

THE EFFECTS OF AN ONLINE INTERVENTION DESIGNED TO CULTIVATE
POSITIVE EMOTIONS ON EMOTIONAL AND HEALTH OUTCOMES IN COLLEGE
STUDENTS.

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ABSTRACT

Rebecca H. Sarniak: The Effects of an Online Intervention Designed to Cultivate Positive Emotions on Emotional and Health Outcomes in College Students
(Under the direction of Karen M. Gil, PhD)

Research has indicated that stress and depression are on the rise in college students, indicating an increasing area of concern. Additionally, previous research has depicted a relationship between stress and physical health, indicating the potential for a decline in health in the presence of increasing stress. Cultivating positive emotions has shown promise in increasing measures of well-being and positive affect, undoing the effects of negative emotions, and decreasing depressive symptoms. Finally, the ease of using the internet for online interventions and data collections may allow for interventions that cultivate positive emotions to reach people who wouldn't otherwise participate in an intervention. Results indicated that the online intervention affected scores on depression and anxiety. Furthermore, the intervention impacted men and women differently on emotional outcomes.

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ABBREVIATIONS

ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
CES-D	Center for Epidemiological Studies Depression Scale
CBT	Cognitive Behavior Therapy
CHIPS	Cohen-Hoberman Inventory of Physical Symptoms
DES	Differential Emotions Scale
E-VAS	Electronic Visual Analog Scale
RSCL-M	Modified Rotterdam Symptoms Checklist
SSL	Secure Sockets Layer
STAI	State-Trait Anxiety Inventory
UNC	The University of North Carolina at Chapel Hill

THE EFFECTS OF AN ONLINE INTERVENTION DESIGNED TO CULTIVATE POSITIVE EMOTIONS ON EMOTIONAL AND HEALTH OUTCOMES IN COLLEGE STUDENTS.

College is a time of transition in which students must learn to live and work independently, manage their workloads, and forge new relationships. Given these challenges, it is no surprise that depression and stress are prevalent on college campuses (Furr, Westefeld, McConnell, & Jenkins, 2001; Hudd et al., 2000; Sax, 1997; Westefeld & Furr, 1987). Research has indicated that students attribute their experiences of stress and depression to grade problems, relationship problems, financial problems, and loneliness (E. Heiligenstein, Guenther, Hsu, & Herman, 1996; Ross, Neibling, & Heckert, 1999). Moreover, additional research has indicated that stress impacts health symptoms and behaviors (Cohen, Tyrrell, & Smith, 1993; Rawson, Bloomer, & Kendall, 1994), suggesting that the high levels of stress on college campuses may be impacting students' health. Furthermore, research has indicated that depression is relatively stable over time (Tanaka & Huba, 1987), but only 17% of those experiencing depression have sought counseling (Furr et al., 2001). Thus, current methods of reaching students may not be adequate.

Positive emotions have been associated with higher levels of subjective well-being (Fredrickson, 2001), and have been shown to contribute to resilience (Bonanno, 2004) and coping (Fredrickson, 1998; Fredrickson, Tugade, Waugh, & Larkin, 2003). Positive emotions have also been hypothesized to counteract the physiological and psychological consequences of negative emotions (Fredrickson, Mancuso, Branigan, & Tugade, 2000), and thereby

improving health outcomes. Thus, interventions that cultivate positive emotions may be especially beneficial to college students by decreasing stress and depression, by optimizing well-being, and by weakening the relationships between stress and distress over physical health symptoms and between stress and health behaviors. Furthermore, on-line intervention strategies that have been used successfully in other “positive psychology exercises” that may have the potential of reaching many students who might otherwise not seek counseling resources.

The purpose of the present study is to test the health and emotional benefits of an on-line intervention that aims to cultivate positive emotion in college students. The intervention is specifically designed to cultivate positive emotions and an enhanced sense of meaning in life. In order to establish the rationale of this study, the introduction will first briefly review research on stress, depression and health symptoms and behaviors in college students. Second, the relevant background theory and empirical support for the intervention to cultivate positive emotion will be presented. Finally, research concerning on-line data collection and intervention approaches will be selectively reviewed with an emphasis on health psychology studies.

Stress, Depression, and Health in College Students

Research has indicated that physical and psychological health in college student is declining. Sax (1997) found that the percentage of college students that rated their physical health in the top 10% when compared to same-aged peers has fallen from 61.6% in 1985 to 52.4% in 1995. The number of first year students that rated their emotional health in the top 10% when asked to compare their emotional health with the average person of the same age declined from 60.3% in 1985 to 53.2% in 1995 (Ross *et al.*, 1999). Increases in stress and

depression may be contributing factors to the decline in self-reported ratings of emotional health as indicated by the high prevalence of stress and depression on college campuses (Furr et al., 2001; Hudd et al., 2000; Sax, 1997; Westefeld & Furr, 1987).

Sax found that 9.7% of first year students surveyed indicated that they felt depressed frequently. Furthermore, reports on the prevalence of experiencing depressive symptoms in college students range from 53 – 81% (Furr et al., 2001; Westefeld & Furr, 1987).

Additionally, the experience of depressive symptoms may be relatively stable over time.

Tanaka and Huba (1987) found that, when using the Center for Epidemiological Studies Depression Scale (CES-D) as a measure of depression, college students who qualified for classification as depressed at one point in time were 4.6 times as likely to qualify as depressed one month later than students that did not initially qualify as depressed.

Research has also sought to identify the sources of depressive symptoms in college students. Westefeld and Furr (1987) surveyed students at three institutions about the sources of depression they have experienced. Students reported sources of their depression as grade problems, problems in their relationships with their boyfriend and/or girlfriend, loneliness, and financial problems. Heiligenstein, Guenther, Hsu, and Herman (1996b) examined the relationship of depression and academic performance by surveying students who indicated that they were concerned about depression. Results indicated that, of those who met criteria for academic impairment (as indicated by missing classes, decreased academic productivity, and significant interpersonal problems), 16% had indications of mild depression, 25% displayed moderate depression, and 41% displayed severe depression. This finding indicates that academic performance is associated with experiences of depression, and given that grade

problems have been identified as a source of depression, the possibility of a downward spiral emerges.

College can also be a stressful experience. College is a time of transition, during which students must learn to be independent, how to manage all of their work, and navigate social relationships. Hudd et al. (2000) found that 52.1% of students indicate that they had relatively high amounts of stress during the semester. Stress in college students comes from a number of sources. The top five sources of stress reported by college students are change in sleeping habits, vacations, changes in eating habits, new responsibilities, and the increase in the amount of work required by classes (Ross, Neibling, & Heckert, 1999). Additionally, Ross et al. found that financial difficulties and a change in social activities are often reported sources of stress.

Research has also indicated that stress may influence health behaviors in college students (Von Ah, Ebert, Ngamvitroj, Park, & Kang, Byrne, Byrne, & Reinhart, 1995; Steptoe, Wardle, Pollard, Canaan, & Davies, 1996; Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). Steptoe et al. (1996) conducted a longitudinal study in which the frequency of smoking, alcohol consumption, and physical activity in students who experienced high academic stress due to exams was compared to students who did not have stress from exams. The results indicated that stress influenced the frequency of smoking and alcohol consumption, and that social support played a protective role. Additionally, Steptoe et al. found that those in the exam-stress group had higher decreases in amount of physical activity when compared to those in the control group. Similarly, Byrne, Byrne, and Reinhart (1995) found that there was an association between smoking onset and maintenance and stress in college students.

Although the prevalence rates of stress and depression on college campuses are high, Furr et al. found that only 17% of undergraduate students sought help when feeling depressed (Furr et al., 2001). Research has also indicated that the rates of stress and depression are increasing on college campuses, which is of increasing concern especially due to the negative consequences of stress and depression. Furthermore, research has indicated that stress and daily mood are associated with health outcomes in individuals with chronic illness. Future research should focus on creation on effective interventions with the capability of reaching a large number and wide range of people.

The Benefits of Positive Emotions

Positive psychology refers to an emerging field of study concerned with positive emotions and character traits that allow people to thrive (Seligman & Csikszentmihalyi, 2000). The field of positive psychology emphasizes the role that positive emotions play in increasing subjective ratings of happiness or well-being. Additionally, research has examined the role that positive emotions play in the experience of negative affect and depressive symptoms as well as in managing stress (Emmons & McCullough, 2003; Folkman & Moskowitz, 2000; Fredrickson et al., 2000). An important contribution of this field of research has been in the design and testing of interventions that cultivate positive emotions, improve levels of subjective well-being, and reduce the impact of negative life events.

