# Positive Emotions' Effect on Buffering and Creativity: An Experimental Design

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**Abstract**

Extending beyond the Undoing Hypothesis and the Broaden-and-Build theory, this experimental design tested whether participants induced with a positive emotion would respond less, using self-report measures, to a mild achievement and social stressor compared to those in a neutral condition. Compared to a neutral condition, participants induced with a positive emotion reported enhanced positive affect. However, participants in the positive condition compared to participants in the neutral condition did not demonstrate any differences in their emotional response to a mild stressor of listing words that begin with a "J" for two minutes while being recorded. Results failed to yield conclusive evidence of buffering, but successfully induced positive affect as well as induced a mild stressor. Additional data suggests that participants induced with a positive emotion listed more J-words during the stressor task, thereby supporting the Broaden-and Build theory. Suggestions for further research include analyzing responses to different stressors that are more sensitive to creativity and cognitive flexibility as well as exploring how trait based optimism rather than emotionally induced positive emotions may act as a buffer.

Keywords: emotion blunting, buffering, Broaden-and-Build theory, positive mood induction, stressor

**Positive Emotions' Effect on Buffering and Creativity: An Experimental Design**

Emotions serve adaptive functions that allow humans to interact with the environment in distinctive and valuable ways. Though humans experience several unique positive and negative emotions throughout the day, emotional responses are not derived from the absence or presence of specific stimuli; rather, one's appraisal elicits a particular emotion (Smith & Lazarus, 1990). Appraisal is defined as one's cognitive evaluation of the significance of a situation in terms of well-being with respect to motivational relevance, congruence, and coping potential. For example, appraisal theory suggests that the presence or absence of a man dressed in dark clothing in a dark alley does not itself evoke an emotional response. Rather, it is the individual's appraisal that the man in the dark alley is a threat to his or her physical well-being coupled with the individual's belief that he or she cannot cope well with the threat that elicits a fear response. With regards to positive emotions, happiness is associated with high motivational relevance and congruence, high self-accountability for a benefit, and high coping potential (Smith & Lazarus, 1990). These appraisals differ from the expected appraisals for negative emotions like sadness, which have high motivational relevance, low congruency, high self-accountability, and low coping potential. The opposing appraisals of congruence and coping potential are hypothesized to blunt, or counteract, one another. A study by Winterich, Han, & Lerner (2010) specifically studied the blunting effects of two negative emotions with differing appraisals, namely sadness and anger. Findings suggest that experiencing one emotion followed by another emotion with conflicting appraisals can result in the minimization of affective response. This particular study found that anger blunts sadness, and conversely sadness blunts anger (Winterich, Han, & Lerner, 2010). Winterich, Han, and Lerner (2010) hypothesized that the differences in the appraisal of other responsibility versus situational responsibility served as the mechanism for the observed

blunting effect (Smith & Ellsworth, 1985). Some cognitive schemas like "belief in a just world" have also been found to buffer against anger, presumably by preventing the appraisal of a situation as unfair (Dalbert, 2002).

Negative emotions have generally been the focus of emotion research partly because the current medical model is disease-oriented, with a focus on treating and alleviating illness. However, the emphasis on preventative healthcare and positive psychology has encouraged research on discrete positive emotions. The following examination of the current body of knowledge in positive emotions will provide a rationale for an experimental study that utilizes positive emotions to buffer against stress.

## Understanding Positive Emotions

The literature suggests that negative emotions elicit specific action tendencies, whereas positive emotions do not always have a predictable, active response (Fredrickson, 1998; Fredrickson, 2001). Negative emotions often occur in response to urgent problems or objective threats that require an immediate response. In contrast, positive emotions can lead to several different response behaviors, according to the Broaden-and-Build framework. For example, fear typically leads to the desire to run and hide. In contrast, happiness has no singular universal behavioral urge. There are a variety of responses to happiness, many of which may build one's resources through behaviors that increase social support, creative problem-solving, resilience, skills, and knowledge (Cohn & Fredrickson, 2009). For example, when one is happy, one might go out with friend to a fun concert. While going to a concert with a friend has no immediate survival value, this action builds a positive social relationship and might increase one's curiosity about music. If such novel actions are continued when one is happy, a long-term friendship is developed, which can provide long-term social support. If the concert sparks increased interest

and study of music, one gains not only knowledge but also musical skills. Fredrickson and colleagues' (2001) study used video clips to induce one of five emotions: joy, contentment, fear, anger, and a neutral condition. Findings indicated that participants induced with positive emotions like joy listed more possibilities for what they wanted to do at the moment revealing that positive emotions have several action tendencies and can lend to creativity. The broadening of one's thought-action repertoire through positive emotions can then build physical, intellectual, and psychological resources through the pursuit of novel and creative solutions as well as alternative responses (Fredrickson, 1998; Fredrickson, 2001).

Besides broadening-and-building thought-action repertoires, positive emotions are hypothesized to be able to undo the effects of negative emotion based on physiological measures in what Fredrickson, Mancuso, Branigan, & Tugade (2000) refer to as the Undoing Hypothesis. Fredrickson and colleagues' (2000) experiment demonstrated that positive emotions are correlated with a faster physiological recovery after a negative emotion induction, thereby "undoing" the lingering effects of negative emotions. In a follow up study, Tugade, Fredrickson, & Barrett (2004) asked participants to prepare a one-minute speech for a presentation that was to be evaluated by their peers in an effort to induce anxiety and stress. Participants were then shown video clips that elicited amusement, contentment, and no emotional response. Participants in the two positive induction conditions, namely amusement and contentment, exhibited faster cardiovascular recovery after the stress-induction than participants in the neutral (no emotional response) or negative (sadness) induction condition (Tugade, Fredrickson, & Barrett, 2004). Additionally, self-reported positive affect as assessed through the Positive Affect Negative Affect Scale (PANAS) led to participants recovering more quickly from the stressor.

Building upon the Undoing Hypothesis, in which positive emotions act as a response system to bring the body's physiological measures to homeostasis, the concept of buffering suggests that when a positive emotion is first induced, it may be able to *prevent* the effects of a negative emotion. For example, if a person just received a big promotion at work, encountering traffic on the way home may not cause as much stress as compared to being stuck in traffic after an average day at work.

Research has also indicated that positive emotions and optimism can act as protective buffers with respect to health, as indicated by studies of immune system functioning (Mahoney, Burrough, & Lippman, 2002); heart disease (Middleton & Byrd, 1996); stroke (Ostir, Markides, Peck, & Goodwin, 2001); diabetes and hypertension (Richman, Kubzansky, Maselko, Kawachi, Choo, & Bauer, 2005); and even the common cold (Cohen, Doyle, Turner, Alper, & Skoner, 2003). In a study on susceptibility to the common cold, participants were measured on their feelings of vigor, well-being, calmness, depression, anxiety, and hostility. Then, participants were administered a shot of the rhinovirus germs that cause colds (Cohen, Doyle, Turner, Alper, & Skoner, 2003). Participants who scored low on the positive emotion style assessments were three times more likely to get sick than those who scored high on the assessments. Optimism has also been associated with better health outcomes, as demonstrated by research on cardiac health (Agarwal, Dalal, Agarwal, & Agarwal, 1995; Kubzansky, Sparrow, Vokonas, & Kawachi, 2001; Rozanski & Kubzansky, 2005; Scheier, et al., 1999) and atherosclerosis (Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004). Positive affect also was a protective factor against negative affect in reaction to pain caused by rheumatoid arthritis (Zatura, Johnson, & Davis, 2005; Strand, Zatura, Thoresen, Odegard, & Uhlig, 2006). While the aforementioned studies provide correlational and experimental evidence of the clinical benefits of an optimistic

disposition, additional research must explore if this evidence links to optimism as a static disposition or fluid emotion state. Linking such health benefits to more ephemeral positive emotions that can be induced may lead to therapies and interventions that induce positive moods rather than therapeutic attempts to change dispositional traits or cognitions. The proposed study intends to explore whether or not inducing positive emotions would reduce the effect of a subsequent mild stressor in an experimental setting in contrast to the long-term correlational benefits found in previous research.

Positive emotions have also been found to increase coping potential and to buffer against depression (Tugade, Fredrickson, & Barrett, 2004; Seligman, Schulman, DeRubeis, & Hollon, 1999). In a study of caregivers whose partners recently died of AIDS, those who used a larger number of positive-emotion words in narratives of the situation taken at 2 weeks, 1 month, and 1 year during the grieving process were found to be in a less depressed mood (Stein, Folkman, Trabasso, & Richards, 1997). Coping strategies related to the elicitation and maintenance of positive emotions help buffer against stress and depression by interrupting prolonged and intense negative affect (Folkman & Moskowitz, 2000). A study by Fredrickson and colleagues (2003) found that experiencing positive emotions in the weeks after the 9/11 attacks buffered against depressive symptoms in college students (Fredrickson, Tugade, Waugh, & Larkin, 2003).

