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The Influence of Self-Enhancement And Stress on Weight Gain: A Biopsychosocial Approach

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Honors Thesis

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Abstract

The current longitudinal study was conducted to test if people perceive their physical body size to be smaller than it is, and if people do self-enhance their body size, then how do body self-enhancement and stress interact to predict subsequent Body Mass Index (BMI). This study toke a biopsychosocial approach to understanding why people make health decisions by measuring participants' self-enhancement, perceived stress, cortisol baseline levels, and stress reactivity and observing their associations and interactions with subsequent weight gain. Self-enhancement is a type of positive illusion characterized by overly positive attitudes people have towards themselves, which is used for promotion and maintenance of a positive sense-of-self. Previous research has found that people's self-enhancing tendencies about their traits and abilities extended to automatic and perceptual judgments of themselves by perceiving themselves as more attractive than they are (Epley & Whitchurch, 2008). The current study questions if this also applies to body size. Additionally, different types of stress were measured, such as perceived stress using the Perceived Stress Scale, as well as baseline cortisol levels and stress reactivity. Saliva samples were collected before and after an acute stressor, the Trier Social Stress Task (TSST), and analyzed using Salimetrics ELISA Cortisol Kit (Birkett, 2011; Kirschbaum, Pirke, & Hellhammer, 1993). TSST was recommended by Dickerson and Kemey's (2004) meta-analysis as an acute stressor that accurately and validly activates the HPA axis, the central stress response system responsible for releasing cortisol (the stress hormone). Previous studies support two conflicting hypotheses about the health implications of self-enhancing (Taylor et al, 2003). The results of this study show that participants do self-enhance their body sizes to be smaller than they are and that there are significant associations between body self-enhancement and BMI, mediated by stress that support and contradict previous hypotheses on the health consequences of self-enhancing.

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Introduction

When it comes to lifestyle choices, most people know that healthy eating and regularly exercising are hallmarks to living healthy but have difficulty in carrying it out. For example, The CDC reported that in 2015 more than 40% of adolescents and adults said they ate fruit and vegetables less than once a day. Additionally, the same study found that 50% of adults 18 years or older did not meet recommendations for aerobic physical activity and 79% did not meet recommendations for muscle-strengthening. Poor lifestyle choices like poor diet and lack of exercise are directly linked to the increased incidence of chronic lifestyle diseases, such as hypertension, cardiovascular disease, type II diabetes, obesity, and obesity that have overtaken infectious diseases as leading cause of adult death in the United States (Golubic, 2013). That is, Nearly half of adults, or 117 million people, have one or more chronic health conditions and now seven of the top ten causes of death in 2014 were chronic diseases (National Center for Disease Prevention and Health Promotion, 2017).

The biomedical model of health (Engel, G. L., 1989) argues that biological variables, external pathogens, and abnormal organ or body system functioning are the key components of illness. Despite once being the dominant explanation for illness, the impact of lifestyle on health suggests that the biomedical model may not be as explanatory. It is even hard to economically justify this model because 86% of the United States annual health care expenditures are for people with chronic and mental health conditions, which could be reduced with the biopsychosocial model (National Center for Disease Prevention and Health Promotion, 2017). The biopsychosocial model takes an integrative biological, psychological, and sociological perspective on health that is more relevant in studying, assessing, preventing, and treating chronic lifestyle diseases. The inclusion of psychological and social determinants of health allows for a multifaceted understanding of illness and the ability to study questions such as why individuals make health-compromising decisions, why different subsets of the population are more prone to chronic lifestyle diseases, and how these factors influence development, course, and outcome of disease (Havelka, Lucanin, J., & Lucanin, D., 2008).

The present research focused on understanding health behaviors and how psychosocial variables influence physical health. Several theories and models have been proposed over the years such as Social-Cognitive Theory (SCT), Motivational Theory, The Health Belief Model (HBM), and The Ecological Approach (Bandura, 1986; Ryan & Deci, 2000; Rosenstock, 1990; Lawman & Wilson, 2012) to explain the association between psychosocial variables and health. Perhaps the most relevant and widely cited model is the HBM, which was adapted from its original version by Green and Murphy (2014) to incorporate self-efficacy, or an individual's perception he/she can accomplish a certain behavior, as a driving force in health decision-making. This model proposes that individuals base their health behaviors on calculating the costs and benefits of making a change in health behavior. The costs include perceived threat of a disease, or an individual's susceptibility to a disease and its severity and the benefits are the positive outcomes of a particular behavior. If the perceived benefits of changing health behaviors surpass barriers, then the individual is likely to employ preventative actions (Deshpande, Basil S., & Basil D., 2009). Research based on the HBM, specifically how it can be used to predict healthy eating, found that perceived severity of health outcomes from gaining weight, dietary status, and perceived susceptibility to gaining weight were significant predictors of the college student eating habits (Middleton & Perri, 2014). Interestingly, this study also found that students with high body mass index (BMI) were more willing to change their eating habits.