One prominent theory is Fredrickson's Broaden-and-Build Theory (1998). The Broaden-and-Build Theory, which describes how positive emotions function to increase an individual's well-being over time by expanding the individual's personal resources, including physical, intellectual, and social resources. Fredrickson (2001) describes how the broadening of a person's thought-action repertoire could result in the broadening of an individual's

personal resources through four positive emotions (joy, interest, contentment, and love).

Fredrickson describes these personal resources as durable and capable of being drawn upon in the future when facing challenges.

Positive emotions have also been shown to increase the amount and range of thoughts and actions that come to mind, referred to as a person's thought-action repertoire (Fredrickson & Branigan, 2000). Whereas positive emotions serve to broaden a person's thought-action repertoire, negative emotions have been shown to narrow a person's focus or thought-action repertoire (Derryberry and Tucker as cited in Fredrickson 2000; Easterbrook as cited in Fredrickson 2000). Positive emotions also play a role in psychological resilience by increasing a person's ability to adapt through widening the array of thoughts and responses in reaction to a stressor.

Positive emotions are also hypothesized to counteract the effects of negative emotions (Fredrickson et al., 2000). Negative emotions are usually associated with specific action tendencies (i.e., negative emotions may lead to specific responses that enable us to survive in adverse situations). These responses require high amounts of physical energy and, consequently, may have physiological outcomes. For example, experiencing these emotions for prolonged periods of time may have negative health consequences such as putting an individual at risk for cardiovascular disease via prolonged cardiac reactivity (Isen & Daubman, 1984).

Fredrickson's "undo hypothesis" posits that positive emotions are thought to undo the physiological and psychological effects of negative emotions. The undoing hypothesis fits in with the broaden-and-build theory. The undoing hypothesis states that positive emotions could aid in negative emotion regulation (Fredrickson et al., 2000) and undo the

consequences of negative emotions. Fredrickson found participants who experienced positive emotion after experiencing an anxiety-inducing task had a shorter period of cardiac reactivity than participants who were in the negative or neutral emotion group. It is important to point out that participants in the positive emotion conditions recovered more quickly than those in the neutral condition, providing evidence that positive emotions might help “undo” the effects of negative emotions.

Furthermore, research has indicated that stress and daily mood predict health outcomes such as pain and healthcare use in individuals with chronic illness (Gil et al., 2003a; Gil et al., 2004a; Schanberg, Gil, Anthony, Yow, & Rochon, 2005). Gil et al. (2004a) found that higher levels of positive mood were associated with lower ratings of pain and decreased health-care use in individuals with sickle-cell disease. Additionally, stress and negative mood were associated with higher ratings of pain. Given the relationship between experiencing stress and physical health consequences, the undoing hypothesis provides a basis for how cultivating positive emotions may serve to undo the effects of stress on physical health.

Positive affect has been also been shown to influence coping with chronic stress (Folkman & Moskowitz, 2000). Positive affect may help buffer against physical consequences of stress (Fredrickson, 1998) as well as help buffer against chronic depression in the presence of chronic stress (Folkman & Moskowitz, 2000). It is important to note that positive affect differs from positive emotions: positive emotions are associated with something that is meaningful to an individual and describe transient states and positive affect can be long lasting and refers to moods, attitudes, sensations that describe a person’s

subjective experience. Additionally, the upward spiral of positive emotions that Fredrickson describes may serve to sustain positive emotions and increase positive affect.

Seligman (2005) created “positive psychology” exercises. To investigate the benefits of the exercises, participants who self-selected to visit a website (<http://www.authentichappiness.com>) and sign up for the study, were placed into one of six conditions, with one of the conditions designated as a placebo condition. One of the conditions was the “three good things in life” (blessings), exercise. Participants completed measures of depressive symptoms (using the CES-D) and happiness (Stein Happiness Index). The “three good things” (writing about three good things that happened to the participant and their causes every day for a week) exercise was shown to be beneficial. Participants in the intervention displayed increases in happiness and decreases in depressive symptoms that were still present at a six-month post-treatment follow-up.

Fredrickson’s broaden-and-build theory may provide an explanation for the lasting effects of the “three good things” exercise. “Three good things” in life promotes people finding positive meaning in their daily events. Fredrickson (2002) found that positive meaning and positive emotions have a reciprocal relationship: finding positive meaning triggers positive emotions and positive emotions then broaden the thought-action repertoire. This increases the likelihood of finding positive meaning in subsequent events, triggering an upward spiral (Fredrickson, 2000). The positive emotions cultivated by thinking about three good things that happened could trigger this upward spiral.

Emmons and McCullough (2003) conducted two studies that compared the effects of listing five things one is grateful or thankful for (counting blessings), five hassles in that occurred, and five events that had an effected one’s life. In the first study, college students

were randomly assigned to one of the three conditions and were asked to complete their a specific each week for ten weeks on packets handed out in class. The results indicated that participants in the counting blessings group rated their lives and expectations for the coming week more favorably than those in the hassles and control conditions. Additionally, Emmons and McCullough found that those in the counting blessings condition reported fewer physical symptoms than those in the hassle and control conditions and reported participating in more hours of exercise than those in the hassles condition.

In the second study, participants were randomly assigned to one of three groups: the counting blessings group, the hassles group, and a downward social comparison group. The counting blessings group and hassles group were given identical instructions as those in the first study. The downward social comparison group was instructed to list ways in which they were more fortunate than others (or had more than other people had). Participants in all groups completed the exercises every day for 16 days. The results indicated that participants in the counting blessings conditions reported experiencing more positive affect than those in the hassles condition, but the difference in positive affect was not significantly different than the downward social comparison group. There were no differences between the any of the groups on health behaviors.

Taken together, these studies indicate that interventions that cultivate positive emotions have the potential to increase positive affect, decrease depressive symptoms, and improve health behaviors. Additionally, the broaden-and-build theory suggests the broadening a person's thought-action repertoire, through triggering an upward spiral of positive emotion and subjective well-being, one might be able to help "undo" the effects of negative emotions.

Online Data Collection and Interventions

As use of the internet increases, so does the ability to reach a wide range of people. The ability and ease of reaching a large number of people via the internet may prove beneficial in the field of mental health, by way of online data collection and online interventions. There are many potential benefits of using the internet in the mental health field. One potential benefit that Atkinson and Gold (2002) discuss is the increased ability for participants to remain anonymous. The ability to remain anonymous could allow participants who would otherwise not have participated in face-to-face research to participate in online research. Online interventions also have the potential to offer more convenience than interventions done in-person because participants may log on to a secure website at convenient times and from convenient locations (Ritterband et al., 2003). These features may entice more individuals to participate in interventions who otherwise could not participate due to scheduling and transportation issues. Although there are potential benefits of using the internet in the mental health field, questions arise about if participants are capable of completing internet based measures accurately and if an online intervention can be effective.

On-line data collection. Ritter, Lorig, Laurent, and Matthews (2004) explored differences in the psychometric properties of 16 self-report measures completed on-line versus in the more typical paper-and-pencil format. In this study, 397 participants with chronic disease were randomly assigned to complete paper-and-pencil measures through the mail or to complete the online version of the measure by logging onto a website. No significant differences by response format were found for any of the measures with the exception of the measures of health distress and shortness of breath. Higher levels of health distress were reported on the on-line measures and greater shortness of breath was reported

on the paper-and-pencil format, however, this may have been due to an unintended higher rate of asthma in that group.

In addition, Bliven, Kaufman, and Spertus (2001) examined the reliability and benefits of using a computer for data collection when compared to paper-and-pencil versions in a sample of 55 cardiac outpatients. No significant differences in ability or results were found between formats. Additionally, Bliven et al. found 82% of participants reported that they preferred the computer versions of the questionnaires and 89% indicated they would be comfortable using the computer version in the future without technical assistance.

Finkelstein, Cabrera, and Hripesak (2000) trained 31 asthma patients to use electronic devices to collect information about their current symptoms and transmit the information via the telephone or wireless network. Finkelstein et al. found that there were no significant differences in supervised versus unsupervised self-reports, indicating that participants are capable of accurate self-reporting and transmitting information in an internet-based study. Additionally, 83.9% of participants described the self-report and use of technology as not complicated and time efficient. The ease and convenience of self-reporting may encourage greater compliance in self-report studies and the ability of participants to provide accurate self-reports indicate that participants are capable of using electronic devices to provide accurate information. Furthermore, Finkelstein et al. reported that the majority of participants indicated that they were strongly interested in using the method of self-report in the future.

