervention	SD	0.90	0.87	0.90	0.99	1.02	1.05	1.08	1.05	1.11	1.23	1.17	1.09
	Mean	3.61	3.54	3.42	3.31	3.34	3.26	3.30	3.17	3.39	3.24	3.17	3.12
	N	191	243	233	255	248	261	256	269	50	234	270	262
Total	SD	0.80	0.76	0.86	0.88	0.89	0.92	0.88	0.91	1.11	0.93	1.00	0.98

Negative Emotion

Week		4	5	6	7	8	9	10	11	12	13	14	15
	Mean	2.10	2.15	2.35	2.35	2.43	2.42	2.43	2.46	[1]	2.45	2.52	2.56
	N	142	192	183	198	196	209	209	213	[1]	196	214	214
No intervention	SD	0.72	0.72	0.82	0.81	0.85	0.79	0.81	0.82	[1]	0.85	0.90	0.88
	Mean	2.11	2.08	2.14	2.18	2.18	2.18	2.14	2.28	2.22	2.25	2.31	2.30
	N	49	51	50	57	52	52	47	56	50	38	56	48
Intervention	SD	0.89	0.90	0.87	0.93	0.98	0.98	0.99	0.97	1.01	1.00	1.04	1.02
	Mean	2.10	2.13	2.30	2.31	2.38	2.37	2.38	2.42	2.22	2.42	2.47	2.51
	N	191	243	233	255	248	261	256	269	50	234	270	262
Total	SD	0.77	0.76	0.83	0.84	0.88	0.84	0.85	0.86	1.01	0.88	0.93	0.91

Effort Regulation

Week		4	5	6	7	8	9	10	11	12	13	14	15
	Mean	5.09	5.05	4.99	5.04	5.12	5.06	5.15	5.23	4.95	4.97	5.02	5.01
	N	142	192	183	198	195	209	209	213	206	196	214	214
No intervention	SD	1.34	1.28	1.40	1.33	1.36	1.37	1.29	1.29	1.37	1.43	1.39	1.33
	Mean	5.51	5.71	5.62	5.54	5.29	5.79	5.55	5.50	5.32	5.63	5.77	5.44
	N	49	51	50	57	52	52	47	56	50	38	56	48
Intervention	SD	1.28	1.33	1.21	1.40	1.46	1.27	1.41	1.53	1.39	1.36	1.61	1.62
	Mean	5.20	5.19	5.13	5.15	5.16	5.21	5.22	5.29	5.02	5.08	5.18	5.09
	N	191	243	233	255	247	261	256	269	256	234	270	262
Total	SD	1.33	1.32	1.38	1.36	1.38	1.38	1.32	1.35	1.38	1.44	1.47	1.40

Stress

Week		4	5	6	7	8	9	10	11	12	13	14	15
	Mean	3.27	3.25	3.23	3.25	3.24	3.26	3.09	3.13	3.17	3.04	3.04	3.32
	N	142	192	183	198	196	209	209	213	206	197	214	214
No intervention	SD	0.82	0.89	0.95	0.92	0.93	0.95	0.99	0.96	0.98	1.02	1.02	1.01
	Mean	3.16	3.13	3.16	3.29	3.44	3.30	3.19	3.38	3.43	3.14	3.12	3.47
	N	49	51	50	57	52	52	47	56	50	38	56	48
Intervention	SD	0.86	0.82	0.99	0.97	0.95	0.92	0.91	0.91	0.96	1.03	1.01	1.07
	Mean	3.24	3.22	3.21	3.26	3.28	3.26	3.11	3.18	3.22	3.06	3.06	3.35
	N	191	243	233	255	248	261	256	269	256	235	270	262
Total	SD	0.83	0.88	0.95	0.93	0.94	0.94	0.98	0.95	0.98	1.02	1.01	1.02

[1] Due to researcher error, positive and negative emotions were not included in the week 12 survey for the no-intervention class

