

January 2013

The Effects of Exercise Modality on State Body Image

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The Effects of Exercise Modality on State Body Image

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science
Department of Physical Education and Exercise Science
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Date of Approval:
March 25, 2013

Keywords: physical exercise, body satisfaction, mood, resistance exercise, aerobic
exercise

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ABSTRACT

Previous research has shown that chronic exercise positively impacts body image in women. Research defining the modality that yields the best results following an acute session of exercise has yet to be determined. This research attempted to show the psychological benefits that exercise could have on female body image after only one bout of exercise. **PURPOSE:** The purpose of the current study was to examine the effects of three different modalities of acute exercise on state body image in women. This study aimed to determine which modality, if any, is more effective in increasing state body image. **METHODS:** Twenty-five female participants (20.2 ± 2.2 years; 23.6 ± 4.0 BMI, 25.5 ± 6.0 body fat percent) attended laboratory sessions on six different occasions; the initial informed consent, risk stratification, and descriptive data session, the familiarization session, the three exercise sessions, and the control session. During the familiarization session, each participant was acquainted with each exercise modality. The aerobic (AE) session consisted of a five-minute warm-up, 30 minutes of treadmill exercise, and a five-minute cool-down. The interval circuit (IC) session involved a five-minute warm-up, two circuits containing five bodyweight exercises each, and five minutes of cool-down stretching. The resistance (RE) session included a five-minute warm-up, three sets of eight repetitions of the bench press, bent-over row, overhead press, squat, deadlift, and lunge exercises, and five-minutes of cool-down stretching. The control session included 40 minutes of quiet reading. Ratings of perceived exertion and

heart rate were monitored and recorded during each trial. State body image, positive mood, and negative mood were measured immediately before and after each experimental session. RESULTS: Following the AE and RE sessions, state body image significantly improved from pre- to post-session (AE: 5.2 ± 1.2 to 5.7 ± 1.0 ; RE: 5.4 ± 1.4 to 5.9 ± 1.2 ; $p < 0.05$). Only the RE post-session state body image (5.4 ± 1.4) was significantly different from the CO post-session state body image (5.4 ± 1.1 ; $p < 0.05$). The AE and RE sessions significantly increased positive mood and decreased negative mood from pre- to post-session ($p < 0.05$). CONCLUSION: Participation in the aerobic and resistance sessions significantly improved body image from pre- to post-exercise. Resistance exercise was the only research modality that yielded significantly higher post-exercise state body image as compared to the control session. Thus, a single resistance exercise session may help individuals to improve their state body image.

CHAPTER 1: INTRODUCTION

Body image refers to self-perceptions and self-attitudes that reflect how one feels, thinks, and behaves towards their body, especially its appearance (Cash, 2004).

Perceptual, cognitive, affective, and behavioral components make up the multidimensional construct of body image (Cash, 1986; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). The majority of the body image literature reports the trait aspects of body image. Trait body image is a stable and unchanging characteristic that is linked to personality traits, appearance-related factors, and socio-cultural influences (Colautti et al., 2011). However, more recent research has found the value of analyzing state body image (Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002; Thompson, 2004). State body image fluctuates on a moment-by-moment basis and these fluctuations are associated with contextual factors, current mood state, and individual differences in personality dispositions and disordered eating symptomology (Colautti et al., 2011). Body image has the potential to dramatically influence emotions, thoughts, and behaviors throughout a lifetime, ultimately impacting quality of life (Pruzinsky & Cash, 2002).

Two populations that especially suffer from negative body image are those diagnosed with obesity and eating disorders. A recent report by the Centers for Disease Control and Prevention indicates that one third of adults and one sixth of adolescents are considered obese (2011). In a review of the literature on obesity and body image, Schwartz and Brownell (2004) found that one component of the psychological distresses

that plague obese populations is a negative body image. Due to severe societal pressures to be thin, it is no surprise that body dissatisfaction increases as people become more overweight.

In severe cases, body image disturbance becomes a significant characteristic of eating disorder symptomology and puts those who do not already have eating disorders at risk of developing one. In the United States, the lifetime prevalences of anorexia nervosa, bulimia nervosa, and binge eating disorder for women are estimated to be 0.9%, 1.5%, and 3.5% respectively (Hudson, Hiripi, Pope, & Kessler, 2007). Body dissatisfaction is associated with binge eating accompanying obesity (Schwartz & Brownell, 2004). Due to the overwhelming prevalence and the associated health consequences of obesity (Centers for Disease Control and Prevention, 2011) and eating disorders (Rome & Ammerman, 2003), it is important to examine the relationship between body image and weight management behaviors.

An unhealthy body image can have a large impact on health. In a review considering the potential health costs of decreased body satisfaction and enhanced body concern, Grogan (2006) suggested that socio-cultural pressures on women in western societies to achieve an unrealistically thin ideal induces body dissatisfaction and negative health behaviors. Women with decreased body image are less likely to quit smoking for fear of gaining weight and are more likely to undergo cosmetic surgery. Body dissatisfaction can lead to excessive exercise and disordered eating behaviors, such as restrictive dieting, binge eating, and induced vomiting (Grogan, 2006; Neumark Sztainer, Paxton, Hannan, Haines, & Story, 2006). Low levels of health-promoting behaviors like exercise are associated with poorer levels of body satisfaction (Neumark Sztainer et al.,

2006). Consequently, it is important to analyze what behaviors are associated with increasing body image and body satisfaction in order to minimize the previous negative behaviors.

Research suggests that chronic exercise interventions improve various body image measures across the lifespan for women. Burgess, Grogan, and Burwitz (2006) found that aerobic dance in adolescent girls decreased body dissatisfaction and increased physical self-perceptions. Walking, another form of aerobic exercise, has been shown to increase satisfaction with physical functioning in sedentary, middle-aged women when step count goals are set and monitored (Arbour & Martin Ginis, 2008). In a circuit weight training study, participants saw significant improvements in appearance evaluation, increased body satisfaction, decreased social physique anxiety, and enhanced physical self-efficacy (P. A. Williams & Cash, 2001). Body image improvements were also seen from a full-body, progressive 12-week strength training program in college-aged men and women (Martin Ginis, Eng, Arbour, Hartman, & Phillips, 2005). Thus, numerous types of chronic exercise have constructive effects on trait body image.

Very few studies have directly compared chronic exercise modalities and their effects on body image. In a study by Tucker and Mortell (1993), middle-aged women were either asked to participate in a resistance training or walking program for three days per week for 12 weeks. The resistance-trained group had significantly greater improvements in body image than the walking group, which the authors attributed to strength training's ability to create real or imagined changes in the body. More recently, Henry, Anshel, and Michael (2006) examined the body image of college females enrolled in either an interval circuit training or an aerobic step class and were compared to

controls over a 12-week period. Utilizing post-hoc analyses, the results indicated significant improvements for only the interval circuit group in overall appearance evaluation. These studies seem to indicate that some component of strength training is necessary for optimal body image (Depcik & Williams, 2004; Tucker & Mortell, 1993). Both of these studies identified the effects of chronic exercise training and thus cannot be used to indicate the influence that a single bout of exercise alone could possibly have on improving state body image.

The literature regarding the effects of acute exercise on state body image is conflicting. Previous research has shown that acute aerobic exercise does not affect body dissatisfaction and does not moderate the effect of media images on negative mood states (Fallon & Hausenblas, 2005). Contrastingly, participation in aerobic dance compared to attending a university course results in significant positive changes in mood and self concept (McInman & Berger, 1993). It has also been shown that both high trait and low trait body dissatisfied females exhibit lower state body dissatisfaction and negative affect and greater positive affect post-exercise (LePage & Crowther, 2010).

In a recent study, Vocks et al. (2009) compared state body image, perceptions of body dimension, and mood of 65 female gym members following an experimental bout of either bicycling or reading a newspaper. The results of this study showed participants felt slightly thinner and were more satisfied with their bodies after the cycling session as compared to reading a newspaper. Similarly, participants showed significantly decreased discontent with one's own body, an attitudinal component of body image, from pre- to post-exercise. Changes in body perceptions were greater when participants were pre-experimentally more dissatisfied with their bodies. Trait body dissatisfaction, trait affect,

and mood states have been indicated as having moderating effects on state body image (Colautti et al., 2011; LePage & Crowther, 2010; Vocks et al., 2009).

Missing from the literature is information regarding state body image responses to different modalities of acute exercise in females. Because of exercise's potential to improve body image and therefore quality of life (Pruzinsky & Cash, 2002), a study focusing on establishing the optimal acute exercise modality for increasing state body image in females is warranted.

Problem Statement

Only one published research article has specifically analyzed the effects of an acute bout of exercise on body image (Vocks et al., 2009). Although the results showed an increase in state body image following a cycling session, this study's findings were limited because it only included one exercise modality, aerobic cycling. No acute exercise intervention study to date has directly compared the effects of three different exercise modalities on state body image. Since there is limited support that chronic resistance training can increase positive body image measures (Henry, Anshel, & Michael, 2006; Tucker & Mortell, 1993), it stands to reason that some form of acute training involving resistance training components might improve body image in women. The question remains as to whether a single modality can improve state body image in females following an acute bout. Furthermore, the optimal modality for producing such increases in state body image satisfaction has yet to be determined. Taking all of these considerations regarding the effect of exercise on body image into account, the present study examined the effects of three different modalities of acute exercise bouts (aerobic,

resistance training, and body-weight interval circuit) on state body image in college-aged women.

Study Variables

The present study included one independent variable, exercise modality, with four levels: aerobic exercise, resistance exercise, interval circuit exercise and a control bout. The aerobic (AE) bout consisted of a treadmill workout and the resistance (RE) condition included a weight-lifting session of six pre-selected exercises to be performed for eight repetitions at three sets each. The interval circuit (IC) exercise bout included an interval circuit-training session that includes both aerobic and resistance components using body-weight only. The control (CO) bout included quiet reading. The dependent variables of state body image and mood were determined by the Body Image States Scale (BISS; (Cash et al., 2002) and the modified Trait Affect Scale (mTAS; (Colautti et al., 2011), respectively.

Hypotheses

H₀: State body image and mood would not change following any acute modality of exercise.

H_{R1}: State body image and mood would improve, regardless of exercise modality.

H_{R2}: State body image and mood would improve greater for resistance exercise than aerobic exercise.