More recent research (Lee Pe & Kuppens, 2012; Winterich, Han, & Lerner, 2010) provides promising initial evidence for buffering on a moment-by-moment basis, also referred to as emotional blunting. In addition to emotional blunting, mood spillover from one domain or situation to another can heighten or lower the threshold for experiencing subsequent emotions. Lee Pe & Kuppens (2012) hypothesize that the mechanism for this phenomenon is valence overlap or appraisal overlap. Using experience sampling, Lee Pe and Kuppens (2012)

demonstrated augmentation of emotional experience among similar valence emotions and blunting of emotional experience among opposite valence emotions. According to the appraisal tendency framework, (Lerner & Keltner 2000) each emotion triggers a cognitive predisposition to appraise future events similarly through the appraisal lens of the initial emotion. Additionally, Lee Pe & Kuppens (2012) found that experiencing a specific positive emotion predicts a decrease in the experience of a negative emotion at the next point in the experience sampling. However, the experience sampling design did not experimentally manipulate emotion states; thus, findings of the study cannot be considered causal.

The current body of knowledge lacks research on buffering on a moment-to-moment basis in a controlled laboratory setting for positive to negative emotions and relies heavily on correlational data. Current knowledge demonstrates how a generally positive disposition can buffer against negative stressors as measured by health outcomes. However, no data exists regarding if induced positive emotions will yield the same protective factors as positive disposition. Buffering has also mostly been measured with regards to physiological responses such as susceptibility to illness rather than subjective well-being. Though buffering research has been conducted on different populations, the populations have been small and rather specific, such as veterans in a hospital that are susceptible to heart conditions (Kubzansky, et al., 2001) or college-students who witnessed the attacks on 9/11 (Fredrickson, 2003). Though previous attempts by this lab to capture the buffering phenomenon experimentally induced positive emotions, results failed to provide causal evidence of buffering likely because the intensity of the positive emotion induction was not comparable to the intensity of the stress induction (Bauman, 2011). The stress induction in the aforementioned experiment was particularly overwhelming and stressful as participants were prepared for singing a popular song in a public place in front of

their peers. The magnitude of this stressor was hypothesized to dwarf and potentially wipe out the buffering effects of the mood induction. By building off this previous experiment, this study intends to remedy the gap in the knowledge by testing the buffering hypothesis through self-report scores and physiological responses. This study assessed the ability of a strong positive mood induction to blunt the mild stressor of a timed two-minute challenge of listing as many words that began with the letter J as possible. While Fredrickson et al. (2000) provided evidence of the benefits of positive emotion on a moment-by-moment basis after a stress induction, studies have not explored the benefits of positive emotion on a moment-by-moment basis *before* stress induction.

According to the two models of buffering, buffering may occur when a person is expecting a stressful event by preventing a stressful appraisal of the situation. Buffering may also occur between the experience of a stressful event and the pathological outcome by eliminating the stress reaction or limiting the psychological and physiological impact of a stressful event (Cohen & Wills, 1985). The goal of this study was to induce participants with positive (or neutral) emotions that were followed by a stressful event in order to record results between the stressful event and the observed response to the stressor. The present study tested the buffering hypothesis that positive emotion induction prior to a stressful event can decrease self-report assessment of negative affect or prevent the participant from appraising the stressor as a threat, thereby also reducing negative affect. Self-report measures as well as physiological data were collected at baseline, following the mood induction, and following a mild stressor. Additionally, data of the outcome measures of the stressor task (which consisted of listing as many words starting with the letter "J" as quickly as possible), were also collected to lend support to the Broaden-and-Build theoretical framework. In line with past findings (Fredrickson 1998;

Fredrickson 2001), the induction of positive affect can increase creativity in such tasks, causing participants in the positive condition to more readily list J-words.

## Overview of the Study

The primary study used self-reported data of subjective emotion at baseline, post mood induction, and post stressor. The central study required the use of a strong mood induction to induce happiness *(Positive)* or no emotion (*Neutral).* Additionally, the central study required a mild stressor task. In order to conduct the study, both a mood induction and stressor required validation. While the design and results of the central study will be outlined in detail further below, the three pilots to validate the mood induction and stressor will first be briefly outlined.

## Pilot 1

Twenty Vanderbilt University students between the ages of 18-25 participated in *Pilot 1*, which was posted as a 90-minute study, worth 3 credits on the SONA system (an experiment management system through which students sign up to participate in experiments in exchange for course credit). Participants were attached to physiological equipment and asked to fill out the DEAL (Discrete Emotional Adjective List) to determine a baseline for 33 discrete emotions. A more detailed description of the DEAL measure can be found in the *Apparatus and Measures* section of *Main Study Methods*. In the positive emotion induction, the experimenter returned after the five-minute baseline and told the participant that the lab had been very efficient in data collection and only required data for shorter pilot studies, so the experiment would end about an hour earlier than scheduled. Participants were told that they would still receive all 3 listed SONA credits even though the experiment would last no more than 30 minutes. In the neutral condition, the experimenter returned after baseline and confirmed with the participant that study was listed as 3 SONA credits and would take 1 hour and 30 minutes to complete. Participants were then

instructed to fill out the previously administered DEAL survey to determine if any mood change occurred.

**Results**

Results indicated that all but one of the 33 emotions measured yielded no significant difference between the neutral condition and positive condition post mood induction when controlling for baseline. The only significant difference between participants in the positive condition ($M$=12.4) and participants in the neutral condition ($M$=41.3) post mood induction when controlling for baseline was that participants in the neutral condition were significantly more nervous $F(1,17)=2.52$, $p<.05$). Especially notable is that the mood induction failed to yield a significant difference in the relief ratings for the positive group ($M$=59.70) compared to the neutral group ($M$=46.40) when using baseline scores as covariates, $F(1,17)=2.187$, $p=.158$, *ns.* Additionally, contrary to the expectation that participants would be surprised that the experiment would end early, there were no significant differences in ratings of surprise from the positive condition ($M$=4.20) to the neutral condition ($M$=7.30) when using baseline as a covariate, $F(1,17)=.597$, $p=.450$, *ns.* Most importantly, contrary to what one would expect in a successful positive mood manipulation, happiness ratings for the positive group ($M$=57.00) compared to the neutral group ($M$=53.70) when controlling for baseline had no significant differences, $F(1,17)=.047$, $p=.831$, *ns*. This mood induction was not considered a viable choice for the final experiment because of the lack of a significant increase in happiness for the positive group relative to the neutral group.

**Pilot 2**

To evaluate the effectiveness of an alternative positive emotion induction, 30 Vanderbilt University students between the ages of 18-25 participated in *Pilot 2* (*Positive=15; Neutral=15*).

The study was posted as a 90-minute study on SONA. The procedure for this pilot followed the same form as *Pilot 1* except an alternate mood induction was tested. After the five-minute baseline, participants were then told that they would need to complete a writing task. Participants in the positive condition listed three things that had made them happy in the past and were asked to elaborate on one experience of their choice. Participants in the neutral condition were asked to list 3 Munchie Marts (the local name given to convenience stores located in a number of dormitories and other buildings on campus) then elaborate with descriptive detail about one Munchie Mart. Participants in both conditions were then instructed to fill out the previously administered DEAL survey to determine any changes in mood.

This pilot tested whether a writing prompt requiring students to list three experiences of happiness and elaborate on one would result in increased positive affect. At baseline, there were no significant differences in happiness between those in the *Neutral* condition ($M$=51.400) and those in the *Positive* condition $M$ =53.800, $F(1,28)$=.116, $p$=.736*, ns*. Post-induction analyses, using baseline ratings as a covariate to isolate the effects of the induction, indicated that the manipulation was effective since there was a significant increase in the happiness scores of participants in the positive condition ($M$=74.80) compared to participants in the neutral condition $M$=58.80, $F$(1,28)= 7.457, $p$=.01. The findings suggest a moderate to strong mood induction with an effect size of $d$=0.69. *Figure 1* illustrates the changes in happiness from pre to post mood induction for both conditions.