Table 5. Results of Multilevel Modeling Analyses

	Control	Value	Pos Emotion	Enjoyment	Neg Emotion	Boredom	Embarrassment	Effort Reg	Stress
Initial Status									
Intercept	**4.371***	**5.476***	**3.462***	**3.459***	**2.224***	**2.843***	**1.516***	**4.990***	**3.309***
Intercept SE	0.042	0.074	0.048	0.054	0.046	0.063	0.047	0.075	0.050
Intervention	0.088	-0.106	0.168	0.070	-0.081	-0.225	0.192	**0.509***	-0.106
SE	0.093	0.161	0.104	0.117	0.100	0.138	0.102	0.163	0.109
Slope									
Time	**-0.011***	**-0.056***	**-0.038***	**-0.052***	**0.034***	**0.045***	**0.033***	-0.005	**-0.015***
SE	0.004	0.074	0.005	0.006	0.005	0.006	0.006	0.008	0.005
Intervention	-0.005	**0.035***	0.007	**0.029***	-0.019	**-0.033***	**-0.026***	0.004	**0.029***
SE	0.009	.017	0.012	0.013	0.010	0.012	0.012	0.017	0.011
Variance									
Within-Person	0.174	0.579	0.184	0.306	0.159	0.376	0.292	0.763	0.352
SE	0.005	0.017	0.006	0.009	0.005	0.011	0.009	0.022	0.010
In initial status	0.368	1.073	0.469	0.567	0.443	0.809	0.406	1.024	0.466
SE	0.039	0.107	0.044	0.056	0.041	0.078	0.042	0.111	0.050
In rate of change	0.002	0.009	0.005	0.005	0.004	0.004	0.005	0.006	0.003
SE	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Covariance	0.003	-0.011	-0.008	-0.003	-0.005	-0.011	0.001	-0.014	-0.003
SE	0.002	0.009	0.004	0.005	0.003	0.005	0.004	0.008	0.004
Fit Statistics									
Deviance	4485	8039	4562	5806	4167	6304	5595	8649	6373
AIC	4501	8055	4578	5822	4183	6320	5611	8665	6389
BIC	5745	6055	5134	5492	5046	5573	5863	6815	6685

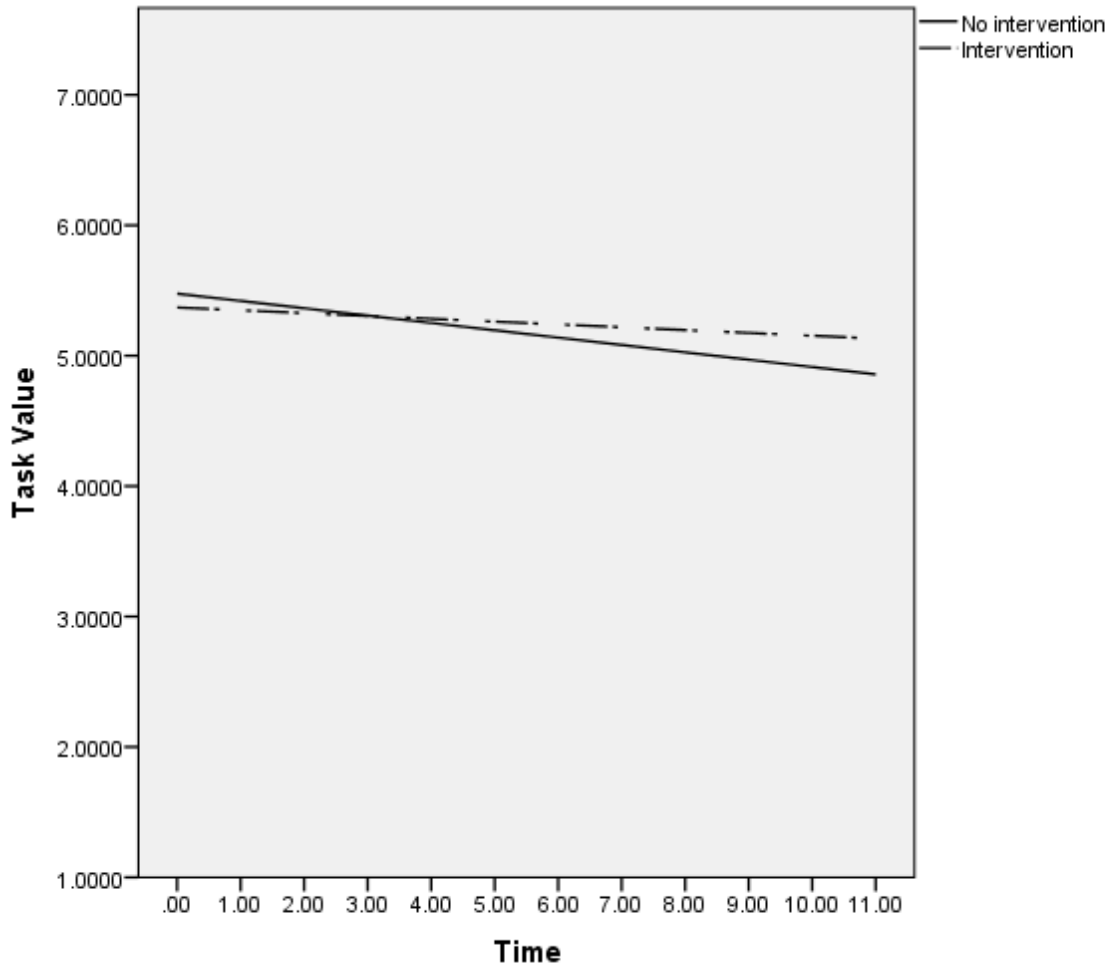
Table 6. Bivariate Correlations at Pretest (Week Eight)

