Self-Affirmation Reduces Attentional Bias Toward Threat

Lauren Vale

The University of Colorado, Boulder

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Thesis Committee:

Akira Miyake Ph.D., Department of Psychology and Neuroscience – Thesis Advisor

Robert Spencer Ph.D., Department of Psychology and Neuroscience – Honor's Council Representative

Paul Gordon Ph.D., Department of Humanities

Abstract

The current study examines the effect of stress on cognition, and the impact self-affirmation has on the negative effects of stress. We introduced a threat manipulation of an impromptu speech, which was intended to significantly raise participants state anxiety. Prior to implementing this experimental stressor, we implemented an emotional intervention called a self-affirmation. In this self-affirmation, participants reinforced their most valued characteristics. Self-affirming was hypothesized to have the ability to alleviate the negative effects of the stressor on cognition, which was measured with three specific components. First, self-reported anxiety was measured throughout the experiment to assess changes in levels of anxiety. Second, a two-part thought suppression task was implemented to test the individual's ability to regulate intrusions from neutral thoughts compared to stressful thoughts. Third, the high level effects of stress were tested using reaction time to threat related stimuli. The findings of the experiment demonstrate that self-affirmation has the ability to effectively reduce attentional bias towards negative, threat-related stimuli when individuals were under a fairly high amount of self-reported stress. In addition, the current study demonstrates that self-reported levels of anxiety did not change as a result of the self-affirmation. Rather, the benefits of the self-affirmation were seen in improvements in cognitive performance.

Self-Affirmation Reduces Attentional Bias Toward Threat

Stress is an unwanted characteristic that has been a growing topic of research in the field of Psychology. Most studies show that stress negatively impacts people; it influences our health, (Phillips, 2011) our attention towards negative information, (Bar-Haim et al., 2007), (Klein & Harris, 2009) and our cognitive abilities (Klein & Boals, 2001). Despite the encompassing influence of stress, the literature lacks adequate techniques that successfully reduce these negative outcomes. By implementing an experimental stressor, in which participants were told they would be giving a speech that would be videotaped and later critiqued, the current study tested whether the negative effects of this stressor could be alleviated by an emotional intervention called a self-affirmation. Because self-affirmation has been shown to benefit people in many different situations, (which will be discussed in detail later) it may also be beneficial in reducing the negative effects of stress on symptoms of anxiety and cognition. This was tested using self-reported and cognitive experimental measures.

When researching the effects of stress and anxiety, it is important to distinguish two types of anxiety, trait and state anxiety. Trait anxiety is a baseline characteristic of how anxious an individual tends to be in general, while state anxiety is how anxious an individual is at the current moment (Edwards et al., 2010). In terms of anxiety, research shows that stress has a significant impact on attention. In a study conducted to determine the effects of stress in trait and state anxious people, it was found that emotional selectivity (orienting attention towards emotional material in general) was mediated by state anxiety, indicating that the more stressed people were, the more attentive they were toward emotional information (Bar-Haim et al., 2007). Additionally, negative selectivity (orienting attention towards negative material specifically) was

mediated by both trait and state anxiety, indicating that state anxious people respond slower to negatively valenced words in a Stroop task (which will be explained later), and this effect is especially true for trait anxious individuals (Rutherford et al., 2004). A similar effect was found in another study where high trait anxious people were shown to respond slower to negative stimuli because it was thought to be more interfering compared to neutral stimuli (MacLeod & Mathews, 1988).

Research also shows that stress can have a negative effect on cognition. People experiencing life stressors put forth more working memory resources towards suppressing unwanted thoughts and as a result, their working memory suffers because they have limited resources available for other tasks (Klein & Boals, 2001), (Engle, 2010). This idea that stressful thoughts affect working memory is also related to the theory of mental control (Wegner, 1994). The theory of mental control states that because people experiencing stress are focusing their efforts to try not to think about unwanted thoughts, and because attempting to block these thoughts requires substantial cognitive demand, they will inevitably perform worse on subsequent tasks they attempt to complete (Wegner, 1994). Collectively, research shows that it is extremely difficult to ignore stress, and that even the act of attempting to ignore stress has negative effects.

One possible technique that may reduce the negative effects of stress lies within an emotional intervention based on the self-affirmation theory. The process of a self-affirmation can involve processes such as actively writing, or choosing highly self-relatable values from a list. First proposed by C. M. Steele (1988), the theory of self-affirmation states that people are driven to protect their self-integrity. Once someone's self-integrity is threatened, the proceeding actions a person takes are particularly aimed

at restoring their self-integrity. A specific way of accomplishing this is through self-affirming highly important and relatable values (Sherman & Cohen, 2006). For example, choosing two or three personally relevant values from a list, and then writing about why these values are important, engages the person in the process of reaffirming their beliefs. Instead of responding to a threat with defensive biases (such as dismissing, denying or avoiding), self-affirming gives the individual the opportunity to respond to the threat indirectly, and allows a chance to focus on valuable characteristics not related to the threat but related to ones self integrity (Sherman & Cohen, 2006). Through this process, people can be distracted from the current stressor, and realize that there are more important characteristics they value that are not being threatened. Once this idea is achieved, people can come back and approach the stressor more open mindedly and less defensively, which can lead to improvements in performance on the task at hand.

Self-affirmations have been proven useful against threats in a multitude of settings, where the affirmation was unrelated to the threat. Some examples are interpreting ones negative health information (Sherman, Nelson & Steele, 2000), reducing the psychological discomfort associated with cognitive dissonance (Matz & Wood, 2005), reducing pressure in certain evaluative situations (Creswell et al., 2005), and reducing the gender achievement gap in college sciences (Miyake et al., 2010). All of these situations have a similar component of threat to ones self-integrity, much like stress. Since self-affirming has been shown to be beneficial in these settings, the current study hypothesizes that self-affirmation has the capacity to reduce the negative impact of stress on cognition.