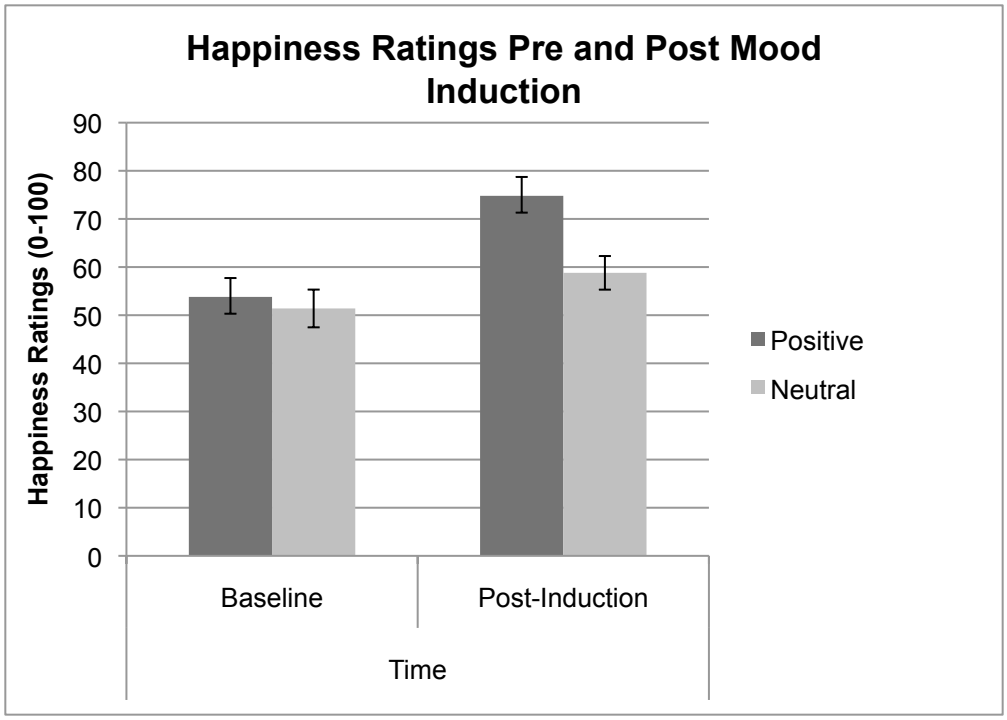


*Figure 1.* Mean Scores for "Happy" Pre and Post Mood Induction. This figure illustrates the significant increase in happiness ratings after the positive mood induction in the *Happy* group compared to the lack of a significant difference in happiness ratings for those in the *Neutral* condition.

**Pilot 3**

To evaluate the effectiveness of a mild stressor, 19 Vanderbilt University students between the ages of 18-25 participated in a 90-minute study posted to SONA. The procedure for this pilot followed the same form as *Pilot 1* except in place of a mood induction, a stress induction was tested. The experimenter returned after the five-minute baseline and told the participant that for the next 2 minutes, he or she would list as many words as he or she could think of that began with a "J." Participants were told that this task had been shown in previous research to be a good measure of verbal fluency, and this lab was interested in measuring physiological responses to this task. To further induce stress, participants were told that the average Vanderbilt undergraduate could list about 30 words. The experimenter indicated that she would record responses via tally and through recording software called Amadeus. After the stress

induction, the participant was asked to fill out another DEAL survey to determine if the J-word task was an adequate stressor.

**Results**

The purpose of this pilot was to validate the J-task as a stressor. If the J-task were an effective stressor, results would indicate an increase in negative affect such as an increase in disappointment, nervousness, irritation, defeat, embarrassment, feeling overwhelmed, and frustration. Results supported the efficacy of the J-task as a stress induction. After the J-task, participants were significantly more disappointed, $t(17)=4.36$, $p <. 01$; nervous $t(17)=4.17$, $p < .01$; irritated $t(17)=2.46$, $p < .01$; defeated $t(17)=3.78$, $p=.01$; embarrassed $t(17)=4.93$, $p <.01$; overwhelmed $t(17)=2.57$, $p =.05$; and frustrated $t(17)=3.65$, $p =.01$ . See *Figure 2* for all items that increased from pre- to post- stressor.

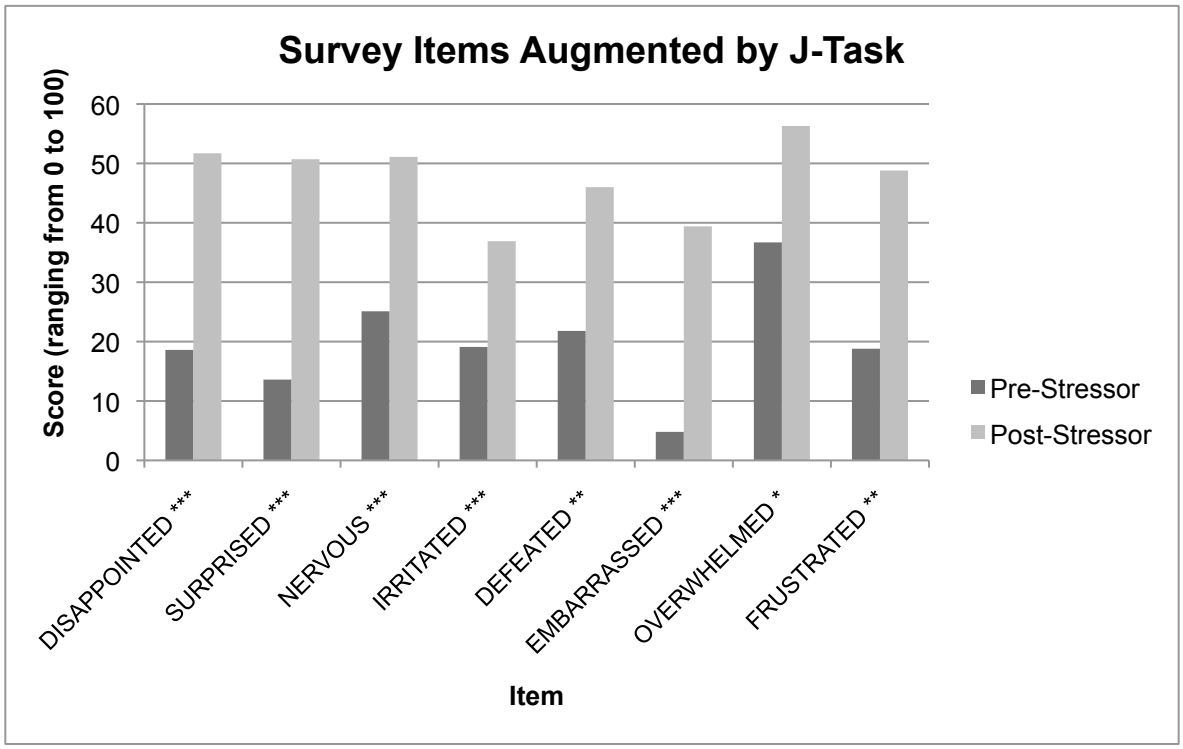


*Figure 2.* Survey Items Augmented by the J-task. This figure illustrates significant increases from pre-stressor scores to post-stressor scores.

Note: * significant at the $p = .05$ level; ** significant at the $p = .01$ level; *** significant at the $p < .01$ level.

If the J-task was an effective stressor, results would also indicate a decrease in positive affect such as a decrease in comfort, joy, tranquility, relief, pride, gratitude, amusement, curiosity, determination, satisfaction, hope, and eagerness. While not all of the aforementioned items decreased in the self-report data, several of these key items decreased significantly enough to indicate that the J-task was an adequate mild stressor for the purpose of the final experiment. Participants reported being significantly less proud $t(17)=-2.27$, $p=.05$; comfortable $t(17)=-2.55$, $p=.05$; grateful $t(17)=-3.09$, $p<.01$; curious $t(17)=-2.35$, $p<.01$; joyful $t(17)=-4.47$, $p=.01$; tranquil $t(17)=-5.52$, $p< .01$; satisfied $t(17)=-3.79$, $p=.01$; bored $t(17)=-3.17$, $p=.01$; and hopeful $t(17)=-3.28$, $p=.01$. Of the hypothesized items expected to decrease only relief, amusement, determination, hope, and eagerness did not yield significant differences after the stressor. *Figure 3* outlines the survey items that were reduced as a result of the stressor.