Correlations

		1	2	3	4	5	6	7	8	9
1	Task Value									
2	State Hope	.37**								
3	Perceived Stress	.16**	.36**							
4	Self-Efficacy	.49**	.40**	.33**						
5	Life Orientation	.31**	.51**	.40**	.31**					
6	Effort Regulation	.33**	.40**	.20**	.36**	.30**				
7	Positive Emotion	.58**	.30**	.17**	.52**	.42**	.34**			
8	Negative Emotion	.45**	.21**	.24**	.53**	.32**	.37**	.70**		
9	Academic Self-Discipline	.13**	.44**	.21**	.23**	.29**	.47**	.17**	.10**	
10	Academic Control	.23**	.37**	.32**	.46**	.27**	.30**	.18**	.33**	.09**

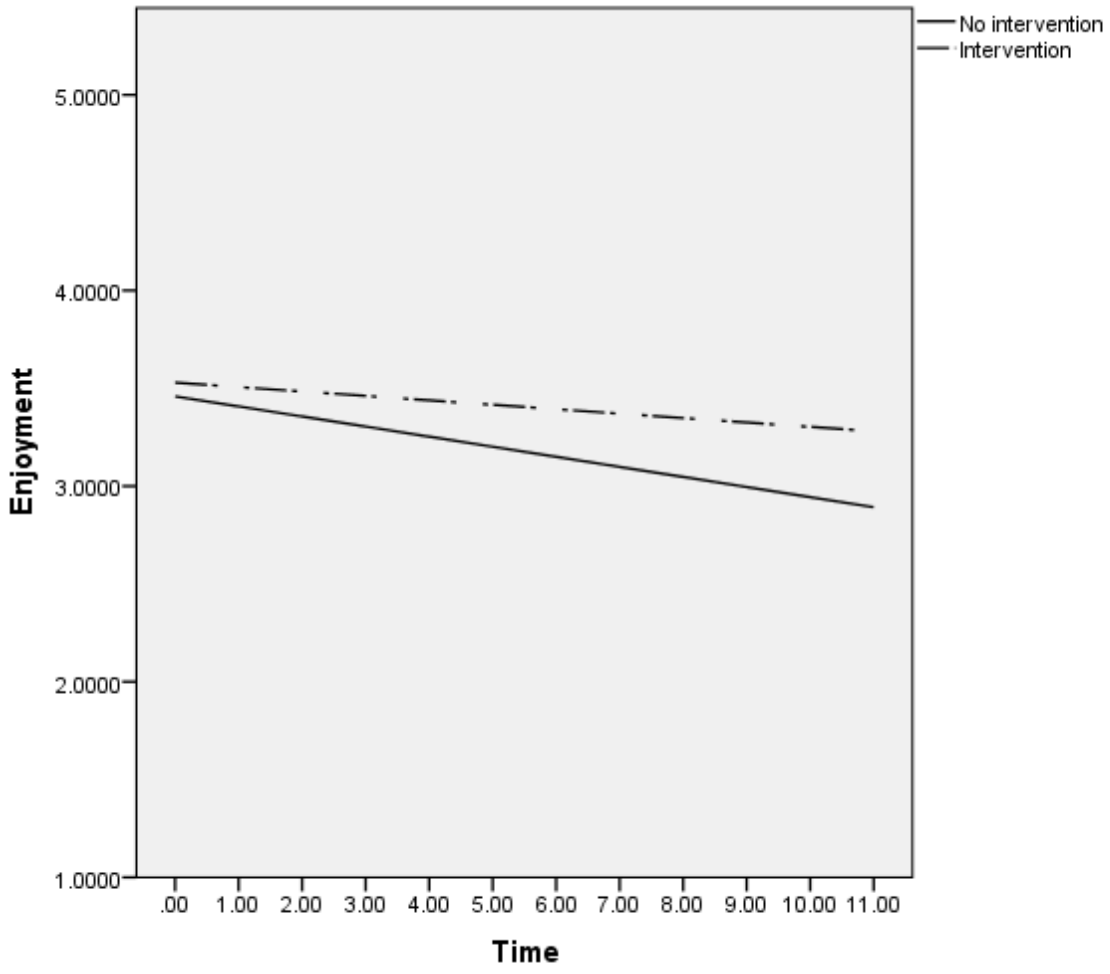
Note. $N = 202$. ** $p < .001$ (2-tailed).