Although it seems natural that self-affirmation would be an effective buffer against the negative effects of stress, difficulty arises when attempting to test this theory

in an experimental setting. The reason for this is that people usually experience stress outside of the research laboratory, which makes it difficult to manipulate because it has to be implemented in a way that is generalizable to non-experimental settings. Consequently, experimentally inducing stress is required to test the effectiveness of self-affirmation. One study that effectively induces stress implemented a self-affirmation followed by an experimental stressor called the Tier Social Stress task (Creswell et al., 2005). First, the experimenters had participants in the self-affirming group complete a values scale in which they assigned ratings to a list of values in their order of personal relevance, while the control group assigned ratings to unimportant values. After the affirmation, participants were introduced to the experimental stressor. They were instructed to perform a 5-minute speech task in front of two speech evaluators (who were actually confederates), which was meant to put participants under high state anxiety. The dependent variables used in the study were primarily biological, and they found that participants in the control group had significantly elevated cortisol levels (a hormone that increases with higher levels of stress) after the stress manipulation, while the affirmation did not (Creswell et al., 2005). This study successfully demonstrates that self-affirming is effective in reducing stress at a biological level.

Current Study

Through examining the research on self-affirmation, stress, and cognition, the current study aims to combine aspects of each domain to ask this question: does self-affirmation have the ability to reduce the negative effects of stress on individuals? The current study introduced a stress manipulation in which participants were told they would be giving a speech that would be videotaped and later critiqued. Like the Tier Social Stress task, (Creswell et al., 2005) this was meant to put all participants under a

high amount of state anxiety. Prior to the stress manipulation, participants completed either a self-affirmation writing exercise or a control writing exercise.

Self-reported anxiety was measured five times throughout the experiment to see how much the stress of giving a speech influenced participants state anxiety, and whether or not self-affirming reduced anxiety overall. Then, participants attentional bias toward negative stimuli was tested two different ways: using a thought suppression task to measure the extent to which individuals were successful in rejecting stressful thoughts, and by measuring reaction time differences between negatively emotionally charged stimuli versus neutrally charged stimuli in an emotional Stroop task (Edwards et al, 2010). Emotional selectivity shows that anxious people are faster to respond to negative stimuli, but this is not the case in the context of an emotional Stroop. Because participants were trying to ignore negative stimuli, it should theoretically take them longer to respond under stress.

Since working memory and trait anxiety have been shown to influence performance on cognitive tasks, (Engle 2010) the current study measured these aspects of all participants, to make sure there were not any baseline differences across affirmation and control groups. The current study was mostly focused on testing state anxiety, but we also tested participants trait anxiety levels because trait anxiety may be correlated with state anxiety. After collecting this trait anxiety measure, we controlled for trait anxiety across all participants so the effect of state anxiety under the stressor would emerge more clearly.

Based on the research of self-affirmation and stress, the hypothesized outcomes for the current study are as follows: people who self-affirm are going to be less influenced by the stress of giving a speech, specifically within three different

dimensions. First, participants who self-affirm should have lower self-reported state anxiety compared to the participants who do not self-affirm because they have had a chance to reinforce personal values. Second, participants who self-affirm will experience more ease in suppressing stressful thoughts compared to those who did not have a chance to self-affirm. Third, participants who do not self-affirm will have more difficulty ignoring stressful stimuli, and will take longer to respond to negatively charged material in an emotional Stroop task compared to participants who do self-affirm. Collectively, self-affirming should serve as a buffer against the stress of giving a speech, and in turn reduce the negative effects of stress on cognitive performance.

Methods

Participants

Seventy-eight subjects (37 males and 41 females) participated in this experiment, and all were recruited using the SONA system at the University. All were undergraduate students enrolled in an introductory Psychology course. Through voluntary sign up, they received partial course credit for participation that was required to receive a passing grade in their class. Three subjects were not included in the data set: two were excluded because of computer failures, and one reported being aware that the study involved deception before the final debriefing.

Design and Materials

Baseline Group Comparisons

Each subject completed two baseline measures before they were introduced to the stress manipulation or stress experimental measures: a spatial working memory span task and a questionnaire assessing trait anxiety.

Spatial Span. First, participants completed a Spatial Span task designed to measure each individuals visuospatial working memory and executive functioning capabilities (Miyake et al., 2001). The Spatial Span presented participants with two simultaneous tasks. First, they had to remember the orientation and order of a series of arrows as they briefly appeared on a computer screen. Second, after the arrow disappeared, participants had to make a "normal" or "mirrored" distinction of a capital letter presented on the same computer screen. This cycle took place 2-5 times each trial, and at the end of each trial participants wrote down the orientation and order of arrows they remembered from the previously presented series. Participants scores were calculated by the number of correct items (arrows that were in the correct orientation and order). The higher number of correct items (out of a total score of 42), the higher the person's working memory capacity.

Beck's Anxiety Inventory. Next, participants completed the Beck's Anxiety Inventory (BAI Beck, 1988). Items on this questionnaire included symptoms such as, "*unable to relax, shaky or unsteady, fear of losing control,* and *scared*." This 21-item questionnaire tested whether there were any baseline trait anxiety differences between participants in the control and affirmation groups.

Self-Affirmation

All participants in this experiment completed a writing task. Participants were randomly assigned to either the control or affirmation group before beginning the experiment. Participants in the self-affirming group chose two or three values that were most important to them (e.g. *being good at art, creativity, relationships with friends or family, independence, music, or spiritual or religious values*). They wrote about these values and why they were personally important to them for 12-15 minutes. Participants

in the control group were instructed to write about their typical morning routine in detail. This was meant to be a neutral writing exercise, in which the participants did not affirm any important or valuable characteristics.

