M OdereTE EXERCISE AS A PREVENTATIVE FACTOR FOR DEPRESSION, ANXIETY, AND SELF-DEPRECIATION

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By

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DEDICATION

This thesis is dedicated to:

My family (Jim, Sue, Julia, Emily and Joe) who were always on my side and always kept me grounded when things got rough. In addition, I would like to dedicate this thesis to Donna Ames, my step-mother, for encouraging me to do my best and to follow my heart. I am grateful to have such a strong support group and a great group of “cheerleaders.” Thank you for always being there for me and lifting me up.

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ABSTRACT

MODERATE EXERCISE AS A PREVENTATIVE FACTOR FOR DEPRESSION AND ANXIETY

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Results from several studies have shown moderate amounts of exercise to be beneficial in reducing symptoms of depression and anxiety. However, no study to the author’s knowledge has looked at whether exercise can be successful in preventing anxiety or depression. Based on previous research, I hypothesized the following: there will be a curvilinear relationship between amount of exercise and measures of anxiety and depression. As amount of exercise increases to a moderate level, anxiety and depression will decrease. If exercise is in excess, depression and anxiety will increase.

Participants were 251 undergraduate students enrolled in lower-division psychology classes at California State University Northridge instructed to fill out surveys that related to their exercise habits and well-being. Exercise habits served as the predictor, and scores on the Beck Anxiety Inventory, the Center for Epidemiological Scale-Depression, and the Self-Deprecation Scale (part of the Rosenberg Self-Esteem Scale) served as the predicted factors. A confirmatory factor analysis revealed that exercise did not significantly predict
anxiety, depression, and self-deprecation. However, Spearman’s rho correlations revealed significantly strong negative correlations between exercise habits and anxiety, depression, and self-deprecation. Limitations of the current study include the use of self-report measures and self-selection. Mental health professionals may use these results and incorporate exercise into treatment plans. Future studies should consider including an experimental design and using participants with known exercise habits. In addition, future studies should explore exercise and how it relates to drug addiction.

Keywords: depression, exercise, anxiety, self-deprecation, serotonin
CHAPTER 1
INTRODUCTION

The *Diagnostic and Statistical Manual TR-IV* (DSM-IV TR) recognizes over 297 different psychological disorders (Shaffer, 1996). According to Kessler, Chiu, Demler, and Walters (2005), approximately 26.2% of adults over the age of 18 suffer from some sort of a mental disorder in any given year. Among the most common diagnosable psychological disorders are mood disorders (e.g., depression) and anxiety disorders (Kessler et al. 1994). These two disorders alone have a huge impact on the economic system in the United States (Greenberg et al., 2003). Much of the cost stems from therapy and psychotropic medication (Greenberg et al., 2003). Due to the high costs of these disorders, it is time to look for alternate forms of treatment.

**Depression and Anxiety**

**Depression**

Depression is one of the most common mood disorders (Wayne, 1987). According to the *Diagnostic and Statistics Manual of Mental Disorders, 4th Edition Revised* (DSM-IV TR), the hallmark characteristic of those diagnosed with depression is either a depressed mood or anhedonia (i.e., loss of interest or pleasure in nearly all activities) for at least 2-weeks (American Psychiatric Association [APA], 2000). In some, such as children and adolescents, the mood may be irritable instead of sad (APA, 2000). Other symptoms that may accompany depression include feelings of hopelessness, guilt, suicidal ideations, weight loss and decreased or increased appetite (APA, 2000). Persons who have been diagnosed with depression may characterize it as feeling “down in the dumps.” Some people state that they “have no feelings” (APA, 2000).
Currently, there are no laboratory tests that can diagnose depression; however, many laboratory findings have been found to be abnormal in those who suffer from depression compared to control subjects (APA, 2000). In addition, EEG results have found that those who suffer from depression have sleep abnormalities (APA, 2000). Those who suffer from depression have sleep disturbances, increased wakefulness, early morning awakenings and reduced REM (rapid eye movement) sleep (APA, 2000). Besides sleep abnormalities, other abnormalities may include dysregulations in the neurotransmitters such as serotonin, norepinephrine, dopamine, and acetylcholine (APA, 2000). The prevalence of depression is quite high. The lifetime prevalence rates for depression in women range from 10% to 25% and for men, values range from 5% to 12% (APA, 2000). Another study conducted by Oquendo, Lizardi, Greenwald, Weisman and Mann (2004) studied the lifetime prevalence rates of depression and found rates to range from 3.24%-9.27%. Finally, a study conducted by Kroenke et al. (2009) utilized the Behavioral Risk Factor Surveillance System. Out of 198,678 participants, depression was found to have a prevalence rate of 8.1%.

**Anxiety**

Besides mood disorders, other common disorders are anxiety disorders, specifically Generalized Anxiety Disorder (GAD). The hallmark characteristic of GAD is excessive worry and excessive anxiety that occurs more days than not for at least six months (APA, 2000). Persons who suffer from GAD find it difficult to control their worry and their anxiety. Other symptoms that are common with respect to GAD are restlessness, disturbed sleep, muscle tension, irritability, and difficulty concentrating (APA, 2000). In a community sample of one year, GAD was found to have a prevalence
rate of three percent and a lifetime prevalence rate of around five percent (APA, 2000).

Another study conducted by Strine et al. (2009) utilized the Behavioral Risk Factor Surveillance System. Out of the 217,379 participants, it was found that anxiety had a lifetime prevalence rate of 11.3%.

**Concomitant Depression and Anxiety**

Numerous physiological studies with humans and rats have shown that depression and anxiety are concomitant, possibly due to levels of serotonin. For example, a cross-sectional study conducted by Molina et al. (2011) studied the effects of the variation of the serotonin 1-A receptor and its relation to comorbid depression and anxiety. A total of 1,059 subjects participated in the study. Deoxyribonucleic Acid (DNA) and saliva were extracted from the participants. The participants were diagnosed with depression from the Composite International Diagnostic Interview using criteria from the DSM-IV and diagnosed with generalized anxiety disorder using the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire. Participants were said to have comorbid GAD and depression if criteria were met for both diagnoses. Results revealed a significant association between carrying the G allele and concurrent mood disorder and generalized anxiety compared to the controls. This difference was found even after controlling for sex, gender, family history, and psychological problems. These results indicate that there is a variation in the 1A receptor of serotonin and those with a variation are more likely to have comorbid depression and anxiety.