H_{R3}: State body image and mood would improve the greatest following circuit exercise.

Conceptual Model

According to Martin and Lichtenberger (2002) and Martin Ginis and Bassett-Gunter (2011), Sonstroem and Morgan's (1997; 1989) expanded Exercise and Self-Esteem Model can be used to explain how exercise-induced changes in physical self-efficacy promote exercise-related changes in body image. The main constructs of Sonstroem & Morgan's model are physical measures, physical self-efficacy, physical competence, physical acceptance, and self-esteem. The physical measures are any type of exercise or physical activity that a person may perform. Physical self-efficacy refers to personal beliefs about one's general physical fitness and functioning in addition to one's capabilities for specific physical tasks. Physical competence is one's overall assessment of the self as possessing general physical fitness, which could reflect the cognitive element of body image. Physical acceptance is the extent to which one feels satisfaction or dissatisfaction with various parts or processes of the body. It has also been indicated as a measure of body acceptance. Thus, physical acceptance could represent the affective component of body image.

In order to fully understand Martin and Lichtenberger's (2002) and Martin Ginis and Bassett-Gunter's (2011) interpretation of the model, it is important to first understand Sonstroem and Morgan's (1989, 1997) Exercise and Self-Esteem Model. The Exercise and Self-Esteem Model asserts that self-esteem-related constructs, such as physical self-efficacy, lead to predictions of global (overall) self-esteem in a hierarchical organization. The model suggests that an intervention will induce changes in physical measures that in turn lead to changes in global self-esteem. Specific self-perceptions anchor the bottom of the hierarchy and general self-perceptions appear at the top. Initiation of self-esteem

change begins at the base of the hierarchy with physical measures. These physical measures can act as a source of specific physical self-efficacy. The composite physical self-efficacy, which combines specific, task-related self-efficacies, informs the more general physical competence. Physical competence influences self-esteem directly or indirectly through physical acceptance. Physical acceptance enhances global self-esteem through the extent that a person is accepting of who he or she is physically.

In Martin and Lichtenberger's (2002) and Martin Ginis and Bassett-Gunter's (2011) extended interpretations of the Exercise and Self-Esteem Model, the effects of exercise are mediated by changes in subjective perceptions of one's physical fitness and competence, meaning changes in physical measures can be real or imagined by the exerciser. Even when exercise training may fail to cause statistically significant increases in strength and fitness, these authors postulate that exercisers may perceive real or imagined yet personally meaningful improvements in physical functioning that significantly enhance self-efficacy. Since the definitions of physical competence and physical acceptance are reflective of the cognitive and affective components of body image, increases in self-efficacy yield positive feelings about one's body and greater body image satisfaction. Utilizing this logic, an acute bout of exercise could induce an imagined and personally meaningful change in personal measures that could enhance physical self-efficacy and consequently increase cognitive and affective components of their body image.

Operational Definitions

‘Trait body image’ was defined as how one generally feels about the appearance of their body. ‘Appearance evaluation’ was defined as the negative-to-positive evaluations of one’s overall appearance. ‘Body satisfaction’ was defined as the degree of approval with aspects of one’s body. ‘State body image’ was defined as how one feels about the appearance of their body right now at this moment.

‘Aerobic exercise’ was defined as walking, jogging, or running on a treadmill. ‘Resistance exercise’ was defined as traditional resistance training using barbells and dumbbells. ‘Interval circuit exercise’ was defined as a circuit-training workout using only body-weight that includes various types of aerobic and body resistance exercises coupled into combinations that are repeated. ‘Control’ was defined as reading a newspaper or reviewing class materials that are absent of body image related content.

Participants were instructed to complete their exercise bout at a ‘moderate intensity.’ ‘Moderate’ was defined as a participant’s subjective rating of perceived exertion between a 3 and 4 on Borg’s CR-10 Scale (Borg, 1998; Garber et al., 2011).

Assumptions

Because the exercise bout was acute, it was assumed that fitness would not improve and any change to state body image was due solely to the psychological benefits of the exercise bout. Because the body image questionnaires are subjective, it was also assumed that participants were responding to the questionnaires with honest, truthful answers. Before each trial, researchers utilized a script to remind participants that all responses should have been reflective of how the participant actually felt and not what

they believe the researchers wanted the participant to feel. Additionally, participants were notified that all responses were kept confidential in compliance with the Institutional Review Board (IRB).

It was also assumed that the presence of the researchers did not affect state body image. In order to reduce perceived negative discrepancies between the participant and the researchers, the researchers and participants were required to wear clothing that was loose fitting and conceals their physique (Martin Ginis, 2008).

Finally, it was assumed that participants were giving adequate effort to reach a moderate intensity for each exercise bout. All participants were familiarized with the Borg's CR-10 scale (1998) prior to testing. The participants were told that during the exercise bouts, they needed to exert themselves between a 3 and 4 on Borg's CR-10 scale from 0 to 10. In order to facilitate this level of effort during the trials, the researchers reminded the participants of the exertion range during the exercise bout utilizing a poster of the Borg's CR-10 Scale. The participants were familiarized prior to the exercise trials with the various exercises that were performed during the study to ensure they could successfully participate in the three exercise bouts. Familiarization with the exercises was conducted between the researchers and participants in the lab and the participants were given access to a tutorial video of sorts utilizing a male actor to demonstrate each activity. A male actor was used in the familiarization video to ensure that participants were not comparing themselves to the actor physically, which might have occurred if a female actor was used. Twenty-four hours prior to the familiarization session, participants were asked to view the tutorial video. Upon arrival to the familiarization session, participants

were asked if they were able to view the tutorial video. If the participant responded ‘no,’ they were then required to watch the video before the familiarization session would begin.

Limitations

A limitation of the present study is the effect that food intake may play on state body image. Vocks, Legenbauer, and Heil (2007) found that consuming a milkshake during a neutral movie can significantly increase state body dissatisfaction. Additionally, high levels of dietary restraint have been associated with lower levels of body image satisfaction. The researchers urged participants to eat at least one balanced, healthy meal on the day of the trial. The researchers asked participants to refrain from eating a large meal within two hours and a small snack within one hour prior to testing. Although these explicit instructions were given to participants, compliance may have been limited. Because of this, the state body image scores may be impacted by food intake or restriction, causing the results to be skewed.

Another limitation impacting state body image is the day-to-day fluctuations in state body image. Melnyk, Cash, and Janda (2004) found that body image variability was significantly predicted by psychological investment in one’s appearance, disturbed eating attitudes, and appearance-fixing coping strategies. Thus, the significance of the results may be hindered by food intake and daily state body image variability. Finally, because convenience sampling is to be employed in order to maximize participant numbers, the results of this study can only be extrapolated to college-aged women.

Delimitations

Three delimitations of age, gender, and body image disturbance were placed upon this study. For convenience purposes, the participation sample included only young women taken from a student population. Individuals were given the Multidimensional Body-Self Relations Questionnaire, which assesses trait body image satisfaction. Based upon the results of this questionnaire, those participants that are considered body image disturbed were excluded from this study. Upon exclusion, body-image disturbed individuals were directed to USF's counseling services via letter. Because of the variability in physical activity level, weight, body composition, height, race, and age within the undergraduate student population, the results of this study may be generalized to the collegiate female population.

Significance

Body image concerns can be devastating if taken to extremes. Patients with anorexia nervosa, bulimia nervosa, and binge eating disorder all exhibit negative body image tendencies. Because of the cost that treatments for these disorders places upon society (Striegel-Moore, Leslie, Petrelli, Garvin, & Rosenheck, 2000), it is important to invest resources into finding cheaper alternatives that can help improve body image satisfaction. Fisher and Thompson (1994) found no significant difference between cognitive behavioral therapy and exercise when treating body image disturbed patients. Monitoring state body image has been named as a useful tool in clinical interventions for self-monitoring daily levels of body dissatisfaction and environmental and contextual influences (Thompson, 2004). It has been noted that analyzing contexts and variables

associated with body image changes is important to understanding the dynamic cognitive and affective processes associated with eating disorders and body image disturbances (Cash et al., 2002). Therefore, exercise may be used as a valid treatment for improving body satisfaction in clinical patients. Other literature has shown that exercise can improve body satisfaction; however, research defining the modality that yields the best results following an acute session of exercise has yet to be determined for women. Thus, this research attempted to show the psychological benefits that exercise could have on female body image after only one bout of exercise.

CHAPTER 2: REVIEW OF THE LITERATURE

Body Image Defined

Body image refers to self-perceptions and self-attitudes, which reflect how one feels, thinks, and behaves towards their bodies, especially its appearance (Cash, 2004). Perceptual, cognitive, affective, and behavioral components make up the multidimensional construct of body image (Cash, 1986; Thompson et al., 1999). Based on this, the perceptual aspect of body image involves how one imagines or sees their body mentally. Cognitively, body image reflects thoughts concerning attractiveness, strength, and fitness about the physical self. The affective construct of body image is a person's positive or negative feelings about their body's appearance and function. Finally, the actions that reflect the other three constructs, such as the types of clothes a person chooses to wear, encompass the behavioral component. A healthy body image includes accurate perceptions of one's body shape and size, positive thoughts and feelings about one's body, and behaviors that reflect the positive appraisal. Body image disturbance is essentially the opposite of a healthy body image. Someone who is body image disturbed has inaccurate perceptions of their body's shape and size, negative thoughts and feelings towards their body, and perform actions to hide or change their body.

In the traditional body image literature, the trait aspects of body image are typically measured. Trait body image is a stable and unchanging characteristic that is

linked to personality traits, appearance-related factors, and socio-cultural influences (Colautti et al., 2011). However, more recent research has found the value of analyzing state body image (Cash et al., 2002; Thompson, 2004). State body image fluctuates on a moment-by-moment basis and these fluctuations are associated with contextual factors, current mood state, and individual differences in personality dispositions and disordered eating symptomology (Colautti et al., 2011). Body image has the potential to dramatically influence emotions, thoughts, and behaviors throughout a lifetime, ultimately impacting quality of life (Pruzinsky & Cash, 2002).

Two populations that especially suffer from negative body image are those diagnosed with obesity and eating disorders. A recent report by the Centers for Disease Control (CDC) and Prevention indicates that one third of adults and one sixth of adolescents are considered obese (2011). In a review of the literature on obesity and body image, Schwartz and Brownell (2004) found that one component of the psychological distresses that plagues obese populations is a negative body image. Due to severe societal pressures to be thin, it is no surprise that body dissatisfaction increases as people become more overweight.