Level of State Anxiety at Different Time Points

Throughout the experiment, participants completed a quick anxiety level scale questionnaire (QALS) consisting of six items from the BAI (Beck, 1988). These short questionnaires were administered for two specific purposes: measuring participants' self reported anxiety levels throughout the experiment as they completed specific tasks, and to serve as a stress manipulation check. The five times at which the QALS were administered were: 1) before, 2) after a self-affirmation writing exercise, 3) after a stress manipulation induction, 4) after a two-part thought suppression task, and 5) after an emotional Stroop. Participants were asked to rate from 1 to 100 the extent to which they were experiencing each of the following six symptoms: *shaky, scared, sweating* (not due to heat), *terrified, nervous* and *afraid of the worst happening*. The QALS score for each of the five administering times consisted of the average rating across all six symptoms.

Stress Manipulation

All participants were told they would be preparing and presenting an impromptu speech. In a study on social phobia, 89% of participants rated speaking in public as their worst fear (Faravelli et al., 2000). Some surveys even suggest that the average person is more afraid of public speaking than dying. Using such a prominent stressor like speaking in public, the current study aimed to influence participants anxiety levels and to expose them to a realistic stressor.

Reading from a script the experimenter said, "The main part of this experiment is a five minute speech that you will prepare and present. This is the most important part

of your participation today. Your speech will be videotaped with this camera, and a group of one hundred communication major students will help us grade the quality of the speech for our study. These students will rate four specific things: the clarity of your speech, the organization of your speech, the quality of your arguments, and your delivery style." Participants were made to believe they would be critiqued, and the deception was meant to heighten their levels of state anxiety. They were told that they would get the topic of the speech five minutes before they present it, so that they had time to prepare. Additionally, since preparation was required they were told they would wait until they had completed the rest of the experiment before they present their speech in front of the video camera. Participants were aware of a working camera in the room that would be used to videotape the speech.

Cognitive Performance Tasks

Thought Suppression. There were two parts to this task, which tested each participant's ability to suppress either a neutral or threatening thought. In part one of the task, which was the neutral version, participants were told to close their eyes and try their best not to think about a white bear, but to press a button every time they do. Since the goal was to try not to think about a white bear, part one gave the participants an opportunity to worry about their upcoming speech. After part one, participants were asked if they thought about the speech during this task. This served as a manipulation check, and to see if self-affirming aided neutral thought suppression. Part two was similar to part one, except in part two participants were told to close their eyes and try their best not to think about their upcoming speech, and to press a button every time they did. Based on the nature of thought suppression, (Wegner, 1994) participants were

likely to engage in thinking about the speech during this time, especially since it was a more stressful topic.

Instead of counting every single button press for the thought suppression tasks, a binning procedure was implemented to ensure that each time the participants pressed the button they were actually referring to a new thought. Instead of using the raw count of how many times participants pressed the button, their responses were binned into 20-second intervals so that each of their responses had to be at least 20 seconds apart from each other. This binning procedure was designed to avoid any odd distributions within participants responses. For example, some participants pressed the button twice in a row, even though it was only one failure. In this sense, the binning procedure more accurately reflects participants suppression failures than the raw count.

Emotional Stroop. The final task was an emotional Stroop. This was the most important measure of the experiment because it focused on the cognitive performance of participants under stress, and whether the self-affirmation was effective in preventing and possibly reducing the negative effects of stress. The emotional Stroop was modeled after the original Stroop task created by John Ridley Stroop in 1935. The original Stroop is commonly used to measure cognitive performance in an experimental setting and the main idea is that incongruent stimuli (e.g. the word “red” displayed in blue ink) are more prone to errors than congruent stimuli (e.g. “red” displayed in red ink) when the goal is to name the ink color and ignore the word. The emotional Stroop has a similar component, but it takes into account emotionally charged stimuli.

In the current study, participants were presented with a combination of white words inside colored rectangles on a black computer screen. Each trial consisted of one word superimposed on top of one colored rectangle, and participants were instructed to

try to ignore the word and to say the color of the rectangle aloud. Instead of being congruent or incongruent stimuli, the words presented were either neutral or negatively emotionally charged. This heightened the overall difficulty of the task (Edwards et al., 2010).

Each participant completed 240 trials. Out of these 240 trials, there were 10 blocks consisting of five different trial types that occurred twice. Each block had 24 trials, and the trial types were determined by different stimulus onset asynchronies (SOAs). There were five different trial types, each with its own SOA (see Figure 1).