Another study conducted by Lehto et al. (2008) studied the effects of psychotherapy on the midbrain serotonin transporter. Participants in this study all met DSM-IV diagnostic criteria for depression. A total of 19 individuals participated in the
study of which eight participants were diagnosed with atypical depression. Levels of serotonin and dopamine were recorded using single photon emission computed tomography (SPECT). Results revealed that after one year of psychotherapy serotonin levels increased in those who had atypical depression but not in those diagnosed with nonatypical depression. This difference may be accounted for by an increased number of serotonergic nerve terminals or some other unknown adaptive mechanism in those who were diagnosed with atypical depression. The results of this study indicate that depression may be due to low levels of serotonin.

Another study conducted by Briley, Chopin, and Moret (1990) studied the effects of serotonergic lesions on anxious behavior in rats. Rats were administered 5,7-dihydroxytryptamine into the cerebroventricles. The rats were then tested in an elevated plus-maze that contained two open arms and two closed arms. The lesion destroyed 81% of the serotonergic innervation in the cortex and 99% in the hippocampus. Lesioned rats had an increase in the amount of times they entered the open arms of the maze compared to rats that were not lesioned. These results suggest that anxiety symptoms may be reduced by lowering the levels of serotonin.

The first study found a genetic variation in the 1A serotonin receptor as it relates to comorbid depression and anxiety. The second study found that depressed persons have a decrease in serotonin, and the third study found that anxiety could be reduced by lowering the levels of serotonin. So, depression and anxiety are both influenced by levels of serotonin.

**Costs of Depression and Anxiety Disorders**
Depression and anxiety disorders have a high cost to our economic system. From 1990-2000, the economic burden for depression increased by seven percent from $77.4 billion to $83.1 billion (Greenberg et al., 2003). From the data collected in 2000, $26.1 billion (31%) were medical costs, $5.4 billion (7%) were suicide-related mortality costs, and $51.5 billion (62%) were workplace costs (Greenberg et al., 2003). For generalized anxiety disorder (GAD), Greenberg et al., (1999) found that the annual cost of anxiety disorders had an estimated cost of $42.3 billion in 1990. The distribution reflected that 54% of the total cost in nonpsychiatric services was due to medical treatment costs, 31% in psychiatric treatment costs, 10% in indirect workplace costs, 3% in mortality costs, and 2% in prescription pharmaceutical costs. Eighty-eight percent of workplace costs were attributable to lost productivity while at work as opposed to absenteeism. So far, the discussion has focused on what are depression and anxiety in isolation. However, depression and anxiety commonly occur together.

Currently, there seems to be a myriad of treatment options out there for depressive disorders and anxiety disorders ranging from psychotherapies to psychotropic medications. However, as previously discussed, depression and anxiety have a cost to society. These costs include medication costs and therapeutic costs. To reduce costs to our society, it is important to start considering alternative treatment options and possible preventative measures.

**Depression and Exercise**

One possible alternative treatment option for depression that is showing itself beneficial is exercise. Jerstad, Boutelle, Ness and Stice (2010) examined the reciprocal relationship between physical activity and depressive symptoms in adolescent girls. A
total of 496 adolescent girls were asked to complete the Schedule for Affective Disorders (depression) and Schizophrenia for School-Aged Children, a modified version of the Past Year Activity Scale, the Satisfaction and Dissatisfaction With Body Parts Scale, and the Network of Relationships Inventory (social support). A semi-structured clinical interview also assessed bulimic symptoms. In addition, the participant’s body mass index (BMI) was obtained. Results revealed that physical activity over time predicted less depressive symptoms. Results also revealed that for every additional physical activity, depression decreased by one percent in depressive symptoms, by eight percent for major and minor depression, and by 16% for major depression.

Another study conducted by Armstrong and Oomen-Early (2009) examined social connectedness, self-esteem, and depression in college athletes versus non-athletes. Students were asked to complete the Rosenberg Self-Esteem Scale (RSES), the Social Connectedness Scale (SCS-R), and the Center for Epidemiological Studies Depression Scale (CES-D). Results revealed that athletes had more social-connectedness and significantly lower depression scores compared to non-athletes. Results also showed that college athletes participated in more aerobic activities per week compared to non-athletes. This suggests that those who exercise more are less likely to display symptoms of depression.

Chu, Buckworth, Kirby, and Emery (2009) tested the effect of three different exercise groups in relation to depressive symptoms. Participants were all women who scored greater than or equal to a 14 on the Beck Depression Inventory-II (BDI-II). Participants in the study were assigned to a high intensity exercise group, a low intensity exercise group, or a stretching control group. Participants in the high and low intensity
exercise groups were instructed to exercise on a treadmill for 30-40 minutes per session, and those in the stretching condition were instructed to perform 30 minutes of supervised stretching or flexibility training. Both of the aerobic exercise conditions (i.e., high intensity and low intensity) started out at the same oxygen uptake reserve (VO₂R), 40-55%. After the third week of training, participants in the high intensity exercise group were instructed to increase their oxygen uptake reserve (VO₂R) to 65-75%. Results revealed a significant reduction in depressive symptoms amongst all three groups. However, those in the high intensity exercise group had significantly fewer depressive symptoms compared to the low intensity group and the stretching group.