In severe cases, body image disturbance becomes a significant characteristic of eating disorder symptomology and puts those who do not already have eating disorders at risk of developing one. The lifetime prevalence in the United States of anorexia nervosa, bulimia nervosa, and binge eating disorder for women are estimated to be 0.9%, 1.5%, and 3.5% respectively (Hudson et al., 2007). As the statistics show, binge eating disorder (BED) appears to be more common than both anorexia nervosa and bulimia nervosa combined. BED exhibits substantial comorbidity with other psychiatric disorders, and is

strongly linked with severe obesity (Hudson et al., 2007). Furthermore, in a review by Vanovski (2003), the prevalence of BED within an obese population is estimated to range from less than 2% in community studies to more than 25% in severely obese treatment-seeking populations. Although rigorous diagnostic criteria decreases the prevalence of BED, distress and dysfunction due to binge eating is evidently clear in a significant proportion of obese persons. The percentage of persons with extreme obesity is increasing more rapidly than the percentage of persons with lesser degrees of obesity. Body dissatisfaction is steadily associated with binge eating accompanying obesity (Schwartz & Brownell, 2004). Due to the overwhelming prevalence and the associated health consequences of obesity (Centers for Disease Control and Prevention, 2011) and eating disorders (Rome & Ammerman, 2003), it is important to examine the relationship between body image and weight management behaviors.

An unhealthy body image can have a large impact on health. In a review considering the potential health costs of decreased body satisfaction and enhanced body concern, Grogan (2006) suggested that socio-cultural pressure on women in western societies to achieve an unrealistically thin ideal induces body dissatisfaction and negative health behaviors. Women with decreased body image are less likely to quit smoking for fear of gaining weight and are more likely to undertake cosmetic surgery. Body dissatisfaction can lead to disordered eating behaviors, such as restrictive dieting, binge eating, and induced vomiting (Grogan, 2006; Neumark Sztainer et al., 2006).

Specific characteristics appear to be associated with a negative body image. Low quantities of health-promoting behaviors like exercise are associated with poorer levels of body satisfaction (Neumark Sztainer et al., 2006). College students with body

dissatisfaction are more likely to diet, exercise and take pills to lose weight in the past 30 days than students satisfied with their body image (Forrest & Stuhldreher, 2007).

Furthermore, significant factors that increase one's risk for body image dissatisfaction include being female, being overweight, consuming meat four or more times per week and depression. Moreover, negative body image is related to emotional distress, smoking, dramatic measures to alter appearance, social anxiety, impaired sexual functioning, depression, and eating disorders (Campbell & Hausenblas, 2009). Based upon these facts, it is important to analyze what behaviors are associated with increasing body image and body satisfaction in order to minimize the previous negative behaviors.

Because associations exist between body image dissatisfaction and billions of dollars are spent each year on products and methods aimed at changing body shape and size, it could be more beneficial to society to look into more cost-effective ways of improving body image, such as exercise (Campbell & Hausenblas, 2009). It is important to critically analyze how physical exercise affects different body image constructs, such as body dissatisfaction.

Exercise and Body Image

Generally, exercise has a positive impact on body image. In a meta-analytic study, Hausenblas and Fallon (2006) indicated that exercisers had a more positive body image than non-exercisers. They also showed that exercise interventions cause participants to report better body image throughout and at the conclusion of the interventions when compared to non-exercising participants. In a follow up meta-analytic study by Campbell and Hausenblas (2009), older participants, interventions with higher frequencies per week

at moderate to high intensities, and exercise-only interventions as compared to those coupled with psychological therapy exhibit greater moderating effects on body image.

The effects of both chronic and acute exercise interventions on body image have been studied. Chronic exercise interventions examine the effects of training that last over several weeks in trait body image. Acute exercise interventions examine the effects of a single bout of exercise in state body image. Furthermore, a distinction must be made between the different types of exercise modalities. Since there are many different modes of exercise interventions that can be performed, such as aerobic, resistance, and circuit training, it is important to analyze them separately before they are compared. Thus, the different chronic modes of exercise were analyzed separately and then compared. Subsequently, acute modes of exercise were analyzed and compared.

Chronic Exercise & Trait Body Image

Chronic Aerobic Exercise

Aerobic exercise generally involves a rhythmic contraction and relaxation of the large muscle groups over an extended period of time. Thus, aerobic activities can range from walking to running to dancing to swimming. Specifically, aerobic dance and walking have been found to increase measures of body image satisfaction.

Aerobic dance has been shown to significantly reduce body image dissatisfaction in adolescent girls (Burgess et al., 2006). In a study of 50 British schoolgirls aged 13-14 years, the impact an aerobic dance class has on body dissatisfaction was compared to a normal physical education course in a within-subjects design over a twelve-week period. All participants were randomly placed into either of the courses for a six-week period,

which was subsequently replaced by the alternative course for six-weeks. The results of this study showed that participation in the aerobic dance course significantly reduced body image dissatisfaction in attractiveness, feeling fat, strength, and fitness. Moreover, enhanced physical self-perceptions in body attractiveness and physical self-worth were revealed.

Walking has also been shown to positively impact body image. In 2008, Arbour and Martin Ginis examined the effects that pedometer step counts had on physical functioning satisfaction in sedentary, middle-aged women over an 11-week period. The experimental group was asked to create specific goals for walking and count their daily step counts. The control group only reported daily step counts. Increased step counts and greater satisfaction with physical functioning, a form of body image satisfaction, were evident in the experimental group. Furthermore, the researchers concluded that the greater the walking distance, the greater the improvements in at least one aspect of the women's body images. Therefore, the literature seems to suggest that various body image constructs benefit from aerobic exercise.

Chronic Resistance Exercise

Resistance training interventions have also been associated with increases in body image satisfaction. This form of training typically involves lifting weights to improve strength, power, or body composition in the various muscle groups of the body. A qualitative study of college females enrolled in a strength training class noted that participants felt “more toned, better about themselves, more confident, healthier, and more positive about their body” at the end of the class (Ahmed, Hilton, & Pituch, 2002, p. 647).

In an early intervention study by Tucker and Maxwell (1992), college-aged females were either placed in a 15-week, two days per week weight training intervention or a control group that did not participate in weight training. The researchers administered psychometric measures pretest and posttest on general well-being measures and body cathexis (e.g. body image). The results of this study indicated that weight training induces significantly higher general well-being and body image scores. Furthermore, five variables predicted approximately 60% of the variance among the women with improved body cathexis: lower pretest body cathexis, greater body weight at the outset, shorter in height, less involvement in non-weight training exercise, and lower posttest skinfold measurements.

Paralleling Tucker and Maxwell's study, Depcik and Williams (2004) administered pre- and post-surveys to body-image disturbed, college-aged women who were either enrolled in a 13-week weight lifting class or a general education class. The results indicated that body satisfaction scores of the participants increased following the intervention, while the control group's satisfaction levels remained stable. In addition, 41% of the weight trainers displayed body image improvements to the extent that they were no longer classified as being body image disturbed.

Chronic Circuit Training

Circuit training involves the completion of several exercises within a series that is repeated two or more times. In a study of 39 male and female college students, Williams and Cash (2001) examined the effects that a six-week circuit weight-training class had on body image-related measures as compared to a matched control group. Students in the circuit weight training class engaged in a full body workout aimed at strengthening and

toning. The circuit weight training class showed enhanced appearance evaluations, induced greater body satisfaction, reduced social physique anxiety, and enhanced physical self-efficacy. Hence, the resistance and circuit training literature imply that some form of resistance training has positive effects on body image. Subsequently, it is important to directly analyze how different modalities compare within a single study.

Direct Comparisons between Chronic Exercise Modalities and Body Image

To date, only two published studies have directly compared two different modes of exercise. In 1993, Tucker and Mortell compared the effects of walking and weight training programs on body image in 60 middle-aged women. The participants were either asked to participate in a resistance training or walking program for three days per week for 12 weeks. The researchers measured body cathexis as an assessment of body image. The results indicated that both groups saw improvements in body image. Interestingly, the resistance-trained group had significantly greater improvements in body image than the walking group. The authors attributed this finding to strength training's ability to create real or imagined changes in the body, such as firmer and shapelier muscles. These changes serve as mechanisms of positive feedback that strengthen esteem and enhance psychological well-being, particularly body image.

Similar to the Tucker and Maxwell study, Henry, Anshel, and Michael (2006) compared 72 college females enrolled in either an interval circuit training or an aerobic step class to controls over a 12-week period. The interval circuit training class included a combination of aerobic and resistance-based muscular strength and endurance training. The aerobic exercise class consisted of step aerobics and abdominal endurance exercises. The control group was asked to maintain their current levels of exercise, which were

relatively low. Utilizing post-hoc analyses, the results indicated significant improvements for only the interval circuit group in overall appearance evaluation. The researchers concluded that the interval circuit training program was superior in improving body image. Thus, the available literature suggests that a training program that includes strength training will yield more positive improvements in body image than aerobic programs or non-exercising controls. In order to complete a review of the literature involving body image and exercise, it is now important to examine the effects that an acute bout of exercise may have on body image.

Acute Bouts of Exercise and State Body Image

The literature regarding the effects of acute exercise on state body image is both limited and conflicting. Previous research has shown that acute aerobic exercise did not significantly reduce body dissatisfaction as compared quiet rest and does not moderate the effect of media images on negative mood states (Fallon & Hausenblas, 2005). This lack of significant body satisfaction benefits was attributed to the sample's reported engagement in large amounts of exercise. Contrastingly, participation in aerobic dance compared to attending a lecture class results in significant positive changes in mood and self concept (McInman & Berger, 1993). It has also been shown that both high trait and low trait body dissatisfied females exhibit lower state body dissatisfaction and negative affect and greater positive affect post-exercise (LePage & Crowther, 2010).