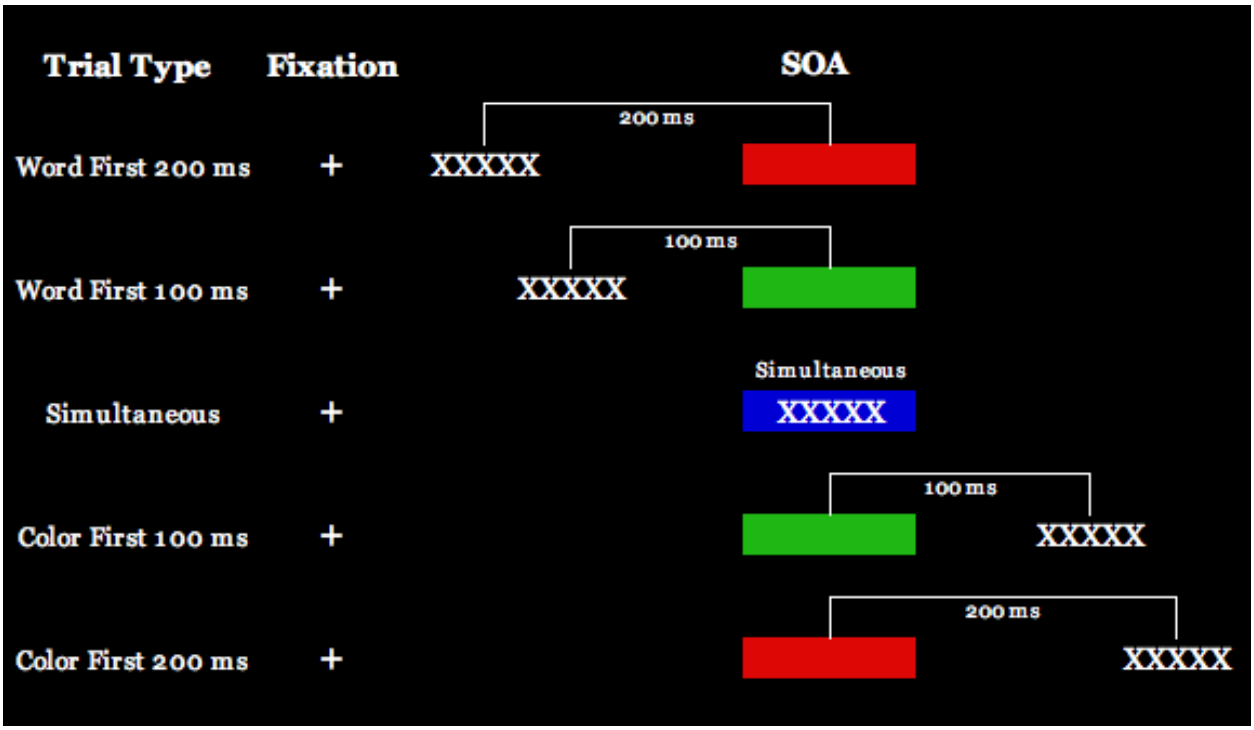

Figure 1*: Emotional Stroop task trial types. The participant saw a fixation in the center of the screen that was fixed across all SOA trial types, and then one of the example stimuli shown above appeared. The "XXXXX" indicates either a neutral or a stressful word. The word and rectangle were either presented word first (with an SOA of 100 ms or 200 ms), simultaneously, or the color first (with an SOA of 100 ms or 200 ms). Participants were instructed to say the color of the rectangle aloud, as quickly and accurately as possible.*

The first two types of trials consisted of the word appearing first followed by a rectangle, which appeared after an SOA of 100 or 200 milliseconds. These will be referred to as word first 200 or 100 ms trials. The other two types of trials consisted of the rectangle appearing first followed by the word, which appeared after an SOA of 100 or 200 ms. These will be referred to as color first 200 or 100 ms trials. The last type of block consisted of the word and rectangle appearing simultaneously. Each block contained 24 trials with the same SOA, where trials were pseudo-randomly ordered and then fixed so that each participant saw the same order of stimuli for a given SOA block. There were 10 blocks, so that each type of SOA appeared twice, and the order of the blocks was randomized for each subject with the constraint that all five SOAs were presented once before the final five blocks were presented. There were equal numbers of neutral and negative stimuli in each block. The negative words were specifically related to the negativity associated with giving a speech, and within the context of the emotional Stroop, these stimuli were more interfering compared to the neutral words (Edwards et al., 2010). The neutral words were chosen to mirror the negative words as far as word usage frequency and length were concerned. The neutral words were: *sort, lyric, weekly, middle, texture, network, element, and forecast*. The negative words were: *fear, panic, stupid, stress, anxious, failure, nervous, and insecure*. All of the words were either nouns or adjectives, and each word only had one use in the English language.

Since accuracy is usually high on Stroop tasks, attentional bias was measured by the difference in reaction times between the negative and neutral stimuli (negative stimuli reaction time minus neutral stimuli reaction time equals the participant's attentional bias). As previously mentioned, anxious people respond slower to negative stimuli in the context of an emotional Stroop because of emotional selectivity (negative

words are more interfering compared to neutral stimuli (MacLeod & Mathews 1988)). Since this is the case, the most interfering block type under stress would be the word first followed by the rectangle, which appeared after 200 ms (word first SOA 200). In the original Stroop task, stimuli are usually presented simultaneously. In the current study, we attempted to make the negative stimuli even more interfering than an original Stroop task by implementing different SOAs and presenting the negative valence words before the color of the rectangle appears. Word reading is a more automatic task compared to color naming, which means that on trials when the word appears first, the participant has already begun processing its meaning by the time the colored rectangle appears. Participants should perform poorly on these word first SOA 200 trials, because it was extremely difficult to ignore the interfering negative word while trying to name the color of the rectangle. This was also true for the block type that has the word first followed by the rectangle that appeared after 100 ms (word first SOA 100). Similar to the stimuli presented in a typical Stroop task, the block type that had the simultaneous trials should be less difficult than the word first block types, but still somewhat interfering. The easiest block type should be the rectangle first followed by the word that appeared after 100 and 200 ms (color first SOA 100 & 200) because the color appeared before the negative valence stimuli, giving participants more time to react to the color of the rectangle.

Procedure

All participants were instructed to read and sign a consent form before beginning the experiment. The first task participants completed was the Spatial Span task, which served as a baseline measure of working memory (Miyake et al. 2001). Participants then completed the Beck's Anxiety Inventory questionnaire, which assessed individual

differences in trait anxiety. This was administered electronically using the program *Qualtrics*. After the questionnaire, participants were randomly assigned to either the affirmation or the control group in which they completed the corresponding writing exercise. Participants were then introduced to the stress manipulation, in which they were told they would be preparing and presenting a speech that would be videotaped and rated. After the stress manipulation, participants completed two thought suppression tasks where they had to first, try not to think about a white bear, second, try not to think about their upcoming speech, and then ended with the emotional Stroop. At the end of the experiment, participants were fully debriefed and the reason for the deception in the study was explained. All computer tasks were completed on a Macintosh (eMAC) computer on the University of Colorado at Boulder main campus.

Results

Baseline Group Comparisons

Before any further analyses, we tested the equivalency of the affirmation and control groups to ensure that there were no group differences in working memory or trait anxiety.

Spatial Span. In a One-Way ANOVA with two groups, Spatial Span scores of the affirmation group (M = 22.67) were not significantly different compared to the control group (M = 24.06), $F(1,74) = .71$, $p = .40$. This indicated that there were no underlying working memory differences between groups.