Doyne et al. (1987) conducted a study on the effects of exercise on the treatment of depression. Participants were 40 depressed women and were randomly assigned to one of three groups: a running group, a weightlifting group, or a waitlisted group. In the running condition, participants walked or ran 1/8 mile on an indoor track in 7-minute intervals. In the weightlifting condition, participants were instructed to use a 10-station program that allowed them to reach a maximum heart rate between 50 and 60 percent. Finally, participants in the waitlisted group were told that there was an 8-week delay in their program. Participants in this group were assessed at 4 and 8 weeks. Participants were advised to attend four exercise sessions per week. Sessions began with a 5-10 minute warm up, followed by the main workout, and then ended with a 5-10 minute cool down. Participants completed the Beck Depression Inventory, the Lubin’s Depression Adjective Check List, and the Hamilton Rating Scale for Depression. Findings showed a significant decrease in depression scores in those assigned to the exercise groups compared to the waitlisted group.
Another study conducted by Dunn, Trivedi, Kampert, Clark and Chambliss (2002) manipulated exercise frequency and exercise expenditure. Participants were randomly assigned to one of five doses of exercise: (1) moderate aerobic exercise 3 days/week, (2) moderate aerobic exercise 5 days/week, (3) high intensity aerobic exercise 3 days/week, (4) high intensity aerobic exercise 5 days/week, or (5) 3 days of stretching and flexibility exercise for 15-20 minutes per day. Participants’ scores on the Hamilton Rating Scale for Depression (HSRD) were measured weekly. Participants completed the first 12 weeks of the program in the laboratory, and then the second 12 weeks of the program were done at home. At home, participants were asked to keep a log of their daily exercise. Results of the study revealed that the high intensity aerobic exercise 5 days a week could be overexertion and too high of a dose and thus, ineffective in reducing depression. All other doses seemed to be effective in reducing depression. Results also revealed a main effect for frequency and a main effect of expenditure. Exercising five days a week was more effective than exercising three days a week, and higher intensity exercise was better than lower intensity exercise in reducing depression scores.

As mentioned previously, those who suffer from depression have abnormalities in their sleep. Brand et al. (2010) conducted a study examining the effects of vigorous physical exercise on sleep patterns and overall psychological functioning in adolescents. A total of 434 adolescents participated in the study. Athletes’ activities consisted of volleyball, skiing, snowboarding, soccer, swimming, cross-country, and other activities. Participants were asked to keep a 7-day log assessing their exercise participation and a 7-day sleep log. Participants were asked to fill out the Depression Scale, a sleep-related personality scale, the State Trait Anxiety Inventory, and the Everyday Stress Scale. On
average, results showed that athletes spent 17.69 hours exercising per week compared to only 4.69 hours for the control group. Results also found that athletes had higher scores for mood, better sleep quality, higher levels of concentration, and decreased tiredness compared to controls. In addition, athletes had lower scores on the depression scale and on trait anxiety compared to controls.

Overall, the above mentioned studies have shown exercise to be effective in reducing depression.

**Anxiety and Exercise**

The previous studies mentioned have shown that exercise reduces depression but can exercise also reduce anxiety? A study conducted by Mackay and Neill (2010) focused on the effects of green exercise on state anxiety and the role of exercise duration, intensity, and greenness using a quasi-experimental design. Participants in this study were already involved in outdoor exercise groups. A total of eight different groups were used. Participants participated in boxercise, road cycling, mountain biking, kayaking, walking, mountain running, orienteering, and cross-country running. The two running groups averaged approximately 20 minutes per session, which was the lowest amount of exercise. All other groups of exercisers averaged a total of 60 minutes per session. Participants were asked to fill out the State Trait Anxiety Inventory (STAI) before and after exercise and a greenness rating scale. Results of the study revealed a significant reduction in state anxiety and a significant interaction between the type of exercise and levels of anxiety. The largest effects of anxiety reduction were for participants in the green exercise groups; these groups included road cycling, boxercise, and mountain biking. Results found no linear relationship between duration and intensity of exercise
and state anxiety. The authors argue that the reduction in anxiety may be explained by an increase in body temperature and a decrease in the excitation of the central nervous system.

Another study conducted by Fulks-Broman, Berman, Rabian, and Webster (2004) conducted a study on the effects of aerobic exercise on anxiety sensitivity. Participants were randomly assigned to one of two exercise conditions: a low-intensity walking group or high-intensity aerobic exercise. Participants were asked to complete the Anxiety Sensitivity Index, the Body Sensation Questionnaire, and the State Trait Anxiety Inventory before the first session, after a 5-minute cool down, and then at the final exercise session. An additional evaluation was conducted at a one-week follow-up. Exercise sessions lasted 20 minutes, and sessions were repeated 2-4 times per week for a total of six sessions across a two-week period. Those in the high-intensity group were instructed to briskly walk or jog on the treadmill to achieve a maximum heart rate between 60 and 90 percent. Those in the low-intensity comparison group were instructed to walk one-mile per hour on the treadmill so that their heart rate never reached 60% of the maximum. Results indicated that those in the high intensity aerobic exercise group had a faster reduction in anxiety symptoms compared to those in the low intensity aerobic exercise group.

Smits et al. (2008) studied the effects of exercise on the reduction of anxiety sensitivity. A total of 60 participants were asked to complete the Anxiety Sensitivity Index (ASI), The Beck Anxiety Inventory (BAI), the Beck Depression Inventory (BDI), and a Credibility and Expectancy Questionnaire. Participants were randomly assigned to one of three conditions: an exercise condition (EX), an exercise intervention plus
cognitive restructuring (EX + C), or a wait list control (WL). Those assigned to the exercise conditions completed six 20-minute exercise sessions in two weeks. Exercise was conducted on a treadmill and started with a 3-minute warm up with speed progressively increasing. Participants trained for 20 minutes at 70% maximum heart rate followed by a 3-minute cool down. Results revealed that all groups showed significant reduction in anxiety from pre-test to post-test. Scores on the BAI did not differ from pre-test to post-test in the WL condition. However, for the EX and EX+C, the scores on the BAI from pre-test to post-test were significantly different such that participants had reduced levels of anxiety. From pre to post, BDI scores were significant only for the exercise conditions such that those assigned to the exercise conditions had reduced depression. Helmerts contrasts were performed to test the differences in outcomes and rates of improvements between the conditions. In the first contrast, WL was compared to the exercise conditions. In the second contrast, both exercise conditions were contrasted with each other. Post treatment scores for each outcome variable were significantly lower (i.e., lower anxiety scores and depression scores) in the exercise conditions compared to the WL condition. Thus, this implies that exercise reduces anxiety sensitivity and depression. No significant difference emerged between the two exercise conditions on any of the outcome measures.

