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SELF-AFFIRMATION AND HEALTHY FOOD CHOICE

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By

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ABSTRACT

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Self-affirmation has been shown to increase open-mindedness and facilitate attitude and behavior change to threatening information. The current study expanded on this research by exploring how self-affirmation impacts healthy food choice in women. In addition, reading time and performance on a memory recall task were investigated as potential mechanisms explaining the effect of self-affirmation on food choice. Participants underwent a self-affirmation manipulation followed by exposure to an article describing the decline in social quality of life associated with obesity. After a short filler task, a memory recall task of the previously read article was performed followed by a dichotomous food choice task containing a healthy and unhealthy food option. Regression analysis revealed that participants with high Body Mass Index (BMI) spent a longer time reading the threatening article after self-affirming compared to those who did not self-affirm. In addition, this manipulation led participants with high BMIs to opt for the unhealthy food option. Limitations and potential future research are discussed.
Section 1: Introduction

According to the Center for Disease Control (2012), 68% of Americans are overweight and 36% are obese. This problem did not happen overnight. Over the last 50 years, every demographic group has experienced a 100% increase in the number of individuals who are classified as overweight or obese. Calorie intake has skyrocketed as daily caloric expenditures have declined. This epidemic brings with it a tremendous burden on both the obese as well as on society as a whole. Obesity has been estimated to account for 10% of total healthcare costs (Hausman, 2010). Some of these costs are absorbed by the obese, who pay an average of 41% more in yearly health care costs than non-obese individuals. These costs are also shared by the rest of society through increased medical costs in Medicare and Medicaid (CDC, 2012). The government has acknowledged this issue and has tried a host of efforts to curb the epidemic, including banning trans fats and putting restrictions on soda size.

Although there is already a billion dollar weight loss industry in the US where one can easily access a variety of diets and exercise routines, 85% of these programs fail (Hausman, 2010). The dieticians who create these programs tend to view the problem through the lens of thermodynamics, that in order to lose weight one must simply burn more calories than they consume. As such, most diets tend to promote drastic reductions in caloric intake combined with equally drastic increases in exercise, emphasizing speed of weight loss over teaching prolonged healthy consumption (Applebaum, 2008). The problem is that little thought is given to the natural limitations of one’s self-regulatory system. That is, even when people start out with the best intentions, they eventually reach regulatory overload and relapse. This repetitive cycle of diet and relapse has been shown
to increase negative affect which in turn undermines future attempts at dietary control (Bridgett, Oddi, Laake, Murdock, & Bachman, 2013).

More promising approaches to weight loss would leverage social psychological principles to effect behavior change. That is, by implementing theoretically derived interventions, people can be nudged into making healthy food and exercise decisions. One theory that seems promising in this regard is self-affirmation theory; the current paper will explore how this theory can be used as a tool to promote healthy food choice. Literature discussing the principles of self-affirmation theory, its potential mechanisms, and how this theory has been applied to a variety of health contexts will be discussed. Finally, an experiment designed to test if self-affirmation theory can promote healthy food choice will be described.

Self-affirmation theory was first developed as a response to cognitive dissonance theory and as such, it is important to first discuss some assumptions of the latter theory. First and foremost, individuals have a fundamental need for psychological consistency among important cognitions. When an inconsistency arises, an individual is filled with feelings of unpleasant dissonance and employs a series of cognitive or behavioral shifts to alleviate this dissonance. A classic example of this is smoking where an individual knows this behavior is detrimental to their health, but continues to smoke anyway. Regardless of the path chosen to alleviate the dissonance, the theory states that it is this dissonance that motivates some restoration of consistency (Steele & Liu, 1983).

Claude Steele (1988) had a different idea. He proposed that it is not simply the feeling of dissonance that drives resolution of inconsistencies, but rather that these inconsistencies threaten one’s positive self-image. This idea of self-integrity is the core
assumption of self-affirmation theory. Specifically, people have a strong motivation to define themselves as a good, moral, and stable person. In an abstract sense, the characteristics and qualities used to define exactly what self-integrity is are arbitrary. These definitions may differ wildly from one culture to another and even within cultures. For example, a skinhead may view hate, violence, and prejudice as positive qualities while a Tibetan monk would value the opposite. Regardless of what values are considered ideal, people will develop and seek out cognitions that present themselves as living up to these ideals. Sometimes, however, people encounter information in which there are inconsistencies between their values and behaviors. Such information is referred to as “threatening information,” as it explicitly threatens people’s self-integrity. This paper will focus on threatening health related information. Most people like to think of themselves as living healthy lives and as such, become quite threatened when presented with information that contradicts this notion.

Sherman (2006) describes three unique ways individuals can respond to threats to self-integrity. First is accommodation, in which an individual accepts the threatening information and makes the appropriate changes in attitudes and beliefs. In terms of the smoking example, accommodation would be recognizing that smoking will lead to premature death and then enacting the appropriate cessation behaviors. The second type of response to threatening information involves discounting the threat through one of many mechanisms that are broadly referred to as the psychological immune system, defense mechanisms, or defense biases. These defense biases take many forms such as changes in framing, denial, dismissal, downward social comparison, and avoidance. A smoker who is presented with threatening health information might employ these
techniques by saying things like, “Well, everyone dies at some point” or “Johnny smokes twice as much as me” in an effort to restore their self-integrity.

A final way to restore self-integrity in the face of threatening information is self-affirmation. This strategy is characterized by affirming alternative values unrelated to the values being threatened. The affirming process itself involves making important values salient and reflecting on past actions that have exemplified these values. Unlike defensive biases, this strategy has been shown to facilitate adaptive attitude change. Specifically, affirming an unrelated value allows an individual to recognize that their self-worth is not unilaterally defined by the specific deficiency presented in front of them, thus affording them self-integrity. Once this ideal is realized, the reflexive defensive biases are suppressed and the threatening information is more able to be accommodated. In reference to the smoking example, when presented with the threatening information, a person who smokes may think about their success in living up to an unrelated value such as being a good parent. By thinking of specific instances where they lived up to this ideal, such as waking up early to feed their child during infancy or skipping the big game to attend their play, the person has effectively settled the argument as to whether or not they are a good and moral person. The threat presented by the smoking information no longer seems threatening enough to dislodge their perceived self-worth. As such, they will become more accepting of this information and be more willing to accommodate changes.