Online Interventions. In a review of the literature, Ritterband et al. examined the feasibility and effectiveness of 12 web-based or on-line health psychology interventions. Twelve online interventions in the area of health psychology were examined. Ritterband et al. found that the online interventions were feasible and effective in changing health

behaviors. In another study, Andersson, Stromgren, Strom, and Lyttkens (2002) conducted internet-based cognitive behavior therapy (CBT) to participants diagnosed with Tinnitus, a condition causing auditory sensations (Bauer, 2004). Andersson et al. found that those who completed the online CBT intervention had scored lower (indicating improvement) on a measure of tinnitus reaction when compared to those on the waiting list. Similarly, Strom, Pettersson, and Andersson (2000) found that 50% of those in a relaxation plus problem solving treatment group showed improvement in their experiences of recurrent headache versus 4% in the waiting-list group. Taken together, these studies suggest the utility of use of online interventions in health psychology.

Although the ease and convenience of using the internet for online interventions is promising, previous research on online interventions has yielded high attrition rates. Ritterband et al. reported that the attrition rate of those in the treatment condition was 51%. Strom et al. reported an attrition rate of 56%. These findings raise the concern that although online intervention maybe potentially beneficial and reach a potentially larger group, attrition rates could be concerningly high.

In summary, research exploring online data collection and online interventions has indicated that participants are able to accurately self-report using electronic means, and online interventions are effective and feasible. Additionally, participants may prefer electronic collection of data to traditional paper and pencil methods of data collection, although attrition rates remain high.

The Present Study: Specific Aims and Hypotheses

The purpose of the present study is to test the health and emotional benefits of an on-line intervention that aims to cultivate positive emotions in college students. The

intervention is specifically designed to cultivate positive emotions and an enhanced sense of meaning in life.

Hypothesis #1. The first hypothesis is that individuals randomly assigned to the intervention will exhibit lower levels of depressive symptoms and negative affect, as well as higher levels of positive affect at posttest in comparison to the control group.

Hypothesis #2. The second hypothesis is that individuals randomly assigned to the intervention will report less distress over physical health symptoms and improved health behaviors at posttest in comparison to the control group.

Hypothesis #3. The third hypothesis is that the effects of stress on health outcomes will depend on the level of positive affect. Given the intervention aims to improve positive affect, I predict that the relationship between stress and health outcomes will be weakened in the intervention group when compared to the control group (see figure 1).

Methods

Participants

Participants were 91 undergraduate students, ages 17 and older who were enrolled in an introductory psychology course at The University of North Carolina at Chapel Hill (UNC). Participants were required to have daily access to the internet as was expected for essentially all eligible undergraduate students on campus. Only participants who completed both pretest and posttest measures (91 students) were included in the analyses. Analyses indicated that participants were 77% female and 20% males. Three participants did not specify a gender. Furthermore, 73% participants identified themselves as white, 9% as African-American, 7% as Asian or Pacific Islander, 2% as Bi-/Multi-Racial, and 2% as “Other,” and indicated that they identified themselves as Persian. Age ranged from 17.9

years-old to 42.5 years-old, with a mean age of 19.6 years ($SD = 3.0$). Based upon the typical samples that are gathered through the participant pool at UNC, these results are as expected (Mann & Gilliom, 2004; T. Mann, Sherman, & Updegraff, 2004).

General Procedure

Students enrolled in an introductory psychology class were recruited through the University of North Carolina at Chapel Hill's Human Participation in Research website and received course credit for their participation. Upon enrollment in the study, participants were sent an email with an anonymous login identification and password which they used for the remainder of the study. Researchers obtained informed consent via the internet and participants completed a brief internet-based demographic questionnaire. Additionally, participants in both groups were told that participating in the study would improve well-being.

Participants then completed the electronic baseline assessment. Instruments included measures of perceived stress, depressive symptoms, affect, health behaviors, and a distress over physical health symptoms questionnaire. Following the baseline assessment, participants were randomly assigned to either the intervention or the control condition. Participants in both conditions completed daily measures of perceived stress, physical health symptoms, and health behaviors (daily diaries) for the duration of the study – 36 days. Participants who were randomly assigned to the intervention group also completed a writing assignment (the intervention) every third day for the entirety of the study. Participants in the control condition did not complete any writing assignment beyond the completion of the daily diary measures. Thus, the completion of daily measures served as the control condition. At the end of the 36 days of the study, all participants were asked to repeat all

baseline measures as well as a credibility questionnaire inquiring about how much they believed their activities in the study helped them.

In the spring semester, participants were awarded five hour credits for participation in the spring semester, divided as follows: one hour each for pretest and posttest measures and three hours for completion of the intervention and/or daily diaries. After analysis of time spent on the study, credit awarded was modified for the summer and fall semesters, divided as follows: one half-hour for each pretest and posttest measures and two hours for the completion of the intervention and/or daily diaries.

Measures

Anxiety. The State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Luschene as cited in Barnes, Harp, & Jung, 2002) was used to measure state anxiety. The state-anxiety scale consists of 20 items that ask people to rate how they are feeling at the moment. Respondents report how they are feeling on a four-point scale that ranges from “not at all” to “very much so.” Barnes, Harp, and Jung (2002) found that the test-retest reliability coefficients of the state-anxiety scale ranged from .37 to .97 with a mean of .70. This wide range of test-retest reliability was expected due to the transient nature of state anxiety. The STAI is widely used in research across multiple populations, including college students (Barnes et al., 2002). For the current study, the state-anxiety scale showed adequate internal reliability (Chronbach’s $\alpha = .88$).

Depressive symptoms. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was used to assess depressive symptoms. The CES-D consists of 20 self-report items that ask respondents the frequency with which they experience depressive symptoms (negative affect, low positive affect, somatic complaints, and interpersonal

problems). Respondents rate these symptoms for the past week using a four-point scale ranging from “never or rarely” to “most of the time or all the time.” The CES-D is a widely used measure among clinical and subclinical populations and has demonstrated an adequate internal reliability (Chronbach’s $\alpha = .85$; Zimmerman & Coryell, 1994), and is a widely used measure. Results indicate that for the current study, the CES-D had adequate internal reliability (Chronbach’s $\alpha = .90$).

Emotions. The Differential Emotions Scale (DES) was used to measure positive and negative emotion. The DES consists of 25 items relating to experiencing positive and negative emotions. The DES asks respondents to indicate the extent they have experienced positive (e.g., amused, fun-loving, silly) and negative (e.g., angry, irritated, frustrated) feelings and emotions in the past week on a four-point scale that ranges from “Never” to “Often or most of the time.” For the current study, the DES has shown adequate internal reliability for positive and negative emotions (Chronbach’s $\alpha = .88$ for positive emotions, = .82 for negative emotions).

Health Symptoms. The Cohen-Hoberman Inventory of Physical Symptoms (CHIPS; Cohen & Hoberman, 1983) was used to assess how much a participant was bothered by physical health symptoms. The CHIPS consists of 39 self-report items in which respondents are asked to rate the extent to which a physical health problem (e.g., headache, weight loss, nausea, cold) has bothered them in the past two weeks. Respondents rate the degree to which a problem bothered them on a five-point scale that ranges from “not at all” to “extremely.” Cohen and Hoberman found that the CHIPS was somewhat correlated ($r = .22 - .29$) with use of the student health facilities in the five weeks following the completion of the survey in a

university population. For the current study, the CHIPS has demonstrated adequate internal reliability (Chronbach's $\alpha = .85$).

Health Behaviors. The Health Behaviors measure was created for the purposes of this study and is modeled after the daily health behavior questions used by Emmons and McCullough (2003). Participants reported how long they slept the previous night, how many caffeinated beverages they consumed, the number of alcoholic beverages they consumed, the time spent exercising, if they ate three meals that day, if they visited student health services the and the number of pain relievers consumed that day. The Health Behaviors Questionnaire has demonstrated adequate internal reliability for this sample (Chronbach's $\alpha = .75$).

Online Positive Emotion Intervention

The intervention used in this study was modeled after Seligman et al.'s "three good things in life" exercise (Seligman et al., 2005). Seligman's intervention asks participants to write daily about three things that went well that day and their causes every night for a week. This intervention was chosen for the current study because prior research has shown that it yields beneficial effects (higher scores on a measure of happiness and lower scores on a measure of depressive symptoms) at the one-month follow-up at post-test in individuals in the general population (Seligman et al., 2005).

In the present study, the writing assignment instructed students who were randomly assigned to the intervention group to "Please take the next ten minutes to describe three positive experiences that you have had in the past two days and the role that you played in your experiences." These participants then described their experiences using a text box on the webpage and clicked on a "submit" button to submit their writing assignment. Participant

compliance was checked nightly by study personnel. Participants who did not complete the nightly assignment were sent email reminders.