Another study conducted by Wipfli, Rethorst and Landers (2008) utilized a meta-analysis approach. A total of 49 studies were included in the results. These studies examined the effects of exercise on anxiety. A total of 3,566 participants participated in the 49 studies. Results from this meta-analysis revealed that the average overall weighted effect size was -.48. The confidence interval was significantly different than zero. Effect
sizes for this meta-analysis were based on Hedges’s $g$. This indicates that people assigned to the exercise groups experienced about $\frac{1}{2}$ of a standard deviation larger reduction in anxiety levels compared to the control group. In addition, 27 out of the 49 studies compared exercise to other common forms of treatment for anxiety. These 27 studies included a total of 1,924 participants. The effect size was -.19. The authors found this effect size to be significantly greater than the other forms of treatment. Thus, these results indicate that exercise is better at reducing anxiety compared to other forms of treatment (e.g., cognitive behavioral therapy, group therapy, pharmacology, music therapy, relaxation, and stress management).

The above studies have shown exercise can reduce depression and anxiety. In addition, it has been shown to be slightly more effective compared to other treatments such as psychopharmacology. However, is there such a thing as too much exercise?

**Studies on Amount of Exercise in Relation to Depression and Anxiety**

A study conducted by Spano (2001) used a total of 210 participants recruited throughout the New York metropolitan area from various arenas such as schools, libraries, and local businesses. Participants were asked to complete the State-Trait Anxiety Inventory, The Obsessive-Compulsive Personality Scale, The Narcissistic Personality Inventory, and The Commitment to Exercise Scale (which is intended to evaluate how psychologically committed a person is to exercise and how much an individual’s well-being is wrapped up in exercise when faced with unfavorable situations). Participants were also asked to complete the Frequency of Physical Activity Form. Results found significant positive correlations between obsessive-compulsiveness and commitment to exercise and between trait anxiety and commitment to exercise. These results suggest that
the higher the commitment to exercise, the higher the level of trait anxiety and obsessive-compulsiveness. In addition, results also revealed a significant positive correlation between narcissism and physical activity. This suggests that people who are more narcissistic have a higher level of physical activity. This may be because those who have narcissistic traits tend to focus more on appearance.

Another study conducted by Morgan, Costill, Flynn, Raglin, and O’Connor (1988) studied the effects of increased training on mood disturbances in male swimmers. Swimming distance was increased from 4,000 to 9,000 meters. Swimmers were asked to complete the Profile of Mood State questionnaire and muscle soreness questionnaire. Findings of the study revealed a significant increase in exercise intensity, muscle soreness, depression, fatigue, and global mood disturbance. Physical activity can also prove detrimental to mental and physical health when taken to an extreme. Persons who suffer from disorders such as anorexia nervosa may utilize excessive exercise to obtain an unhealthy body weight (APA, 2000).

**Contributing Mechanisms (Neuroscience and Cognitive Flexibility)**

The above studies have shown exercise to be effective in reducing anxiety and depression to a certain point; however, why does exercise reduce anxiety and depression? One possible theoretical formulation involves the idea of the imbalance of neurotransmitters, specifically norepinephrine and serotonin. Dishman (1996) conducted studies that utilized rats. Findings of his study found that chronic wheel running and treadmill exercise training increased norepinephrine or its metabolites in the pons medulla, frontal cortex, and hippocampus. These brain areas are highly active during behavioral responses to stressors that produce depression, and anxiety. The study also
suggests that chronic wheel activity protects against the depletion of brain norepinephrine. Changes in norepinephrine and GABA imply antidepressant and anxiolytic (anti-anxiety) effects.

Jeong, Lee, and Park (2005) conducted a study on dance movement therapy (DMT) and its effects on neurohormones in adolescents with mild depression. Participants were randomly assigned to a control group or the dance movement therapy group. Plasma serotonin and dopamine concentrations were measured using high performance liquid chromatography. Results revealed an increase in plasma serotonin after 12-weeks of DMT compared to the control group. The DMT group also showed decreased somatization, obsessive-compulsive, depression, anxiety, and phobic anxiety. These results suggest that DMT may show possible therapeutic benefits for depression and anxiety by stabilizing the sympathetic nervous system.

Chaouloff (1996) conducted a review of several papers. The review focused on the effects of acute physical exercise on central serotonergic system in wheel training of rats. Previous studies have found that acute exercise increases brain serotonin (5-HT) synthesis. Exercise serves to provide feedback. Acute exercise induces an increase in the release of serotonin and the biosynthesis. Serotonin is one of the neurotransmitters responsible for mood regulation, whether antidepressant effects or anxiolytic effects.

One component of depression seems to be cognitive inflexibility. Davis and Hoeksema-Nolen (2000) say that persons who ruminate about their negative mood and experiences have more intense depressive episodes. Rumination is a sign of cognitive inflexibility and can cause perseveration. Perseveration can be defined as a failure to change current thinking and/or behavior even after feedback is given. Sixty-two
participants were selected based on answers provided on the Ruminative Response Scale. This scale assesses how persons respond to their own negative emotion. Other scales used include The Beck Depression Inventory, Primary Mental Abilities, Backwards Digit Span, Wisconsin Card Sorting Test, a vocabulary test, and a color subtest. Results revealed that ruminators committed more perseverance errors compared to nonruminators. These findings suggest that ruminators have difficulty in changing their cognitive mindset to changing environmental contingencies.

Clarke, Dalley, Crofts, Robbins, and Roberts (2004) studied the effects of cognitive inflexibility after prefrontal serotonin depletion using a reversal paradigm. Depletion of serotonin levels in the prefrontal cortex produced perseverative responding. These findings show the importance of serotonin depletion in behavioral and cognitive flexibility. This is especially important in the behavior of those who suffer from substance abuse, schizophrenia, and obsessive-compulsive disorder.

Masley, Roetzheim, and Gualtieri (2009) conducted a study on the effects of aerobic exercise on cognitive flexibility. Participants were randomly assigned to one of two groups: treatment and control. Participants assigned to the aerobic exercise group showed significant increases in mental speed, reaction time, attention, and cognitive flexibility compared to the control group. The results of this study suggest central mechanisms are affected in the brain due to exercise, particularly the frontal cortex, which is responsible for executive function.

Based on previous research, I hypothesized that there will be a curvilinear relationship between exercise and both depression and anxiety. More specifically, I
hypothesized that exercise would reduce anxiety and depression at low to moderate levels; however, at excessive exercise levels, depression and anxiety scores would increase.
CHAPTER II
METHODOLOGY

Participants

Two hundred and fifty-one undergraduates (197 women, 97 men, \( M_{age} = 19.67 \) years, age range: 18-53; \( SD = 3.88 \)) enrolled in lower division psychology classes at California State University, Northridge participated in this study in partial fulfillment of a course requirement. Please see Table 1 for the ethnicity distribution of the sample.