There are numerous examples in the literature that support these concepts outlined by self-affirmation theory. First, in Steele and Liu’s (1983) seminal study, prospective participants completed an attitude survey on a potential tuition increase as well as a
values survey. Individuals who held strong negative attitudes on the tuition issue were selected for the study. Participants were then told that the university needed them to write an essay arguing for the tuition increase. This was presented as either giving the participants high choice or low choice in their decision to write this essay. Half of the participants were then randomly assigned to completed a value affirmation scale and, last, all participants completed an attitude scale. Participants who experienced high dissonance in the high choice condition exhibited more attitude shift than those in the low choice condition. This was not the case however for individuals who were able to affirm a cherished value before recording their final attitudes.

One of the primary benefits of self-affirmation is that it facilitates the accommodation of new information. This is important because people often only accept information that is consistent with prior attitudes. This biased assimilation creates a propensity to focus on and remember strengths of confirming evidence while minimizing the weaknesses. The opposite appears to be true as well, where more emphasis is placed on the weaknesses of counterattitudinal arguments and less on their strengths. For example, proponents and opponents of the death penalty were asked to read two articles; one confirming and one disconfirming the effectiveness of capital punishment. Afterward, they were asked to rate the effectiveness of the articles and rerate their attitudes on the issue. Both proponents and opponents rated the articles that supported their preexisting belief as more convincing. Moreover, this process actually made their beliefs become more polarized (Lord, Ross & Lepper, 1979). Cohen, Aaronson, and Steele (2000) wanted to see if these defensive processes could be ameliorated by a self-affirmation manipulation. Again, participants were screened based on attitudinal
strength towards capital punishment. This time however, half of the participants completed a self-affirmation manipulation in which they wrote a short paragraph about why a cherished trait was important to them. Participants in the control condition were asked to write about their diet over the previous 48 hours. Next, participants were presented with an article that was either consistent or discrepant with their beliefs on capital punishment. Self-affirmed participants viewed the counterattitudinal article as more favorable, more convincing, and ultimately shifted their attitudes toward the counterattitudinal message. The self-affirmation manipulation was able to reduce the defensive tendencies usually associated with confronting new information.

Another example of self-affirmation producing open-mindedness can be seen in the context of the presidential election of 2008. People who affiliate with the major political parties and their candidates often experience significant pressures to adhere to their party’s core principles. Party affiliation often becomes a heuristic to assess attitudes on unfamiliar topics. Based on these facts, it is no surprise that those who affiliate with a party tend to view their membership as an integral part of their self-identity. In addition, validation of opposing arguments could potentially threaten group membership. Binning, Sherman, Cohen, and Heitland (2010) set out to examine if this crystalized belief structure could be affected by self-affirmation. Republican and Democratic participants were recruited two days prior to the 2008 election and half received a self-affirmation manipulation. They then were asked to watch excerpts from a presidential debate. As to be expected, there was a clear partisan gap between non-affirmed Republicans and Democrats in evaluating Obama’s performance. This gap disappeared however for affirmed participants. Furthermore, affirmed Democrats tended to become more pro-
McCain and affirmed Republicans become more pro-Obama. The authors also followed up with Republican participants ten days after the election and found those that affirmed had a significantly more optimistic view of the Obama presidency compared to Republicans who did not affirm. This last point highlights the notion that the open-mindedness created by self-affirmation can have lasting effects.

Thus far, the discussion has centered on the outcomes of self-affirmation. But what are the underlying mechanisms that are actually driving these changes in cognition? Research on this topic suggests that there may not be a single mediator responsible for the effects of self-affirmation. Rather, it appears that there are several mechanisms which operate at varying levels in tandem. One such mechanism is mood. While several studies have confirmed that self-affirmation has no effect on explicit mood, it does appear to provide an upward shift in implicit mood (Sherman & Cohen, 2006). For example, participants who self-affirmed were much more likely to choose letters creating positive valenced words in a word completion task. Moreover, analysis revealed that this increase in implicit positive affect acted as a mediator between the effects of self-affirmation and the quantity of ruminating thoughts (Koole, Smeets, Kippenberg, & Dijksterhuis, 1999).

Correll, Spencer, and Zanna (2004) proposed that the open-mindedness generated by affirmations could be due to one of three mechanisms — objectivity, agreeableness, or trivialization. As mentioned earlier, self-affirmation theory suggests that stabilizing one's self-integrity allows for diminished concern for the self, which in turn allows the individual to dispassionately evaluate persuasive communication. Alternatively, self-affirmations could increase global agreeableness so that all counterattitudinal arguments are viewed more favorably. Last, affirmation could cause all issues to become trivialized,
making people appear less biased simply because they care less about the issue presented to them. To test these ideas, the authors exposed affirmed and non-affirmed participants to pro- and counterattitudinal arguments that varied in strength. They then rated the persuasiveness of arguments presented to them on the merits of a tuition increase. Analysis revealed that affirmed participants displayed reduced bias and increased sensitivity to argument strength. This was driven by increased openness to strong counterattitudinal arguments and increased rejection of weak proattitudinal arguments. In addition, this effect only persisted when the argument pertained to a topic that was deemed personally important to the participant. If the affirmation manipulation increased the heuristic processing of triviality or agreeableness, all arguments, regardless of argument strength, would have been viewed more favorably and produced attitude shift.