In a recent study, Vocks et al. (2009) compared state body image, perceptions of body dimension, and mood of 65 female gym members following an experimental bout of either bicycling or reading a newspaper. This study utilized a within-subjects design to

allow for each participant to act as her own control. The only exercise modality utilized in this study was stationary cycling. The researchers noted that they chose this type of training because it is often performed by females to burn calories. It is important to note, however, that even though the American College of Sports Medicine recommends strength training as part of a weekly routine to all genders (Garber et al., 2011), strength training was not considered. In terms of intensity, this study utilized a heart rate monitor to ensure that the participants were remaining within an optimal heart rate zone between 65 and 85% of maximum heart rate. Thus, there were no subjective measures to indicate how hard the participants felt they were working. In order to assess state body image, Vocks and her colleagues utilized the Body Image States Scale and reported an internal consistency for this experiment of an alpha equal to 0.85.

The results of the Vocks et al. (2009) study showed participants felt slightly thinner and were more satisfied with their bodies after the cycling session as compared to reading a newspaper. Similarly, participants showed significantly decreased discontent with their body, an attitudinal component of body image, from pre- to post-exercise. Changes in body perceptions were greater when participants were pre-experimentally more dissatisfied with their bodies. In light of these results and in order to fully understand exercise's impact on state body image, the gaps in the literature must be reviewed in order to determine the research study that is warranted to fill these gaps.

Gaps in the Literature and Directions for Research

While it has been shown that many forms of exercise produce positive effects on body image, the optimal exercise modality has yet to be identified. Only two published

studies have explicitly examined the differences between two differing modalities of chronic exercise (Henry et al., 2006; Tucker & Mortell, 1993). The findings of these two studies show that chronic strength and circuit training are superior to aerobic training. Because of the lack of literature, however, the modality of exercise that yields the greatest results is still unknown. Furthermore, little is known about the effects of a single bout of exercise on state body image. Because body image is both a trait and state construct, research into the effects of an acute bout of various exercise modalities on state body image in females is warranted. The present study intended to examine the effects of three different modalities of acute exercise bouts (aerobic, resistance, and circuit training) on state body image in women.

CHAPTER 3: METHODS

Participants

Utilizing convenience sampling, volunteers were recruited from exercise psychology courses, elective exercise courses, such as boot camp and aerobic dance, online personal wellness and nutrition courses, University of South Florida Campus Recreation, and by word of mouth. Female participants were recruited for the study. Fifty-two participants were recruited in order to accommodate for drop-outs and withdrawals. Participants were required to sign an informed consent and fill out a medical history form in accordance with the Institutional Review Board. Individuals were given the Multidimensional Body-Self Relations Questionnaire, which assesses trait body image satisfaction. Based upon the results of this questionnaire, those participants that were considered body image disturbed were excluded from this study. Upon exclusion, body image disturbed individuals were directed to USF's counseling services via letter.

Before every experimental trial, the researchers utilized a script via email to urge participants to eat at least one balanced, healthy meal on the day of the trial. The researchers asked participants to refrain from eating a large meal two hours prior and a small snack one hour prior to testing. The participants were required to wear proper footwear and clothing that was comfortable and reflective of what they typically wore during exercise sessions.

Instrumentation

The following scales were used as instrumentation regarding trait and state body image respectively: Multidimensional Body-Self Relations Questionnaire (MBSRQ; (Brown, 1990; Cash, 1994) and the Body Image States Scale (BISS; (Cash et al., 2002). Both measures have received extensive background validation with numerous and diverse samples (Thompson, 2004).

The Appearance Evaluation (MBSRQ-AE) and Body Areas Satisfaction (BAS) are the two subscales from the MBSRQ that were utilized for the measurement of trait body image. The MBSRQ-AE is a seven-item measure that utilizes a 5-point Likert scale, ranging from 1 (definitely disagree) to 5 (definitely agree). The MBSRQ-AE assesses negative-to-positive evaluations of one's overall appearance. The MBSRQ-AE score is calculated by summing all responses to its seven individual items. Higher scores on the MBSRQ-AE indicate a more positive assessment of overall appearance. Internal consistency for the MBSRQ-AE has been shown to be 0.88 and its one-month stability was 0.91 (Cash, 1995). The BAS, also using a 5-point Likert scale, consists of nine-items that assess ratings of dissatisfaction-satisfaction with aspects of one's body. The average of the nine-items is calculated to create a single composite score for the BAS. Higher BAS scores suggest increased satisfaction with appearance. Internal consistency for the BAS was reported to be 0.73 and its one-month stability was 0.74 (Cash, 1995).

State body image was measured using the BISS. The BISS is a nine-item measure that assesses momentary evaluative/affective experiences of one's physical appearance. Items were measured on a 5-point Likert scale ranging from 0 (never) to 5 (always). Calculating a mean for the nine individual items after reverse-scoring the three positive-

to-negative items creates a composite BISS score. For women and men, respectively, the internal consistency was reported as 0.77 and 0.72 and the temporal stability was 0.69 and 0.68 (Cash et al., 2002).

The Trait Affect Scale (TAS) was used to measure positive and negative trait affect (Colautti et al., 2011). Items were measured on a 5-point Likert scale ranging from 0 (never) to 5 (always). Participants are asked to rate if they generally feel happy, satisfied and content to measure positive affect (PTA). Negative affect (NTA) asked participants if they generally feel unhappy or discontent. Cronbach's alpha estimates in the Colautti et al. (2011) study were 0.78 for positive affect and 0.82 for negative affect.

Mood state was measured by modifying the TAS scale (mTAS) so that participants answer how they feel "right now" instead of "in general." Items were measured on a 5-point Likert scale ranging from 0 (never) to 5 (always). Items were scored to reflect the two subscales: positive mood (PSA) and negative mood (NSA). Colautti et al. (2011) calculated Cronbach's alpha to be 0.94 for both positive and negative aspects of this modified scale.

The 15-item Drive for Muscularity scale (McCreary & Sasse, 2000; McCreary, Sasse, Saucier, & Dorsch, 2004) was used as a descriptive measure for a participant's preoccupation with increasing her muscularity. Items were measured on a 6-point Likert scale ranging from 1 (never) to 6 (always). The items were averaged to give a singular score, with higher numbers indicating a greater drive for muscularity. The Cronbach's alpha estimate in McCreary and colleagues' (2004) study was 0.82 for women.

The Drive for Thinness subscale of the Eating Disorder Inventory-2 was used as a descriptive measure for a participants' weight preoccupation (Garner, 1991). Seven items

were measured on a 6-point Likert scale ranging from 1 (never) to 6 (always). The first question was reverse-scored. The items were averaged to give a singular score, with higher numbers indicating a greater drive for thinness. The internal consistency estimate in Hausenblas and Fallon's (2002) study was 0.87.

Borg's CR-10 scale (1998) was used to measure ratings of perceived exertion (RPE) and was utilized as a manipulation check for exercise intensity. Borg's CR-10 scale ranges from zero (rest) to ten (maximal exertion) and requires the participant to choose a single number to represent their perceived exertion.

Equipment

Height and weight measurements were taken using the Health O Meter™ Professional scale and body mass index (BMI) was calculated. Body composition was determined using an Omron® HBF-306C Fat Loss Monitor. A Polar FT™ heart rate monitor was worn for all exercise and control trials. The warm-up, aerobic exercise session, and cool-down were performed on a standard treadmill. The resistance exercise sessions utilized a Fitness Gear™ power cage, an assortment of standard dumbbells and a barbell with a range of weights. The body-weight interval circuit exercise session required a foam mat. An Apple™ iPad utilizing the iOpinion software was used to record participants' responses to the MBSRQ-AE, BAS, BISS, TAS, and mTAS.

Procedures

The procedures for the present study were based on research conducted by Vocks et al. (2009) and utilized a within-subjects, repeated measures design. The condition each

participant encountered during her four trials was counterbalanced. All exercise bouts lasted approximately 40 minutes, with a five-minute warm-up and five-minute cool-down within that time limit. The health history screening, familiarization session, and all exercise trials took place in either the teaching lab in REC105 or the Health Promotion Laboratory in PED 103 at the University of South Florida. The REC105 lab space consists of a larger teaching room, a cardiovascular area, and a partitioned exercise area. The larger teaching room consists of desks, a sink, and television. The cardiovascular area consists of one treadmill and three stationary bicycles. The majority of testing occurred in the partitioned exercise area. This area is a matted area that can be closed off from the rest of the lab space and includes an examination table, a power-lifting cage, and a treadmill. PED103 consisted of a treadmill, power-lifting cage, and table with chairs. All walls of both lab spaces were left blank and no mirrors were utilized during exercise to minimize state body image fluctuations due to external sources.

Informed Consent, Risk Assessment, & Initial Questionnaires

All participants underwent a risk stratification based on ACSM procedures utilizing the PAR-Q and a standardized health history questionnaire (American College of Sports Medicine, Thompson, Gordon, & Pescatello, 2010). Utilizing participants' responses to the PAR-Q and health history questionnaire, ACSM's logic model for risk stratification was used to determine participants' risk. Those participants that were considered low risk were allowed to partake in the research study. Next, the participants were given an informed consent in compliance with the IRB. The participants were asked to read the informed consent, asked if they have any questions, and finally signed the informed consent. Once the participants had consented, descriptive data were collected.

Participants were then given the Apple iPad to answer the MBSRQ, and Leisure-Time Activity Questionnaire.

In case of an emergency, the research staff defaulted to the USF Campus Recreation staff and their current Emergency Action Plan. Campus Recreation Staff trained all research staff how to activate the Emergency Action Plan. If an emergency had occurred, the research staff would have activated the Emergency Action Plan that is already in place within USF's Campus Recreation. In addition, all supervising researchers were CPR trained. No emergencies occurred during data collection.

Initial Questionnaires & Exercise Modality Familiarization

Twenty-four hours prior to the initial questionnaires and familiarization session, participants were emailed a link to a tutorial video and were asked to view the video prior to their scheduled session the following day. Upon arrival at the familiarization session, participants were asked if they were able to view the tutorial video. If the participant responded 'no,' they were then required to watch the video before the familiarization session would begin.

Following confirmation that the tutorial video was watched, participants were given the Apple iPad to answer the BISS, and TAS questionnaires. Next, each participant was familiarized with each exercise modality and the various aerobic and resistance exercises that were required of the participant during the study. The participant was first asked to warm-up on the treadmill for five minutes. During this time, they practiced using the RPE scale and self-selecting their intensity.

After warming up, they were asked to increase their intensity to their self-selected "moderate" level by changing the speed and incline of the treadmill. The researcher asked

the participants if they felt comfortable at this level and if they felt that they could maintain this pace and incline for 30 minutes. Once each participant was confident in her aerobic level of intensity, the researcher recorded the speed and incline and asked the participant to step off of the treadmill.