Figure 2. Task Value by Intervention Over Twelve Weeks



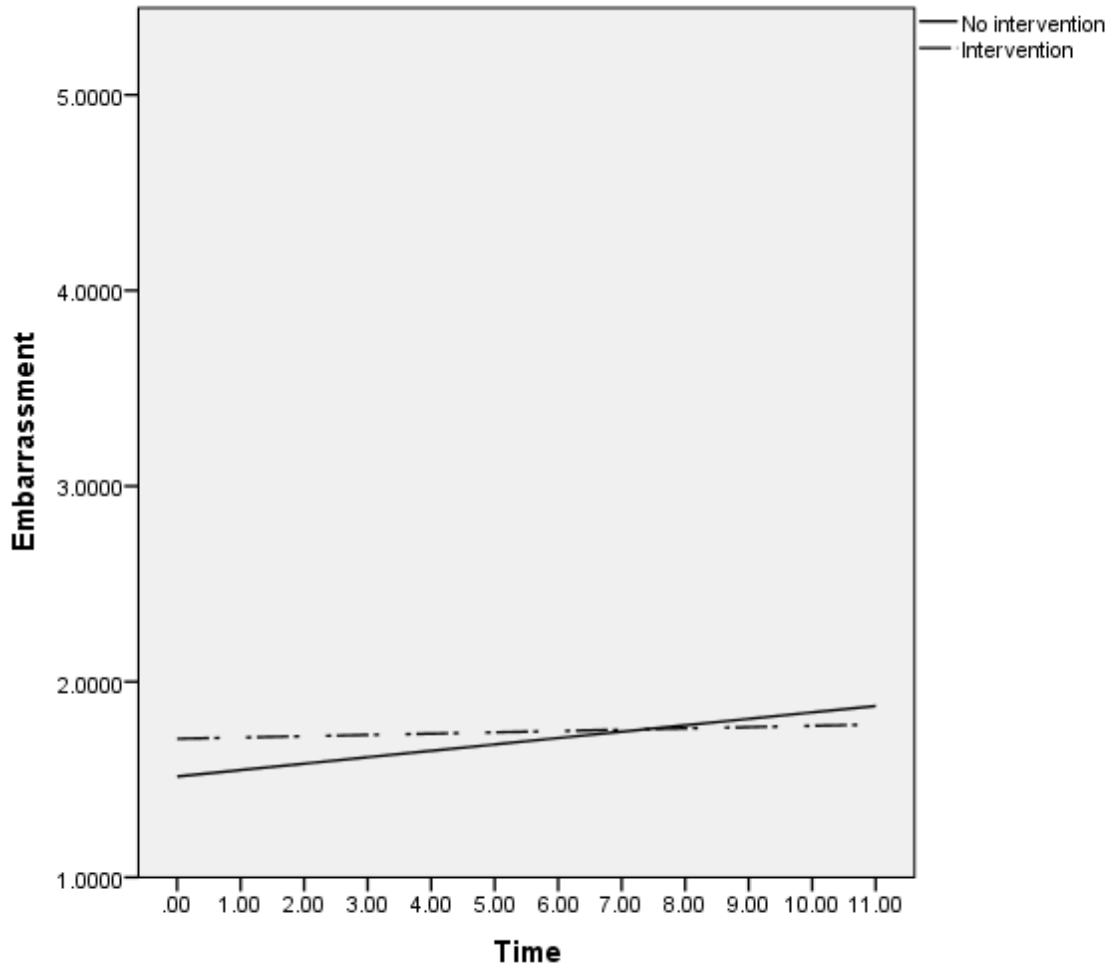
Note. Time 0 = Week 4, Time 1 = Week 5, etc.