Another potential mechanism that could account for many of the effects associated with self-affirmation is level of construal. Schmeichel and Vohs (2009) tested this idea while investigating how self-affirmation could facilitate self-control in a depleted state. In their first set of experiments, they were able to show a difference in level of persistence on a challenging puzzle task between ego-depleted participants who self-affirmed and those that did not. They hypothesized that this difference could be explained by a shift in levels of construal. As a person’s ability to exert self-control diminishes, they tend to start to processes the world through lower levels of construal. Low levels of construal tend to be associated with short-term gratifications and concrete sensations. On the other hand, high levels of construal tend to promote more abstract thought and a focus on long-term goals. To test this, ego depleted participants underwent either a self-affirmation or no-affirmation manipulation and were then asked to describe a
set of behaviors. Those that self-affirmed were significantly more likely to embrace more abstract descriptions of the behaviors giving support to the idea that the effects of self-affirmation are in fact mediated by shifts in levels of construal.

Legault, Al-Khindi, and Inzlicht (2012) attempted to take these cognitive findings one step further by investigating how self-affirmation alters the normal neurophysiological response to self-threat. Here, self-threat is operationalized as a performance error as the two both induce threats to perceptions of personal efficacy. Past research has identified a distinct neurophysiological response to performance errors, dubbed error-related negativity (ERN). The ERN is characterized by a pronounced negative deflection on the EEG occurring immediately after making an error on a task and is thought to be generated by the anterior cingulate cortex (ACC). This response is believed to be part of an error detection system associated with reinforcement learning and is initiated when a discrepancy appears between an expected and actual outcome (Holroyd & Coles, 2002). As self-affirmation has been shown to increase openness to threat in a variety of contexts, the researchers hypothesized that self-affirmed participants would demonstrate greater emotional responsiveness to performance error and in turn, an increased ERN compared to those who did not self-affirm. To test this, participants engaged in a go/no-go task where incorrect responses were accompanied with the word “WRONG!” flashing on the screen. As predicted, participants who self-affirmed showed a significantly larger ERN compared to non-affirmed participants. In addition, this difference in brain activity led those who were self-affirmed to make fewer mistakes that those who were non-affirmed.
This far, we have presented the tenets of self-affirmation theory and described the related mechanisms which increase open-mindedness and assimilation. Based on these facts, it is no surprise that these principles have begun to be applied to health-related contexts. Health information has been shown to be particularly threatening and consequently tends to evoke strong defensive biases. For example, Ditto and Lopez (1992) had participants undertake a bogus medical test that would determine if they had a particular disease that would cause lifelong complications. Half were told by the test that they did have the disease while others were told they did not. They then completed a questionnaire which measured their defensiveness toward a variety of health disorders. Participants who received the health deficient outcome were much more critical of the test, dismissive of potential health consequences, and examined the test results for an average of 30 seconds longer than those in the no-deficiency condition. This study highlights people’s sensitivity to threatening health information and the corresponding defensive processes which follow.

Sherman, Nelson, and Steele (2000) conducted one of the first studies examining how self-affirmation could affect the acceptance of personally relevant health information. Female coffee and non-coffee drinkers were recruited and were presented with an article describing the link between caffeine and breast cancer. There was a significant main effect for affirmation such that those that were affirmed were more willing to accept the article's conclusions than those who were non-affirmed. This effect was driven by coffee drinkers, who had a high stake in the information. (Indeed, self-affirmation appears to have the largest effect when the threatening information is of high relevance to the individual; Correll et al., 2004). Non-affirmed female coffee drinkers
were much more critical of the article than affirmed coffee drinkers. Lastly, participants in the affirmed coffee drinker condition predicted much less future caffeine consumption than their non-affirmed counterparts.

Although the study described above made an important first step in linking self-affirmation to a reduction in biased processing of health information, it was not clear whether this intervention could produce behavior change. That is, even though the affirmed coffee drinkers expressed a desire to reduce future caffeine consumption, it was unclear if this intention actually translated into actual reductions in coffee consumption. To address this issue, the authors conducted a subsequent study where they conducted a follow-up survey to assess behavior change. Sexually active participants were recruited and were assigned to either an affirmation or non-affirmation condition. Next, they were asked to watch an educational video describing how unprotected sex could lead to increased risk of HIV infection. In addition to a survey assessing attitudes about perceived personal risk for HIV, the researchers employed two additional dependent measures. The first was a HIV prevention pamphlet made available at the end of the experiment. For the second behavioral measure, the experimenters offered to sell the participants condoms at the same discounted price that was offered through the university health center. As predicted, self-affirmed participants viewed themselves at significantly more risk to contract HIV, and were more likely to take the pamphlet and purchase condoms (Sherman, Nelson & Steele, 2000).

Another example of self-affirmation producing health behavior change can be seen in the context of using sunscreen on a beach. Tanned skin is often associated with beauty in Western culture and one of the ways this is achieved is by lying out on a beach.
Jessop, Simmonds, and Sparks (2008) conducted an experiment in which they compared the attitudes and behaviors towards sunscreen between self-affirmed and non-self-affirmed individuals. One characteristic of this study that makes it unique from previous research was that it was conducted in a more natural setting. Female participants were recruited at a local beach in Southern England. Half of participants underwent a self-affirmation manipulation, whereas the other half simply continued on with the experiment. All participants were then presented with a pamphlet describing skin cancer and sun safety followed by a questionnaire measuring their attitudes about their personal vulnerability to skin cancer. As expected, participants in the self-affirmation conditions engaged in less defensive processing of the health-risk information (greater perceived vulnerability to skin cancer) and were more likely to request a free sample of sunscreen than participants in the control condition.