Several modifications were made to the intervention in this study from previous studies. First, in the present study, participants in the intervention group were asked to complete a writing assignment on every third day, rather than every day. The frequency and duration of the completion of the intervention (once every three days for five weeks) was chosen as a compromise between the studies conducted by Seligman et al. (2005) and Emmons and McCullough (2003). Seligman et al. found that daily completion of the diaries for one week improved ratings of subjective well-being and depressive symptoms. Emmons and McCullough found that weekly completion of the exercises for ten weeks yielded effects on health behaviors and positive affect. Second, students will receive incentive for completing the intervention in the form of credit for their introductory psychology class. This strategy was expected to enhance compliance and reduce attrition. Finally, the present intervention used a daily exercise to control for the effects of completing a daily activity. This strategy improves upon prior studies and serves as a neutral activity that does not cultivate positive emotions.

Control Condition

As part of a larger study in Karen Gil's research laboratory, participants enrolled in this study also kept a daily diary. Because the present study focuses on pretest and posttest measures, the daily diary data will not be analyzed as part of this study; however, completion of the daily measures served as the control condition. The daily diaries were expected to take 5 to 7 minutes to complete, in contrast to the 15 minutes expected completion time for those in the intervention group, and consists of the measures described below.

The Electronic Diary (E-Diary), created by Edward Forrest Morrill (2004) is an electronic self-report questionnaire that includes measures of stress, physical health symptoms, and physical activity. The first section of the daily diary consists of an electronic visual analog scale (E-VAS) in which participants rate their overall level of perceived stress for that day from 0 (no stress) to 100 (highest stress). The second section of the diary consists of the modified Rotterdam Symptoms Checklist (RSCL-M; Stein et al., 2003), a 28-item checklist of physical health symptoms. The third section of the diary is the Differential Emotions Scale (DES) as described above, but asks participants 20 questions about their experience of positive and negative emotions “right now.” The fourth section of the diary is an index of health behaviors (e.g., sleep, caffeine use, etc) modeled after questions from a previous intervention study that aimed to cultivate positive emotions (Emmons & McCullough, 2003). Each of these sections of the diary parallel a baseline measure. The final section of the diary asks participants to report on the amount of time, in 15-minute intervals, they participated in moderate and vigorous-intensity physical activity during the day.

Data Management

The electronic baseline measures, daily diaries, and intervention webpage were posted on a secure server on the University network. Participants were assigned a study identification number and password to access the daily study materials. Only participants and authorized study personnel were able to access this webpage. All data (baseline measures, daily diary measures, intervention information) were transmitted from the participants’ computer to the secure server using 128 bit encryption and over a secure channel using the secure sockets layer (SSL) protocol. Additionally, information that identifies participants and

their study identification number were stored on a password protected server so that participation in introductory psychology experiments could be appropriately credited. Pretest and posttest data were transported into Microsoft Excel and stored on a password protected server.

Results

As described above, all participants were instructed to complete diaries on 36 days. Participants in the intervention group were also asked to complete the intervention every third day for a potential total number of 12 intervention days. Of the 100 participants recruited, only participants who completed both pretest and posttest measures were included in the analyses resulting in 91 participants being included in the analyses. Three participants withdrew from the study due to time constraints and six participants did not complete posttest measures. Figure 2 shows the distribution of diaries missed by all participants over the duration of the 36-day study. Participants missed a mean of 8.9 days ($SD = 6.4$), resulting in 75.4% completion rate of the daily diaries. Figure 3 shows the distribution of intervention days missed for participants in the intervention group over the duration of the 36-day study. Participants in the intervention group missed a mean of 3.1 ($SD = 2.62$) of the 12 intervention days, resulting in a 74.3% completion rate on intervention days. Participants in the intervention group did not differ from the control group in number of overall days missed $F(1, 89) = 3.38, p > .05$, indicating that there was not a significant difference in study participation by group.

Preliminary analyses indicated that there were no significant differences between groups on any of the baseline measures of depressive symptoms, state anxiety, positive mood, negative mood, physical health symptoms, and health behaviors indicating that the

intervention and control groups did not differ at pretest. Scores on the credibility measure taken at posttest were compared by group to test whether expectations for the effects of the participation in the study differed by group. Results indicate that there were no differences between how much each group believed that participation would impact well-being $F(1, 89) = 1.25, p > .05$. The mean for the intervention group was 19.26 (SD = 10.61) and the mean for the control group was 21.59 (SD = 9.31).

Testing Hypothesis 1: The Effects of the Intervention on Emotional Outcomes. To test the first hypothesis that individuals randomly assigned to the intervention would exhibit differences in emotional outcomes (depressive symptoms, anxiety, positive mood, and negative mood) at posttest in comparison to the control group, a series of ANCOVAs were conducted. Pretest measures were entered into the ANOVA model as covariates and posttest means were compared by group. Table 2 summarizes the ANCOVA findings. The ANCOVA results indicate that scores on the CES-D, the measure of depressive symptoms, differed significantly by group $F(1, 88) = 5.13, p < .05$. Participants in the intervention group reported significantly fewer adjusted mean depressive symptoms at posttest when compared to the participants in the control group as seen in Table 1. The ANCOVA results also indicated that scores on the anxiety measure differed significantly at posttest by group $F(1, 89) = 7.1, p < .01$. Participants in the intervention had significantly lower mean anxiety scores at posttest when compared to the participants in the control group. No significant results were found for scores on positive mood or negative mood.

To investigate whether there were any significant effects by gender, the ANCOVA analyses were repeated with gender added as a fixed factor. Pretest measures were entered into the ANOVA model as covariates and posttest measures were compared by group and

gender. As shown in Table 2, a significant effect of gender was found for depressive symptoms, $F(1, 89) = 5.12, p < .05$, indicating that the intervention may have affected men differently than women on a measure of depression. No significant effects were found for any other outcome variables.

To further explore the differences in the effects of the interventions within each gender group on all outcome measures, ANCOVA analyses were repeated including only women in the analyses. Results indicated that the intervention group differed from the control group on the measure of anxiety $F(1, 73) = 4.21, p < .05$, indicating that the intervention effects on anxiety were observed in women. Women in the control group scored significantly higher on the anxiety measure at posttest when compared to women in the intervention group. No significant effects of the intervention on the other outcome variables (depressive symptoms, positive mood, negative mood) were found. When only men were included in the analyses, the intervention group differed from the control group on measures of depressive symptoms $F(1, 17) = 5.99, p < .05$, and positive mood, $F(1, 17) = 7.39, p < .05$. Men in the intervention had significantly better scores at posttest on the measures of depressive symptoms and positive mood when compared to men in the control group. Thus, men who participated in the intervention showed lower levels of depression and higher levels of positive mood, than men in the control group.

Testing Hypothesis 2: The Effects of the Intervention on Health Outcomes. To test the second hypothesis that individuals randomly assigned to the intervention would report fewer physical health symptoms and improved health behaviors at posttest in comparison to the control group, a series of ANCOVAs were conducted. Pretest measures were entered into the ANOVA model as covariates and posttest means were compared by group. Posttest

measures of health behaviors and distress over physical health symptoms were compared by group with distress over physical health symptoms entered into the ANOVA models as covariates. No significant results were found, indicating that people who participated in the intervention experienced health outcomes no different than those who did daily diaries only.

Testing Hypothesis 3: Testing the Mediated-Moderator Model. The third hypothesis was that the effects of anxiety on health outcomes would depend on the level of positive mood. This hypothesis was not evaluated statistically as the intervention did not significantly impact positive mood- that is, there was no significant difference in positive affect at posttest between groups with pretest positive affect entered into the ANOVA model as a covariate.

Post-Hoc Analyses. In order to explore the possibility that the number of intervention days completed had an effect on the outcomes (i.e., the amount, or dose, of the intervention a participant received impacted outcome measures), a series of regressions were conducted. For each outcome measure, pretest measures and number of intervention days were entered into the regression model as independent variables and posttest measures were entered into the model as the dependent variable for the intervention group only. The results are summarized in Table 3. The analyses showed that, for each outcome measure, number of intervention days completed did not predict posttest scores when controlling for pretest measures. It may be important to note that for the CES-D, $p = .07$. Finally, the results indicate that the number of intervention days completed did not impact emotional and health outcome measures.

Given the differential effect of the intervention on gender found for emotional outcomes in Hypothesis 1, further analyses were conducted using women only, as the number of men in the sample was too small to conduct meaningful analyses. In order to

explore the possibility that the number of intervention days completed had an effect on the outcomes for women (i.e., the amount of intervention a participant received impacted all outcome measures), a series of regressions were conducted. For in the intervention group only, pretest measures and number of intervention days were entered into the regression model as independent variables and posttest measures were entered into the model as the dependent variable for the intervention group only. The results are summarized in Table 4. The analyses showed that, for each outcome measure, number of intervention days completed did not predict scores at posttest when controlling for pretest measures. This would indicate that the number of intervention days completed did not impact emotional and health outcome measures in women.