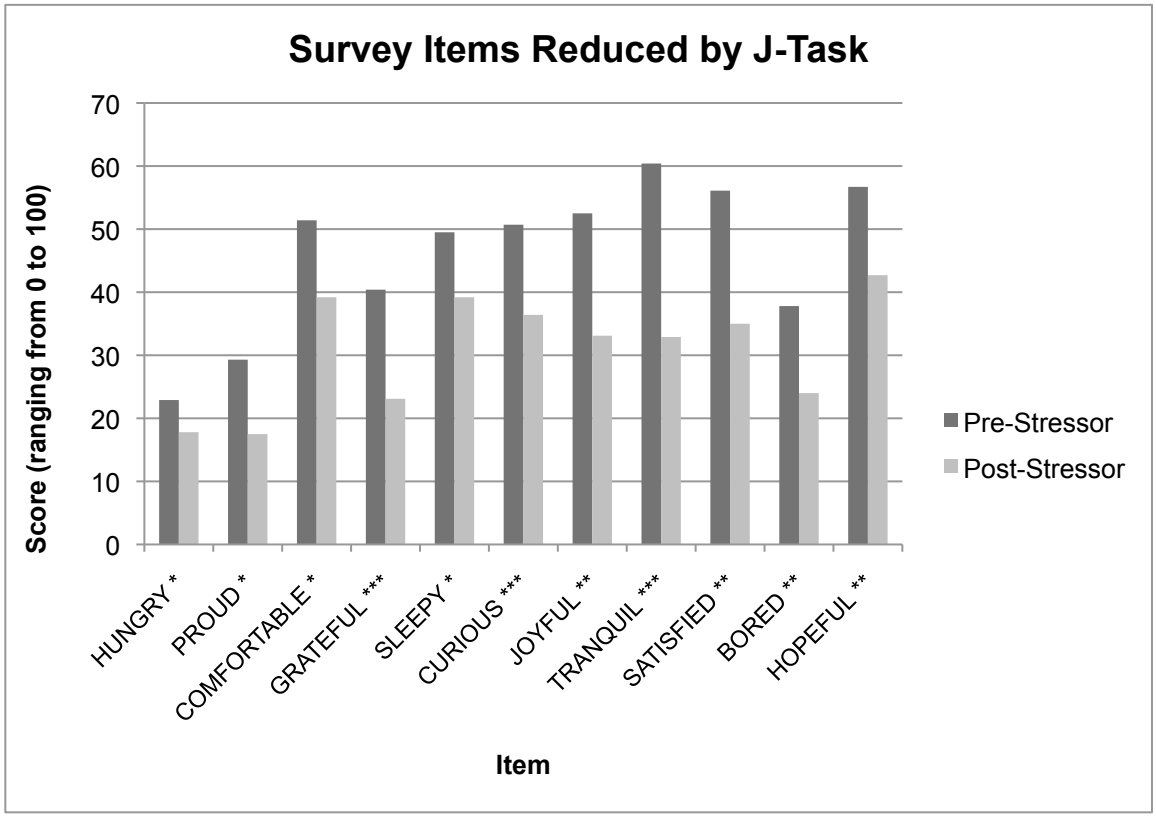

*Figure 3.* Survey Items Reduced by the J-task. This figure illustrates significant decreases from pre-stressor scores to post-stressor scores.

Note: * significant at the $p = .05$ level; ** significant at the $p = .01$ level; *** significant at the $p < .01$ level.

## Main Study Methods

The Institutional Review Board at Vanderbilt University approved all measures and procedures. All participants signed an informed consent at the beginning of the experimental session.

### Apparatus and Measures

**Research Electronic Data Capture (REDCap).** The full study required the use of a computer with Internet capabilities for the administration of surveys through REDCap (Harris, Taylor, Thielke, Payne, Gonzalez, & Conde, 2009). Study data were collected and managed using REDCap electronic data capture tools hosted at Vanderbilt University through Vanderbilt Institute for Clinical and Translational Research grant support **(UL1 TR000445 from NCATS/NIH)**. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

**The Discrete Emotion Adjective List (DEAL).** The DEAL, which lists groups of one to three adjectives associated with a particular emotion, asked participants to generate a single rating for each word group. The DEAL assesses 33 discrete positive and negative emotions on a sliding scale of 0-100, and instructs participants to move the slider to indicate how much they are feeling a certain cluster of emotions at any given time. See *Appendix A* for the DEAL used in this study. The DEAL was administered at baseline, post mood induction, and post stressor. A

combination of self-report and physiological methods was used in previous studies (Tugade & Fredrickson, 2004) to assess resilience as both a psychological and physiological phenomenon. This study used similar measures to provide self-report and physiological evidence of buffering. This experiment also used electrodes, which recorded skin conductance through the use of Windaq 200 software and physiological recording equipment. While it is noted here that these physiological data were collected, the data are still undergoing reduction and analysis, and thus will not be presented further in this thesis.

**Linguistic Inquiry and Word Count (LIWC).** REDCap was also used to administer the writing prompt mood induction based on branching logic in the survey. The writing samples were then exported to an Excel file and translated into a .txt file for analysis in LIWC (Pennebaker, Francis, & Booth, 2001). The LIWC2007 software was used to calculate the degree to which people used different categories of words. Specifically, this study assessed positive emotion words and negative emotion words in the writing sample using the Standard LIWC2007 dictionary. There were 405 words in the positive emotions category including terms like "happy," "pretty," and "good." There were 499 words related to negative affect in the negative emotions category including terms like "hate," "worthless," and "enemy." The total number of words in a specific category (e.g. positive emotion words) was divided by the total number of words in the writing sample and was reported as a percentage in LIWC's reports.

The experimenter also used pen and paper as well as a clipboard to record participant responses to the stressor of listing words that began with a "J." Additionally, Amadeus recording software on a Mac desktop was used to record sound files of participants listing J-words during the stressor task. Lastly, statistical analysis software such as SPSS and Microsoft Excel were used in the analysis of results.

**Participants**

Eighty-three students (74.7% female) at Vanderbilt University between the ages of 18-25 signed up for this study using the university research tool, SONA. The study was posted as a 90-minute study, worth 3 credits. Four participants were excluded from the data set for failing to follow the directions on the writing prompt mood induction. Participants were randomly assigned to one of two emotion induction conditions, Positive ($n$=38) or Neutral ($n$=41).

**Procedure**

Participants arrived at the lab, were seated in front of a computer, and were then provided with a consent form. The experimenter explained that the study would involve measuring physiological activity while the subject performed a variety of concrete and abstract tasks. The participant was then asked to read through the consent form and sign it after asking the experimenter any questions. The consent form was collected, and participants were instructed to wash their hands and scrub down their fingertips where skin conductance electrodes would be attached. Electrode skin conductance sensors were placed on the participants' index and ring fingers on their right hand at their second phalange. Physiological measures were recorded as an indicator of stress throughout the experiment by a computer located in a control room adjacent to the participant's room. This data is still undergoing analysis and will not be further considered in this study. The participant was then told to settle in while the experimenter indicated that she would be prepping items in the adjacent room. The experimenter indicated that she needed to get a few supplies ready and would return soon. The participant was left alone for 5 minutes to establish a physiological baseline by recording skin conductance on the physiological equipment. The participant was then asked to fill out a survey on the computer that consisted of questions from the DEAL intended to gather baseline emotion measures. The experimenter, however,

stated that the purpose of the surveys was to determine how the participant was perceiving their environment upon coming into the lab. Participants were told that this perception assessment would then be correlated with the physiological data. This masked the intent to collect data for emotions purely for noting changes in emotions caused by the mood manipulations. Participants were further told that they would respond to the same questionnaire at various points throughout the experiment in order to correlate changes in their perception to changes in the physiological data.

The experimenter then followed the procedures described in *Pilot 2* to induce a positive or neutral emotion state. The mood induction writing prompt was framed as a writing task. The participant then completed a DEAL survey, which would serve as the manipulation check for the mood induction. The participant was then stressed using the induction technique described in *Pilot 3*. The J-word stressor task was framed as a problem-solving task. After the stress induction, the participant was asked to fill out another set of the DEAL surveys previously administered to determine if the mood induction had persistent effects after the stressor was introduced. Each time the DEAL was administered, a continuous slider scale was used for all 33 elements that ranged from 0 (not at all) to 100 (very much). See *Appendix A* for the administered DEAL. As a final task, participants completed a series of surveys containing a variety of personality measures that go beyond the scope of this experiment. The final series of questionnaires was framed as another set of questionnaires about perceptions. The participant was then debriefed on the purpose of the experiment being to explore if positive mood inductions can buffer against stress responses. A complete script for the study is provided in *Appendix B* for reference.

Twelve measures were of primary interest for positive affect (relief, calm, determined,

gratitude, interest, hope, proud, amused, curious, happy, eager, and satisfaction) and were averaged into a composite positive affect score. The reliabilities for the raw data, for baseline, post-induction, and final scores were $\alpha$= .88, .91, and .93, respectively. Similarly, ten measures were of primary interest for negative affect (resignation, frustration, anger, boredom, anxiety, overwhelmed, fear, annoyed, embarrassment, and disappointment) and were averaged into a composite negative affect score. The reliabilities for the raw data, for baseline, post-induction, and final scores were $\alpha$=.83, .86, and .89, respectively.

## Results

The hypothesis was tested in a series of one-way ANOVAs at each of the three time points, namely baseline, post-mood induction, and post-stress induction. For the second and third time-points, measures at the previous time points were used as covariates to isolate the effects of the mood induction and stressor task, respectively. The condition of positive or neutral was the independent variable, while positive affect ratings and negative affect ratings served as the dependent variables. The total raw data set revealed that the average number of missing values was 4 for the total of 69 listed values per participant. The average percent of missing data from the total data set was 6.07%. The following analysis was conducted excluding fields where data was missing. As a result, the *df* associated with the error term varies from analysis to analysis due to missing data.

### Baseline Individual Emotion Analyses

At baseline, there was no significant difference in positive affect in the positive group compared to the neutral group, $F(1, 75)=.489$, $p=.486$, *ns.* At baseline, global negative affect was significantly higher in the positive condition ($M=18.55$, $SD=14.34$) compared to the neutral condition ($M=12.06$, $SD=8.17$), $F(1, 77)=6.21$, $p< .05$. As reflected in the global negative affect

reported above at baseline, students in the positive condition were specifically more frustrated (*M*=20.62), angry (*M*=9.05), overwhelmed (*M*=32.54), annoyed (*M*=17.05), and disappointed (*M*=18.63) than students in the neutral condition (all *F*s>74, with all *ps*<.05). Given that participants were randomly assigned to condition, and that participants in both conditions received the same treatment during the baseline period, this difference at baseline was unexpected. It is unknown why this baseline difference between the two conditions occurred.