The above experiments demonstrate not only the link between self-affirmation and a reduction in the defensive processing health related information, but also that this intervention can facilitate immediate behavior change. These studies did not address whether self-affirmation can effect long term healthy behavior change. That is, although self-affirmed participants were more likely to purchase condoms and request sunscreen immediately after the experiment, there was no measure of whether the participants actually used the condoms and sunscreen, or the length of time for which the effect lasted. In an effort to address these questions, Harris and Napper (2005) conducted an experiment examining the effect of self-affirmation on long term reduction in alcohol use. Female participants were recruited and split into two groups based on whether or not they exceeded the recommended maximum alcohol units consumed per week (14 units) as
defined by the United Kingdom Alcohol Guidelines. Participants then underwent either the self-affirmation or non-affirmation (writing about a value important to someone else) manipulation. Afterwards, all participants were presented with an article describing the link between exceeding the recommended levels of alcohol and breast cancer. This was followed by a series of questionnaires assessing attitudes toward their own health as well desire to reduce alcohol assumption. Similar questionnaires were collected from participants after one week and again after one month. Similar to previous studies, participants in the high threat affirmation condition exhibited a reduction in biased processing (greater perceived risk for breast cancer) and greater intentions to change behavior (reduce the number of alcohol units consumed per week). Most interestingly, these results persisted at both the one week and one month assessments. While these shifts in risk perceptions and behavior change intentions proved durable over time, this was not associated with an actual reduction in alcohol consumption. The authors note that there may be additional factors which explain this discrepancy in the desire to change behaviors and actually changing them. Alcohol consumption tends to be linked to very strong social components. As a result, these social factors may have overridden the motivation to enact behavior change. This problem of pressure from social groups promoting unwanted behaviors has been shown to be prevalent with obesity as well. Christakis & Fowler (2007) examined 30 years of medical data of participants within close social clusters. They found that the spread of obesity through these social networks mimicked that of a virus. For example, a person’s chance of becoming obese increased 57% if they were in close contact with another person who was obese. The lesson from
these studies is clear: although self-affirmation may provide a boost in the desire to change unwanted behavior, it remains one piece of a complex puzzle.

A recent study conducted by Logel and Cohen (2011) has contributed further evidence on the long-term health benefits of self-affirmation. They set out to test the long term effects of self-affirmation on weight loss while also testing a core assumption of self-affirmation theory. All of the self-affirmation and health articles discussed in this paper so far followed a similar paradigm wherein a self-affirmation manipulation would occur followed by the presentation of threatening health information. Indeed, self-affirmation has no effect on information that is deemed neutral or nonthreatening (Sherman, 2006). Thus, the presentation, and subsequent acceptance, of threatening information is a key factor in changing attitudes and behavior (Schmeichel & Vohs, 2009). Female participants were recruited and underwent a series of tests assessing their weight and working memory. These measures were done in a way that kept the participants blind to their specific results. This was followed by a standard self-affirmation or no-affirmation manipulation. Participants returned and were re-measured approximately 2.5 months after the first session. The authors hypothesized that affirming one’s values would free up participants working memory from stressful ruminations and facilitate weight loss. Results indicated a significant difference in weight and waist size between conditions at the second weigh-in. Furthermore, participants in the no-affirmation condition gained weight and waist circumference while the self-affirmed participants lost weight and waist circumference. There were also differences in working memory between groups, and regression analysis revealed that there was a significant working memory x condition interaction that significantly predicted weight loss.
Although this study provides strong evidence for self-affirmation as a tool in weight loss over time, the question of whether self-affirmation can be used as a tool to promote immediate healthy food choice remains to be tested. The current study will attempt to answer this question as well as account for the potential mechanism by which this process occurs. Specifically, this study predicts that participants who self-affirm will be more likely to make a healthy food choice compared to participants who do not self-affirm. Furthermore, research on self-affirmation clearly states that threatening information is required to produce an effect. Despite this, participants in Logel and Cohen’s (2011) study above exhibited legitimate behavioral changes without any exposure to threatening weight-related information. This begs the question of whether something is unique about weight in reference to other health domains such as skin care, HIV infection, or even alcohol consumption. To test this idea, effects of exposure to relevant threatening article describing the social costs associated with obesity, as well as a control article, will be assessed. It is predicted that the presence of threatening information will be an essential requirement for the effects of self-affirmation to take hold. If self-affirmation in conjunction with threatening information does have an effect on food choice, by what mechanism does this effect occur? It is believed that healthy food choice will be moderated by the depth of processing of the threatening information. This latent variable will be measured by reading time of the article and performance on a memory recall task pertaining to the article. Thus, undergoing a self-affirmation manipulation will lead to deeper processing of the threatening information as evidenced by longer reading times and better memory recall of the information. It was predicted
that this increased depth of processing would in turn lead participants to opt for a healthy food in a food choice task.
Section 2: Method

Participants and Design

One hundred twenty-one female undergraduates were recruited from the California State University, Northridge Psychology Department subject pool and received partial course credit for participating in the study. A prescreening measure of body mass index (BMI) was assessed and only participants whose BMI ratio exceeded 24.9 (designated as overweight by the Center of Disease Control, 2012) were initially selected for participation. This restriction substantially impaired recruitment and, as a result, the minimum BMI threshold was reduced to 21.5, which represents the upper half of what is designated as normal weight. Only females were recruited, as females tend to care more about their weight than men (Logel & Cohen, 2011). The goal of these restrictions was to select a population in which the threatening weight-related information would be as meaningful as possible.

The study employed a 2 (Affirmation Type: Self-Affirmation or No-Affirmation) x 2 (Article Information: Threatening Health Information or Non-Threatening Control) between-subjects design. The dependent variables were reading time on the Threatening/Non-threatening article, quantity of information presented on the memory recall task measured by word count, and a dichotomous food choice (a prepackaged, single serving bag of freeze-dried apple slices or chocolate chip cookies).