Another set of regression analyses were conducted to explore the possibility that the number of daily diaries completed, not intervention days, could predict the outcome measures. The number of daily diaries completed and pretest measures were entered into the regression model as predictors and posttest measures were entered into the model as the dependent variable for both groups. Results are summarized in Table 5. Results showed that the number of daily diaries completed overall significantly predicted negative mood and depressive symptoms at posttest when controlling for pretest measures. The analyses also indicated that number of diaries completed did not predict state-anxiety, positive emotion, health symptoms, and health behaviors when controlling for pretest measures.

Finally, to take advantage of the daily diary data collected, the aggregate scores for the first and last three days of the study were calculated for each measure. In part, this was done because it was possible that pretest measures were skewed because of the effect of transient emotions on the outcome measures, and therefore the mean of the first three days

could be a more reliable measure of the outcome variables of interest. Three day aggregate scores were used because participants in the intervention group had completed daily measures for three days before the first day of the intervention. The aggregate of each of the measures of the last three days were entered into the ANCOVA model and scores were compared by group. The aggregate of the first three days of the study was entered into the study as a covariate. Results are summarized in Table 6. Results indicate that there were no significant differences by group on any of the daily measures, indicating that the intervention did not have a statistically significant effect on any of the outcome measures when using daily scores. Additionally, positive and negative emotions were compared by group everyday over the course of the 36 diary entry days to explore whether or not there was a trend in the data. Results are presented in Figures 3 and 4 and indicate that the mean scores on daily positive and negative emotions did not support a trend in positive or negative emotions in either the intervention or the control groups.

Discussion

The present study tested the efficacy of an intervention designed to increase positive emotions in college students. The intervention, the cultivating positive emotions intervention, was modeled after Seligman and Csikszentmihalyi's (2000) "three good things in life" exercise. Students in the intervention group were asked to write about three good things that happened over the course of three days and to describe the role they played in the positive events or experiences. In both the intervention and control groups, students completed measures of physical health symptoms, emotions, health behaviors, and perceived stress on a daily basis. I hypothesized that people in the intervention group would score better on emotional measures as well as on a measure of health behaviors and distress over physical

health symptoms at posttest when compared to the control group. Moreover, I hypothesized that the mechanism by which intervention would impact health outcomes was that the intervention would improve positive emotions, thereby weakening the relationship between stress and health outcomes.

There are several unique features of this study. Unlike previous research (e.g., Emmons and McCullough, 2003), this intervention was administered via the Internet. This mode of administration not only allowed for participants to participate in the intervention at times and locations convenient to them, but also eliminated the need for participants to keep track of study materials as necessitated in paper and pencil studies. Additionally, online data collection allowed for the date and time at which participants completed daily diaries to be recorded, unlike in paper and pencil measures. Thus, I have more confidence in the accuracy of diary completion rates in this study than in paper and pencil diary studies in which participants may have completed multiple measures in one day without the knowledge of study personnel. Participants in this study also did not seek out interventions that specifically aim to cultivate positive emotions. This is important because, in contrast to prior studies (e.g., Seligman & Csikszentmihalyi, 2000), participants did not have an expectation that this intervention would work specifically to improve positive emotions. The control condition in this study is also unique in that participants in the control condition completed daily diaries, tracking the same variables as those in the intervention group. Thus, participants in the control group also took part in completing an activity online. Furthermore, participants in the control condition answered questions about their health behaviors, whereas those in the study conducted by Emmons and McCullough were not asked about health behaviors.

The results of this study indicated that those who participated in the cultivating positive emotions intervention reported lower mean depressive symptoms and lower state anxiety at posttest compared to the control group. This finding partially supports the first hypothesis which predicted that those in the intervention would have better emotional outcomes at posttest when compared to the intervention group. Seligman and Csikszentmihalyi (2000) similarly found a decrease in depressive symptoms at posttest in response to listing “three good things” in one’s life. Surprisingly, in the current study, the number of intervention days completed was not associated with outcome measures. In other words, participants saw the same benefits no matter how many times they participated in the intervention, as long as they did so at least once during the course of the study. This finding is contrary to my expectations that depression, anxiety, and emotions would improve the more intervention days a participant completed. However, as participants’ number of overall days completed increased, negative emotions decreased. Perhaps contact with the study overall predicts negative emotions, not just participation in the intervention. Future research should investigate more closely which aspects of the study affected negative emotions, the intervention or the daily measures.

Students should be expected to experience higher levels of stress at the end of the semester and midsemester due to specific increases in the academic pressures over the course of the semester, such as final examinations. For example, Sarin, Abela, and Auerbach (2005) found that there were significant differences in depressive symptoms in college students when comparing the beginning of the semester to immediately after students received midterm grades as well as four days after the midterm grade was received. Thus, students may experience increased depressive symptoms and anxiety over the course of the semester.

Heiligenstein, Guenther, Hsu, and Herman (1996) found that depression was associated with functional impairment in school (academic impairment, absenteeism, decreased productivity, and interpersonal friction). Furthermore, higher levels of severity on a measure of depression were associated with higher levels of functional impairment. In the current study, students in the intervention group improved on measures of anxiety and depressive symptoms, whereas students in the control group worsened on measures of anxiety and depressive symptoms. The pattern of symptoms change observed in this study suggest that the intervention could have more distal effects on school performance, in that students may be able to better cope with the problems facing college students.

Unexpectedly, the prediction that those in the intervention group would have higher levels of positive emotions and lower levels of negative emotions at posttest when compared to the control group was not supported. This results contrast with a study by Emmons and McCullough (2003), who found that those who listed five good things in their lives had higher levels of positive affect at posttest when compared to a group that listed five hassles. Because positive emotions were not impacted by being in the intervention group, it was not possible to explore the proposed mechanism that an increase in positive emotions would result in an upwards spiral of positive emotions and, consequently, reduce depressive symptoms and anxiety. However, one cannot fully discount this mechanism without further research to clarify whether these types of interventions impact positive emotions or not.

The findings that participants in the intervention and control group did not differ on measures of positive and negative emotions at posttest were not expected in light of previous literature. Seligman and Csikszentmihalyi (2000) found that participants who “counted their blessings” experienced an increase in happiness and decrease in depressive symptoms at

posttest. Also, prior research supported the idea that interventions that aim to increase positive emotions may reduce the experience of negative emotions and depressive symptoms (Emmons & McCullough, 2003; Folkman & Moskowitz, 2000; Fredrickson et al., 2000). This unexpected finding could possibly be explained by the content of the negative emotions measure. Emotions in the negative emotion measure such as contempt and disgust may be present but not contributing to depressive symptoms, thus we see an impact on depressive symptoms and not on negative emotions. Similarly, previous interventions seemed to be targeted at feelings such as happiness and contentment (Emmons & McCullough, 2003; Seligman & Csikszentmihalyi, 2000) and positive emotions such as fun-loving and silly were not targeted by this intervention.

Regarding health symptoms, the results indicated that those in the intervention group did not score differently on a measure of distress over physical health symptoms than those in the control group. Thus there was no support for my second hypothesis. Additionally, the third hypothesis that positive emotions would work to improve health outcomes by counteracting the physiological consequences of negative emotions (Fredrickson, Mancuso, Branigan, & Tugate, 2000) was not tested because positive emotions were not significantly higher in the intervention group when compared to the control group. Emmons and McCullough (2003) found that participants who were asked to count blessings once per week for ten weeks reported fewer physical symptoms at posttest than those who were asked to report on five hassles and five events that had affected one's life. This could possibly be explained by the role of stress in physical illness. As academic pressures build and course workload increase for students over the course of the semester, participants may experience increasing levels of stress, thereby becoming more susceptible to illness (Cohen, Tyrrell, &

Smith, 1993; Rawson, Bloomer, & Kendall, 1994). For example, Cohen et al. found that those who scored higher on a perceived stress scale were more vulnerable to a cold infection. Additionally, participants in this study may not have had time to engage in healthful behaviors such as getting a sufficient amount of sleep or physical activity as the semester went on, thus resulting in no change in distress over physical health symptoms. Alternatively, the intervention may not have impacted distress over physical health symptoms and health behaviors.

Gender differences

The results indicated that the intervention impacted men and women differently on a measure of depressive symptoms. When examining men only, men in the intervention group had a lower mean depressive symptoms score at posttest when compared to men in the control group, indicating that the intervention impacted depression in men; this relationship was not found in women-only analyses. This finding may owe differences in how men and women cope with depressive symptoms and stress they experience during their college years. Surveying undergraduate students on measures of stress, depression, and coping strategies, Felston (1998) found that women scored higher on seeking social support. Furthermore, women may also be more likely than men to seek non-specific social support and engage in positive self-talk (Tamres, 2002). Women may already be constructing a narrative of the good (and bad) things that are happening in their lives, which was one of the components of the intervention. Men may typically do this to a lesser degree; if so, the intervention may have provided an opportunity to assign a narrative to their experiences, thereby providing some relief from depressive symptoms and stress.