Figure 3: Enjoyment by Intervention Over Time



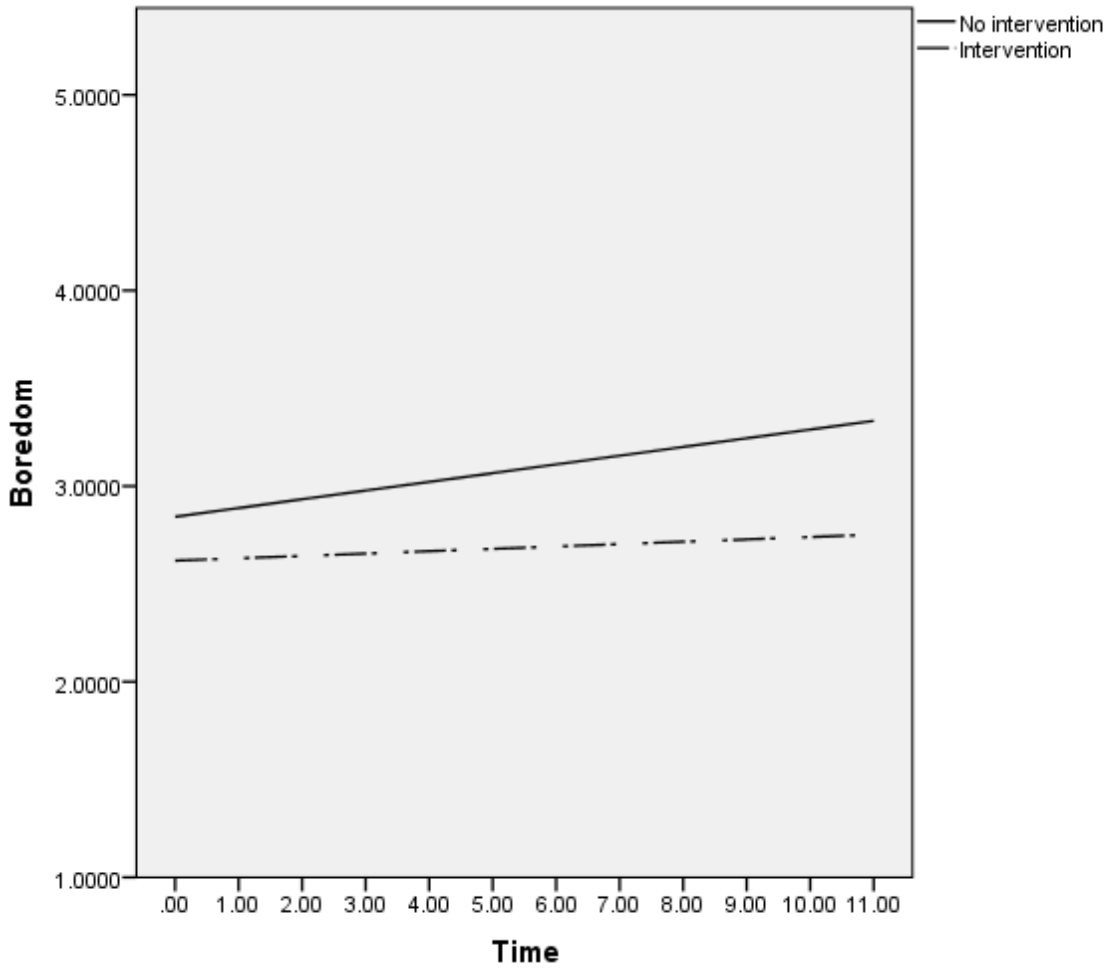
Note. Time 0 = Week 4, Time 1 = Week 5, etc.