Procedure

Upon arrival, participants were greeted by a female experimenter whose own BMI exceeded 24.9. Experimenters were selected based on these two criteria in an effort to avoid any demand characteristics their appearance would have on the participants. After
providing informed consent, participants were placed at a computer station where they completed a series of tasks associated with the experiment. Upon accessing the survey, they were randomly assigned to one of the four experimental conditions; Self-Affirmation with relevant Threatening Health Information, No-Affirmation with relevant Threatening Health Information, Self-Affirmation with Non-Threatening Information, and No-Affirmation with Non-Threatening Information. All participants were then asked to read a short article unrelated to the study. The time it took to read this article was recorded and served as a baseline measure of reading time.

Affirmation Manipulation

Participants were then given 5 minutes to complete the affirmation phase of the experiment. This manipulation consisted of two parts. In the first, all participants were presented with a list of 10 values (e.g. compassion, intelligence, creativity) and were asked to rank these values in the order of most important to least important. The next part of this manipulation differed between those in the Self-Affirmation and No-Affirmation conditions. Participants in the Self-Affirmation conditions were asked to write an essay describing why their top ranked value was important to them as well as provide real life examples of how they have lived up that value. Participants in the No-Affirmation conditions were also asked to write an essay, but about how their 9th ranked value could be important to someone else. They were instructed to try and include hypothetical real life examples of how this value would have helped someone else in daily life. This method of inducing affirmation has been used successfully across a host of self-affirmation experiments (Sherman, 2006).

Information Manipulation
Those in the Threatening Information condition were asked to read a short article describing the social quality of life costs associated with obesity. Examples include being physically unable to participate in social activities with friends and family and fears of being negatively judged by people based on their weight. This article also briefly discussed how eating low-calorie and unprocessed foods could greatly reduce the risk of obesity. Participants in the Non-Threatening Information condition read a control article about the fall of the Berlin Wall. These two articles were matched on word count and no significant differences were found in reading time in pilot analysis. Participant reading time was recorded.

Memory Recall Task

All participants then completed a filler task in which they were presented with pairs of faces and were asked to rate how similar they thought the faces were. This task lasted approximately five minutes. After completing the filler task, participants were given three minutes to type everything they could remember from the second article they had read.

Demographic Survey and Food Choice Task

After completing the memory recall task, participants were told that the final portion of the experiment was to complete a short demographic survey. This task had two purposes. First, it would act as a buffer between the memory recall task and the upcoming food choice task. In addition, it would also signal to the participant that the experiment was coming to an end. This was important part of masking the food choice task as unrelated to the experimental manipulation, thereby avoiding demand characteristics. When participants had completed the survey and notified the
experimenter, they were told that as a reward for their participation they would be able to take a parting gift that was leftover from a previous unrelated study. They were offered a choice between a prepackaged single serving of freeze dried apple slices or chocolate chip cookies. The freeze dried apple slices represented the healthy option and had 35 calories per bag. The chocolate chip cookies represented the unhealthy option and had 280 calories per bag. If participants did not want to choose one of the options, they were asked what they would choose if they had to make a choice. These two food choices were compared in a pilot study and were rated on the variables of healthiness, cost, calories, and desirability. No significant differences were found in cost ($p = .689$) and desirability ($p = .784$), but significant differences were found for healthiness, $F(1, 38) = 439.28, p < .001$, and calories $F(1, 38) = 195.97, p < .001$. This technique has been used successfully in previous healthy food choice experiments (Fishbach & Dhar, 2005). Upon completion of this task, participants were debriefed and dismissed.
Section 3: Results

Initial data screening and quality control checks resulted in the removal of several cases. First, a problem occurred in the collection of reading time data where the “submit page” button was not always clicked immediately after the article was finished being read by the participants. Instead, it was at times only clicked after the face survey section of the experiment was completed. This produced a situation where some participants appeared to be taking more than 7 minutes to read the article that in actuality took them much less time to complete. To correct for this error, data of participants with reading times in excess of 5 minutes was excluded from the analysis \( n = 30 \). In addition, responses to the affirmation manipulation were examined for adequacy. Two research assistants examined the responses to the affirmation manipulation and were instructed to flag responses they deemed were insufficient or inappropriate in reference to the specific directions of the manipulation. Inter-rater reliability was substantial \( (\text{Kappa} = .775, \ p < .001) \). Cases that both raters felt did not meet the requirements of the assignment were excluded \( n = 12 \). This practice of excluding participants based on their performance in the affirmation manipulation, while often not reported, is considered standard operating procedure in self-affirmation research (Logel, 2013). Additionally, participants who did not make an initial food choice during the food choice task were excluded \( n = 3 \). The remaining cases were then screened for violations of GLM assumptions. Univariate outliers were assessed by identifying reading times and BMI scores that exceeded +/- 3.3 units after being converted to Z-scores. One outlier in BMI score was identified and excluded from analysis. Combined, these screening procedures resulted in 46 cases being excluded from further analysis, yielding a total sample of 75 participants.
Normality was assessed by examining skewness and kurtosis statistics. The normality statistics for both reading time (skewness = .012, kurtosis = .405) and BMI (skewness = .401, kurtosis = .033) suggest that the assumption of normality was met. Lastly, the assumption of homogeneity of variance was tested by examining scatterplots between variables as well as through Levene’s test of equality of error variances. A visual analysis of the scatterplots revealed the spread of residuals appeared fairly consistent across the independent variables. In addition, Levene’s test was not significant (p=.303). Both of these suggest that the assumption of homogeneity of variance was met.

**Reading Time**

Several types of analysis were employed to test whether participants who underwent the self-affirmation manipulation would spend more time reading an article depicting quality of life costs associated with obesity than participants who underwent a non-affirmation manipulation and/or were exposed to an unthreatening control article. An initial ANCOVA examined reading time as the dependent variable with self-affirmation/no-affirmation and threatening health related article/control article as independent variables. A covariate of initial reading time was also used in an effort to reduce variation in post-affirmation reading time due to individual differences; this covariate was significant, $F(1, 70) = 32.396, p < .001$. This analysis revealed no significant difference in reading time based on Affirmation Type, $F(1, 70) = .099, p = .753$, or threat, $F(1, 70) = .179, p = .673$.