Limitations

A significant limitation of the study is the relatively high percentage of women. However, the number of women in the study did not differ from what was expected based on previous studies conducted at the University of North Carolina (Mann & Gilliam, 2004; Man, Sherman, & Updegraff, 2004). Additional gender differences may have been present, but the disproportionate number of females (77%) when compared to males may have rendered those effects difficult to detect. For example, men in the intervention group scored significantly higher on the measure of positive emotions when compared to the control group, whereas women did not. However, the overall ANOVA results do not indicate an effect of gender and group on positive emotions. Additionally, women in the intervention group scored better on a measure of anxiety at posttest when compared to the intervention group and there was not a significant difference between men in the control group and the intervention group. However, despite the differences in anxiety when looking at each gender separately, the overall ANCOVA did not show a significant effect of the intervention by gender on anxiety. The findings only supported a difference in the effects of the intervention by gender on depressive symptoms. A greater balance in genders may help to clarify gender differences in future studies.

The intervention did not improve positive and negative emotions. As previously mentioned, this result may be due to the emotion measure not specifically focusing on the emotions that were targeted by the intervention (e.g. happiness or meaning in life). Future studies should take care to specify which positive emotions the intervention should affect and to target and measure those emotions. Alternatively, participants' level of motivation to engage in the intervention may also have affected the emotion results. Participants in the study may not have been motivated to engage in the intervention because they were

participating for course credit rather than for improving their well-being. The data indicated that some participants would complete multiple entries in one day after having missed a day, which may indicate that they completed measures and the intervention haphazardly, even though reminder emails for participants were sent on a regular basis.

All participants were told at the beginning of the study that participating in the study was expected to improve well-being. The study participants in both groups completed a credibility questionnaire and the results indicated that there were no differences between the intervention and control conditions in how credible it was that participating in the study improved well-being. Additionally, there were no differences in the number of diary days completed compared to number of intervention days completed. Participants in the intervention group completed 74.3% of intervention days indicating a high level of completion comparable to previous daily diary studies in adult populations (Gil et al., 2004). However, completion of the diaries was necessary to receive course credit and thus may not be a strong indicator that participants were motivated to complete the intervention. It is not known how motivated participants were to complete the intervention to the best of their abilities. Further research could be conducted on students who are more motivated to improve well-being, or as part of treatment for individuals seeking improvement on depressive symptoms as the current study did not select for students who were experiencing distress. Alternately, a measurement of how much a person was motivated to complete the writing assignment could be entered into future studies as a covariate.

Another limitation of this study was that students participated during three separate semesters (Spring, Summer, and Fall). Although it would have been beneficial to collect data from all participants at once and at the same point in the semester, that was not possible for

the current study due to the limits on the participant pool at the University including the number of credit hours that can be given to a study in a given semester. Additionally, students in the shorter Summer semester began the study on their first day of class and ended on the last day of class. Students in the Spring and Fall semesters participated only over a portion of the semester and took measures at the midpoint of the semester.

Additionally, in the Spring semester of data collection, students who signed up for the study began data collection half way through the semester and completed the daily diaries within the last few days of the semester. In the Fall semester, students began study participation at the beginning of the semester and completed the posttest at the midpoint of the semester. Thus, students from different semesters may have faced different stressors at different points of the semester and therefore during participation in the study. For example, Brissette, Scheier, and Carver (2002) found that perceived stress was higher at the end of the semester as opposed to the beginning of the semester, but the researchers did not assess perceived stress at the midpoint of the semester. Furthermore, students who signed up to participate in the study at the beginning of the semester may be different from students who signed up to participate at the end of the semester, who have fewer options to choose from to obtain credit and therefore may not have chosen this study because it was interesting or personally relevant. Future studies should standardize the point in the semester in which students participate in the intervention.

Finally, participants were sent daily links to the diary that they were to complete online that day. Despite being instructed to only complete the link sent to the student on that particular day, many students completed two diary entries on one day after having missed the previous day. For the purposes of the study, a participant was counted as having missed a

diary if the student did not complete the diary within 24 hours of having completed the previous diary entry. This may have impacted the results because students did not participate in study activity as scheduled. Those participants who completed multiple daily measures in one day did not complete the measures and intervention as intended and may not have received the benefit the intervention offered over time. Furthermore, completing measures haphazardly may also be indicative of a lack of investment in the study. Future studies should consider only allowing students to access the website once per 24 hour period.

Summary and Future Directions

Future studies could improve upon the current study by including measures of emotions that focus on the emotions targeted by the current intervention. The current study asked participants in the positive emotion cultivation intervention to write about three good things in their life. This may target positive emotions such as gratitude, appreciation and contentment and a measure specifically targeted at those feelings might be a better indication of the effects of the intervention. Additionally, the current study did not test for motivation to complete the intervention and future studies should consider measuring for motivation. The current study also did not take full advantage of the richness of the narratives provided every third day by the intervention group. Future research should examine the writing assignment and code for meaningfulness in completion. Future research could code for sincerity and depth in the narratives in order to examine the impact of the intervention when the intervention is meaningful to the participant.

The current intervention also aimed to improve distress over health symptoms and health behaviors. Future studies could specifically target health outcomes. In the current study, the proposed mechanism to improve health outcomes was that as a result of an upward

spiral of positive emotions, physical health would improve. This would occur because positive emotions would “undo” the effects of negative emotions (Fredrickson et al., 2000). It was also hypothesized that participants in the positive emotion cultivation intervention would engage in more healthful behaviors, thus also improving physical health. However, participants in the intervention group did not differ from those in the control group on these measures. Future studies should consider targeting health in the intervention. For example, participants could describe three healthy activities they engaged in that day and how it made them feel. This may increase appreciation for their healthy behaviors and positive feelings about healthy behaviors and, thus, may improve health behaviors and physical health.

The current study was administered over the Internet, but did not take full advantage of the benefits of Internet interventions. For example, Atkinson and Gold (2002) described one potential benefit as the ability to tailor the communication to the individual participant. Participants’ names could be included in the communication, or the website’s appearance could be tailored based on personal preferences. Additionally, the use of interactive elements such as audio could be incorporated to keep up interest in the intervention. These additions might improve motivation and completion rates if included in future studies. Furthermore, the future studies should consider limiting the number of times a participant can access the website to once per day so that participants do not complete multiple measures and interventions in one day after having missed the previous day.

Due to limitations of the study population, additional research will be necessary to establish the efficacy of the intervention in different populations. Previous research on the efficacy of the “three good things” intervention has been conducted on college students and participants who were members of the authentic happiness website. Given that the

intervention appeared to reduce depressive symptoms and anxiety, this intervention may be of importance for those with chronic conditions who are experiencing serious psychological distress, such as individuals who are dealing with chronic illnesses and individuals dealing with traumatic events. Shih and Simon (2008) found that serious psychological distress was experienced by 28% of disabled individuals and by 14% of those who rated their health as fair or poor. Serious psychological distress included items such as nervousness, restlessness, hopelessness, and feeling “so sad that nothing could cheer me up.” Therefore, as higher levels of serious psychological distress were associated with poorer ratings of health-related quality of life (Shih and Simon, 2008), an intervention such as the one examined in the current study may impact health-related quality of life.

Another specific population that might benefit from an intervention to cultivate positive emotions is individuals dealing with breast cancer. Previous research has indicated that negative psychological outcomes experienced by cancer survivors include anxiety, depression, uncertainty, and symptoms of PTSD (Alter et al., 1996; Cordova, 1995; Cordova, 2000; Deimling et al., 2002; Gil et al., 2004; Thomas et al., 1997; Zabora et al., 2001). Additionally, research has shown that experiences of these symptoms do not decrease over time (Andrykowski et al., 2000; Gil et al., 2004). The “undoing” hypothesis proposed by Fredrickson (2000) suggests that experiencing positive emotions can help to undo the effects of negative emotions and help to build an individual’s personal resources, which may be particularly beneficial to cancer survivors.

In summary, the online intervention that aimed to cultivate positive emotions reduced self-reported measures of depressive symptoms and anxiety. Depressive symptoms and anxiety may be of particular importance in the college population. Furthermore, the

intervention impacted men and women differently on emotional outcomes, specifically the measure of anxiety. When examining the results for each gender separately, the intervention impacted anxiety in women, but did not statistically impact anxiety in men. When looking at men only, the intervention impacted depressive symptoms and positive emotions, however, this gender difference may not have shown up in the overall ANCOVA analyses due to the disproportionate number of women in the sample. Future research should also be conducted on non-college populations. Specifically, the intervention may be beneficial for individuals dealing with trauma, chronic stress, or chronic illnesses such as breast cancer. Additionally, the intervention should be modified to include a focus on health outcomes by asking participants about health promoting behaviors they have engaged in and how that has made them feel.