Design

A cross-sectional correlational design was utilized. The Exercise Questionnaire served as the predictor factor and the Beck Anxiety Inventory (BAI), Self-Deprecation Scale, and the Center for Epidemiologic Studies Depression Scale (CES-D) served as predicted factors.

Measures

Anxiety. The Beck Anxiety Inventory (BAI) is a 21-item scale that assesses common symptoms of anxiety (Beck, Epstein, Brown & Steer, 1988). Participants or responders are asked to indicate how much they have been bothered by the symptoms listed on the scale. Participants rate their answers on a 4-point Likert scale ranging from 0 = “Not at all” to 3 = “Severely-I could barely stand it.” Items on the scale are summed to yield a composite score. Scores range from 0-63.

The BAI demonstrates high internal consistency (\( \alpha = .92 \)) (Beck et al., 1988). Total item-correlations with each other ranged from .30 to .70. The BAI also demonstrates high test-retest reliability. A subsample of the population tested 1-week later after intake resulted in a Cronbach’s alpha of .75.
Factor analysis of the scale revealed two factors that were obtained using a scree plot. The first factor consisted of somatic symptoms and the second factor consisted of anxiety and panic symptoms (Beck et al., 1988). Please refer to Appendix I for the scale.

**Self-deprecation.** The Self-Deprecation Scale is composed of the five negatively worded items from the Rosenberg Self-Esteem Scale (Rosenberg, 1979). The self-deprecation items are more consistently related to depression, deviant behaviors, and personality. The scale demonstrates good construct and discriminative validity (Supple & Plunkett, 2011). In addition, another study conducted by Frank, Plunkett, and Otten (2010) found good reliability on the Self-Deprecation Scale. Cronbach’s alpha was found to be .83. Please refer to Appendix K for the scale.

**Depression.** The Center for Epidemiologic Studies Depression (CES-D) was developed for use in the general population (Radloff, 1977). It was designed to measure current levels of depression symptomology.

The scale consists of components such as feelings of guilt, worthlessness, depressed mood, hopelessness, loss of appetite and disturbances of sleep. The CES-D consists of 20-items and scores range from 0-60. The following stem precedes the items: “How often in the past week did you…” The scale is scored using a 4-point Likert scale with 0 indicating “Rarely” and 3 indicating “Most of the time.” Items are summed to yield a composite score. Scores ranges from 0-60 with higher scores indicating greater degrees of depression.

The scale consists of 20 symptoms that may occur in the healthy population or in persons that are depressed. The CES-D demonstrates high internal consistency and high reliability. Cronbach’s alpha ranged from .85-.90, and split-half reliability values ranged
from .77-.85 (Radloff, 1977). In addition, Spearman-Brown values ranged from .87-.92. Over eight weeks, the CES-D demonstrated good test-retest reliability with scores at week two measuring a retest value at .51, and scores at week eight demonstrating a value of .57 (Radloff, 1977). Please refer to Appendix J for the scale.

**Exercise.** The Exercise Questionnaire was created by the primary investigator due to the lack of availability of a standardized exercise questionnaire. The Exercise Questionnaire consists of 5 items. The items on the scale assess respondents’ exercise level. Respondents are asked to reply to questions such as, “In the past six months, how many days have you exercised per week, on average” or “What is the primary reason for engaging in exercise.” For purposes of analysis, the questions, “In the past six months, how many days have you exercised per week, on average?” “On average, how many minutes do you spend exercising each time you exercise (e.g., 30)” and “How many months have you been consistently exercising” were used to define the exercise factor. Please refer to Appendix L for the scale.

The scale has not been previously tested so there are no measures of reliability or validity.

**Demographic data.** The demographic background questionnaire contains 13-items. Participants are asked to answer questions such as, “What is your age?” and “What is your ethnicity?” Please Refer to Appendix M for the scale.

**Procedure**

Participants were instructed to sit at one of five computer stations and answer a series of questionnaires (BAI, CES-D, RSES, STAI, and the Exercise Questionnaire) followed by a short background questionnaire. To prevent fatigue effects, the order of the
scales were counterbalanced. The current study utilized PsychSurveys. On average, participants took 15-20 minutes to complete the survey. After participants completed the questionnaires, they were debriefed. Due to the nature and content of the study, informed consent was not needed.

**Analytic Strategy**

Analyses were performed using SPSS and EQS. The EQS was used to conduct structural equation modeling (SEM). SEM allows the flexibility to make causal hypotheses based on data that is correlational in nature. Goodness of fit was assessed by using a $\chi^2$ statistic ($\alpha = .05$), comparative fit index (CFI), and the root mean square error of approximation (RMSEA). The CFIs range from 0 to 1; it compares the hypothesized model to the model in which all variables are independent of one another. Values that are greater than .95 are desirable. For the RMSEA, values that are below .06 are desirable.
CHAPTER III
RESULTS

The Hypothesized Model

With factor solutions included as part of the SEM, a large number of parameters were to be estimated concurrently; therefore, the use of item parceling was employed. Item parceling divides a scale into subsets, and then the subsets are averaged together to form composite parcels (Kishton & Widaman, 1994).

The SEM was run from a total of 235 participants. A total of 16 cases were excluded due to missing data. A test of fit for the SEM was not rejected, $\chi^2_{171} = 81.14, p = .19$. In addition to the chi-square statistic, other fit statistics suggested a good model fit for the data, as well (CFI = .99; RMSEA = .03). Please see Figure 1.

Post hoc model modifications were performed next. The Wald test proposed the deletion of several nonsignificant relationships between variables, including those between exercise and anxiety, exercise and depression, and exercise and self-deprecation. Figure 2 reflects the final modified model. Fit statistics for this model were slightly improved from the original model: $\chi^2_{174} = 83.12, p = .22$; CFI = .99; RMSEA = .02.