This lack of difference could have been due to the fact that recruitment of participants with BMIs of 25 and above was challenging. As noted previously, in order for the self-affirmation manipulation to be effective, the threatening information must be
relevant to the participants. By opening the study to participants with a minimum BMI of 21.5, it is possible that those participants who fell within the normal BMI range did not feel that the threatening obesity-related article was applicable to them. If this were the case, they would likely show no difference in reading time. It was therefore hypothesized that an interaction between BMI, affirmation, and threat conditions could reasonably exist. As such, participants with higher BMIs would exhibit longer reading times compared to participants with lower BMIs. To test if this was the case, the data were analyzed through a linear regression model.

This model consisted of Affirmation, Threat, and BMI predicting reading time with baseline reading time used as a covariate. Correlations between predictor variables are presented in Table 1. As expected, baseline reading time was significantly correlated with post-manipulation reading time, $r = .561, p < .000$. BMI was also significantly correlated with post-manipulation reading time, $r = .308, p = .007$. To test the interactions between these variables, a linear regression model was constructed with the variables of affirmation, threat, BMI, and their interactions predicting reading time. In an effort to make the intercepts meaningful, BMI was mean centered. This model accounted for a significant amount of the variability in reading time, $R^2 = .450$, adjusted $R^2 = .383$, $F(8, 66) = 6.738, p < .001$.

Contrary to what was predicted, this equation produced no main effects for the Affirmation, $B = -14.896, t(66) = -1.484, p = .143$, and Threat variables, $B = -14.084$, $t(66) = -1.463, p = .148$. To probe the interaction effects, simple slopes were generated and compared while centering BMI scores one standard deviation below the mean, at the mean, and one standard deviation above the mean. This allowed for a comparison of
predicted reading times for participants who had low, average, and high BMI scores. In addition, the affirmation and threat variables were centered as well. When the affirmation variable was centered at “No Affirmation”, a significant Threatening Information*BMI interaction emerged, \( B = 27.316, t(66) = 2.079, p = .042 \). As depicted in Figure 1, participants who did not self-affirm and read the threatening article did not significantly vary in reading time depending on their BMI. In contrast, participants who did not self-affirm and read the threatening article demonstrated a significant increase in reading time as their BMI’s increased. It is unclear what was driving this effect as the two variables appear to have no established relationship in the literature.

When centering the threat variable at “Threatening Information”, a marginally significant Affirmation*BMI interaction emerged, \( B = 6.590, t(66) = 2.1948, p = .056 \). This interaction is depicted in Figure 2. Participants who did not self-affirm and read the article pertaining to the threatening costs of obesity showed no difference in reading times across all levels of BMI. As predicted, however, participants who read the threatening article and did self-affirm varied significantly in expected reading time as a function of their BMI.

Lastly, a comparison of regression lines across the centered variables revealed a significant three-way interaction between Affirmation, Threatening Information, and BMI, \( B = 12.844, t(74) = 2.592, p = .012 \). A comparison of the different centered regression lines revealed that this effect was the product of a significant interaction between the Affirmation and Threatening Information variables, but only at high BMI levels, \( B = -9.979, t(66) = 2.373, p = .021 \). As depicted in Figure 3a, the intercepts of the regression line for participants who self-affirmed and read the threatening article were
substantially larger than the intercepts for participants who only read the threatening article or self-affirmed. It should also be noted that the intercept for those who do not affirm and are not exposed to the threatening article was very close to the intercept for those who self-affirm and read the threatening article, which likely also contributed to the interaction.

**Memory Recall Analysis**

It was predicted that participants who self-affirmed would recall more information about the article they read than those who do not self-affirm. Furthermore, those that had also read the threatening article in addition to self-affirming were predicted to produce the greatest amount of recalled information. As there were two different texts from which participants were assigned to read and remember information, a comparison of conditions between these texts would be problematic, in that any differences could simply be attributed to the differences in the texts themselves. Linear regression was conducted with Affirmation, BMI, Reading Time 2 and the Affirmation*BMI interaction predicting verb count in the memory recall task. There was no significant difference in verb count for both the Threatening, $F(4, 40) = .248, p = .909$, and Non-Threatening text, $F(4, 35) = .386, p = .698$. None of the individual predictors were significant in the Threatening Information equation, Affirmation $p = .945$, BMI $p = .986$, and Affirmation*BMI $p = .992$. The same was true for the Non-Threatening equation, Affirmation $p = .578$, BMI $p = .722$, and Affirmation*BMI $p = .639$. Additionally, there appeared to be no relationship with reading time of the article and verb count in both the threatening article, $p = .365$, and the non-threatening article, $p = .273$. This was
somewhat surprising as time spent reading a passage has been shown to be positively correlated with memory recall tasks (Ericsson & Kintsch, 1995).