Figure 4: Embarrassment by Intervention Over Time



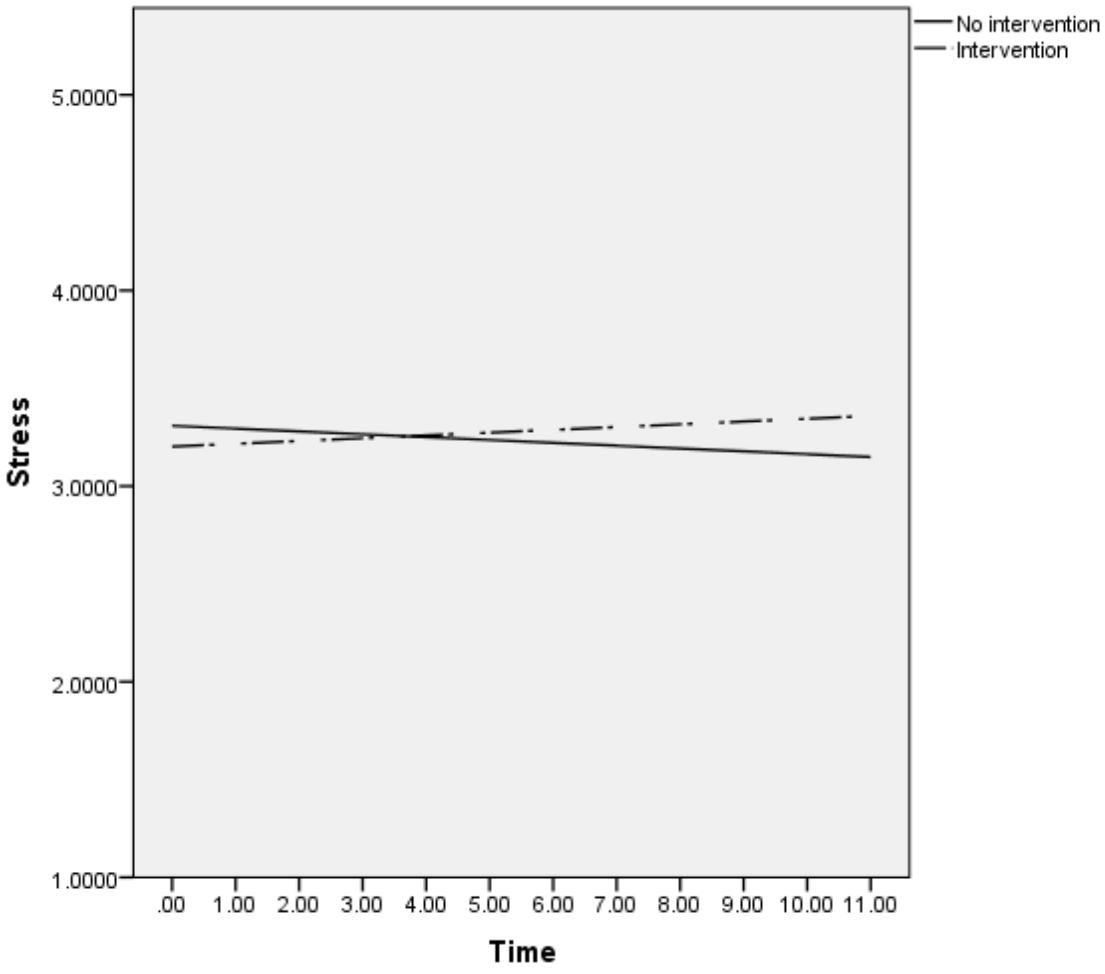
Note. Time 0 = Week 4, Time 1 = Week 5, etc.

Figure 5: Boredom by Intervention Over Time



Note. Time 0 = Week 4, Time 1 = Week 5, etc.

Figure 6: Stress by Intervention Over Twelve Weeks



Note. Time 0 = Week 4, Time 1 = Week 5, etc

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Appendix A: Literature Review on Achievement Emotions

Achievement Emotions are Related to Students' Academic Success

Achievement emotions are those emotions students experience in the process of completing an achievement-related activity (e.g., studying for an exam) or experiencing an achievement outcome (e.g., receiving an exam score; Pekrun, 2006). Similar to more general models of emotion, achievement emotions are dynamic, multidimensional constructs that have cognitive, affective, physiological, expressive, and motivational components. For example, nervous thoughts (e.g., "I'm going to fail this test") and feelings (e.g., feeling scared) characterize the common achievement emotion of anxiety, as do facial expressions (e.g., clenched teeth), body changes (e.g., rapid heartbeat) and motivational urges (e.g., desire to avoid studying) (Linehan, 1993; Scherer, 2005).

Researchers classify achievement emotions by valence, or the extent to which they are subjectively positive or negative (Lewis, Haviland-Jones, & Barrett, 2011), as well as activation level (i.e., whether the emotion prompts motivation toward or away from the emotional stimulus). For example, positive emotions, such as joy, are typically pleasant to feel and think about. Negative emotions, such as sadness, are typically unpleasant to experience (Frederickson & Branigan, 2005; Watson, Wiese, Vaidya, & Tellegen, 1999). Enjoyment, joy, and frustration are activating, in the sense that they prompt motivation to act in ways that either maintain or resolve the emotion. In contrast, deactivating emotions, such as relief and shame, prompt motivation to avoid or withdraw from the emotional stimulus. Some emotions can be either activating or deactivating depending on the context (Pekrun et al., 2006). For example, frustration has generally been considered a deactivating emotion, but some studies have linked it with increased

self-regulation, perhaps due to a desire to mitigate the unpleasant consequences of feeling frustrated (Artino, 2009; Artino & Jones, 2012; Marchand & Gutierrez, 2012).