Correlations

As a reminder to the readers, one of the purposes of the current study was to see if there were curvilinear relationships between exercise and anxiety and exercise and depression. To assess these relationships, Spearman’s rho correlations were conducted. The Spearman’s rho analyses revealed a statistically significant negative relationship between the BAI composite score and the square of how many months have you been consistently exercising ($r_s(249) = -.13, p < .05, R^2 = .02$). Please see Figure 3 for a
scatterplot of the data demonstrating the curvilinear relationship. Another Spearman’s rho correlation revealed a statistically significant negative correlation between the composite depression score and the square of how many months have you been consistently exercising ($r_s(249) = -.14, p < .05, R^2 = .02$). Please see Figure 4 for a scatterplot of the data demonstrating the curvilinear relationship. A third Spearman’s rho correlation was conducted, and results revealed a statistically significant negative relationship between self-deprecation and the square of how many days, on average, you exercised in the past six months ($r_s(249) = -.13, p < .05, R^2 = .02$). Please see Figure 5 for a scatterplot of the data demonstrating the curvilinear relationship. See Table 2 for means and standard deviations of the questionnaires and see Table 3 for additional correlations.
CHAPTER IV
DISCUSSION

I hypothesized that there will be a curvilinear relationship between exercise and depression and anxiety. More specifically, I hypothesized that exercise will reduce anxiety and depression at low to moderate levels; however, at excessive exercise levels, depression and anxiety scores will increase.

For the hypothesized SEM model, exercise did not significantly predict anxiety, depression, or self-deprecation. One explanation could be that there was a restriction in range in the measures. The majority of college students, 83.3%, produced scores of 0-21 on the BAI. Scores in this range indicate very low anxiety. In regards to the CESD, 67.7% of the college students produced a score of 16 or lower. Scores lower than 16 are not considered depressed. This is potentially a problem because I did not have participants who were severely depressed or had severe anxiety. I cannot generalize the results to those who are severely depressed or who have severe anxiety. Due to the potential restriction in range in these measures, I have less variability in the measures, and therefore, power is reduced for the analysis.

Another reason as to why the exercise factor may have not predicted depression, anxiety, and self-deprecation is because the SEM model in this study only assessed linear relationships. The relationship between exercise, anxiety, depression, and self-deprecation could be curvilinear. If the relationships between these factors are curvilinear, this test would produce nonsignificant relationships. To test whether or not curvilinear relationships existed, Spearman’s rho correlations were conducted. Overall, the Spearman’s rho correlations supported the hypotheses. The first Spearman’s rho revealed
a statistically significant negative relationship between anxiety and the square of how many months have you been consistently exercising. This suggests a curvilinear relationship such that as the number of months increase, anxiety decreases to a certain point. Due to the restriction of range on this measure, I am unable to determine when anxiety will increase again. The second Spearman’s rho correlation revealed a statistically significant negative correlation between the depression and the square of how many months have you been consistently exercising. This suggests a curvilinear relationship such that as the number of months increase, depression decreases to a certain point. However, after a certain point of about 14 months, depression increases again. The final Spearman’s rho correlation revealed a statistically significant negative relationship between self-deprecation and the square of how many days, on average, you exercised in the past six months. This suggests a curvilinear relationship such that as the number of days of exercise increases, self-deprecation decreases to a certain point but after six days of consistently exercising per week, self-deprecation increases.

However, in the hypothesized model, results did reveal significant relationships between anxiety, depression, and self-deprecation. For the first correlation between anxiety and depression, as depression increased, so did anxiety. This is to be expected because previous research has suggested a common variation in serotonin is associated with comorbid depression and anxiety (Molina et al., 2011). In addition, there was also a positive correlation between depression and self-deprecation. As depression increased, so did self-deprecation. This is also consistent with previous research that found self-deprecation and depression to be related (Gomez, Vance, & Gomez, 2011).
As mentioned previously, earlier research has shown exercise to reduce depression, anxiety, and self-deprecation. However, this study adds to the literature because no study to my knowledge has assessed curvilinear relationships between exercise and anxiety, depression, and self-deprecation.

Limitations of the current study include reliance on self-report of exercise behavior and mood ratings. Self-report is a problem because participants could be intentionally or unintentionally lying about their actual levels of exercise, anxiety, depression, and self-deprecation. They might not want to reveal true feelings. Participants could also try to present themselves in a favorable light or unfavorable light. In addition, ratings could be influenced by how the person feels at the time of the questionnaire. This limitation could be addressed in future research by having a licensed clinical psychologist perform a structured clinical interview. Another limitation is the Exercise Questionnaire. The Exercise Questionnaire has not been tested against other scales; therefore, there is no data to evaluate the reliability and the validity of this scale. This could be addressed in future research by using a modified version of the Frequency of Physical Activity Form (Spano, 2001). An additional limitation of the current study includes self-selection. Participants self-selected themselves into the study. Self-selection into a study could produce a bias because those who self-selected into the study could be more interested in the topic compared to those who did not elect to participate. Self-selection is also a problem because these participants could differ in characteristics compared to others who did not self-select into the study. Future studies could implement a random selection procedure. Another limitation of the current study is that the participants were very homogenous on several dimensions (such as BAI and CESD). This limits the
generalizability and external validity of the results. Future studies could address this limitation by sampling more people who have higher depression and anxiety scores.

Another limitation is that there was a restriction in range on age. Ninety-four percent of participants fell between the ages of 18 to 23; therefore, I cannot draw conclusions about those who fall out of this age range. I am not able to determine how exercise affects depression, anxiety, and self-deprecation in the older population. Due to the potential restriction in range on the age variable, I have less variability in the measure and this also reduces the sensitivity of the analysis.

An additional limitation could be that college students seem to be more active than the general population. A study conducted by Miller, Staten, Rayens and Noland (2005) utilized the National College Health Risk Behavior Survey. A total of 903 college students returned their survey. Results indicated that 46% of the participants engaged in vigorous activity and 58% of participants participated in moderate exercise. Vigorous activity was defined as participating in sports activities for 20 minutes which made one breathe hard and sweat at least three times a week. Moderate exercise was defined as participating in walking or biking for at least 30 minutes a day three times a week. Another study conducted by Bernstein, Costanza and Morabia (2001) focused on physical activity in urban adults in the general population. A total of 3,410 (men = 1707, women = 1703; age range: 35-74) participants completed information on diet and physical activity frequency. Results indicated that physical activity decreased with age. A sedentary life was defined as less than 10% of total energy expended. A sedentary life was observed in 57% of the men and 70% of the women. This is a limitation because it affects the generalizability of the results. A final limitation of the study includes the population
studied. The current study utilized college-aged students. Thus, the current study results are only generalizable to college-age students. Future studies should include a wider age range.