**Food Choice**

It was predicted that participants exposed to both a self-affirmation manipulation as well as threatening obesity-related information would be more likely to make a subsequent healthy food choice. To test this, a discriminant function analysis was performed with affirmation and threat acting as the independent variables and food choice acting as the dependent variable. Participant data that was excluded in the analysis for reading time due to a collection error (n=28) was included in this analysis, yielding a total sample of 103 participants. This statistical test was unable to significantly classify participants into the correct food choice, Wilks’ $X^2(2, 101) = 3.96, p = .820$. Again, as the BMI restriction was loosened, it is possible that the food choice was in fact moderated by a participant’s BMI score. A binary logistic regression analysis was employed to test if affirmation, threat, BMI, and their interactions significantly predicted food choice. Again, BMI scores were centered on the mean to make the intercepts meaningful. This regression equation did not significantly predict food choice, $X^2(7, 96) = 10.008, p = .188$. An examination of the individual predictors revealed the Threatening Information variable was largely ineffective. A new binary logistic regression was created to explore this phenomenon in which Threatening Information was excluded and only Affirmation, BMI, and their interaction were used as predictors of food choice. The overall model was only almost significant, $X^2(3, 100) = 7.735, p = .052$. Both Affirmation, Wald $X^2(1, 102) = .420, p = .517$, and BMI, Wald $X^2(1, 102) = 2.111, p = .146$, were not significant predictors of food choice. However, the Affirmation
BMI interaction was a significant predictor of food choice, Wald $X^2(1, 102) = 6.355, p = .012$. To explore this interaction, simple slopes were compared with BMI scores centered at 1 standard deviation above and below the mean and affirmation scores centered at “Self-Affirmation”. These results are depicted in Figure 4. In the binary logistic equation, apple slices were coded as 0 and cookies were coded as 1. The further the predicted intercept is from one of those numbers, the less likely a participant will choose that given food. For example, at .5, the participant would be equally likely to choose either food option. In contrast, at 1, they would be much more likely to choose cookies. Based on the analysis, only the intercepts for those with high BMIs ($M + 1SD$) were significantly different, Wald $X^2(1, 102) = 4.244, p = .035$. Thus, in contrast to predictions, participants with high BMIs were much more likely to make an unhealthy food choice if they self-affirmed than if they did not self-affirm.

The purpose of collecting data on memory recall and reading time was to account for the latent variable of depth of processing. It was predicted that these variables would act as mediators between Affirmation/Threat and Food Choice. To test this, Affirmation and Threat would have to first successfully predict reading time and/or verb count. While there was evidence to support these variables predicting reading time, they did not predict verb count. A binary logistic regression was conducted to test the relationship between reading time and food choice, but produced no significant effects were observed, Wald $X^2(1, 74) = .350, p = .544$. Based on the lack of significance in these relationships, reading time and verb count on a memory recall task do not appear to be mediators between Affirmation and Threatening Information on food choice.
Discussion

The present study set out to examine the effectiveness of self-affirmation manipulations as a tool to promote healthy eating as well as the underlying conditions and mechanisms that govern this process. This superordinate research goal was broken down into several research questions. To begin with, assuming time spent reading an article was indicative of the depth of processing the information, how did the presence of a self-affirmation manipulation, threatening nature of the text, and BMI affect reading time? Furthermore, if longer reading times were in fact representative of deeper processing, would this difference be evident in longer memory recall responses? And lastly, how could this combination of variables affect a subsequent choice in food?

Initial analysis showed that neither the variables of Self-affirmation or Threatening Information influenced reading time. However, incorporating the participant’s BMI into the equation revealed a more complex pattern of results. First, BMI was a significant predictor of reading time, across all conditions. By examining some of the interactions, a more complete story emerged. Based on the interaction between the Threat variable and BMI, participants who did not self-affirm and were exposed to threatening information did not vary in reading time as a function of their BMI. In contrast, those that did not self-affirm but were exposed to the non-threatening article did vary in reading time as a function of their BMI. This result was surprising, in that no effect was expected for those participants in the No-Affirmation / No-Threat condition and it is unclear what drove this difference. There are several plausible explanations. First, there could be something unique about the No-Threat article that was responsible for this effect, but this seems somewhat unlikely (as it was a historical article...
about the Berlin Wall that was previously shown to be similar to the threatening article in reading difficulty). Another possibility is that this effect could have resulted from chance alone and that this effect would not replicate consistently.

There was also a significant interaction between the Affirmation and BMI variables. There were no differences in reading time across differing levels of BMI when participants read the threatening article about the costs of obesity after not affirming. However, reading time did increase with BMI for participants who read the threatening article after self-affirming. This finding supports the idea that as the article became more personally relevant and threatening, those that self-affirmed had their defensive biases suppressed, resulting in longer reading times. This possibility is further substantiated by the significant three-way Affirmation, Threatening Information, and BMI interaction. This interaction was driven by a difference in regression slopes between those that had self-affirmed and were exposed to the threatening information and those that had not affirmed but were exposed to the threat article as well as those who did self-affirm but were not exposed to the threat article.

There are several reasons why this 3-way interaction may have been only present in high-BMI participants. In order for self-affirmation to produce cognitive and behavioral changes, several things must occur. First, the affirmation manipulation must be taken seriously; it works best when participants are given ample time to plan and write a series of thoughts related to the selected value. The quality of the affirmation procedure in the present study was somewhat questionable. In other self-affirmation studies, participants are given ten to fifteen minutes to complete the task and are often given additional time based on need. Due to time constraints in the current study, participants
were only given five minutes to complete the task, with no possibility of additional time. Moreover, the space that was provided to participants to write their response, while technically unlimited, appeared to be only 4 lines of visible space. It is quite possible that even though participants could have gone on writing, they decided to stop once the box was getting full. The lack of visible space created the expectation that the experimenter was only looking for 4 lines of text. Perhaps if participants had written more on their chosen value, the effects of the manipulation may have been more robust and extended to those with smaller BMIs. Another potential problem could lie in the nature of the threatening article itself. Self-affirmation works best at reducing defensive processes associated with chronically threatening information. Participants with lower BMIs may have never contemplated the issues addressed in the article. Furthermore, the examples presented in the threatening article may have been too extreme and/or only applicable to people on far end of the BMI spectrum, as it primarily dealt with obesity. For instance, one example that was used in the article was not being able to play with young relatives due to their weight. Even if the participant was overweight, they conceivably could have thought this particular threat was not applicable to them as they have young relatives and experience no problems interacting with them. Moreover, they could maintain the same eating habits and weight without fear of such an instance becoming a problem. As BMI increased to levels of obesity, the threats described in the article becomes more applicable and threatening and ultimately, become more susceptible to being affected by the self-affirmation manipulation (Logel, 2013).