**Post-Induction Individual Emotion Analysis**

Findings support the hypothesis that positive affect will increase post mood induction in the positive but not in the neutral condition when baseline is used as a covariate to isolate the effect of the induction. As predicted, following the mood induction, global positive affect increased significantly for those in the positive writing condition (*M*=56.161) compared to those in the neutral condition (*M*=42.640) when baseline was used as a covariate, *F*(1, 73)=45.946, *p*<.001. Contrary to the global positive affect scale, when controlling for covariates, there was no significant effect on relief between the positive (*M*=56.03) and neutral (*M*=47.91) conditions post induction, *F*(1, 61)=2.134, *p*=.149, *ns.* There was also no significant effect for calm between the positive (*M*=61.26) and neutral (*M*=60.59) conditions post induction, *F*(1,65)=.181, *p*=.672, *ns*. However, each of the other ten positive emotions contributing to the positive affect scale did show reliable differences (*p*< .05) between the positive and neutral conditions post-induction. As expected, when controlling for baseline levels of positive affect, after the induction, global positive affect was higher in the positive condition than in the negative condition. These results indicate that the mood induction successfully strongly increased overall positive affect in the positive condition but not the neutral condition. A larger effect size than reported in the pilot studies indicate this mood manipulation resulted in an even stronger mood induction, *d*=.86.

Post mood induction, however, showed no significant difference between the positive ($M$=12.633) and neutral ($M$=10.951) conditions for negative affect when baseline was used as a covariate, $F(1,76)=3.409$, $p$=.069, *ns*. This indicates that after the induction, differences observed between the two conditions at baseline were no longer evident, and the elevated negative affect in the positive group seen at baseline was no longer present. Positive condition participants reported less overall negative affect after the mood induction *(*$M$=12.633*)* than at baseline *(*$M$=18.546*),* $F(1, 72)=110.462$, $p<.001$. This finding reveals that the elevated negative affect in the baseline positive group, which was unexpected and unwanted, was dissipated by the mood manipulation. Though the global negative affect scale indicated that there was not a significant difference between the neutral and positive groups, students in the positive condition specifically reported significantly *less* boredom post-induction ($M$=20.97) compared to students in the neutral condition ($M$=34.34), $F(1,65)=6.526$, $p < .05$ and significantly *less* annoyance post-induction ($M$=9.62) compared to students in the neutral condition $M$=13.90, $F(1,75)= 6.670$, $p< .05$. In contrast, neutral condition participants reported approximately equal global negative affect *(*$M$=10.9514*)* after the writing prompt mood induction compared to ($M$=12.0619) at baseline, $F(1, 72)= 3.409$, $p< 1$, *ns*.

Further evidence indicates a successful mood manipulation. Students in the positive writing condition used more positive words in their short essays as determined by an LIWC analysis ($M$=5.29) compared to students in the neutral writing prompt condition ($M$=1.15), $F(1, 77)=105.6$, $p< .001$. However, findings also indicate that students in the positive writing condition also used significantly more negative words in their essays ($M$=.92) compared to the neutral condition writing prompt ($M$=.29) based on a LIWC analysis of the writing samples

F(1,77)=22.003, $p<.001$. However, the rates of negative words in both conditions is less than 1% of total words used, so this finding is not likely to have a major impact.

**Post Stressor Analysis**

Findings contradict the hypothesis that the J-task would elicit higher levels of global negative affect in the neutral condition compared to the positive condition when baseline and post-induction emotion measures are used as covariates to isolate the effects of the stressor task. Contrary to the hypothesis, the observed mean for negative affect in the positive condition *(M*=29.4126*)* was slightly higher than that observed in the neutral condition *(M*=26.5354). However this difference was not statistically reliable, $F(1,75)= .219$, $p= .641$, *ns.* These results are contrary to the hypothesis that participants in the positive condition would respond less to the mild stressor of the J-task. In accordance with this general finding that there was no differential response to the stressor between the two conditions, there were no differences observed for most of the negative emotions contributing to the negative affect score. However, there was one emotion that was differentially affected by the stressor in the opposite direction of the predicted effect. Specifically, when controlling for covariates, students in the positive condition were significantly more annoyed (*M*=29.97) than students in the neutral condition (*M*=22.58), $F(1,71)= 4.191$, $p<.05$, after the stressor.

As hypothesized, positive condition participants reported more overall positive affect (*M*=42.8260*)* than neutral condition participants *(M*=37.6684*)* after the stressor. Though manipulation of positive affect persists slightly from the mood induction manipulation, the two conditions do not change differentially in positive affect in response to the J-task stressor $F(1, 72)=.950$, $p< .333$, *ns* once baseline and post induction scores are used as covariates. Contrary to the results for global positive affect, when controlling baseline and post induction scores as

covariates, students in the positive condition reported significantly more surprise ($M$=45.13) than students in the neutral condition ($M$=30.00), $F(1,65)= 5.269$, $p<.05$ after the stressor task.

Thus, there were no enduring effects of buffering when controlling for covariates in baseline and post induction. *Figures 5* and *6* outline changes in means for positive affect and negative affect respectively, thereby revealing trends that people in the positive condition had greater global positive affect post mood induction. However, the two groups did not differentially respond to the stressor, thereby failing to provide evidence of buffering. These findings *contradict* the hypothesis that positive affect induced by the positive condition writing prompt would blunt the subsequent experience of a mild stressor.

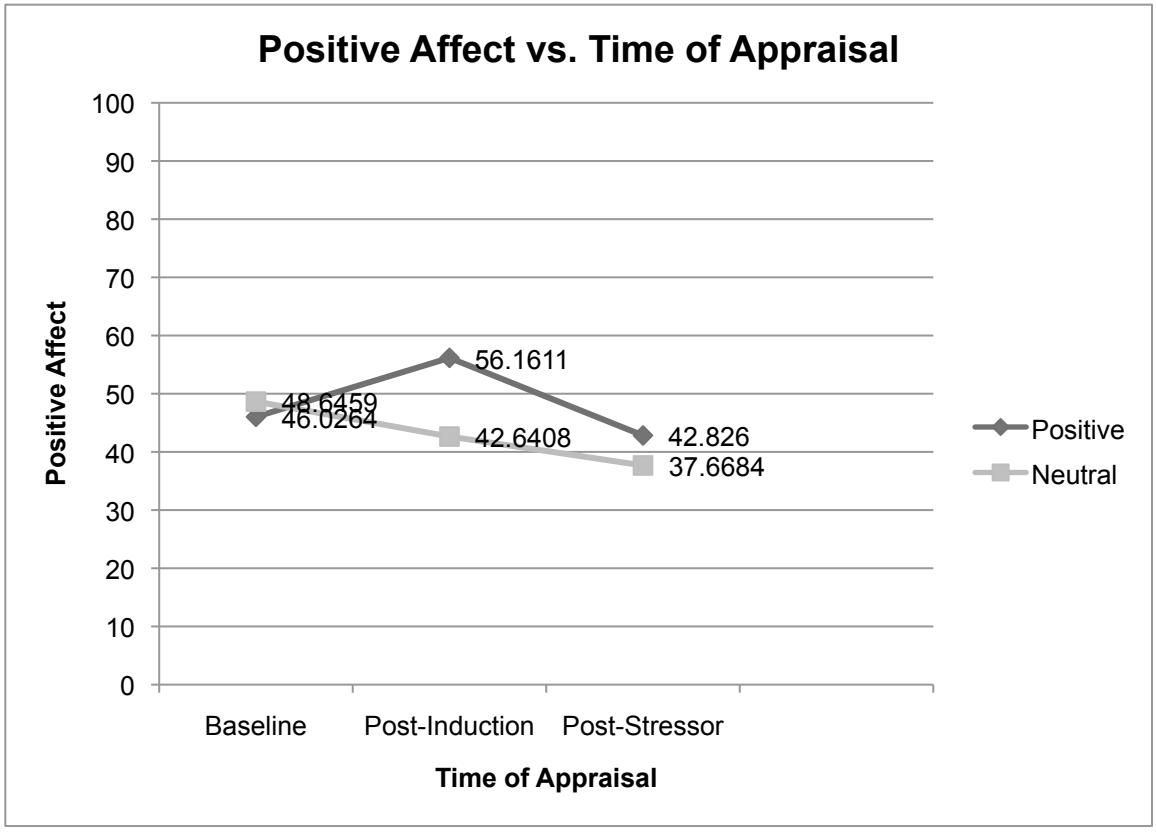


*Figure 5*. Positive Affect vs. Time of Appraisal. This figure illustrates changes in global positive affect for both the neutral condition and the positive condition at baseline, post-mood induction, and post-stressor.