Next, the participant was familiarized with the different exercises associated with the body-weight interval circuit. The researcher described and demonstrated each exercise for five seconds. The participant then performed each exercise for a total of 15 seconds. The participant was asked if they felt comfortable performing each exercise at a moderate level for 30 seconds of work and rest.

Next, the participant was familiarized with the different exercise associated with the resistance trial. The researcher described and demonstrated two repetitions of each exercise. The participant self-selected weights and completed one set of eight repetitions. During the familiarization, the researcher would ask the participant for their current RPE and if they felt that their weight was adequate to complete a moderate intensity workout. Based upon the participant's RPE and level of comfort, the selected weight was increased, decreased or remained the same for the experimental trial. The weight associated with each exercise was recorded for each participant.

Exercise Trial Days

Participants were notified upon scheduling whether or not they should come prepared to exercise or with study materials.

Trial Overview

All experimental trials began with the participant filling out the BISS and mTAS. Next, they put on a heart rate monitor and informed the researcher when they were ready

to exercise. After completing the surveys and donning the heart rate monitor, participants were ready to begin the exercise session. Prior to beginning the exercise trial, the participants were reminded that they should be working at a moderate intensity, which is between 3 and 4 on the Borg's CR-10 scale. If the participant was above or below the "moderate" range (3 to 4), they were instructed to adjust their intensity level accordingly. During all experimental sessions, the researcher was available to spot and aid the participant during their exercise bout if needed. The warm-up for each experimental trial was linked to RPE and consisted of moving on a treadmill at a pace corresponding to "light" (between 1 and 2) on the Borg's CR-10 scale for five minutes. The participants manipulated grade and speed to elicit a "light" intensity. The cool-down for the aerobic trial mirrored its warm-up. The cool-down for the resistance and interval circuit trials consisted of stretching for five minutes. Throughout each research trial, researchers asked the participants for RPE and recorded heart rate at time point zero, three minutes into the warm-up period and every five minutes after during each experimental trial.

Pre-Exercise

Participants were given the iPad to answer the BISS and mTAS questionnaires. Participants were then asked to put on a heart rate monitor. After completing the surveys and donning the heart rate monitor, participants were ready to begin the exercise trial.

Aerobic Trial (AE)

RPE and heart rate data were taken at time point zero, three minutes into the warm-up period and every five minutes during exercise. To warm-up, participants moved "lightly" at a self-selected pace on a treadmill. During the AE session (Table 1),

participants moved on a treadmill at a self-selected “moderate” intensity for 30 minutes. To cool-down, participants moved at a self-selected “light” pace for five minutes.

Table 1. Aerobic Exercise Bout.

Aerobic Exercise (AE) Bout		
	Time (minutes)	Exercise Activity
Warm-up	5	Self-selected "light" activity on treadmill
Aerobic Training	30	Self-selected "moderate-high" run on treadmill
Cool-down	5	Self-selected "light" activity on treadmill

Resistance Trial (RE)

RPE and heart rate data were taken at time point zero, three minutes into the warm-up period and every five minutes during exercise. To warm-up, participants moved “lightly” at a self-selected pace on a treadmill. During the RE trial, participants were asked to complete a series of pre-determined weight-lifting exercises. After an initial five-minute warm-up, the participants performed three sets of 8 repetitions for each of the exercises listed in Table 2. The exercises were barbell or dumbbell bench press, barbell or dumbbell bent-over row, dumbbell shoulder press, dumbbell squat, dumbbell lunge, and dumbbell dead lift. The participants were timed to completion of all three sets of the six exercises within a 30 minute time period. Between exercises, participants were given approximately two minutes to change equipment and prepare for the next lift. To achieve a moderate intensity workout, participants were asked to choose their own weights at a level that caused their total exertion to be between a 3 and 4 on the Borg’s CR-10 scale. To cool-down, participants stretched for five minutes.

Table 2: Resistance Exercise Bout.

Resistance Exercise (RE) Bout		
Three (3) sets of each exercise		
Eight (8) repetitions per set		
Two (2) minutes of rest between each set		
Time (minutes)	Exercise Activity	
Warm-up	5	Self-selected "light" activity on treadmill
Resistance Training	30	Barbell (BB) Bench Dumbbell (DB) or BB Bent-over Row DB Overhead Press Standing DB Squats DB or BB Dead Lift DB Lunges
Cool-down	5	Self-selected stretching

Interval Circuit Trial (IC)

RPE and heart rate data were taken at time point zero, three minutes into the warm-up period and every five minutes during exercise. If the participant was above or below the “moderate” range (three and four), they were instructed to adjust their intensity level accordingly. To warm-up, participants moved “lightly” at a self-selected pace on a treadmill. During the warm-up, the researcher notified the participant of the five exercises that constituted the first combination. Participants were asked to complete a series of two separate exercise combinations as seen in Table 3. There were five exercises per combination. Participants attempted to complete as many repetitions as possible at a moderate-intensity of each exercise activity within a 30-second time period. After the work period, participants were allowed to rest for 30 seconds. Between combinations, participants received a two minute and 30 second or three minute and 30 second rest period where they were allowed to get water (Table 3). Also during this rest period, the

researcher instructed and reminded the participant as to what exercises were to be completed in the subsequent combination. To cool-down, participants stretched for five minutes.

Table 3: Interval Circuit Exercise Bout.

Interval Circuit Exercise Bout		
Attempt to complete as many repetitions as possible of each exercise activity at a moderate level during the 30 second work period 1:1 work to rest ratio (30 seconds work, 30 seconds rest) Perform each combination two times		
Time (minutes)	Exercise Activity	
Warm-up	5	Self-selected "light" activity on treadmill
Combo 1	5	Pushups (standard or on knees) Leg Raises Body Squats Plank Hold Jumping Jacks
REST	2	Water break & rest between combinations
Combo 2	5	Mountain Climbers V-Ups Jumping Lunges Superman Jump Rope
REST	2	Water break & rest between combinations
Combo 1	5	Pushups (standard or on knees) Leg Raises Body Squats Plank Hold Jumping Jacks
REST	3	Water break & rest between combinations
Combo 2	5	Mountain Climbers V-Ups Jumping Lunges Superman Jump Rope
REST	3	Water break & rest between combinations
Cool-down	5	Self-selected stretching

Control (CO)

Participants were instructed upon scheduling to bring class materials. Upon arrival, the materials brought were examined to ensure that no body-image themed material was included. Once checked, the student was allowed to study for 40 minutes. RPE and heart rate data were taken at time point zero, after three minutes, and every five minutes.

Post Exercise

Immediately following the exercise session, the participants were asked to fill out the BISS and mTAS questionnaires on the Apple iPad. Once participants had completed the questionnaires and returned the heart rate monitor, they were allowed to leave.

Statistical Analyses

Data analysis was conducted utilizing the SPSS 21.0 for Mac statistical software package. Baseline descriptive statistics, mean differences and effect sizes for the BISS and mTAS scores for each exercise trial between pre- and post-exercise for each modality were analyzed using a repeated measures within-subjects ANOVA (Hedges, Olkin, Statistiker, Olkin, & Olkin, 1985). Follow-up ANOVAs of the pre-exercise BISS and mTAS scores, respectively, were calculated to view any significant differences between trials at baseline. Paired t-tests were calculated for both BISS and mTAS scores to view any significant changes from pre- to post-exercise scores within each trial. Paired t-tests were also utilized to calculate the post-exercise BISS and mTAS score differences among trials. The alpha or significance criterion was set at 0.05. Cronbach's alpha was

calculated to determine internal consistency. All values are expressed as mean values \pm standard deviation.

CHAPTER 4: RESULTS

Participants' Characteristics

Twenty-five female participants successfully completed all experimental trials. The average age of the participants was 20.2 ± 2.2 years. The average BMI and body fat were 23.6 ± 4.0 lbs/in² and 25.5 ± 6.0 percent, respectively, for the current population. Means, standard deviations, and Cronbach's alpha (where appropriate) are listed in Table 4 for the participants' age, BMI, body fat percentage, average physical activity (PA) per week, MBSRQ subscale scores, positive and negative trait affect based upon TAS scores, drive for muscularity scores, and trait affect scores.

Participants' drive for muscularity scores at 2.9 ± 0.6 was slightly higher than previous studies (McCreary et al., 2004) and indicates a moderate preoccupation with muscularity. The participants' drive for thinness scores at 3.3 ± 1.1 were slightly lower than previous studies and indicates a moderate weight preoccupation (Hausenblas & Fallon, 2002). The previous research on drive for muscularity and thinness in similar populations was conducted in Saskatchewan, Canada and Florida, United States, respectively. The geographical location may have had an effect on drive for muscularity and thinness with populations closer to the equator possibly exhibiting higher scores due to the warmer weather and its associated clothing and emphasis on outdoor activities.

Table 4: Participant Descriptive Statistics.

Descriptive Statistics			
Measure	Mean	SD	Cronbach's alpha
Age (years)	20.2	2.2	-
BMI	23.6	4.0	-
Body Fat (%)	25.5	6.0	-
Average PA (days/week)	3.2	2.1	-
MBSRQ			
. Appearance Evaluation	3.4	0.7	0.88
. Appearance Orientation	3.5	0.5	0.70
. Fitness Evaluation	3.7	0.9	0.75
. Fitness Orientation	3.8	0.8	0.86
. Health Evaluation	3.9	0.7	0.65
. Health Orientation	3.7	0.8	0.78
. Illness Orientation	3.5	0.7	0.61
. Body Areas Satisfaction	3.2	0.6	0.83
. Overweight Preoccupation	2.5	0.9	0.73
. Self-Classified Weight	3.2	0.6	0.80
Positive Trait Affect	11.6	1.9	0.70
Negative Trait Affect	4.0	1.2	0.70
Drive for Muscularity	2.9	0.6	0.73
Drive for Thinness	3.3	1.1	0.88

Manipulation Checks

Ratings of Perceived Exertion

Borg's CR-10 scale (1998) was utilized during each trial as a manipulation check for exercise intensity. Figure 1 depicts the means and standard errors for all ten time points that RPE was recorded within each research session. To investigate if participants' RPEs during the activity exclusive of warm-up and cool-down was significantly different among conditions, a grand mean for RPE during time points 8', 13', 18', 23', 28', and 33' was calculated (Table 5). Next, a 1 (RPE) x 4 (Activity: AE, CO, IC, RE) repeated

measures ANOVA was calculated. There was a significant main effect for Activity ($F(1, 24) = 405.5, p < 0.001$).