While it is important to understand whether or not people believe they are capable of making health behavior changes, it is also important to understand how people's overly favorable self-perceptions, i.e., self-enhancement, might influence whether individuals' perceive a need to make behavioral changes. Previous research finds that self-enhancement can impact a variety of self-perceptions, including physical appearance. A series of studies by Epley and Whitchurch (2008) examined if a person's enhancing inferences about their traits and abilities extended to automatic and perceptual judgments of themselves. Epley and Whitchurch (2008) found that when they morphed participants' faces with an attractive and unattractive same-sex target and asked to select the face that represents their actual face (that is, the face that was 100% their own, or not morphed with a target), participants were more likely to select a slightly enhanced version of their face as their actual face. This self-recognition self-enhancement was also positively correlated with measures of implicit self-worth such that the more a participant perceived their face as more attractive the more the higher they unconsciously perceived their self-worth.

Even though self-enhancement is used to promote and maintain positive sense-of-self and self-worth, whether self-enhancement is adaptive or maladaptive has been the focus of much debate. Research by O'Mara, McNulty, and Karney (2011) examined whether mental health is better when negative experiences are viewed accurately or more positively through the formation of positively biased appraisals. Across the studies, self-enhancing during relatively mild (not very negative) experiences had fewer depressive symptoms over a four year span, while those self-enhancing during relatively severe (more negative) experiences had more depressive symptoms. These findings suggest that cognitive biases are not inherently positive or negative; their implications for mental health depend on the context in which they occur.

In regards to physiological health, two contradicting hypotheses dominate. McEwen's (1998) hypothesized that self-enhancement can foster health and longevity, as he observed participants with higher self-enhancement experiencing a decreased chronic toll on their stress regulatory systems because they possessed better stress regulation and lower acute responses to stress than those without self-enhancing tendencies. In contrast, some theorists and researchers have suggested that self-enhancement is a defense mechanism of denial and repression (Colvin, Block, & Funder, 1995). Defining self-enhancement as a defensive neuroticism, Eysenck (1994) suggests that it leads to self-deceptive suppression of negative information about the self, which is physiologically taxing and expected to have overactive stress systems in the form of either high or unregulated autonomic functioning and elevated hypothalamic-pituitary-adrenocortical (HPA) axis activity. The HPA axis is the central stress response system, coordinating the central nervous system and endocrine system, through the release of several hormones including cortisol, to prepare a person for fight-or-flight when exposed to a stressor stimulus (Buckley & Schatzberg 2005). Although these responses are protective in the short term, over the long term, recurrent or chronic activation of these systems can confer damage with adverse implications for health (Smith & Vale (2012).

Taylor et al. (2003) sought to reconcile prior inconsistent findings regarding the physiological health effects of self-enhancement. They found evidence in support of McEwen's hypothesis as self-enhancers had lower baseline cortisol levels and lower reactivity during acute stress tasks. These findings also directly contradicted the hypothesis that self-enhancement is a defensive denial of negative personal characteristics that may exert physiological costs to suppress. Instead, they are consistent with a growing body of literature that ties positive mental states, including positive illusions like self-enhancement, to healthier physiological and neuroendocrine functioning. The present research sought to extend previous research examining stress and self-enhancement by examining the interactive effects of each on physical health, specifically BMI. Stress is influential in health behaviors, particularly when it pertains to eating patterns. For example, one study found that high levels of physiological stress, as indicated by elevated cortisol levels, is positively associated with increased food consumption (Epel et al., 2001). Epel et al. (2001) exposed participants to an acute laboratory stressor and those that had higher cortisol reaction levels consumed more calories and ate significantly more sweet and high fatty foods than those with lower cortisol reaction levels. Therefore, stress plays a significant role in participants eating behaviors.