The Control-Value theory of achievement emotions. The Control-Value Theory provides a comprehensive framework for understanding achievement emotions and learning outcomes (Pekrun et al., 2006). A primary assumption of the theory is that achievement emotions have direct effects on motivation and self-regulation, which in turn affect learning and achievement outcomes. For example, positive and/or activating emotions are thought to boost motivation and prompt adaptive self-regulatory behaviors and flexible, deep cognitive processing (e.g., elaboration strategies in which students make connections between different information sources). Negative and/or deactivating emotions are theorized to result in disengagement and more rigid and superficial self-regulatory behaviors and learning strategies (e.g., rehearsal strategies in which students recite material over and over). Preliminary research has supported these assumptions; in particular, researchers have shown that positive emotion generally facilitates successful student outcomes, whereas negative emotion appears to impede learning and performance. I review this research in the next section.

Positive emotion facilitates student success. Congruent with the assumptions of the Control-Value theory, positive achievement emotions appear to facilitate successful student outcomes. For example, undergraduates' reports of hope and pride, measured one day before an exam, showed moderate, positive relationships with exam performance (Pekrun, Elliot, & Maier, 2009). Researchers have also linked positive achievement emotions with student satisfaction and engagement, two known predictors of motivation, performance, and retention (Pascarella & Terenzini, 2005; Pekrun & Linnebrink-Garcia,

2012). Similarly, a longitudinal study of high school math students linked student reports of pride with higher levels of engagement and effort to complete mathematics homework one year later (Dettmers et al., 2011).

With respect to positive emotion in online environments, research has generally replicated findings from face-to-face settings. That is, online learners tend to report levels of positive emotion equal to those of face-to-face learners, and these positive emotions are similarly related to learning outcomes (Daniels & Stupinsky, 2012). For instance, students' self-reported experiences of enjoyment were moderately, positively correlated with students' learning intensity (as measured by clicks on the course website) and final exam performance in a recent study (Tempelaar, Niculescu, Rienties, Gijselaers, & Giesbers, 2012). Students' self-reported enjoyment and hope during online learning experiences have also been linked with higher levels of adaptive self-regulatory behaviors (e.g., elaboration strategies to link material from different sources), with average correlations in the moderate to large range (Artino & Jones, 2012; Marchand & Gutierrez, 2012).

The research linking positive achievement emotions with student success is congruent with more general research on positive emotion and performance. For instance, laboratory participants for whom positive emotional states have been induced tend to show greater cognitive and behavioral flexibility on difficult tasks (Frederickson & Branigan, 2005; Rowe, Hirsh, & Anderson, 2007). Similarly, induced positive emotion has been linked to greater creativity and open-mindedness when solving problems (Davis, 2009). In naturalistic settings, students who reported more global positive emotion tended to receive higher performance evaluations from teachers (Abe, 2011), as well as greater

self-reported satisfaction on final course evaluations (Bolin, Khramtsova, & Saarnio, 2005).

Negative emotions hinder learning and performance. Just as positive emotions seem to facilitate improved student learning outcomes, negative emotions appear to impair many aspects of learning and performance. For instance, a recent study showed that greater amounts of negative, deactivating emotions predicted decreased ability to remember complex concepts that required the integration of multiple stimuli (Kuhbander & Pekrun, 2013). Results from classroom settings support these findings, such that the negative achievement emotions of boredom, anger, hopelessness, anxiety, and shame have shown a negative relation to students' exam performance in a number of studies (Ahmed, van der Werf, Kuyper, & Minnaert, 2013; Dettmers et al., 2011; Pekrun et al., 2009). Students who reported greater amounts of negative achievement emotion have also reported lower enjoyment of studying, lower motivation, and reduced effort to complete academic responsibilities (Ahmed et al., 2013; Dettmers et al., 2011; Pekrun, Goetz, Daniels, Stupinsky, & Perry, 2010).

Research in online settings is generally congruent with findings from face-to-face environments, such that students in both types of settings report similar levels of negative emotion (Daniels & Stupinksy, 2012), and these negative emotions are related to indicators of course performance (Tempelaar et al., 2012) and self-regulatory behaviors (Artino & Jones, 2012). However, one study found that self-reported frustration negatively impacted self-regulatory behaviors in face-to-face students but not in online students (Marchand & Gutierrez, 2012). One possible explanation is that frustration was a more activating emotion for the online students, who had fewer options for external

self-regulation and therefore had more internal motivation to regulate and/or resolve the emotion. To explore this possibility, there is a need for continued research on emotions and self-regulation in online settings, as previously noted.