Follow-up paired t-tests revealed no significant difference in RPE between the aerobic and resistance conditions ($p > 0.05$). All other comparisons were significant ($p < 0.05$). Based upon the means and standard deviations of these grand means, which are listed in Table 5, these follow-up results suggest that perceived exertion was highest for aerobic and resistance exercise, slightly lower for interval circuit exercise, and the lowest for the control condition.

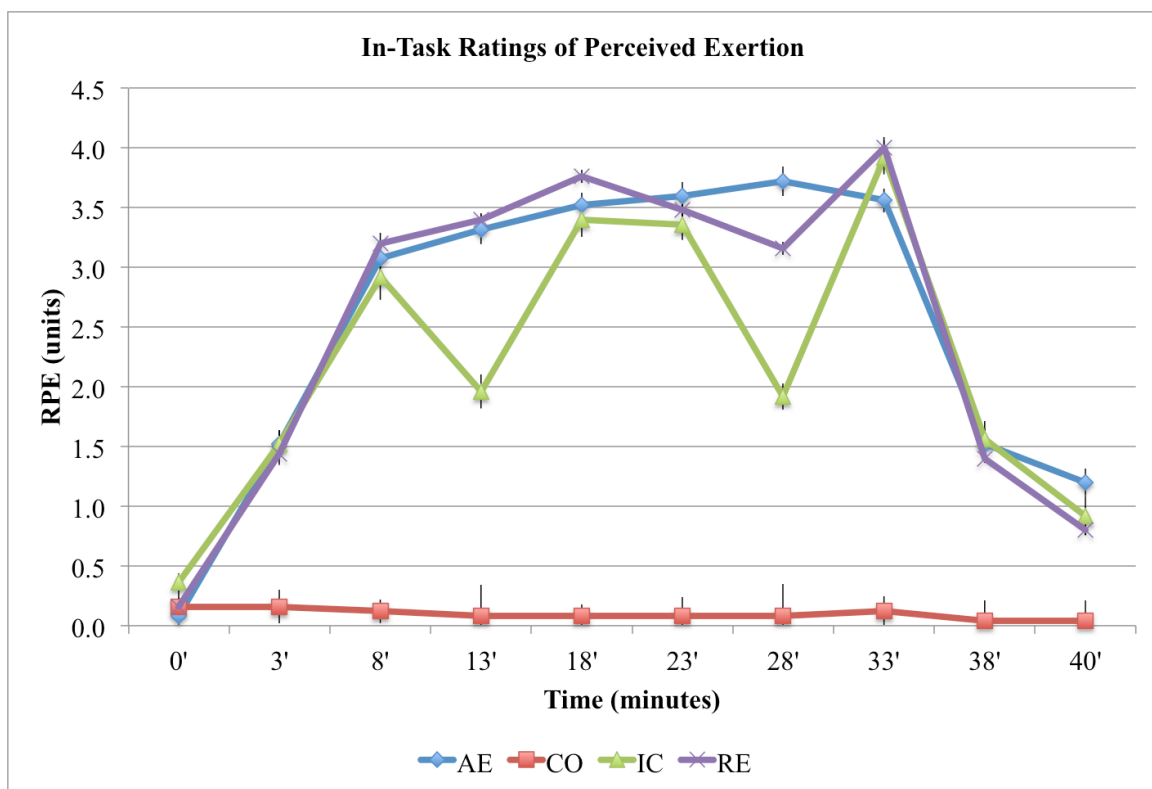


Figure 1: In-task ratings of perceived exertion (RPE) for the aerobic (AE), resistance (RE), interval circuit (IC), or quiet reading (CO) sessions.

Table 5: Grand means and standard deviations (*SD*; in parentheses) for the rate of perceived exertion variable (RPE) and heart rate for aerobic exercise (AE), resistance exercise (RE), interval circuit exercise (IC), or quiet reading (CO) trials.

	Grand Mean			
	AE	CO	IC	RE
RPE	3.5 (0.4)	0.9 (0.3)	2.9 (0.6)	3.5 (0.4)
Heart Rate	153.6 (21.4)	72.2 (8.6)	127.4 (12.1)	125.3 (15.4)

Heart Rate

Heart rate was also utilized as a manipulation check for exercise intensity. Figure 2 depicts the means and standard errors for all ten time points that heart rate was recorded within each research bout. To investigate if participants' heart rate during the activity exclusive of warm-up and cool-down was significantly different among conditions, a grand mean for heart rate during time points 8', 13', 18', 23', 28', and 33' was calculated (Table 5). Next, a repeated measures ANOVA for heart rate was calculated. There was a significant main effect for Activity ($p < 0.001$).

Follow-up paired t-tests revealed no significant difference in heart rate between the interval circuit and resistance conditions ($p > 0.05$). Follow-up paired t-test analyses indicated significant differences among all other trials ($p < 0.001$). Based upon the means and standard deviations of these grand means, which are listed in Table 5, these follow-up results suggest participants' heart rates were highest for aerobic exercise, slightly lower for interval circuit and resistance exercise, and the lowest for the control condition.

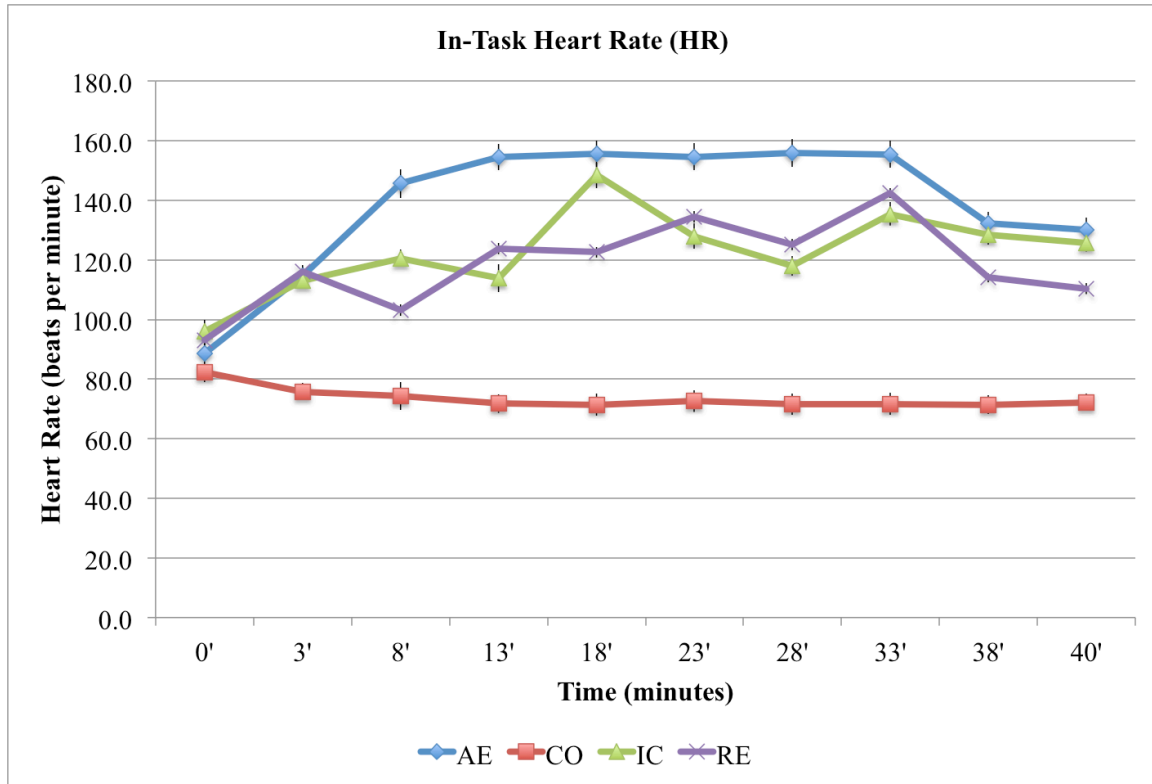


Figure 2: In-task heart rate for the aerobic (AE), resistance (RE), interval circuit (IC), or quiet reading (CO) sessions.

Effects of Physical Exercise Sessions on State Body Image and Mood

Body Image States Scale

BISS means, standard deviations, and effect sizes of are listed in Table 6. Post-session effect sizes between exercise modalities are listed in Table 7. To investigate whether participation in a single bout of aerobic exercise, resistance exercise, interval circuit exercise, or quiet reading was associated with changes in state body satisfaction, a 2 (Time: pre-bout, post-bout) x 4 (Activity: AE, RE, IC, CO) repeated measures ANOVA was conducted. There was a significant main effect for Time ($p < 0.05$), but not Activity ($p > 0.05$). A significant Time x Activity interaction emerged ($p < 0.05$). The significant

interaction effects are depicted graphically in Figure 3. A follow-up ANOVA of the pre-BISS scores revealed that there were no significant differences in the level of participants' body satisfaction at baseline ($p > 0.05$).

Table 6: Pre- and post-session means, standard deviations (*SD*; in parentheses), and effect sizes for the body image variable (BISS) and mood (PSA and NSA) before (pre) and after (post) aerobic exercise (AE), resistance exercise (RE), interval circuit exercise (IC), or quiet reading (CO).

		AE	CO	IC	RE
BISS	Pre	5.2 (1.2)	5.5 (1.3)	5.4 (1.5)	5.4 (1.4)
	Post	5.7 (1.0)	5.4 (1.1)	5.7 (1.2)	5.9 (1.2)
	Effect Size	0.4	0.0	0.2	0.4
PSA	Pre	10.0 (3.0)	10.4 (3.0)	9.8 (3.0)	10.5 (2.7)
	Post	12.1 (2.2)	10.2 (2.9)	11.6 (2.1)	12.2 (2.3)
	Effect Size	0.8	-0.1	0.7	0.7
NSA	Pre	3.5 (2.0)	3.2 (1.2)	3.5 (1.6)	3.3 (1.5)
	Post	2.7 (1.0)	3.4 (1.3)	3.0 (1.3)	2.8 (1.2)
	Effect Size	-0.4	0.2	-0.3	-0.4

Table 7: Effect sizes for the body image variable (BISS) and mood (PSA and NSA) before (pre) and after (post) aerobic exercise (AE), resistance exercise (RE), interval circuit exercise (IC), or quiet reading (CO).