Table 1

Summary of Adjusted Means and Standard Deviations and Results of the Analysis of Covariance by Group (Intervention and Control Group) for all Outcome Measures

	Intervention		Control		ANOVA Results	
	Adjusted Posttest Means	Posttest SDs	Adjusted Posttest Means	Posttest SDs	F	p
Depressive Symptoms	34.24	(9.07)	36.01	(11.53)	3.86	0.05
State Anxiety	36.98	(8.57)	45.73	(9.77)	7.10	0.01
Positive Mood	19.51	(8.31)	16.93	(7.68)	1.98	<i>ns</i>
Negative Mood	5.18	(3.94)	5.22	(4.65)	0.01	<i>ns</i>
Health Symptoms	15.72	(11.86)	19.01	(10.75)	0.56	<i>ns</i>
Health Behaviors	21.41	(4.25)	24.91	(4.64)	0.56	<i>ns</i>

**Note: df = 1*

Table 2

Summary of the Results for the Analysis of Covariance by Group (Intervention and Control Group) and Gender for All Outcome Measures

Source	F	p
Depressive Symptoms	5.13	0.03
State Anxiety	0.58	<i>ns</i>
Positive Mood	1.86	<i>ns</i>
Negative Mood	2.40	<i>ns</i>
Physical Symptoms	0.57	<i>ns</i>
Health Behaviors	0.52	<i>ns</i>

**Note: df = 1*

Table 3

Summary of the Results for the Regression Analyses (Intervention group only) with Number of Intervention Days Completed and Pretest Measures Predicting Posttest Measures

Source	β	p	t	SE
Depressive Symptoms	0.26	0.07	-1.85	.48
State Anxiety	0.08	0.54	-.61	.49
Positive Mood	0.07	0.64	-.47	.46
Negative Mood	0.24	0.10	.99	.17
Physical Symptoms	0.20	0.18	-1.36	.63
Health Behaviors	0.12	0.32	1.02	.22

Table 4

Summary of the Results for the Regression Analyses (Women in the Intervention Group Only) with Number of Intervention Days Completed and Pretest Measures Predicting Posttest Measures

Source	β	p	t	SE
Depressive Symptoms	-0.23	0.15	-1.48	.52
State Anxiety	-0.05	0.77	-.29	.57
Positive Mood	-0.08	0.70	-.39	.66
Negative Mood	-0.28	0.10	-1.69	.30
Physical Symptoms	-0.12	0.52	-.65	.79
Health Behaviors	0.03	0.81	.24	.27

Table 5

Summary of the Results for the Regression Analyses (Intervention and Control Group) with Number of Days Completed and Pretest Measures Predicting Posttest Measures

Source	β	p	t	SE
Depressive Symptoms	-0.25	0.006	-2.07	.169
State Anxiety	-0.04	0.63	-.541	.17
Positive Mood	-0.07	0.49	-.02	.17
Negative Mood	-0.34	0.001*	-2.02	.10
Physical Symptoms	-0.03	0.80	-.82	.22
Health Behaviors	0.05	0.56	.86	.08

Table 6

Summary of the adjusted means for the last three days of daily diaries and results of the analysis of covariance by group using the aggregate of the last three days as outcome measures

Source	Intervention		Control		ANCOVA	
	Adjusted Means	SDs	Adjusted Means	SDs	F	p
Positive Mood	17.31	7.23	17.43	7.41	1.50	0.23
Negative Mood	3.98	2.54	3.96	3.44	0.02	0.88
Health Symptoms	6.79	11.47	7.64	3.53	0.7	0.40
Health Behaviors	27.07	3.40	20.33	8.30	0.58	0.45

Figure 1

Mediated Moderation Model for the Effect of Positive Affect on the Relationship between Stress and Health Outcomes