Beck's Anxiety Inventory. In a One-Way ANOVA with two groups, BAI scores of the affirmation group (M = 34.25) were not significantly different compared to the control group (M = 32.08), $F(1,74) = 1.29$, $p = .26$. This indicated that there were no underlying trait anxiety differences between groups.

Level of State Anxiety at Different Time Points

In examining the effect of the experimental stress manipulation, anxiety levels significantly increased with respect to the stress induction. A 2 (group) x 5 (QALS) mixed ANOVA showed a significant main effect of QALS, $F(4,71) = 15.96$, $p < .01$.

Number	Administering Time Point
QALS 1	Before the self-affirmation
QALS 2	Before the threat induction
QALS 3	After the threat induction
QALS 4	After the White Bear task
QALS 5	After the Emotional Stroop task

Figure 2: *The five times at which the quick anxiety level scale was administered with respect to the other experimental tasks.*

Because of this overall main effect of administering time point, we expected the largest increase in anxiety to occur between QALS 2 and 3 (as illustrated in Figure 2, QALS 2 was administered before the speech and QALS 3 was administered after). Collapsing across affirmation and control groups there was significant a difference between QALS 2 and 3, $F(1,74) = 67.73$, $p < .01$, QALS 2 and 4, $F(1,74) = 34.34$, $p < .01$ and QALS 2 and 5, $F(1,74) = 29.05$, $p < .01$, indicating that participants responded to the threat manipulation with high levels of state anxiety. Also, there were significant differences between QALS 3 and 4, $F(1,74) = 21.16$, $p < .05$, and QALS 3 and 5, $F(1,74) = 21.53$, $p < .05$, but no significant difference between QALS 4 and 5, $F(1,74) = 1.17$, $p = .29$. As shown below in figure 3, while participants anxiety levels decreased after the stress manipulation (between QALS 4 and 5), once their anxiety was increased by the stress manipulation (at QALS 3), they did not return to baseline anxiety levels seen at QALS 2. Collectively, these results show that the stress manipulation of telling participants they will be giving a speech was marginally successful in increasing participants anxiety.

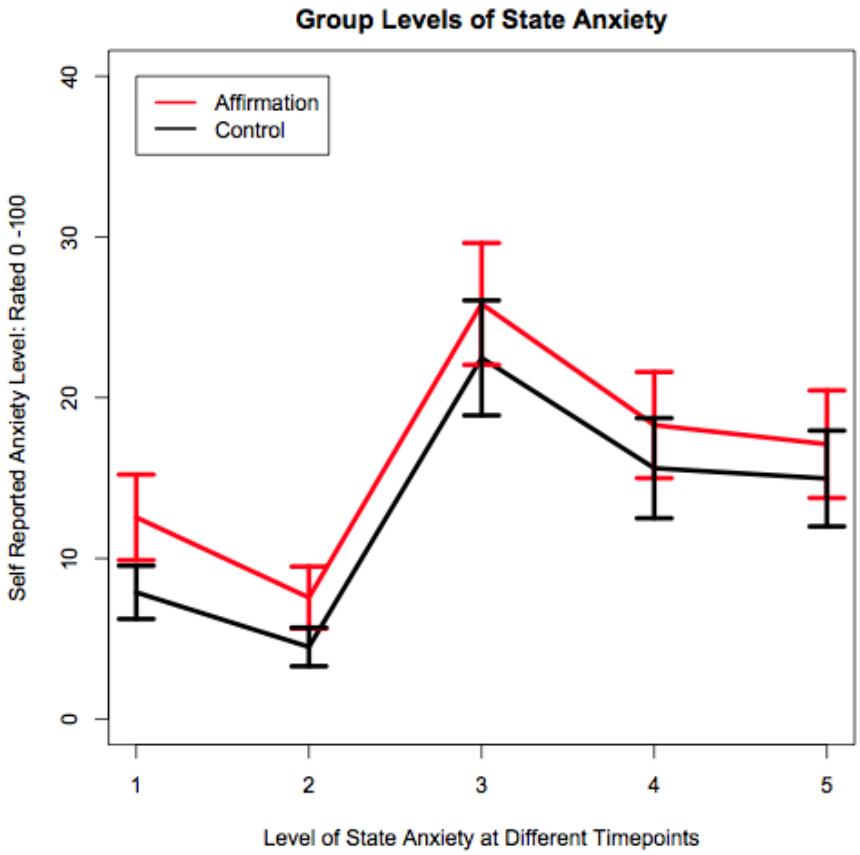

Figure 3: *Average level of state anxiety for each administering time point, showing the affirmation and control groups separately.*

In testing the effect of the affirmation on self-reported anxiety, the 2 (group) x 5 (QALS) mixed ANOVA also revealed that there was no interaction between group (affirmation vs. control) and QALS, $F(4,71) = .026$, $p = .69$, indicating that the control and affirmation groups did not have significantly different anxiety levels (see Figure 3). In examining anxiety differences between affirmation and control groups, results show that self-affirming did not significantly reduce anxiety. This effect was also tested with individual t-tests for each QALS administering time point, and proved to have the same result (all *p's* > .13). In the graph depicted above, it appears that the affirmation group had higher levels of self-reported anxiety compared to the control group. While the

average score for the affirmation group (M = 16.27) was higher than the control group (M= 13.08) this difference was not significant, $F(1,74) = .53$, $p = 0.49$.

In testing whether trait anxiety moderated self-reported state anxiety, a 2 (group) x 5 (QALS) mixed ANOVA controlling for BAI (trait anxiety), showed a significant main effect of QALS, $F(4,71) = 33.06$, $p < .01$, replicating the analyses above where trait anxiety was not controlled for. Although trait anxiety may have made self-reported anxiety slightly higher in the affirmation group, these results were not significant. This indicates that trait anxiety was not influencing the effect of state anxiety on the QALS. However, the interaction between QALS and BAI was significant, $F(4,71) = 3.63$, $p < .01$, indicating that state and trait anxiety levels were closely related.