College students are an ideal population to study the relationships between self-enhancement, stress, and healthy behaviors involving diet because they are high-risk for gaining weight as independent living at college is associated with reduced physical activity and poor nutritious diets (Lowe et al., 2006). Understanding the relationship between self-enhancement regarding one's physical weight or physical size and stress may explain another piece of how individuals consciously and subconsciously make health decisions. Additionally, as previously discussed, poor diet and obesity can lead to chronic lifestyle diseases in the future (Golubic, 2013), so understanding how bad lifestyle choices manifest during college could bring insight in how to prevent them from forming. This is especially important because the effect of excess weight on years of life lost was greatest for young individuals and decreased with increasing age (Grover et al., 2015). Grover et al.'s (2015) study found that men ages 20-39 with excessive bodyweight had a range of years of life lost from 4.4 to 7.4. Grover et al. observed a similar pattern with women ages 20-39, whose years of life lost ranged from 4.6 to 7.6. Healthy life years lost were two to four times higher than life lost for all age groups. That is, not only are young adult men and women who have access weight more likely to lose several years of their life, but they will lose more healthy years than those without excess weight.

The current research used a longitudinal design that examined changes in participant's BMI over the course of a semester. This study took a biopsychosocial approach to understanding what might influence these changes by measuring body self-enhancement, perceived stress, and physiological stress. Given that higher BMIs are associated with health costs, one way that a person may self-enhance is to perceive their body as physically smaller than it actually is, or underestimating their BMI. Perceiving the self as having a physically smaller size than one's actual size suggests that the perceived threat of weight gain is less than people who accurately evaluate their physical size.

Method

Participants

The participants were male and female students attending the University of Dayton during the fall semester of 2017 who participated in exchange for course credit and were between the ages of 18-22. At Time 1, 75 students participated and 42 participants returned for Time 2.

Procedure

To conduct this longitudinal study, participants were asked to come in for assessment at the beginning of the semester (Time 1), and again approximately one-month later (Time 2). At Time 1, participants began by completing measures on the computer, including self-reported perceived stress, and self-reported perceived physical size. After getting acclimated to the room, participants provided their first saliva sample, which was later analyzed using the Salimetrics ELISA Cortisol Kit to measure participants' baseline cortisol levels. Baseline heart rate and blood pressure values were also recorded using an Omiron Wrist cuff once an adequate amount of time passed for participants to acclimate to the lab environment.

After the pre-task measurements, participants completed a modified Trier Social Stress Task as an acute stressor (Birkett, 2011; Kirschbaum, Pirke, & Hellhammer, 1993). For the task, participants were told they were to complete a Verbal and Quantitative Fluency Task in front of an evaluative committee obscured from the participants view behind a room divider. Participants were also told the video camera would stream their performance to the evaluative committee on the other side of the divider and record their performance for further evaluation. The video camera, however, did not contain a tape in it and therefore was unable to record. The evaluative committee was a single confederate reading from a script and timing each task. The task consisted of a five minute speech in which participants explained why they should be hired for their ideal job, followed by a five minute arithmetic portion that required participants to sequentially subtract the number 13 from 1,022 and verbally report their answers as quickly as possible. If participants finished their speech before the five minutes, the confederate asked them to continue and if they made a mistake during the arithmetic portion, they were asked to start over.

Post-task measures were then completed after the TSST. A post-task heart rate and blood pressure was taken immediately after the task using the Omiron Wrist cuff. Other post-task measures were completed through a paper questionnaire, which collected information on participants' exercise, academics, extracurricular/volunteer activities, sleep habits, and menstrual cycles (women only), and another set of online measures that focused on alcohol/drug use and demographics. These measures were included because previous research by Kudielka (2008) showed that recent consumption or chronic use of alcohol/ recreational drugs is associated with dysregulation of the stress-response system, while a study by Griskevicius et al. (2011) found associations between stress and SES, politics, and religion. Exactly thirty minutes after the TSST began, the second saliva sample was collected to measure post-task cortisol levels. The participants were then measured for their height and weight using a physician scale to calculate their actual Body Mass Index (BMI) at Time 1. Before concluding Time 1, participants were debriefed regarding the purpose of the TSST and scheduled for their Time 2 assessment. Figure 1 depicts a condensed timeline of steps completed in Time 1 of this longitudinal study.

During Time 2, a similar procedure was conducted with the exception of the TSST. Participants provided a baseline saliva sample, completed the paper questionnaire, and had their first heart rate and blood pressure values recorded using the Omiron Wrist cuff after an adequate amount of time passed to acclimate to the lab environment. Participants then completed both sets of online measures and had their heart rate and blood pressure recorded a second time. Before concluding the Time 2 assessment, participants were measured for their height and weight using a physician scale to calculate their actual BMI at Time 2.