There is also the issue of how closely the sample matched the population. BMI scores between 25 and 29.9 are characterized as overweight and scores of 30+ are
characterized as obese. According to the CDC (2012), the mean female BMI in the United States is 29.0. In the current study however, the mean BMI was 25.36 with a standard deviation of 3.68. Thus, high BMI participants (BMI +1 standard deviation above the mean) referenced in the current study only have a BMI of 29.04. This BMI is not only below the mean female BMI in the United States, but it does not even cross the obesity classification threshold. Based on this discrepancy, it is likely that the results would have been more pronounced if the sample population was closer aligned with the population at large.

There is also the question of how the BMI of the experimenter may have affected the food choices of the participants. The experimenter BMI restriction of 25 was initially imposed when the participant BMI cutoff was set at 25. This was done in an effort to eliminate social desirability pressure on the participants to choose the healthy option; if the experimenter was similarly overweight, participants would feel more comfortable choosing the unhealthy food choice if they were so inclined. As the BMI restriction fell to 21.5 however, the fact that the experimenter BMI was 25+ could have become problematic. Specifically, participants could have been judging their own weight in reference to the experimenter. Thus a participant who may generally feel concerned about their weight may have had these feelings dulled by the presence of the experimenter who was likely to have a BMI substantially larger than their own. In future studies, an experimenter with a lower BMI may be more appropriate as they would draw contrast between the participants and make their own weight more salient.

The question still remains whether or not this increase in reading time was associated with deeper processing on the topic. The greater the processing, the more
neural networks should be activated, and the participant should then be able to access and recall the information more efficiently. In other words, longer reading times should predict greater word count on a memory recall test. Unfortunately, neither ANOVA nor regression analysis yielded any evidence of a connection between reading time and subsequent word count. There are several potential reasons for this. To begin with, only three minutes were given for the memory recall task. It is possible that this period of time did not allow for enough variability in responses that would be necessary to show up on any statistical tests. Another potential issue is that memory recall may be a poor measure of depth of processing. Just because someone spends more time reading an article, it does not necessarily follow that the extra time is spent actually reading or encoding the specific information in the article. Instead, the extra time could be spent thinking about concepts that were activated by the information in the article and not the specific information itself. Thus, when asked to recall the specifics of the article, the person may do just as well as someone who spent less time reading the article and was processing the information on a much more superficial level. A more appropriate measure of depth of processing could have been to instruct participants to write down everything they could remember from the article as well as anything else the article made them think about.

To assess the effects of the affirmation and threat conditions on food choice, a discriminate function analysis was performed. Again, it was thought that BMI could be crucial in explaining the variability in food choice. A logistic regression was then performed and the equation of affirmation, BMI and their interaction predicting food choice was marginally significant. The BMI and affirmation interaction was a significant predictor of food choice. Upon further inspection, this effect was again contained to
those with high BMIs. This effect, however, was in the opposite of the predicted direction. For those with high BMIs, self-affirmation led to a substantially greater chance of selecting the unhealthy cookies as opposed to the healthy apples. Research on moral credentialing may provide insight into this unexpected result. The general idea behind this concept is that people who affirm themselves as moral in a given area lose the drive to prove themselves in the domain in question and become more willing to act in ways that violate their moral principles. Mazar & Zhong (2010) compared subsequent behaviors of participants who affirmed their value of environmentalism through the purchase of eco-friendly products with those who purchased conventional products. Participants who affirmed their environmental values acted less altruistically and were more likely to cheat and steal compared to those did not affirm any values. Perhaps something similar is occurring in the present study. By affirming a value unrelated to health or food, participants may have been more willing to do something they that would normally cause feelings of guilt. It may be that this effect was limited to high-BMI participants because that low and average-BMI participants may have not viewed choosing the cookies as something they should not do.

The findings presented in this study offer a starting point for future research. To begin with, understanding how self-affirmed participants spend the extra reading time is important to understand. The use of eye tracking systems could be helpful in examining whether particular parts of the threatening text lead to slower reading times. In addition, focusing on the obese population for future work seems logical, both in the hopes of discovering more robust self-affirmation effects as the information will be most threatening, but also because this population could benefit the most from exploring new
ways to promote healthy eating. A final direction future research could take is to examine the interaction between mood and self-affirmation on food choice. Elevated implicit mood has been shown to be a byproduct of the self-affirmation effect (Sherman & Cohen, 2006). Mood also plays a strong role in how people make their decisions. Specifically, people are motivated to either get into or stay in a good mood and this goal impacts decisions and behaviors (Cialdini, Schaller, Houlihan, Arps, Fultz, & Beaman, 1987). It follows, then, that self-affirmation could be putting participants in an implicitly good mood and they are then more willing to choose the unhealthy food as a way to maintain that good mood. This association between unhealthy food and good mood is likely to be especially strong in high-BMI participants.

The goal of this study was to explore the relationships among self-affirmation, threat and food choice. Several significant effects emerged. Participants who self-affirmed and were exposed to threatening information took longer to read the article compared to those who did not affirm, but were exposed to the same threatening article. This relationship was especially pronounced for participants who had higher BMIs. Although this effect was consistent with predictions, the effect of self-affirmation on food choice was not; self-affirmed participants with high BMIs were more likely to choose an unhealthy food compared to a healthy one. On one hand, this study was unsuccessful in showing how self-affirmation could be used as a tool to promote healthy food choice. However, the manipulation did lead to behavior change, and further investigation of this phenomenon may reveal an interesting and potentially problematic side effect of self-affirmation.
References


Appendix A: Tables

Table 1.

*Bivariate Correlations Among Study Variables*

<table>
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<th>2</th>
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<th>4</th>
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<td>.561**</td>
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*Note: **p < .01*
Appendix B: Figures

Figure 1. Differences in intercept of reading time in Non-Affirmed participants by BMI
Figure 2. Differences in intercept of reading time in Affirmed participants by BMI
Figure 3. Intercept of reading time when BMI was centered at one standard deviation above the mean.
Figure 4. Food choice by BMI and Self-Affirmation

![Graph showing food choice by BMI and Self-Affirmation](image)