Cognitive Performance Tasks

Thought Suppression. The first part of the thought suppression task (the neutral part) will be referred to as white bear count, and the second part (the stressful part) will be referred to as speech count, such that higher numbers indicate more suppression failures. In examining the effect of the self-affirmation on the thought suppression task, a 2 (group) x 2 (white bear count vs. speech count) repeated measures ANOVA showed a significant main effect of count, $F(1,73) = 7.56$, $p < .01$, revealing that all participants experienced more failures when suppressing thoughts about the speech compared to the white bear. However, the interaction between group and count was not significant, $F(1,72) = .67$, $p = .415$. These results indicate that there were no differences between affirmation and control groups on their thought suppression ability averaged across part one and two of the task.

However, within each group there was a positive effect of the affirmation. For the control group, a One-Way ANOVA comparing white bear count to speech count showed

a significant difference, $F(1,35) = 5.02$, $p < .05$, indicating that control participants had more failures in attempting to suppress the stressful thought compared to the neutral thought. In comparison, a similar test within the affirmation group showed no significant difference between white bear and speech count, $F(1,37) = 1.59$, $p = .21$, indicating that participants who self-affirmed were equally successful in suppressing stressful and neutral thoughts (see Figure 4).

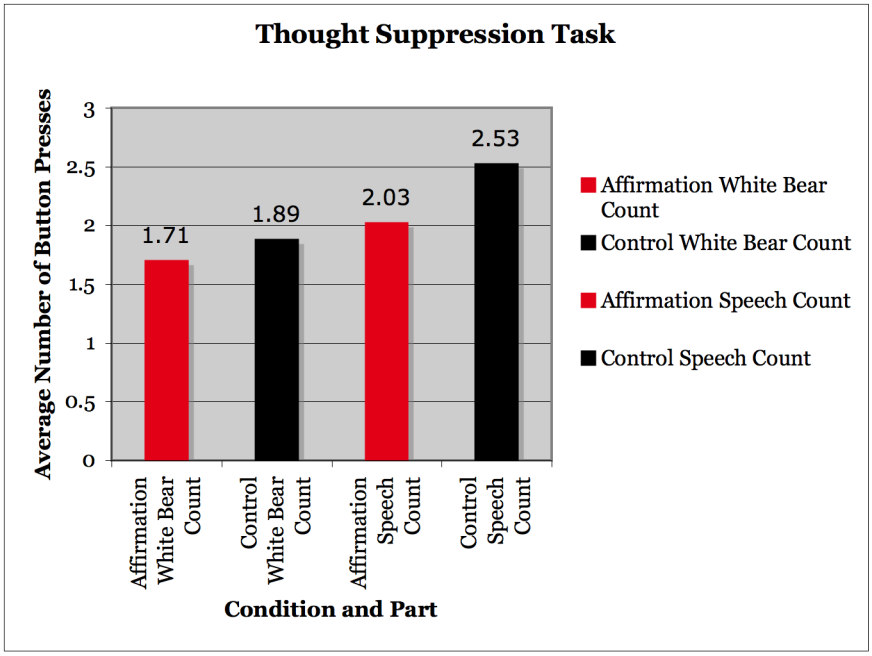

Figure 4: *Thought suppression failures (white bear and speech thoughts) for affirmation and control groups. There was a significant difference between affirmation and control groups in part two of the task, in which the control group (rightmost black bar) thought about the speech more than the affirmation group (rightmost red bar). There was no difference between groups in part one of the task (leftmost bars), which was about a neutral thought (white bear).*

When asked after part one of the task if they had thought about their upcoming speech, 66.67% of participants responded yes in the affirmation group and 75% of participants responded yes in the control group. Overall, participants in the control

group had a more difficulty suppressing the stressful thought of giving a speech compared to participants in the affirmation group.

Emotional Stroop. The emotional Stroop task was the main experimental measure of cognitive performance in the current study. In a 2 (group) x 2 (stressful vs. neutral words) x 5 (SOA) mixed ANOVA, there was a significant main effect of word type, $F(1,73) = 6.29$, $p < .05$ along with a significant word type by SOA interaction, $F(4,70) = 4.31$, $p = .01$. Stressful words had longer reaction times compared to neutral words overall, and this difference also depended on the five different SOAs in the task.