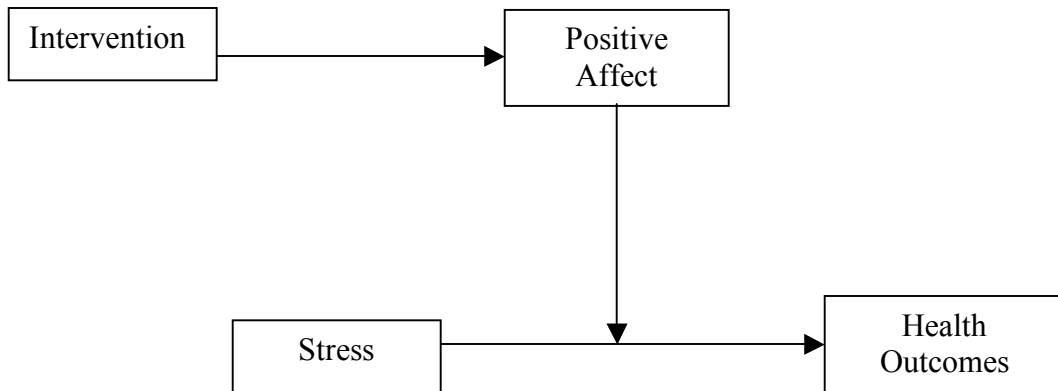


Figure 2

Participant count of days not completed of the 36-day study

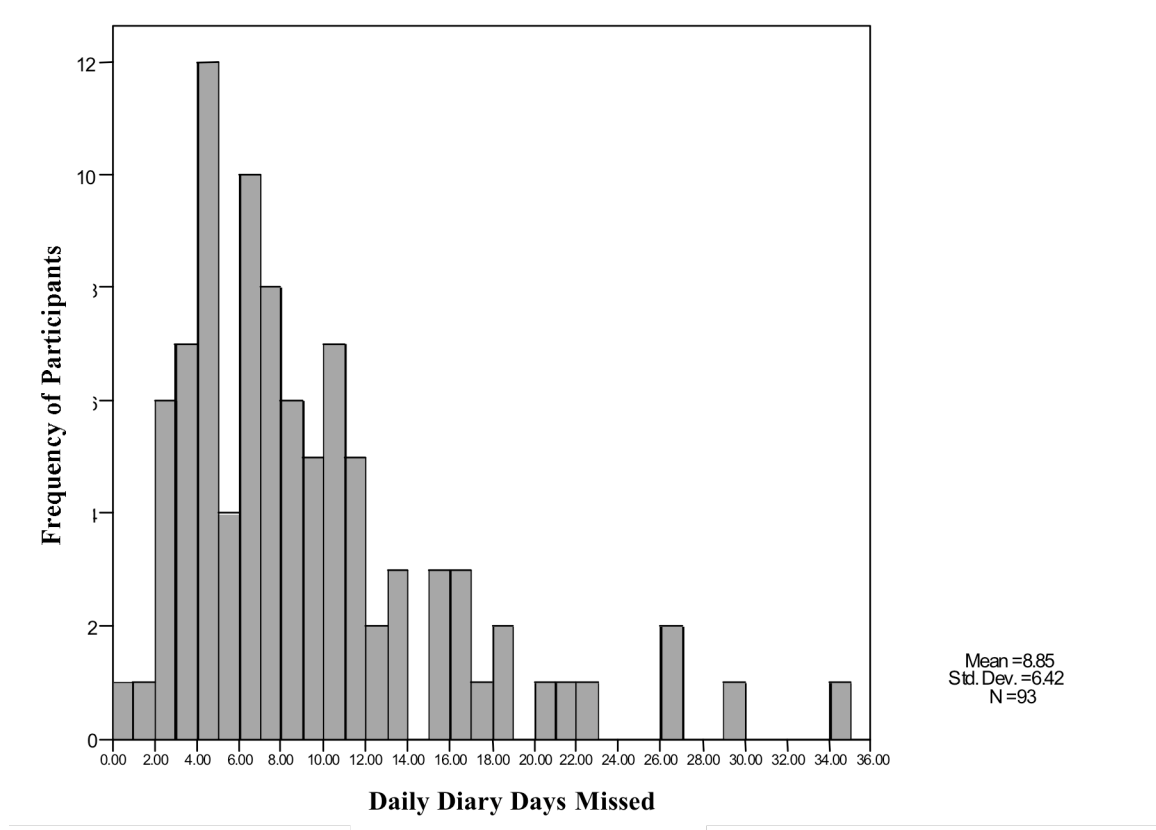


Figure 3

Days of intervention missed within the intervention group

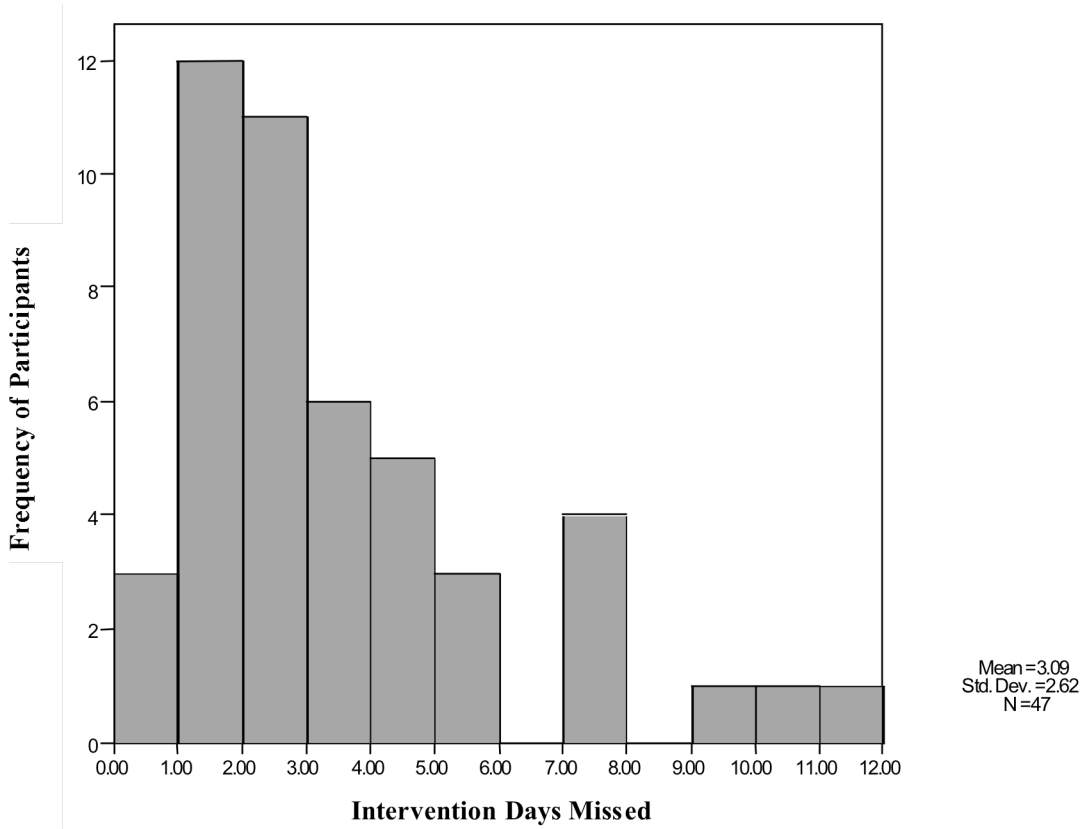


Figure 4

Mean positive mood by group over the 36 daily diaries days

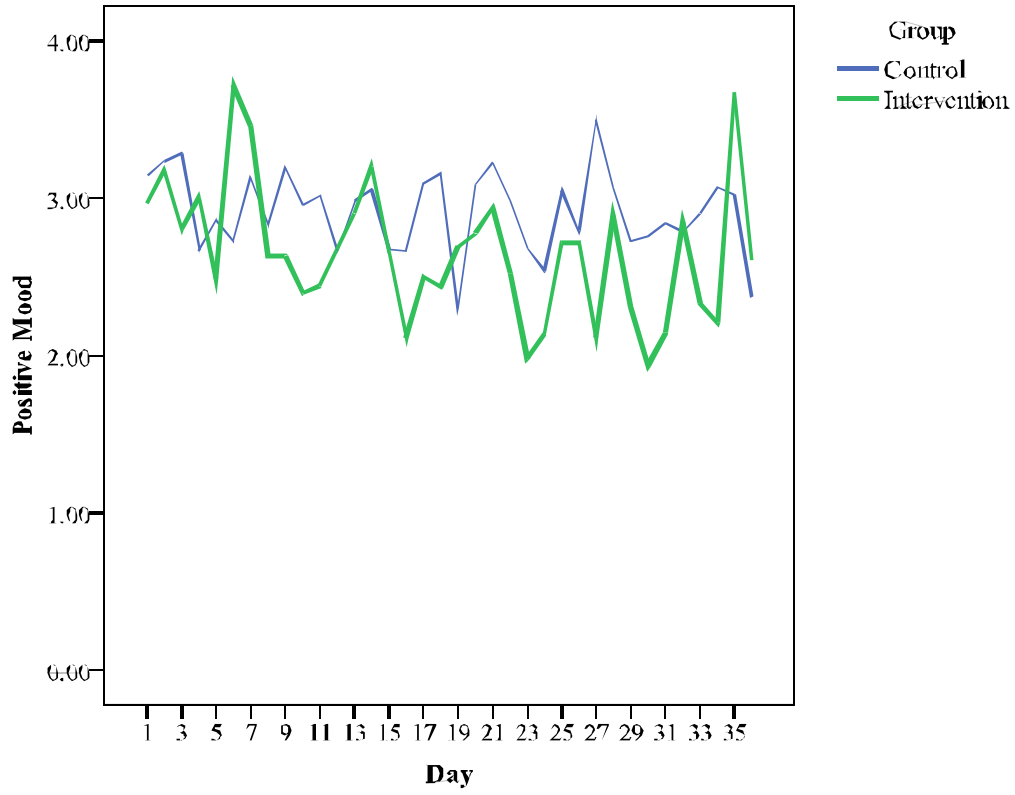
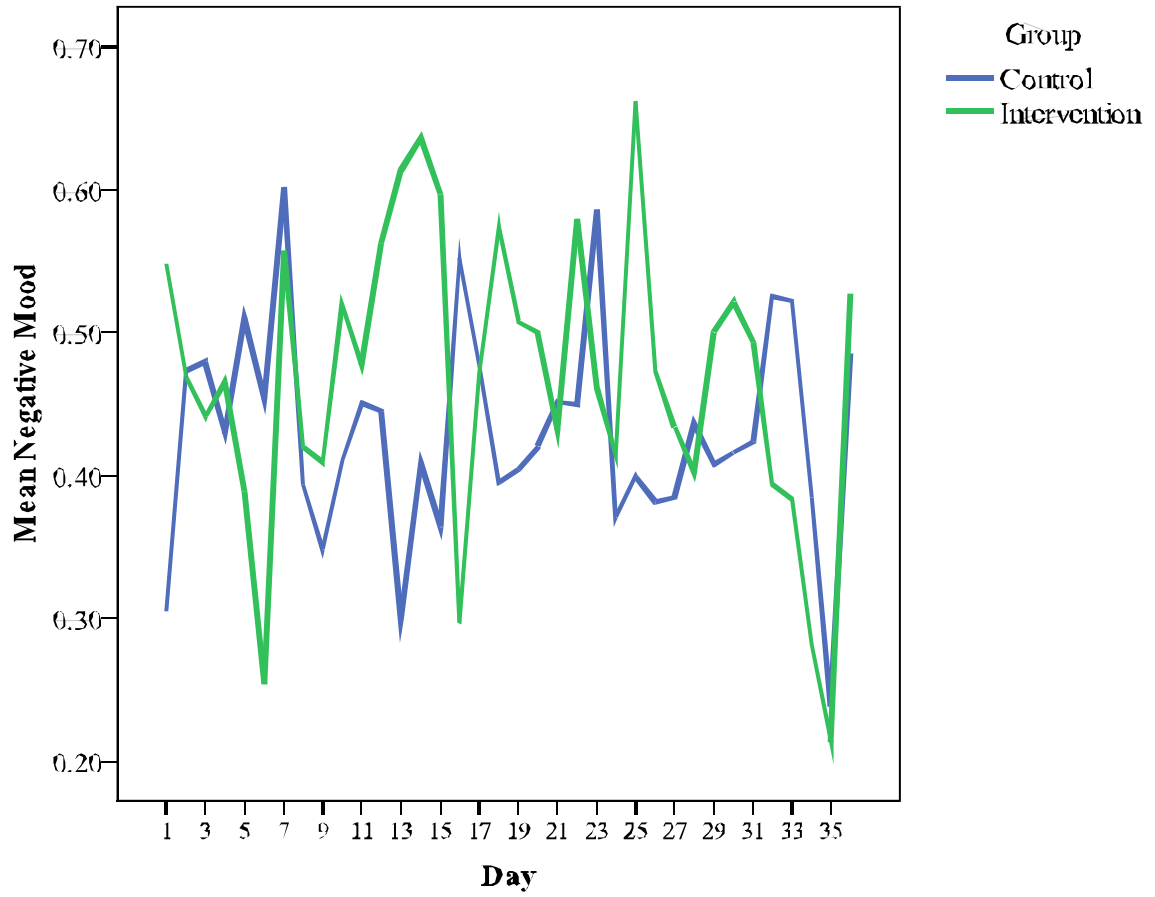


Figure 5

Mean negative mood by group over the 36 daily diaries days



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