Post-Exercise Effect Sizes					
Exercise Modality		AE	CO	IC	RE
BISS	AE	-			
	CO	0.3	-		
	IC	0.0	0.3	-	
	RE	0.2	0.4	0.2	-
PSA	AE	-			
	CO	0.7	-		
	IC	0.2	0.6	-	
	RE	0.0	0.8	0.3	-
NSA	AE	-			
	CO	0.6	-		
	IC	0.3	0.3	-	
	RE	0.1	0.5	0.2	-

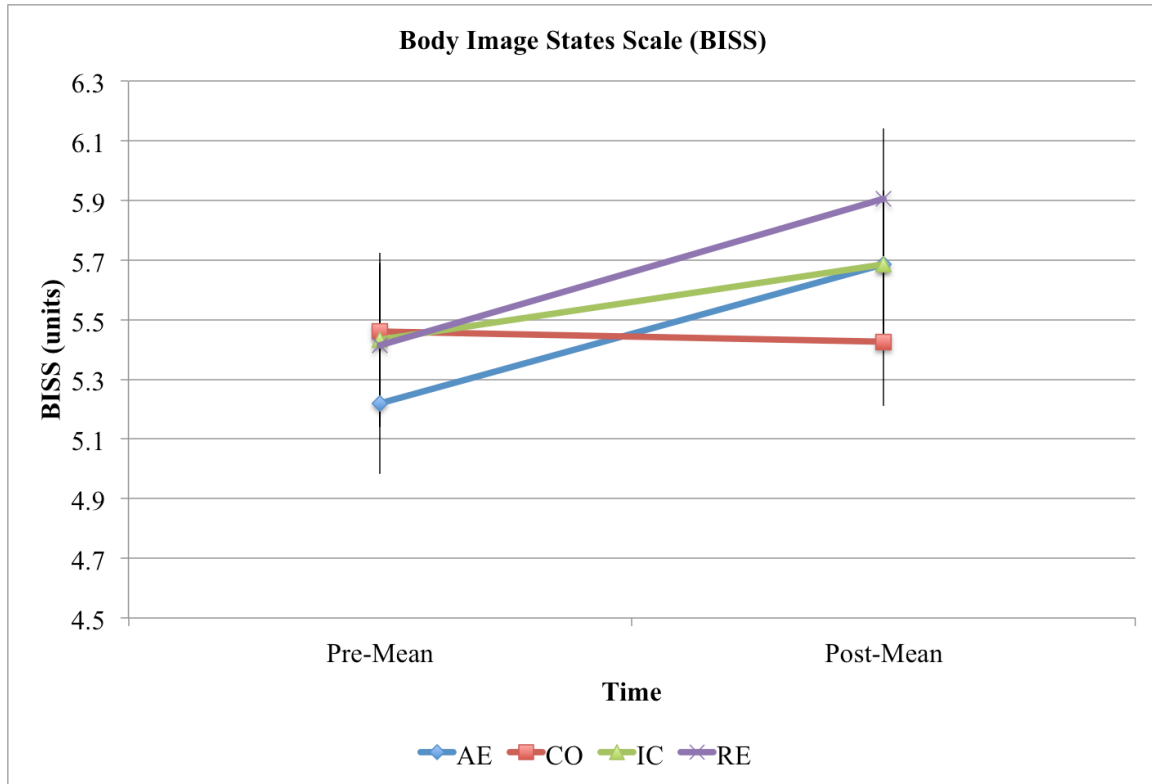


Figure 3: Body image states scale (BISS) interaction for the aerobic (AE), resistance (RE), interval circuit (IC), or quiet reading (CO) sessions.

Paired t-tests revealed no significant differences between pre- and post-BISS scores for the CO and IC trials ($p > 0.05$). Follow-up paired t-test analyses indicated significant differences between pre- and post-BISS scores for the AE and RE trials ($p < 0.05$). These results suggest that the post-BISS scores for both the AE (5.7 ± 1.0) and RE (5.9 ± 1.2) trials were significantly higher than their respective pre-BISS scores (AE: 5.2 ± 1.2 , RE: 5.4 ± 1.4), demonstrating that the participants had higher body satisfaction following an aerobic and resistance bout of exercise.

Paired t-test analyses of the post-trial BISS scores revealed that only the comparison between the CO and RE post-BISS scores yielded significant results ($p < 0.05$). All other comparisons yielded non-significant results ($p > 0.05$). The post-BISS

RE score of 5.9 ± 1.2 was significantly greater than the CO post-BISS score of 5.4 ± 1.1 , indicating that participants had significantly higher body satisfaction following the resistance exercise trial as compared to quiet reading.

Mood

Positive Mood

Positive mood means, standard deviations, and effect sizes are listed in Table 6. Post-session effect sizes between exercise modalities are listed in Table 7. To examine whether participation in a single bout of aerobic exercise, resistance exercise, interval circuit exercise, or quiet reading was associated with changes in positive mood, a 2 (Time: pre-bout, post-bout) x 4 (Activity: AE, RE, IC, CO) repeated measures ANOVA was conducted. There was a significant main effect for Time and Activity ($p < 0.05$). For PSA, the Time x Activity interaction reached statistical significance ($p < .001$). The significant interaction effects are depicted graphically in Figure 4. A follow-up ANOVA of the pre-PSA scores revealed that there were no significant differences in the level of positive mood prior to each of the activity types ($p > 0.05$).

Paired t-test analyses revealed no significant differences between pre- and post-PSA scores for the CO condition ($p > 0.05$). Follow-up paired t-tests analyses yielded significant differences between pre- and post-PSA scores for the AE, IC, and RE conditions ($p < 0.05$). These results suggest that the post-PSA scores for the AE (12.1 ± 2.2), IC (11.6 ± 2.1), and RE (12.2 ± 2.3) trials were significantly higher than their respective pre-PSA scores (AE: 10.0 ± 3.0 , IC: 9.8 ± 3.0 , RE: 10.5 ± 2.7), signifying that the participants had a higher positive mood following an aerobic, interval circuit, and resistance bout of exercise.

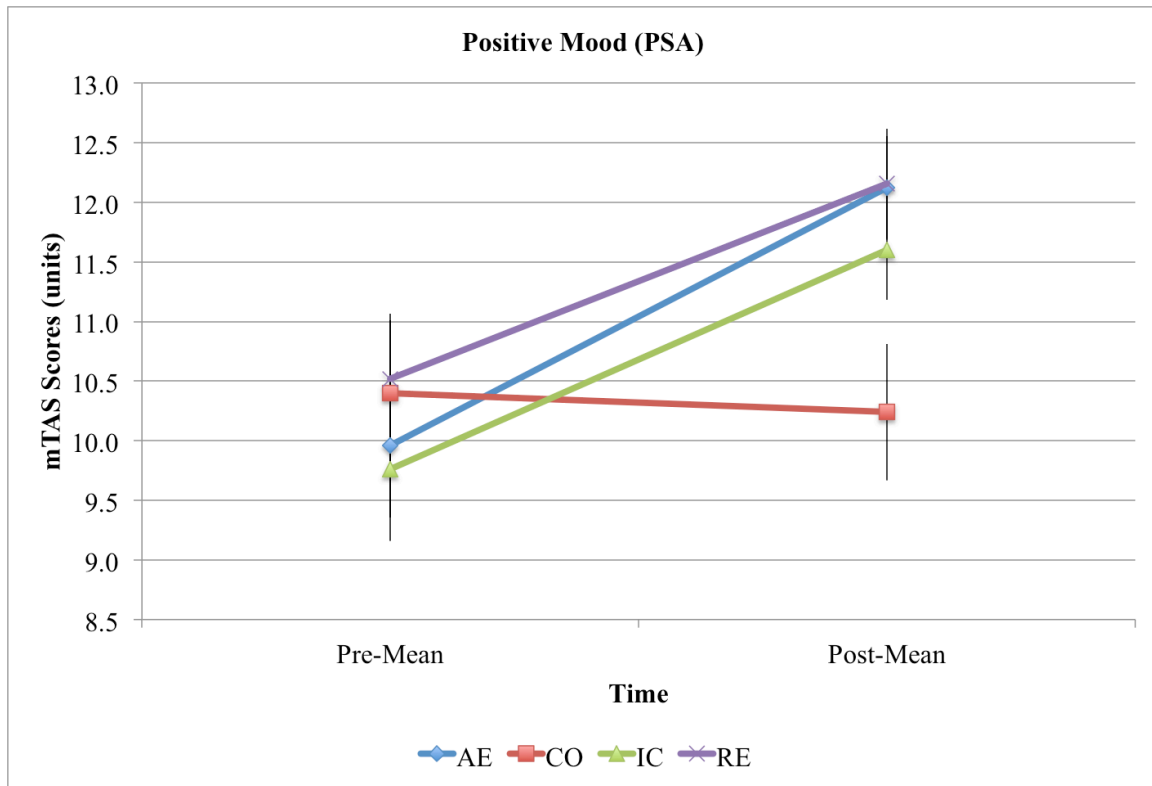


Figure 4: Positive mood (PSA) interaction for the aerobic (AE), resistance (RE), interval circuit (IC), or quiet reading (CO) sessions.

Finally, paired t-tests analyses of the post-trial PSA scores were calculated. All exercise trials (AE, IC, and RE) yielded significantly different PSA scores post-activity as compared to the control trial ($p < 0.05$). The AE post-PSA score of 12.1 ± 2.2 was significantly higher than the CO post-PSA score of 10.2 ± 2.9 ($p < 0.05$). The IC post-PSA score of 11.6 ± 2.1 was significantly higher than the CO post-PSA score of 10.2 ± 2.9 ($p < 0.05$). The RE post-PSA score of 12.2 ± 2.3 was significantly higher than the CO post-PSA score of 10.2 ± 2.9 ($p < 0.05$). When compared, the exercise trials (AE, IC, and RE) did not yield significant differences ($p > 0.05$). These results seem to indicate that participating in any type of exercise will yield more positive mood states after the activity than a quiet reading session.