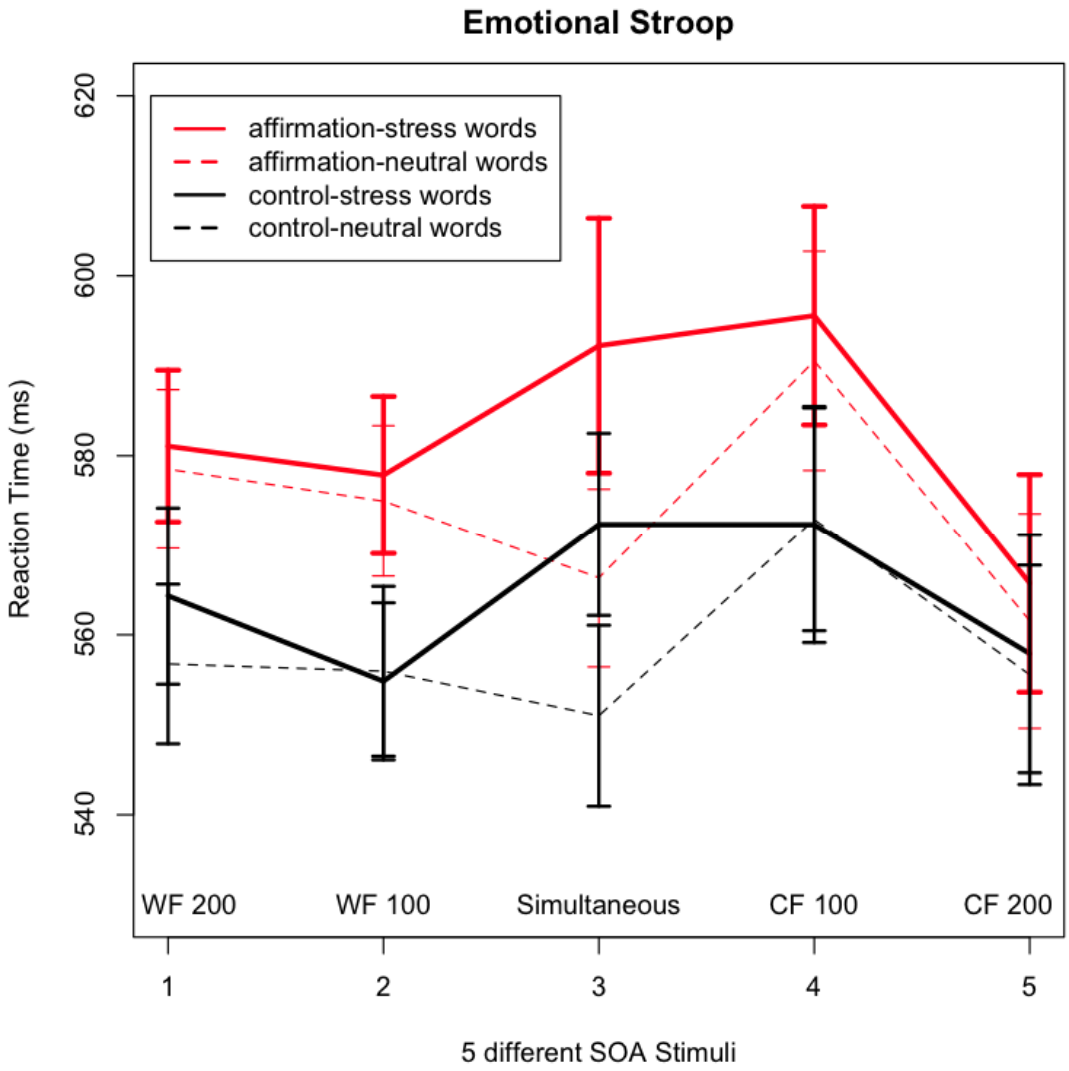

Figure 5:
** WF 200 = Word first SOA 200 ms trials (Most Interfering)*
** WF100 = Word first SOA 100 ms trials*
** Simultaneous = Simultaneous SOA trials*
** CF 100 = Color first SOA 100 ms trials*
** CF 200 = Color first SOA 200 ms trials*
Emotional Stroop task reaction times for the affirmation and control groups (for the stressful and neutral words, and for each of the five SOAs). The most difficult trial type (WF 200) can be seen on the far left. Note: the affirmation group seemed to have slower reaction times overall compared to the control group. This difference however, is not significant, $F(1,74) = 1.66$, $p = .2$.

Expanding on the analyses above, there showed to be a further effect of the affirmation (see Figure 5). For the simultaneous SOA trial type only, there was a significant difference between stressful and neutral words for both the affirmation, *F*

(1,74) = 14.58, $p < .01$ and control groups, F (1,74) = 28.38, $p < .01$. Even though the simultaneous trials were hypothesized to be a somewhat easy trial type, these results show that participants had significant reaction time interference whenever the color and word were presented together. This pattern is similar to what is commonly found in the original Stroop task, in which participants are supposed to respond to stimuli simultaneously presented before them.

Going further into the specificity within the affirmation effects on the different SOAs, there were interesting significant results concerning the most difficult trial type WF 200 (see Figure 5). In the word first SOA 200 trials, which were originally hypothesized to be the most interfering, there was a significant effect of the affirmation. In a One-Way ANOVA comparing the difference between neutral and stressful words (attentional bias) for the control group on word first SOA 200 trials only, there were significant differences in reaction times, F (1,74) = 4.93, $p < .05$, indicating that participants in the control group responded slower to the stressful words compared to neutral words. However, when doing the same analysis for the affirmation group, the difference between stressful and neutral words was not significant, F (1,74) = .50, p = .48, indicating that the affirmation group showed no difference in reaction time to stressful and neutral words. The interaction between the two was not significant, F (1,74) = 1.02, p = .32, indicating that the stress vs. neutral word difference for the control group was not significantly different compared to the affirmation group. These patterns were not observed in the other SOAs with less interference (all p's > .05). These results collectively show that on the most interfering stimuli, self-affirming proved to be beneficial in improving high level cognitive performance under stress. Because the attentional bias measured by the stressful vs. neutral word interference was significant

in the control group and not in the affirmation group, this supports the hypothesis that self-affirming serves as a buffer against the negative effects of stress.

General Discussion

The current study was designed to test the effect of self-affirmation on performance within three specific dimensions: self-reported anxiety levels as a result of the experimental stressor, performance on a thought suppression task that included threatening and neutral thoughts, and the extent to which attentional bias was influenced by negative selectivity in an emotional Stroop task. It was hypothesized that participants in the affirmation group would be less stressed compared to the control group, they would be more successful at suppressing unwanted threatening thoughts compared to the control group, and they would exhibit less negative selectivity on an emotionally charged cognitive task compared to those who did not self-affirm. The results of the current study show that self-affirmation did not prove to be beneficial in reducing self-reported anxiety. However, self-affirming aided cognition by resulting in fewer failures in a thought suppression task containing stressful and neutral thoughts, and by reducing attentional bias towards negative stimuli in an emotional Stroop task.