Measures

Actual Body Mass Index. Each participant's actual BMI was calculated using the standard equation of weight in kilograms divided by height-squared in centimeters. Participant's height and weight was recorded using a physician scale at both Time 1 and Time 2.

Perceived Body Mass Index. The Body Dissatisfaction Scale Tool (Mutale, Dumm, Stiller, & Larkin, 2016) was used to measure participants' perceived BMI. Participants were presented with a picture of 10 body size images that matched their sex. Body 1 was the smallest body size, Body 10 the largest body size, and Body 2-9 sequentially increased from small to large. Participants were asked to identify the body size image that most closely reflects their current body. Their response was recorded and compared to a chart that provided information on the weight, height, and BMI associated with the photos for each sex. The participants' perceived BMI was recorded as the BMI associated with the image they identified as their current body size.

Body Self-Enhancement. The amount participants underestimated their body size, or their body self-enhancement, was calculated as the difference between their actual BMI and perceived BMI. If participants underestimated their body size, then their actual BMI would be larger than their perceived BMI, resulting in a positive difference, or higher levels of body self-enhancement. If a participant was accurate in how they perceived their body, then they did not underestimate their body size and should be no difference.

Perceived Stress. Self-reported stress was assessed using the Perceived Stress Scale (Cohen, Kamarck, and Mermelstein, 1983). The 14-item measure assessed participants perceived stress in the last month using a 1 (*never*) to 5 (*very often*) scale.

Baseline cortisol. The participants' first saliva sample collected at Time 1 was analyzed using the Salimetrics ELISA Cortisol Kit to measure the participants' baseline cortisol levels, or the amount of cortisol in the participants' saliva without an acute stressor present. The intended use of the kit was specifically designed and validated to quantitatively measure salivary cortisol. The enzyme-linked immunosorbent assay (ELISA) quantifies the amount of cortisol in saliva by linking the protein to an enzyme. The protein-enzyme complex is then exposed to the horseradish peroxidase enzyme, which turns blue as a result of the reaction. An acidic solution is added to stop the reaction and turns the solution yellow. The optical density is read on a standard plate reader at 450 nm that detects the amount of cortisol enzyme conjugate, which is inversely proportional to the amount of cortisol present in the solution.

Stress Reactivity. Stress reactivity was calculated as the difference between the amount of cortisol in the second saliva sample, or the post-task cortisol, and the amount of cortisol in the first saliva sample, or the baseline cortisol. If participants were highly reactive to the acute stressor, there was a large spike detected in their post-task cortisol levels, meaning the post-task was greater than their baseline resulting in a greater difference in the amount of cortisol detected in the samples. If the participants were not reactive, then the difference would be minimal.

Results

Time 1 results. To test whether body self-enhancement, or underestimating one's BMI, is associated with current BMI, and whether this association is moderated by stress, several analyses were conducted. First, Time 1 BMI was regressed onto Time 1 self-reported perceived stress, Time 1 body self-enhancement, and the interaction term. Body self-enhancement was positively associated with BMI, $b = 0.7926$, $SE = 0.2049$, $t(72) = 3.87$, $p = .0002$. That is, underestimating one's BMI is associated with higher BMI at Time 1. Perceived stress was also positively associated with BMI, $b = 2.2558$, $SE = 1.0601$, $t(72) = 2.13$, $p = .0368$. Therefore, the more stressed one feels is related to a higher BMI at Time 1. These effects were not qualified by the perceived stress by body self-enhancement interaction, $b = 0.1434$, $SE = 0.5323$, $t(72) = 0.27$, $p = .7883$.

Second, Time 1 BMI was regressed onto Time 1 cortisol baseline levels, Time 1 body self-enhancement, and the interaction term. Again, Time 1 body self-enhancement was positively associated with BMI, $b = 0.6932$, $SE = 0.2022$, $t(71) = 3.43$, $p = .0010$. However, effects were not statistically significant for an association between Time 1 BMI and Time 1 cortisol baseline with BMI, $b = 0.2908$, $SE = 1.8532$, $t(71) = 0.16$, $p = 0.8758$. That is, the amount of cortisol in saliva samples before the acute stressor does not predict higher or lower BMI at Time 1. Effects were also not qualified by the Time 1 cortisol baseline and Time 1 self-enhancement interaction, *b* = -0.6142, *SE* = 0.9968, *t*(71) = -0.62, *p* = .5397.