The current study has many practical implications. First, exercise, in moderation, can potentially be used to lower health care costs. Caution should be used in exploring this possibility since this study was correlational in nature, and, therefore, it cannot be inferred on the basis of this study that exercise would prevent or reduce depression or anxiety. However, a study conducted by Fremont and Craighead (1987) randomly assigned participants to one of two treatment conditions. Participants were selected based on having mild or moderate depression scores on the Beck Depression Inventory. Findings found that exercise produced equivalent improvements in depression and anxiety to those produced by cognitive therapy. A single session of cognitive therapy can be $60.00 per hour and an exercise session, per group, can be $4.00 per hour. Thus, exercise is more cost-effective. In addition to therapy costs, a decrease in the use of psychotropic medications can be expected. As previously mentioned, depression has a high cost to society (Greenberg et al., 2003). Exercise can potentially be used in lieu of psychotropic medication. One study conducted by Babyak et al. (2000), found that after 10 months, the exercise group had significantly lower relapse rates than subjects in the medication group. Exercise has been shown in previous research to produce benefits in lowering depression and anxiety. However, practitioners should be careful in how much exercise should be prescribed. The results of the current study suggest that too much exercise can produce an increase in depression, anxiety, and self-depreciation. In addition to the current study, a study conducted by Spano (2001) revealed that too much exercise
or too much of a commitment to exercise can produce maladaptive behaviors. Results of the study revealed that anxiety and obsessive-compulsiveness were related to commitment to exercise and narcissism was related to physical activity.

Future studies could correct for the above mentioned limitations by employing a longitudinal experimental design that would study children who are at high risk for developing depression and anxiety. In future studies, children could be assigned to different exercise groups and followed over a period of time. Children could range in ages to see whether or not exercise can be used as a preventative factor for depression and anxiety. Finally, future studies would also like to look at the effects of exercise on curbing impulsive substance use and abuse.

**Conclusion**

As stated previously, depression is one of the most common mood disorders and anxiety is another common psychological disorder. Both of these disorders place a huge burden on our economic system totaling billions of dollars each year. Much of the money is spent on treatment such as prescription drugs and/or psychotherapy. To reduce healthcare costs, other treatments should be considered. Past research has shown exercise to be effective in reducing anxiety, depression, and self-deprecation. The current study supports past research; however, it also looked at whether or not curvilinear relationships exist. The hypotheses were supported; there were curvilinear relationships with respect to exercise and anxiety, depression, and self-deprecation. Practitioners could consider implementing exercise in addition to or as an alternative to medications; however, exercise should be prescribed in moderation. The current study’s results indicate that depression, anxiety, and self-deprecation decrease to a certain point; however, when
amount of exercise is too extreme, they tend to increase. Future studies should examine whether or not exercise can be used to prevent depression, anxiety, and self-deprecation. In sum, exercise seems like a promising potential treatment for reducing anxiety, depression, and self-deprecation.
REFERENCES


### Table 1

*Ethnicity Characteristics of Participants*

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>19</td>
<td>7.6</td>
</tr>
<tr>
<td>Asian</td>
<td>17</td>
<td>6.7</td>
</tr>
<tr>
<td>Filipino</td>
<td>10</td>
<td>4.0</td>
</tr>
<tr>
<td>Hispanic</td>
<td>137</td>
<td>54.6</td>
</tr>
<tr>
<td>Indian</td>
<td>1</td>
<td>.4</td>
</tr>
<tr>
<td>Jewish</td>
<td>2</td>
<td>.8</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>5</td>
<td>2.0</td>
</tr>
<tr>
<td>Mixed</td>
<td>18</td>
<td>7.2</td>
</tr>
<tr>
<td>Persian</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>White</td>
<td>37</td>
<td>14.7</td>
</tr>
</tbody>
</table>
Table 2

*Means and Standard Deviations of Questionnaires*

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exercise</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ave Exercise Days Per Week</td>
<td>251</td>
<td>2.92</td>
<td>1.74</td>
</tr>
<tr>
<td>Ave Minutes Exercised Per Session</td>
<td>251</td>
<td>54.57</td>
<td>37.57</td>
</tr>
<tr>
<td>Months Consistently Exercising</td>
<td>251</td>
<td>7.14</td>
<td>18.07</td>
</tr>
<tr>
<td><strong>BAI</strong></td>
<td>251</td>
<td>12.87</td>
<td>9.64</td>
</tr>
<tr>
<td><strong>CESD</strong></td>
<td>251</td>
<td>13.86</td>
<td>8.32</td>
</tr>
<tr>
<td>Self-Deprecation</td>
<td>251</td>
<td>4.40</td>
<td>3.03</td>
</tr>
</tbody>
</table>
APPENDIX C

Table 3

*Correlations between Exercise Questions and Anxiety, Depression, and Self-Deprecation*

<table>
<thead>
<tr>
<th>Question</th>
<th>BAI</th>
<th>CESD</th>
<th>Deprecation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sq. Ave Exercise Days/Week</td>
<td>-.10</td>
<td>-.08</td>
<td>-.13*</td>
</tr>
<tr>
<td>Square Ave How Many Minutes</td>
<td>-.08</td>
<td>-.07</td>
<td>-.08</td>
</tr>
<tr>
<td>Exercised per Session Consistently Exercising</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Square Months Consistently Exercising</td>
<td>-.13*</td>
<td>-.14*</td>
<td>-.11</td>
</tr>
</tbody>
</table>

*Note.* Correlations with an asterisk indicate significance at $p = .05$
Figure 1: Exercise as a predictor of anxiety, depression, and self-deprecation. Ovals represent factors and rectangles represent measured variables. Arrows from exercise to anxiety, depression and self-deprecation represent regressions. Double arrow lines represent correlations. Arrows from factor to measured variables represent factor loadings.
APPENDIX E