For the first hypothesis, participants self-reported anxiety levels were not affected by the self-affirmation. After the implementation of the stress manipulation, people who self-affirmed were not significantly less anxious compared to those who did not. This goes against our hypothesis by indicating that self-affirming was unsuccessful in easing participants self-reported feelings of anxiety in stressful situations. In terms of this null result, it is important to note that participants in the affirmation group had slightly higher anxiety overall (though not significant) compared to participants in the control group, and did not show a significant decrease in state anxiety after the stress

manipulation. Based on the nature of self-affirmation, we would expect people in the affirmation group to have lower anxiety levels when faced with a threat because they had the chance to reinforce their self-integrity (Sherman & Cohen, 2006), but this was not the case. This null effect could be attributed to the randomization of participants, in which there were more trait and state anxious people in the affirmation group compared to the control group.

As for the second and third hypothesis, the thought suppression and emotional Stroop tasks showed a more beneficial effect of self-affirmation.

For the thought suppression task, there were significant differences between affirmation and control groups exhibiting a positive effect of the self-affirmation. In the affirmation group, participants showed no difference in thought suppression ability between task one (the neutral task) and task two (the stressful task). However, in the control group, participants significantly differed in thought suppression ability between task one and task two. Participants who self-affirmed showed higher thought suppression ability compared to those who did not self-affirm when faced with a stressful thought. Overall, people who self-affirmed were more successful at suppressing negative thoughts in a stressful situation compared to those who did not self-affirm.

For the emotional Stroop task, there was a significant difference in performance across groups on the most interfering trial type. People who self-affirmed showed no difference in attentional bias toward stressful versus neutral words on the most difficult stimuli. However, the control group showed a significant increase in attentional bias toward threatening words under stress, which aligns well with the theory of negative selectivity (Bar-Haim et al., 2007). Most importantly, participants in the control group exhibited higher negative selectivity compared to participants who had the opportunity

to self-affirm. These results indicate that self-affirmation has the ability to strengthen cognitive performance especially in stressful situations, and supports the self-affirmation theory by showing that people are more successful at resisting bias towards threatening information once they have had a chance to reinforce their personal values (Sherman & Cohen, 2006).

Limitations and Future Directions

One limitation of the current study concerned the experimental stressor in which participants were told they would be preparing and presenting an impromptu speech. Although most people fear public speaking, this is not true for everyone (Faravelli et al. 2000). As a result, the stress manipulation in the current study did not have as much impact on state anxiety as intended. This was most clearly displayed by participants average self-reported anxiety ratings on the QALS, which were low, given that the scale ranged from 0-100. The average rating across the five administering time points was 14.75, and the highest average score was 30, which was seen at QALS 3 immediately after the stress manipulation. Some participants exhibited a drastic increase in anxiety, but overall self-reported anxiety ratings were low. This is an issue when testing the effects of state anxiety. If self-reported anxiety were higher, then the results of the current study may have been different.

Because of the limitation of the stress manipulation, there were participants in this sample who were most likely not extremely stressed, and therefore did not benefit from the self-affirmation as much as their stressed counterparts. A future direction that addresses this issue would be to prescreen and only test participants who are highly afraid of public speaking. A follow up study could implement a questionnaire that assesses fear of public speaking, and then use this questionnaire as a prerequisite for its

participants. By only testing participants who were highly afraid of public speaking, one could then ensure that the stress manipulation adequately implemented an effective stressor. Once there was a significantly stressed subject pool, one could test whether implementing a self-affirmation had the ability to reduce participants state anxiety and improve their performance on cognitive tasks in comparison to those who were not able to self-affirm.

Another limitation of the current study concerned the subjective quality of the self-reported anxiety measures. This measure was not based on performance like the thought suppression and emotional Stroop tasks. Rather, it was a subjective measure of perceived anxiety from each participant. This was problematic in that some participants may not have been truthful in their responses on the QALS because they were embarrassed or they did not want to seem anxious about giving the speech. In addition to embarrassment, there were numerous possible external influences on participants subjective responses. In the context of the current study, self-reported measures may not have been the most appropriate way of testing participants' state anxiety levels.

One future direction that addresses this issue would be to implement more objective measures of state anxiety. A future study could measure participants physiological stress levels, much like (Creswell et al., 2005). Possibilities of objective measures include participants cortisol levels, heart rate, blood pressure, perspiration, or respiratory rate. If a future study implemented some of these more accurate measures of stress, then state anxiety measures would be more precise and in turn allow for definite testing of the effects of the affirmation.

In terms of the stress manipulation failing to equally affect participants anxiety, another future direction lies within trait anxiety. Research shows that although state

and trait anxiety are often found together, they can influence the impact of stress on cognition in distinct ways (Edwards et. al 2010). It is possible that trait anxious people are also predisposed to high state anxiety, and that under this high state anxiety they might benefit more from the self-affirmation compared to those with low trait anxiety. In the current study, we equated participants on their trait anxiety because we were interested in examining the effects of a self-affirmation on state anxiety. However, for a future study, one could implement the Beck's Anxiety Inventory as a prerequisite (much like the fear of public speaking questionnaire) and gather a highly trait anxious group of individuals. Subsequently, one could implement a self-affirmation manipulation to test if high trait anxious people would benefit more from a self-affirmation as opposed to those who do not self-affirm. Testing this group of high trait anxious individuals would be beneficial because the combination of high trait and state anxiety may moderate the effect of the affirmation in other dimensions. For example, people who are doubled on anxiety (i.e. have high trait and state anxiety) might show larger improvements in performance under stress after self-affirming.

Conclusion

The results of the current study show that through self-affirmation it is possible to alleviate the negative effects of stress on cognition. By implementing a number of experimental measures while participants were under stress, the current study allowed for a closer examination of the effects of stress on individuals. On the surface, it may seem like self-affirmation has no effect on an individual's performance, however this is not the case. In the current study self-affirmation proved to be beneficial at objective high levels of cognitive processing. More specifically, this experiment successfully demonstrated that the simple exercise of writing down valued personal characteristics

helped performance implicitly, without participants subjective awareness. This additional positive aspect of self-affirmation can now be added to the long list of ways people may benefit from this simple, yet powerful exercise.

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