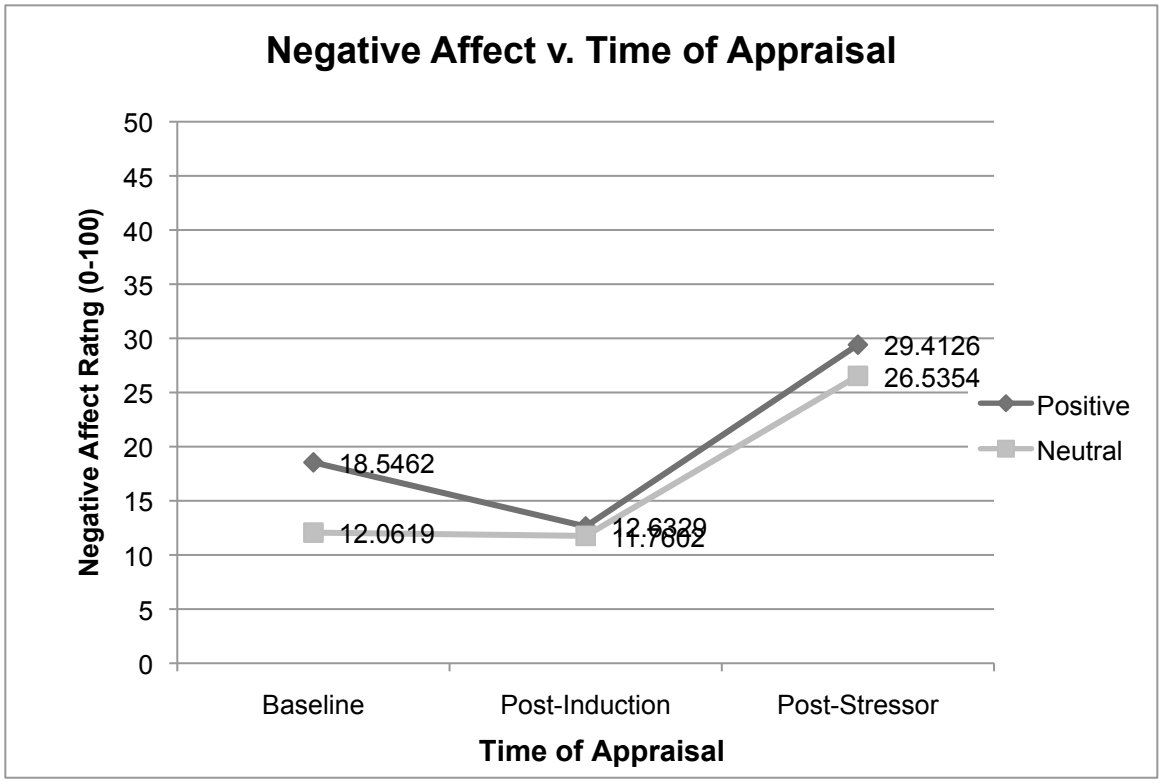


*Figure 6.* Negative Affect vs. Time of Appraisal. This figure illustrates changes in global negative affect for both the neutral condition and the positive condition at baseline, post-mood induction, and post-stressor.

**Behavioral Outcome Measures**

Additional analyses examined if positive affect would result in increased creativity in the stressor task of listing words that begin with the letter J. Findings from Fredrickson's (1998, 2000, 2001) studies indicate that participants induced with positive emotions listed more possibilities for what they wanted to do at the moment. Listing words that start with "J" draws on similar creative tendencies examined in the tasks used in Fredrickson's (2001, 2000) studies. Thus, in line with the Broaden-and-Build theory of positive emotions, one might expect that participants in the positive condition would perform better on the J-word task than participants in the neutral condition. The number of total J-words listed, the number of root words listed, and the average word length was tested by means of a one-way ANOVA. Condition (Positive or

Neutral) was the independent variable. The number of words listed and complexity, as measured by total number of unique root words and average word length, were the dependent variables. Results indicated that the mean for the total number of words listed for those in the positive condition was $M$=17.68 versus $M$=14.98 in the neutral condition, $F(1,77)=4.497$, $p<.05$. Students in the positive condition named significantly more words beginning with a J in the stressor task than students in the neutral condition. However, there was no significant difference between the positive group ($M$=12.58 words) and the neutral group ($M$=11.10 words) in the number of unique root words listed, $F(1,77)=3.00$, $p=.087$, *ns*. There was also no significant difference in the average word length of the J-words participants listed in the positive condition ($M$=5.24 letters) compared to participants in the neutral condition $M=5.37$, $F(1,77)=.596$, $p=.442$, *ns.* The finding that students in the positive condition listed more total J-words supports the Broaden-and-Build hypothesis by suggesting that that those in the positive condition were able to draw on more creative resources during the J-word task than were those in the neutral condition.

## Discussion

The results of the aforementioned study will contribute to the existing literature on buffering and emotion induction by providing an example of a successful positive mood induction that increased positive affect. The findings and methods of this work further provide a mild social and achievement stressor that can be used in other experiments. To date, a moment-by-moment analysis has not been conducted providing experimental evidence for buffering with positive to negative emotions, and the findings of this paper did not yield experimental evidence for buffering. Additional follow-up studies that capture the buffering phenomenon experimentally are required. The aforementioned study isolates the variable of positive emotion

to determine its effect on buffering in an experimental condition.

This study also provides evidence for the Broaden-and-Build theory that those in a positive mood are able to creatively list more words beginning with the letter "J" than those in a neutral emotion state. While this finding does not focus on increased action tendencies of participants in a positive mood as in the original research (Fredrickson, 2001), this finding adds to the Broaden-and-Build hypothesis by supporting that positive emotions increase both creativity and cognitive flexibility, which may in turn build long-term resources. For example, increased cognitive flexibility can result in being able to view situations from multiple perspectives, which in turn can aid with mediation of problems or even with daily tasks, like critical thinking when writing a paper.

**Limitations**

Major limitations of this study include a laboratory-induced stressor that may not translate into generalizable daily stressors. Additionally, this study does not examine the effects of the magnitude of the mood induction and stressor on buffering. Evidence in the behavioral measures of creativity in the J-word task suggests the positive mood induction was strong enough to affect self-reported mood and behavioral outcomes. Though a stronger positive induction and a weaker stressor may be more likely to yield evidence of buffering, the external validity of those findings would be very limited since the J-word task was already a mild stressor. Evidence of buffering with a milder stressor would not lend to many real-life situations and external validity. Findings suggest that the phenomenon of buffering is not robust enough to detect or may only occur for smaller portions of the population like those with very high emotional intelligence (EI). It is more likely that buffering against mild stressors is related to trait characteristics like strong optimistic disposition or cognitive schemas, like a belief in karma. For

example, Kubzansky, Sparrow, Vokonas, & Kawachi's (2001) series of cardiovascular monitoring experiments found that optimists were less likely than pessimists to suffer from heart attacks because consistent experience of positive emotions likely diminishes hyper-responsiveness and reduces the clinical adversity rate (Rozanski & Kubzansky, 2005). One method to test this hypothesis would be to group people with above average dispositional optimism scores in one group and determine if they differentially respond to stressors compared to those with below average dispositional optimism scores based on self-report mood data as well as behavioral outcomes. Also, although the script was specific (See *Appendix B*.), having six different experimenters could have led to increased variance in how the experiment was conducted, and thus, how participants responded in the lab.

With regards to the writing sample, a potential confound is the difference in writing sample length for those in the positive condition compared to those in the neutral condition. Those in the positive condition were more likely to write longer mini essays ($M$=349.68 words) compared to those in the neutral condition ($M$=256.32 words), $F(1,77)=5.481$, $p<.05$. This difference suggests that future mood manipulations should consider listing a word count range for both writing prompts to eliminate this item as a potential confound. Additionally, since all participants were given a five-minute minimum for time spent writing but no maximum, the time that some participants chose to spend on the writing prompt was sometimes significantly different from one participant to another. While it would be natural for the positive emotion prompt to be more interesting to subjects than the neutral writing task, this may be a confound because writing for a longer period of time might cause subjects to be more relaxed and calm, which were measures considered for the positive affect scale.

Additionally, with respect to the writing task, some participants found that explaining the task as related to verbal fluency specifically stressful. For students that learned English as a second language (ESL), measures of fluency may have caused significantly more stress evidenced by some subjects trying to explain that they were not born in America. Despite writing samples that indicated written fluency, some subjects indicated limited spoken fluency in the task. While based on random assignment, there would be roughly the same amount of ESL students in each condition; this study had at least six participants identify English as a second language. Future studies using this task may consider excluding participants who list English as a second language or may include this item at the beginning of the DEAL to sort for this potential confound that may have increased the stress related to the J-task for several participants.