Lastly, Time 1 BMI was regressed onto Time 1 stress reactivity, or the difference between participants' baseline cortisol and post-task cortisol levels, Time 1 body self-enhancement, and the interaction term. Time 1 body self-enhancement was positively associated with BMI, *b* = 0.7161, *SE* = 0.1993, *t*(71) = 3.59, *p* = .0006. However, effects were not statistically significant for an association between stress reactivity with BMI, *b* = 2.3999, *SE* = 1.6549, *t*(71) = 1.45, *p* = 0.1514. Meaning, the more reactive the participants were to the acute stressor was not an indicator of higher or lower BMI at Time 1. Similarly, effects were also not qualified by the Time 1 cortisol difference and Time 1 self-enhancement interaction, *b* = 0.2988, *SE* = 0.5775, *t*(71) = 0.52, *p* = .6065

Time 2 results. To test whether body self-enhancement, or underestimating one's BMI, is associated with subsequent BMI at Time 2, and whether this association is moderated by stress, several analyses were conducted. First, Time 2 BMI was regressed onto Time 1 self-reported perceived stress, Time 1 body self-enhancement, and the interaction term. Body self-enhancement was negatively associated with BMI, *b* = -0.2868, *SE* = 0.0688, *t*(37) = -4.17, *p* = .0002. That is, underestimating one's BMI is associated with lower BMI at Time 2. Perceived stress was not associated with BMI, *b* =-0.0301, *SE* = 0.3245, *t*(37) = -0.09, *p* = .9267. These effects, however, were qualified by the perceived stress by body self-enhancement interaction, *b* = 0.8362, *SE* = 0.1804, *t*(37) = 4.63, *p* < .0001. Therefore, while one its own perceived stress was not associated with BMI at Time 2, when interacting with body-self enhancement, there is a positive relationship with BMI at Time 2. At high levels of perceived stress, there was no association between body self-enhancement and BMI, *b* = 0.1194, *SE* = 0.09255, *t*(37) = 1.29, *p* = .2049. At low levels of perceived stress, body self-enhancement is negatively associated with BMI, *b* = -0.6930, *SE* = 0.1275, *t*(37) = -5.43, *p* = <.0001. That is, underestimating one's BMI is associated with lower BMI at Time 2. At high levels of body self-enhancement, perceived stress is positively associated with BMI, *b* = 2.0186, *SE* = 0.5031, *t*(37) = 4.01, *p* = .0003. That is, for participants with high body self-enhancement, their Time 2 BMI increased as their perceived stress increased. At low levels of body self-enhancement, perceived stress is negatively associated with BMI, *b* = -2.0788, *SE* = 0.5901, *t*(37) = -3.52, *p* = .0012. Therefore, for participants with low body self-enhancement, their Time 2 BMI decreased as their perceived stress increased.

Secondly, Time 2 BMI was regressed onto Time 1 cortisol baseline values, Time 1 body self-enhancement, and the interaction term. Body self-enhancement was not associated with BMI, *b* = -0.02125, *SE* = 0.1063, *t*(37) = -0.20, *p* = .8427. Similarly, cortisol baseline levels were not associated with BMI, *b* =-0.2872, *SE* = 0.5276, *t*(37) = -0.54, *p* = .5895. These effects, however, were qualified by the baseline cortisol levels by body self-enhancement interaction, *b* = 1.8797, *SE* = 0.8212, *t*(37) = 2.29, *p* = .0279. At high baseline cortisol levels, body self-enhancement was not associated with BMI, *b* = 0.5948, *SE* = 0.3541, *t*(37) = 1.68, *p* = .1014. At low baseline cortisol levels, body self-enhancement was negatively associated with BMI, *b* = -0.6373, *SE* = 0.2052, *t*(37) = -3.11, *p* = .0036. That is, for participants with low baseline cortisol levels, their Time 2 BMI decreased as their body self-enhancement increased. At high levels of body self-enhancement, baseline cortisol levels were positively associated with BMI, *b* = 4.3181, *SE* = 2.1663, *t*(37) = 1.99, *p* = .0536. Therefore, for participants with high levels of body self-enhancement, their BMI at Time 2 increased as their baseline cortisol levels increased. At low levels of body self-enhancement, baseline cortisol levels are negatively associated with BMI, *b* = -4.8924, *SE* = 1.9900, *t*(37) = -2.46, *p* = .0188. For participants with low levels of body self-enhancement, their BMI at Time 2 increased as their baseline cortisol levels decreased.