Figure 2: Represents the final model after post hoc modifications. Ovals indicate factors and rectangles indicate measured variables. Arrows from exercise to anxiety, depression, and self-deprecation represent regressions. Double arrow lines represent correlations. Arrows from factor to measured variables represent factor loadings.
Figure 3: Represents the first Spearman’s rho correlation between the Beck Anxiety Inventory and the square of how many months you have been consistently exercising.
Figure 4: Represents the second Spearman’s rho correlation between the Center for Epidemiological Studies Depression Scale (CESD) and the square of how many months have you been consistently exercising
Figure 5: Represents the third Spearman's rho correlation between self-deprecation and in the past 6 months, how many days have you exercised per week on average
APPENDIX I

Beck Anxiety Inventory

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Not at All</th>
<th>Mildly, but it didn’t bother me</th>
<th>Moderately, it wasn’t pleasant at times</th>
<th>Severely – it bothered me a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbness or tingling</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling hot</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Wobbliness in legs</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Unable to relax</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fear of worst happening</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dizzy or lightheaded</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Heart pounding/racing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Unsteady</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Terrified or afraid</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nervous</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling of choking</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Hands trembling</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Shaky/unsteady</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fear of losing control</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Difficulty in breathing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fear of dying</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Scared</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Indigestion</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Faint/lightheaded</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Face flushed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Hot/cold sweats</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Column Sum</strong></td>
<td><strong>0</strong></td>
<td><strong>1</strong></td>
<td><strong>2</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>
Scoring - Sum each column. Then sum the column totals to achieve a grand score. Write that score here ____________.

Interpretation

A grand sum between 0 – 21 indicates very low anxiety. That is usually a good thing. However, it is possible that you might be unrealistic in either your assessment which would be denial or that you have learned to “mask” the symptoms commonly associated with anxiety. Too little “anxiety” could indicate that you are detached from yourself, others, or your environment.

A grand sum between 22 – 35 indicates moderate anxiety. Your body is trying to tell you something. Look for patterns as to when and why you experience the symptoms described above. For example, if it occurs prior to public speaking and your job requires a lot of presentations you may want to find ways to calm yourself before speaking or let others do some of the presentations. You may have some conflict issues that need to be resolved. Clearly, it is not “panic” time but you want to find ways to manage the stress you feel.

A grand sum that exceeds 36 is a potential cause for concern. Again, look for patterns or times when you tend to feel the symptoms you have circled. Persistent and high anxiety is not a sign of personal weakness or failure. It is, however, something that needs to be proactively treated or there could be significant impacts to you mentally and physically. You may want to consult a counselor if the feelings persist.
APPENDIX J

Depression Screening

Center for Epidemiologic Studies Depression (CES-D)

Scale Description:

The following scale was developed by the Center for Epidemiologic Studies (Radlof, 1977). The scale has been found reliable (Alpha>.85) in previous research (Hann et. al., 1999). A Spanish version of this scale is also available.

Scale items:

Below is a list of some ways you may have felt or behaved. Please indicate how often you have felt this way during the last week by checking the appropriate space. Please only provide one answer to each question.

<table>
<thead>
<tr>
<th>During the Past Week:</th>
<th>Rarely or none of the time (less than one day)</th>
<th>Some or a little of the time (1-2 days)</th>
<th>Occasionally or a moderate amount of the time (3-4 days)</th>
<th>Most or all of the time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was bothered by things that usually don’t bother me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I did not feel like eating; my appetite was poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt that I could not shake off the blues even with help from my family or friends.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt I was just as good as other people.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I had trouble keeping my mind on what I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
was doing.
I felt depressed.
I felt that everything I did was an effort.
I felt hopeful about the future.
I thought my life had been a failure.
I felt fearful.
My sleep was restless.
I was happy.
I talked less than usual.
I felt lonely.
People were unfriendly.
I enjoyed life.
I had crying spells.
I felt sad.
I felt that people disliked me.
I could not get going.
APPENDIX K

Self-Deprecation (Negatively worded items from Rosenberg Self-Esteem Scale)

The scale is a five item Likert scale with items answered on a four point scale - from strongly agree to strongly disagree.
Instructions: Below is a list of statements dealing with your general feelings about yourself. If you strongly agree, circle SA. If you agree with the statement, circle A. If you disagree, circle D. If you strongly disagree, circle SD.

2. At times, I think I am no good at all                     SA A D SD
5. I feel I do not have much to be proud of                SA A D SD
6. I certainly feel useless at times                       SA A D SD
8. I wish I could have more respect for myself             SA A D SD
9. All in all, I am inclined to feel that I am a failure    SA A D SD
APPENDIX L

1. In the past six months, how many days have you exercised per week, on average?
   0  1  2  3  4  5  6  7

2. On average, how many minutes do you spend exercising each time you exercise (e.g., 30)? _________

3. How many months have you been consistently exercising?__________

<table>
<thead>
<tr>
<th>How many minutes do you engage in the following activities per exercise session?</th>
<th>Write in # of minutes</th>
<th>Circle the level of intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>1 2 3</td>
<td>Low  Moderate  Vigorous</td>
</tr>
<tr>
<td>Jogging</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Weight Lifting</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Aerobics</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Running</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Abdominal Crunches</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Bicycling</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Dancing</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Gymnastics</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Calisthenics</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Other(s)</td>
<td>1 2 3</td>
<td></td>
</tr>
</tbody>
</table>

4. What is the primary reason for engaging in exercise?
   1. Physical health
   2. Mental Health
   3. Coping
   4. Stress
   5. Other ____________________

5. Based on the number of days you exercise in a given week, how many days do you:
   1. Exercise alone? _________________
   2. Exercise with another person? _________________
APPENDIX M

Demographic Background Questionnaire:

Are you currently attending a university/college? 1. Yes 2. No

If yes, what university/college? __________________________

5. Master’s student

What is your current major? __________________________

What is your gender? 1. Female 2. Male

What is your age?___


Which relationship status best describes your parents?

Do you currently live with either of your parents? 1. Yes 2. No If so, which one(s)? __________________________

In what country were you born? __________________________

If you were NOT born in the United States, how many years ago did you arrive to the U.S.? _
In what country was your mother born?____________________

In what country was your father born?____________________

What is your ethnicity?____________________

Which of the following best describes your primary mother figure?
1. Birth mother  2. Stepmother  3. Other ______________

Which of the following best describes your primary father figure?
1. Birth father  2. Stepfather  3. Other ______________