Also, since participants were not timed when they were filling out all three DEAL surveys, some participants spent significantly more time filling out the DEALs compared to others. Participants who seemed anxious to finish the experiment likely spent very little time on the DEAL, while others who might have been focused on precision seemed to take exponentially more time. Differences in time taken to fill out the DEAL might have caused some participants to ruminate more about their emotions, thus causing differential effects in emotion reporting.

A more sensitive measure for creativity other than the J-task should also be explored if a similar design is used to detect evidence in support of the Broaden-and-Build theory. There were significant results suggesting that students in the positive condition were able to list more words that began with a "J," though additional measures of creativity would bolster this finding. The measure of average word length may not have been a sensitive enough measure for creativity. While "jobs" and "jazz" are both four letter words, it is more likely that "jobs" will appear on a list of J-words because of the availability heuristic compared to "jazz," perhaps making "jazz" a

more creative word though they would both be equivalent in word length measures. Additionally, calculating the total number of unique word roots may have been a flawed measure of creativity because the strategy of adding word endings to different roots may have required increased cognitive flexibility. Those who listed more J-words may have better been able to frame the task in such a way that allowed them to creatively view the solution to the J-word task as using a root word with several endings.

Further studies will need to explore if buffering is a phenomenon attached to specific dispositional characteristics that can be captured in laboratory emotion self-report scales. Questions of interest for future study include understanding mediating factors in buffering such as dispositional traits or emotional intelligence. An additional follow-up study can also be conducted using the physiological data already collected to determine if there is evidence of buffering physiologically. Finally, data collected from questionnaires including the Subjective Happiness Scale, Satisfaction with Life Scale, and Life Orientation Test can also be analyzed to determine if dispositional optimism and positivity were correlated with increased creativity in the J-word task or differential emotion reporting to the stress induction.

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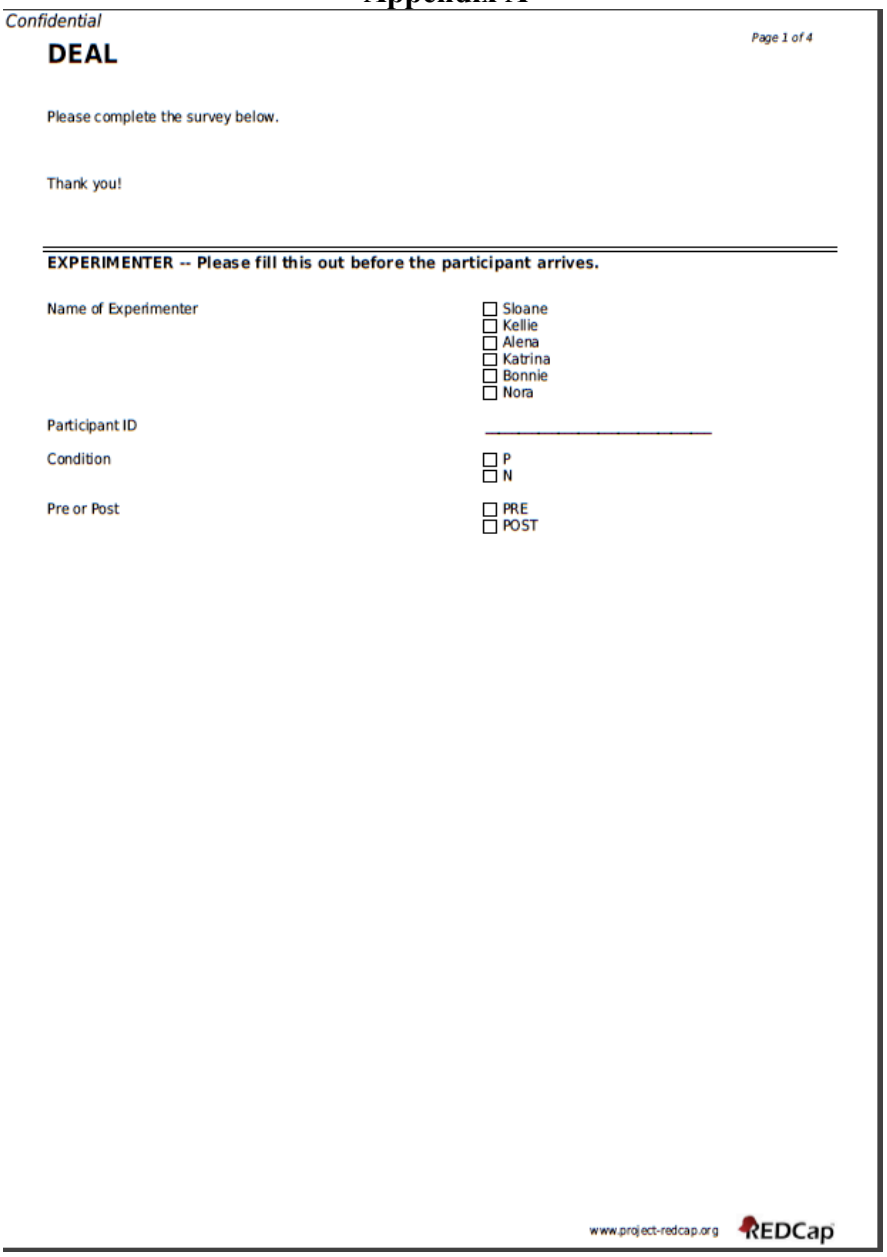
# Appendix A



*Confidential*

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**DEAL**

Please complete the survey below.

Thank you!

**EXPERIMENTER -- Please fill this out before the participant arrives.**

Name of Experimenter
- ☐ Sloane
- ☐ Kellie
- ☐ Alena
- ☐ Katrina
- ☐ Bonnie
- ☐ Nora

Participant ID _____

Condition
- ☐ P
- ☐ N

Pre or Post
- ☐ PRE
- ☐ POST

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**Please DO NOT complete this form until instructed to do so. Thank you!**

Below are a number of adjective clusters that describe different emotions or feelings. EACH group of adjectives is meant to convert to a SINGLE basic emotion or feeling. Please indicate the extent to which you are feeling the emotion listed RIGHT NOW.

surprised --- astonished
not at all moderately extremely
*(Place a mark on the scale above)*

defeated --- resigned --- beaten
not at all moderately extremely
*(Place a mark on the scale above)*

relieved --- unburdened
not at all moderately extremely
*(Place a mark on the scale above)*

tranquil --- calm --- serene
not at all moderately extremely
*(Place a mark on the scale above)*

frustrated --- thwarted --- exasperated
not at all moderately extremely
*(Place a mark on the scale above)*

determined --- motivated --- persistent
not at all moderately extremely
*(Place a mark on the scale above)*

grateful --- appreciative --- thankful
not at all moderately extremely
*(Place a mark on the scale above)*

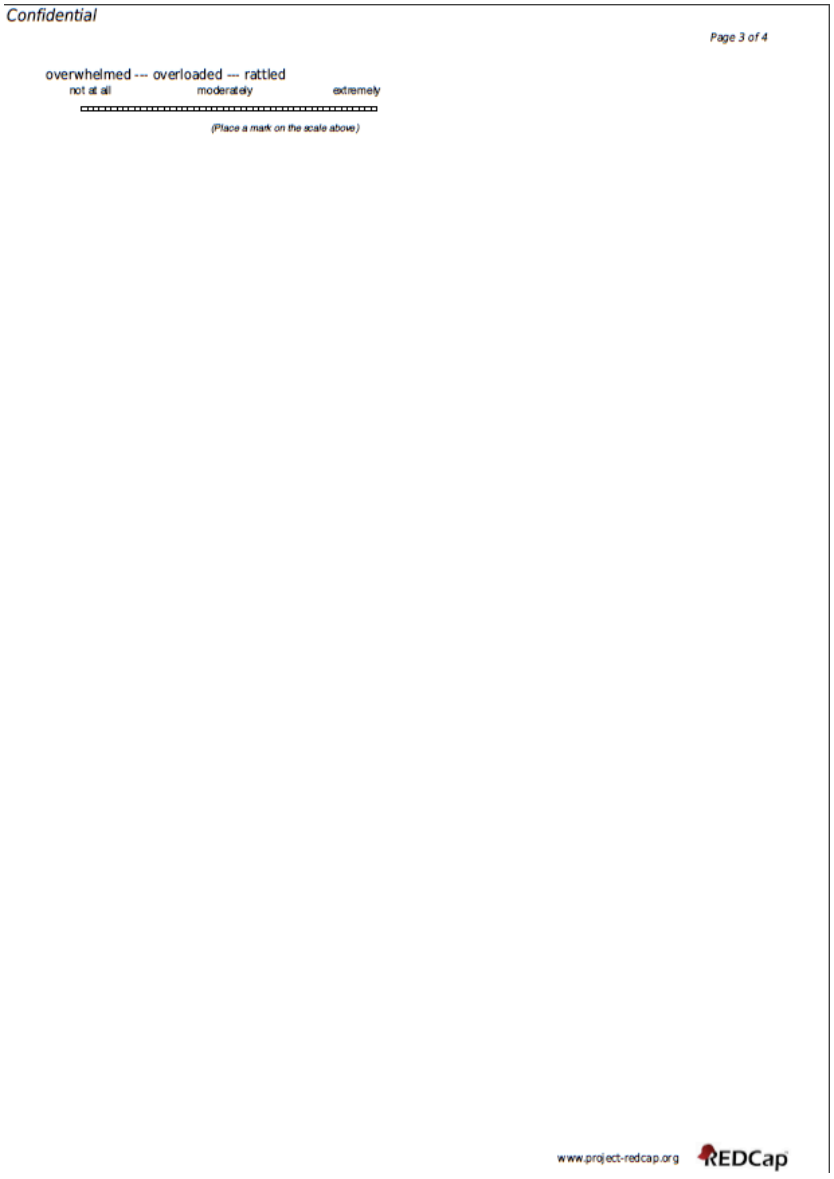
interested --- engaged
not at all moderately extremely
*(Place a mark on the scale above)*