Thirdly, Time 2 BMI was regressed onto Time 1 stress reactivity, or the difference between participants' baseline cortisol and post-stressor cortisol levels, Time 1 body self-enhancement, and the interaction term. Body self-enhancement was not associated with BMI, *b* = -0.1054, *SE* = 0.06162, *t*(37) = -1.71, *p* = .0956. Stress reactivity was not associated with BMI, *b* = 1.5290, *SE* = 0.5296, *t*(37) = -3.63, *p* = .0065. These effects, however, were qualified by the stress reactivity by body self-enhancement interaction, *b* = -0.6569, *SE* = 0.1809, *t*(37) = -3.63, *p* = .0009. At high stress reactivity, Time 1 body self-enhancement was negatively associated with BMI at Time 2, *b* = -0.2886, *SE* = 0.06888, *t*(37) = -4.19, *p* = .0002. At low levels of stress reactivity, Time 1 body self-enhancement was not association with BMI at Time 2, *b* = 0.07782, *SE* = 0.08913, *t*(37) = 0.87, *p* = .3882. At high levels of body self-enhancement, stress reactivity was not associated with BMI at Time 2, *b* = -0.08032, *SE* = 0.7764, *t*(37) = -0.10, *p* = .9182. At low levels of body self-enhancement, stress reactivity was positively associated to BMI at Time 2, *b* = 3.1384, *SE* = 0.5926, *t*(37) = 5.30, *p* = <0.0001.

Discussion

The current study was conducted to test if people perceive their physical body size to be smaller than it actually is, and if people do self-enhance their body size, then how do body self-enhancement and stress interact to predict subsequent Body Mass Index (BMI). The results from the present study found that people do self-enhance their body size and that there are interactions between self-enhancement and different measures of stress that influence subsequent Time 2 BMI. Regression analysis revealed that when Time 1 BMI was regressed onto body-self enhancement there was a positive association, that is, underestimating one's BMI is associated with higher BMI at Time 1. A similar relationship was found regressing Time 1 BMI onto perceived stress, indicating that the more stressed participants felt, the more likely they would have a higher Time 1 BMI. These were the only significant results found from analyzing only Time 1 data, as there was no associations between Time 1 BMI and baseline cortisol levels or stress reactivity and no interactions between any stress measurement and body self-enhancement that influenced Time 1 BMI. These were intriguing preliminary findings, however, they do not provide much information on health decisions and there subsequent consequences without comparing how they change over time.

When analyzing similar regressions of Time 2 BMI on body-self enhancement mediated by stress, several statistically significant associations were found. First, at low levels of perceived stress, participants self-enhancing their body size had lower Time 2 BMI than those with low perceived stress that did not enhance their body size. At high levels of perceived stress, there was no significant relationship between enhancement and Time 2 BMI. This finding, demonstrated in *Figure 2*, suggests that body self-enhancement, or perceiving one's body as smaller than it is, acts as a protective factor against gaining weight when one also perceives their stress as lower than those who do not. This finding adds to Taylor et al.'s (2003) study that found self-enhancers had lower baseline cortisol levels and lower reactivity during acute stress tasks because this study found high body self-enhancers with low perceived stress had lower Time 2 BMI than those with low body self-enhancement and participants with high perceived stress. However, because there was no significant change for participants with high perceived stress, this suggests that body self-enhancement is helpful only under certain conditions, similar to O'Mara, Mcnulty, & Karney's findings (2011).

Second, at low baseline cortisol levels, that is, low amounts of stress hormone in one's saliva when not under acute stress, high body self-enhancers again had lower Time 2 BMI than those with low baseline cortisol levels that did not perceive their body as smaller than it is. At high baseline cortisol levels, the opposite relationship was observed. Participants with high amounts of stress hormone in their saliva, even when not exposed to an acute stressor, had higher Time 2 BMIs if they perceived their body as smaller than it is compared to those that did not. See *Figure 3* for the graphical representation of this finding. These findings, therefore, support both McEwen's (1998) hypothesis that self-enhancement can foster health and longevity by reducing stress and Eysenck (1994) hypothesis that suggested self-enhancement leads to self-deceptive suppression of negative information about the self, which is physiologically taxing and expected to have overactive stress systems in the form of either high or unregulated autonomic functioning and elevated hypothalamic-pituitary-adrenocortical (HPA) axis activity. The findings this study may also be related to the notion that high body self-enhancement could lead to reduced perceived threat of gaining weight and therefore, higher BMI (Rosenstock, (1990). The influence of stress on weight gain may also be linked to the eating habits observed by Epel et al. (2001) that found participants with higher stress levels tended to eat more fatty and sugary foods than those with lower stress levels.