In summary, the research on achievement emotions and student learning outcomes generally supports the tenets of the Control-Value theory, such that positive and activating emotions appear to facilitate increased motivation, self-regulatory behaviors, and learning and performance outcomes. Conversely, negative emotions are generally detrimental, though in some cases the activating nature of these emotions promotes motivation to reduce emotional distress through adaptive coping strategies. Taken together, these results underscore the importance of fostering positive, activating emotions in students' learning environments. Within the framework of achievement emotions, research suggests that targeting students' appraisals, or thoughts, about their learning and achievement, is a promising area of intervention for changing achievement-related emotions. I review the research on appraisals and achievement emotions in the next section.

Appendix B: Sample Values Intervention Content

Personal values can be defined as areas of your life that have meaning for you. They are unique to you, although you may have learned some about your values from other people. Values can direct your behavior over long periods of time - say throughout college and even beyond it.

Values are not the same as goals. Values are directions we keep moving in, whereas goals are what we want to achieve along the way – things that can be "crossed off." For example, if you want to be a dedicated, hardworking student, that is a value – an ongoing process. In contrast, if you want to get an "A" in this class, that's a goal - it can be 'crossed off' or achieved.

The following are examples of values common to college students. Choose one or more that are important to you.

Remember that not everyone has the same values, and this is not a test to see whether you have the "correct" values.

- ☐ Being a high achiever
- ☐ Learning new things
- ☐ Making my friends and family proud
- ☐ Meeting expectations of those around me
- ☐ Opening doors for a future career
- ☐ Persisting in difficult situations
- ☐ Mastering a subject
- ☐ Helping others
- ☐ Other: _____

Which of the values you have chosen are most important to you?

Now, think about this class. How might succeeding in this course be relevant to the values have chosen?

If you are having trouble, you also might think about how general success in college fits with your chosen values.

Appendix C: Weekly Control and Values Questions

Thinking about your academic responsibilities in the week ahead, please answer the questions below.

What about your academic work (either in this class or other classes) is stressful for you?

List the aspects of your stressors that you cannot control.

List the aspects of your stressors you can control and the actions you can take.

Remember that "letting go" of uncontrollable stressors is also an option. Here is an exercise to help you practice.

Take a look at the actions you can take. How does taking these actions reflect the personal values that you identified earlier in the course?

Appendix D: Results of Pre-Post Analyses (ANCOVAs and Within-Group T-Tests)

ANCOVA BY INTERVENTION (Controlling for Week 8 Values)

	Week 12 Intervention Mean N = 50**	**SD**	**Week 12 No Intervention Mean** N = 206**	**SD**	**F**	*p* value	**between-group cohen's *d***
Academic Control	4.30	0.72	4.27	0.83	0.01	0.94	0.00
Task Value	4.95	1.69	4.97	1.41	0.03	0.86	0.03
Positive Emotion*	3.37	1.29	3.23	0.87	0.31	0.58	-0.15
Negative Emotion*	2.16	0.99	2.45	0.86	0.71	0.40	-0.02
Effort Regulation	5.33	1.44	4.98	1.37	1.77	0.19	0.15
Perceived Stress	3.48	0.99	3.15	0.98	2.72	0.10	0.16

WITHIN-GROUP T-tests: Week 8 to Week 12

Intervention

	Week 8 Mean N = 52**	**SD**	**Week 12 Mean** N = 50**	**SD**	**t**	*p* value	**within-group** *d*
Academic Control	4.37	0.79	4.30	0.72	0.80	0.43	-0.09
Task Value	5.16	1.72	4.95	1.69	1.60	0.12	-0.12
Positive Emotion*	3.57	1.14	3.37	1.29	1.67	0.11	-0.18
Negative Emotion*	2.19	1.02	2.16	0.99	0.41	0.69	-0.03
Effort Regulation	5.30	1.52	5.33	1.44	-0.12	0.91	0.02
Perceived Stress	3.41	1.00	3.48	0.99	-0.47	0.64	0.07

No Intervention

	Week 8 Mean N = 195**	**SD**	**Week 12 Mean** N = 206**	**SD**	**t**	*p* value	**within-group** *d*
Academic Control	4.34	0.77	4.27	0.83	1.29	0.20	-0.09
Task Value	5.22	1.36	4.97	1.41	2.99	0.00	-0.19
Positive Emotion*	3.29	0.84	3.23	0.87	1.10	0.28	-0.07
Negative Emotion*	2.46	0.86	2.45	0.86	0.19	0.85	-0.01
Effort Regulation	5.15	1.32	4.98	1.37	1.64	0.10	-0.13
Perceived Stress	3.23	0.92	3.15	0.98	1.33	0.19	-0.10

*Week 13 measures were used for Positive and Negative Emotion

**Means of these pre-post analyses may differ slightly from means reported in HLM analyses, due to differences in how missing data were handled