mad --- angry --- irate
not at all moderately extremely
*(Place a mark on the scale above)*

hopeful --- optimistic
not at all moderately extremely
*(Place a mark on the scale above)*

bored --- detached --- uninterested
not at all moderately extremely
*(Place a mark on the scale above)*

nervous --- anxious --- apprehensive
not at all moderately extremely
*(Place a mark on the scale above)*


Confidential
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overwhelmed --- overloaded --- rattled
not at all
moderately
extremely
(Place a mark on the scale above)
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proud --- triumphant
not at all moderately extremely
*(Place a mark on the scale above)*

afraid --- frightened --- scared
not at all moderately extremely
*(Place a mark on the scale above)*

irritated --- annoyed
not at all moderately extremely
*(Place a mark on the scale above)*

amused
not at all moderately extremely
*(Place a mark on the scale above)*

curious --- inquisitive
not at all moderately extremely
*(Place a mark on the scale above)*

happy --- glad --- joyful
not at all moderately extremely
*(Place a mark on the scale above)*

eager --- enthused --- excited
not at all moderately extremely
*(Place a mark on the scale above)*

embarrassed --- humiliated
not at all moderately extremely
*(Place a mark on the scale above)*

disappointed --- let down
not at all moderately extremely
*(Place a mark on the scale above)*

satisfied --- content
not at all moderately extremely
*(Place a mark on the scale above)*

*Appendix B*

# SPRING 2013 BUFFERING STUDY SCRIPT

## BEFORE P ARRIVES

1) Put appropriate sign on door. (Please knock sign.)

2) Turn on new Mac computer in the room the participant will be sitting in, physio computer, and physio technology (big red button and small black button).

*3)* Refer to **participant info sheet** to determine participant ID number and condition. *Remember to counter-balance conditions based on sex by referring to the left columns and crossing out the condition based on the participant's sex. If you are unsure based on SONA, then wait for the participant to arrive.*

4) New MAC computer: Open Firefox and click on **Pre-DEAL FINAL** in the **bookmark toolbar** (under the row in which you would usually enter a site address). This survey will serve as the baseline mood assessment.

5) Enter relevant information on the first page of the **Pre-DEAL FINAL**, and click "Next Page" so that you are on the first page of the DEAL that the participant will be completing. Open a new tab to mask the questionnaire until the P fills it out.

6) Get a **consent form** from the top shelf of the small red bin in the experiment room. Place it next to the Mac computer along with a pen.

7) Physio computer – go to Programs → Windaq → Windaq 200
    a. Press F4 and save file as participant number (####) under the **newbuff~1** folder on the **d-drive**
    b. Change data collection time to **1:45:00**
    c. **Put program in standby by pressing CTRL+F4** until the participant arrives. The bottom of the screen will say STBY.
8) Open Amadeus Pro on the new Mac in the participant room.
    a. Save the file as S#j in the desktop folder called J-task files.

## BASELINE

1) [*as P enters lab*] Hi, are you here for our study? Please take a seat and get settled in.

2) [*sit P at Mac*] The first thing I'll have you do is read through the consent form. Our study will involve measuring your physiological activity while you perform a variety of tasks. Please read through the form and let me know if you have any questions. I'll

be getting a few things ready for the experiment in the next room. Just speak up when you're finished. I can hear you in the next room.

3) [*collect consent, sign 3rd page, and insert completed form into manila envelope*] Okay, the first thing I'm going to have you do is fill out this brief questionnaire. Because we're going to be looking at physiological responses, we need to look at how you're perceiving things when you first come into the lab, since some of this might impact your physiology. In order to help us interpret how you are physiologically responding throughout the experiment we will also assess your feelings from time to time with the questionnaire. Please let me know when you're finished.
    a. Close out of the tab masking the **Pre-DEAL FINAL**, so that the participant can fill the DEAL out.

4) Now I'm going to get you set up with the physio. These sensors measure your skin conductance activity, which is how much your hands are sweating. Research indicates that skin conductance is responsive to attention and other cognitive tasks. I'll need you to go wash your hands before we put the stickers on. Go ahead and scrub down your pointer and ring finger on your right hand. The bathroom is three left turns from our front door. Just come on back in when you're set!

5) [*hook P up to physio*] Alright go ahead and get settled in. We need to get a baseline assessment of your physiology, so please just sit here and relax for a few minutes while we take this initial reading. You can read these magazines if you'd like, just try not to move around too much. While we're taking this initial reading, I'll be in the next room prepping for the experiment. I'll be back in a few minutes and we'll get started. [*This is the 5-minute baseline, so make sure you're recording on the physio computer!!! Attach physio at second knuckle/phlange of right hand palm up. Note clips need to be positioned to best enable typing*]

    a. Hit f4 on the physio computer to start recording. Then, "Insert a Commented Mark" and write "Begin Baseline."
    b. After the 5 minutes, "Insert a Commented Mark" and write "End Baseline."

**MOOD INDUCTION**

1) Click the bookmarked link to **Memory Task & DEAL**. (The DEAL is now added on to the writing task here for another data collection point.) There is branching logic on the survey, so as long as you click the correct condition, the correct writing prompt will appear.
2) We realize typing with the sensors on may be more challenging, but try to fully immerse yourself in the situation and remember the details as vividly as possible while you are writing.

    **SAY (Be precise about this wording. You can use your own words but use the key words in bold):** As your first task, we will need you to complete this **memory-based task**. We want you to really **immerse yourself** in the memories as much as you can. Try to remember the **details** of your past experience as **vividly** as possible and respond based on those

memories. You will need to write for five minutes and immerse yourself as **fully and deeply** as possible. Please respond thoughtfully and thoroughly. The text box will expand as you write.

3) *Start the stopwatch for five minutes and ask if they are finished at the five minute mark.*
    a. If the participant is finished proceed to the DEAL attached to the prompt.
    b. If the participant is NOT finished, ask them to please speak up when they are finished.

4) A second DEAL is attached to the end of the writing prompt. When the P speaks up and says they are finished make sure to click through the next page of the survey to allow them to take the DEAL ***before*** the stressor.

**STRESSOR**

1) [ *notepad, and pen in order to administer J-word task*] As your next task you will be completing a problem-solving task. For the next ***two minutes***, I would like you to list as many words that begin with a certain letter that you can think of. This has been shown in previous research to be a good measure of verbal fluency. In our lab, we're interested in measuring physiological responses to this task. Just so you know, the average Vanderbilt undergraduate can list about 30 words. I'll be recording your responses as you go. Please do not use any proper nouns. (Pause ***Click on Amadeus to begin recording.*** *Start timer and* ***tally the number of words the participant names.****)*.
2) Your specific letter will be J. You may begin when I say "begin"… Begin!
    a. Give P a one minute warning.
    b. BE SURE TO SAVE THE AMADEUS FILE.
3) [*after telling P to stop*.] Click on the **Post-DEAL and questionnaires** bookmark and fill out the necessary information on the first page.

    **SAY:** Okay, next you will fill out this brief questionnaire. Please let me know when you're finished. (You may close out of physio at this point by just closing out of the program since the data auto-saves.) The end of the DEAL prompts the participant to call the experimenter into the room.

    *(After the participant finishes the DEAL)* **SAY:** The third task you will engage in is a series questionnaires that will assess your perceptions. Please let me know when you are finished.

**DEBRIEFING**

1) Take the sensors off the participants' fingers and offer them a **paper towel** to wipe off their hands. The purpose of this experiment was to determine if those who wrote about positive emotions in their writing prompt would respond less to the stressor based on survey responses and physiological data compared to those who wrote about neutral topics. Do you have any questions? Comments? Concerns? Thank you for participating in our study!
2) **GRANT THE PARTICIPANT CREDIT ON SONA.** Also, please write the time it took from start to finish for the experiment in the notes sections so we can adjust time slots accordingly.