Third, there was a significant association found between stress reactivity, which is how much salivary cortisol levels increased from the baseline sample to the post-task sample, and Time 2 BMI. Statistical regression found that as stress reactivity increased, so did Time 2 BMI. Stress reactivity is indicative of an over active or under controlled HPA axis because of the larger spike in cortisol levels as a response to the acute stressor. For participants with this heightened response, they will most likely have a higher Time 2 BMI. A similar pattern was seen for participants with low body self-enhancement. At low body self-enhancement, participants with high stress reactivity had higher Time 2 BMI, while those with low stress reactivity had lower Time 2 BMIs. At high body self-enhancement, the difference in BMIs for participants with low and high stress reactivity was not significant. This relationship is illustrated in *Figure 4.* These findings contradict both Taylor et al.'s (2003) finding and Eysenck's (1994) hypothesis. That is, based on Taylor et al.'s (2003), the participants with high body self-enhancement and low stress reactivity should have had lower Time 2 BMIs than the high body self-enhancement and high stress reactivity group. Similarly, Eysenck's (1994) hypothesis that participant's with high self-enhancement are deceiving themselves, which leads overactive stress systems in the form of an elevated HPA-axis, would expect participants with high body self-enhancement and high stress reactivity to have higher Time 2 BMI than the participants with high body self-enhancement and low stress reactivity. Because of these contradicting findings, there are most likely extraneous variables not evaluated in this study that confound the relationship between body self-enhancement on Time 2 BMI, mediated by stress. This only further supports the biopsychosocial model on health because of the vast amount of variables that influence weight gain and interact with each other (Havelka, Lucanin, J., & Lucanin, D., 2008)

While several of the results showed statistical significance, it is important to note some of the limitations of this study. Since the sample population was college students, the study cannot be broadly applied to a whole population. Additionally, because of the small sample size of participants that provided data at both Time 1 and Time 2, reliability of the findings is not as strong as it would be with a larger sample size. Data was collected throughout other semesters that were not analyzed and included in this study, therefore, in the future, analysis of the data collected in Spring 2017 and Spring 2018 may strengthen the findings of this study. It is also important to note that several other measures and types of information were collected from these participants, specifically on exercise activity, motivations for exercising, and alcohol consumption, which would provide a fuller picture of the types of health perceptions and behaviors participants have that could influence weight.

Even though there are limitations to the study, these results support why the biopsychosocial perspective on health is more useful and insightful way to study health behaviors that can lead to chronic lifestyle diseases in the future. This research is necessary because understanding why people make health-compromising decisions can lead to better interventions and programs to reduce those behaviors and save years of life and health lost due to chronic lifestyle disease. When the psychosocial determinants of health behaviors are incorporated into public health policy and programming, then questions such as what is the optimal number of behaviors that should be intervened, which behaviors should be targeted, is it better to increase health decisions or decrease unhealthy ones, and how to succinctly accomplish this at multiple ecological levels of society (Spring, Moller, & Coons, 2012) can be answered. Body self-enhancement is one more piece to the puzzle in understanding why people make health-compromising decisions even though they know healthier alternatives.

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Figure 1. Visual representation of the chronological sequence of steps followed during Time 1 protocol.

	Pre-Stressor Task						Stressor Task				Post-Stressor Task								
Time 1	Complete Questionnaires					Saliva Sample #1	Acclimation	Preparation	Speech	Arithmetic	Complete Questionnaires				Saliva Sample #2	Complete Questionnaires			Stressor Task Debrief
Minute	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90

Figure 2. Relationship between body self-enhancement, at high and low levels, and Time 2 BMI mediated by perceived stress.

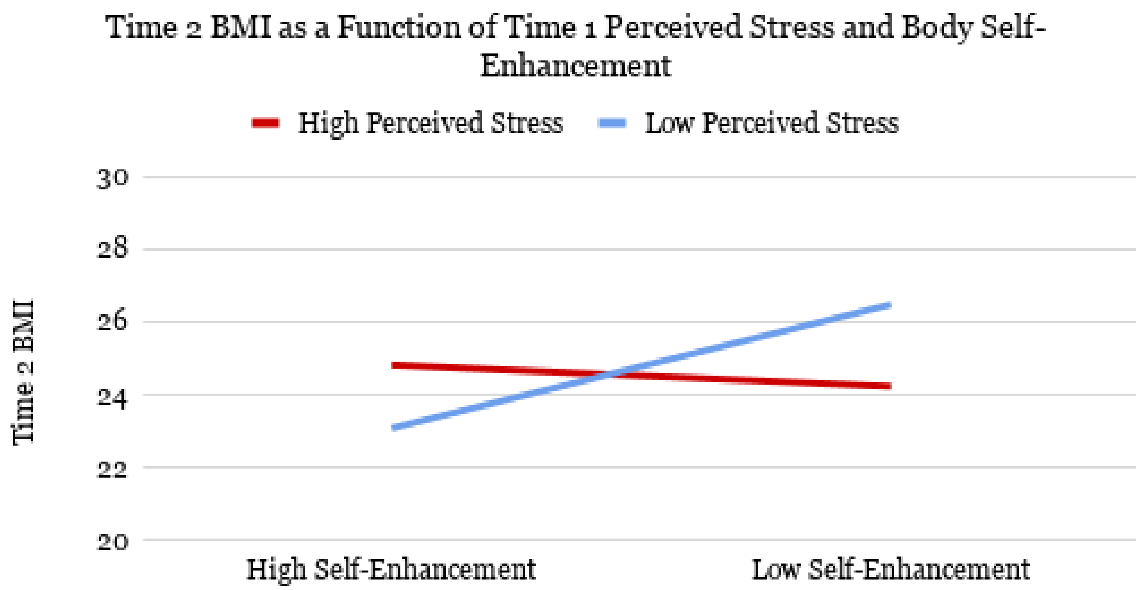

Figure 3: Relationship between body self-enhancement, at high and low levels, and Time 2 BMI mediated by baseline cortisol levels measured before exposure to acute stressor.

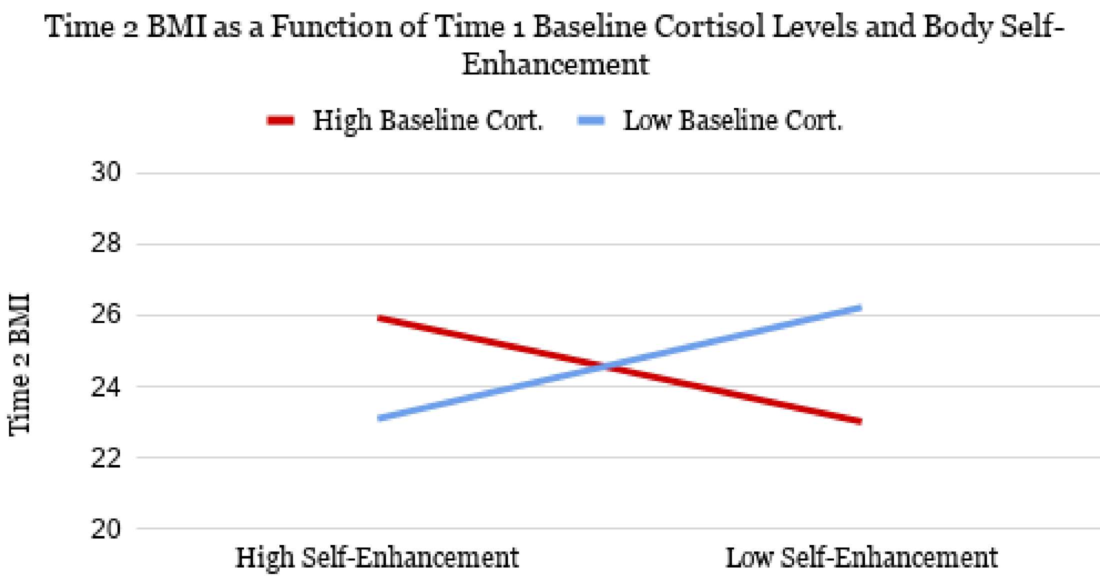

Figure 4: Relationship between body self-enhancement, at high and low levels, and Time 2 BMI mediated by stress reactivity to acute stressor.