Negative Mood

Negative mood means, standard deviations, and effect sizes of are listed in Table 6. Post-session effect sizes between exercise modalities are listed in Table 7. To observe whether participation in a single bout of aerobic exercise, resistance exercise, interval circuit exercise, or quiet reading was associated with changes in negative mood, a 2 (Time: pre-bout, post-bout) x 4 (Activity: AE, RE, IC, CO) repeated measures ANOVA was performed. There was a significant main effect for Time ($p < 0.05$), but not Activity ($p > 0.05$). For negative mood, the Time x Activity interaction was not statistically significant ($p > 0.05$). The interaction effects are depicted graphically in Figure 5. A follow-up ANOVA of the pre-NSA scores revealed that there were no significant differences in the level of negative mood prior to each of the activity types ($p > 0.05$).

Follow-up paired t-test analyses revealed no significant differences between pre- and post-NSA scores for the CO, IC and RE conditions ($p > 0.05$). Follow-up paired t-tests analyses yielded significant differences between pre- and post-NSA scores for the AE condition ($p < 0.05$). These results suggest that the post-NSA scores for the AE (2.0 ± 1.0) trial was significantly lower than its pre-NSA scores AE (3.5 ± 2.0), indicating that the participants had a lower negative mood following an aerobic exercise session.

Lastly, follow-up paired t-tests analyses of the post-trial NSA scores were calculated. The AE post-NSA score of 2.7 ± 1.0 was significantly lower than the CO post-NSA score of 3.4 ± 1.2 ($p < 0.05$). The RE post-NSA score of 2.8 ± 2.3 was significantly lower than the CO post-NSA score of 3.4 ± 1.2 ($p < 0.05$). The IC post-NSA score of 3.0 ± 1.3 was not significantly different from the CO post-NSA score of 3.4 ± 1.2 ($p > 0.05$). These results seem to indicate that participating in aerobic or resistance

exercise will yield less negative mood states after the activity than a quiet reading or interval circuit session.

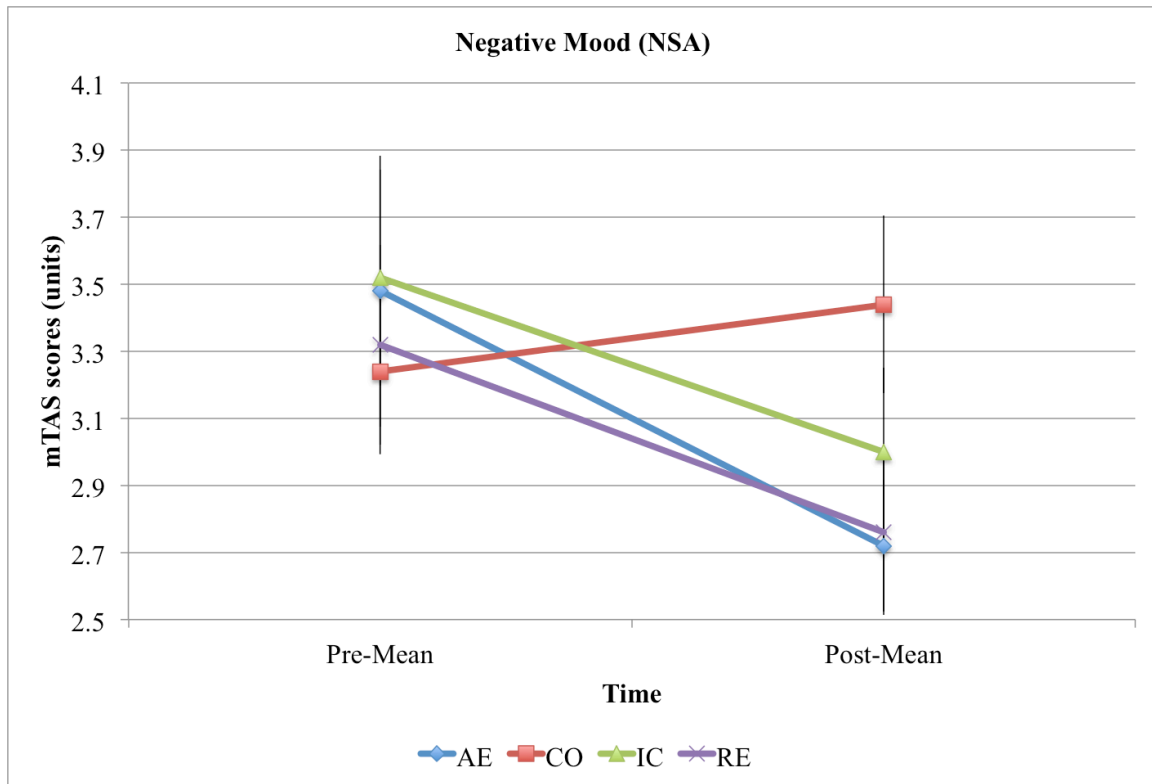


Figure 5: Negative mood (NSA) interaction for the aerobic (AE), resistance (RE), interval circuit (IC), or quiet reading (CO) sessions.

CHAPTER 5: DISCUSSION

The purpose of the current study was to examine the effects of three different modalities of acute exercise (aerobic, resistance, and interval circuit training) on state body image in women. This study aimed to determine which modality, if any, was the most effective in increasing state body satisfaction. The following research hypotheses were investigated:

H_{R1}: State body image and mood would improve, regardless of exercise modality.

H_{R2}: State body image and mood would improve greater for resistance exercise than aerobic exercise.

H_{R3}: State body image and mood would improve the greatest following circuit exercise.

The hypotheses of the present study were partly supported, with participation in the resistance exercise session yielding significantly greater post-exercise state body satisfaction than the control, aerobic, and interval circuit sessions. There were significant body satisfaction improvements from pre- to post-session in the resistance and aerobic modalities; however, body satisfaction following the aerobic session was not significantly different from the control session. The interval circuit modality did not induce any significant body satisfaction changes and was not significantly different from any other modality's post-session body satisfaction.

Body Image States Scale

The BISS measures the momentary evaluative and affective experiences of one's physical appearance. Pre-session BISS scores for all trials were similar and consistent with previous research in a similar sample (Cash et al., 2002). These pre-session scores fell around the midpoint of the scale, indicating a neutral body image state.

Partially supporting the research hypotheses, the resistance exercise trial yielded significant improvements in state body image from pre- to post-exercise with a moderate effect size of 0.4. Furthermore, the resistance exercise session induced a state body image that was significantly higher than the control, aerobic, and interval sessions, with effect sizes of 0.4, 0.2, and 0.2 respectively. Because higher BISS scores indicate more favorable body image states (Cash et al., 2002), it can be inferred that a single resistance exercise session increases body satisfaction to levels above those following a session of quiet reading, aerobic exercise, or interval circuit exercise.

Although previous research has not analyzed the effects of resistance exercise on state body image, the current findings support previous findings involving chronic resistance exercise and trait body image satisfaction. Tucker and Maxwell (1992) found that a 15-week, two days per week weight training intervention yielded significantly higher general well being and body image scores as compared to a control condition in college-aged females. Depcik and Williams (2004) analyzed body satisfaction changes due to either a weight lifting class or a general education class in body image disturbed women over a 13-week period. Their results indicated that body satisfaction scores following the weight lifting course improved with 41% of the weight trainers no longer being classified as body image disturbed. In the present study, resistance exercise

significantly increased state body image from pre- to post-session with a small to moderate effect. These studies combined indicate that state body satisfaction can be influenced positively through an acute session of resistance exercise.

Three potential mechanisms underlying improvements in state body image due to resistance exercise are perceived changes in fitness, increases in physical self-efficacy, and increases in body awareness. The present findings may be a result of perceived increases in strength and muscularity and decreases in body fat. The acute resistance exercise session from this study could not have induced any actual increases in fitness, leaving only the possibility of perceived gains in fitness. Martin Ginis and Bassett-Gunter (2011) have postulated that perceived changes in fitness, such as strength or muscle tone, may be responsible for enhancements in body image, without the requirement of objective changes in fitness.

Two studies to date have directly examined the influence of perceived changes in fitness on body satisfaction. Martin Ginis and colleagues (2005) analyzed the relationship between body image change and subjective and objective physical changes following a 12-week strength-training program in college-aged men and women. Among the female subjects, increased BAS scores, an indicator of trait body image, were correlated with perceived changes in body fat, strength and muscularity. Only actual changes in strength were associated with female body image improvements. A more recent study by Martin Ginis and colleagues (2012), examined the effects of a 16-week diet and exercise intervention on body image, perceived and actual changes in physical fitness, and self-efficacy in obese and overweight women. The exercise intervention consisted of 45-60 minutes of aerobic exercise seven days per week and progressive resistance exercise two

days per week. The dietary intervention required participants to restrict their dietary intake to 500 kilocalories below their weight maintenance energy requirements. The researchers found that perceived physical changes, especially enhancements in body fat, and self-efficacy predicted variance in body image change outside of changes explained by actual physical improvements. The current findings following a single bout of resistance exercise that produced no realistic reductions in body fat, strength gains, or increased muscularity are reflected in Martin Ginis and colleagues' suggestion that women's evaluations of their bodies can be improved by changing perceptions of their strength and muscularity.

Resistance exercise may also improve body image through increasing physical self-efficacy (Martin Ginis & Bassett-Gunter, 2011; Sonstroem, 1997). Martin Ginis and Bassett-Gunter (2011) have stated that perceived indices of fitness depict the meaningfulness of the change to the exerciser. Personally meaningful, perceived increases in physical functioning and appearance following a single session of strength training have the capacity to induce increases in physical self-efficacy. Martin and colleagues' interpretation of Sonstroem and Morgan's extended Exercise and Self-Esteem Model suggests that increases in physical self-efficacy may prompt positive changes in physical competence, the cognitive component of body image, and physical acceptance, the affective component of body image.

Martin Ginis and Bassett-Gunter (2011) also noted that significant relationships exist between changes in body image and exercise-induced changes in self-efficacy that represent the sense of personal control, physical mastery, and competence obtained through exercise participation. The resistance exercise session may have allowed

participants to feel a sense of mastery through performing the selected exercise with correct form, which was denoted by feedback from the researcher. They also were able to feel more competent about resistance exercise as a whole, due to the familiarization and trial instruction that included scripted information about what muscles each exercise utilized and how to properly execute the lift. If a participant were not confident in their form during a lift, they were given additional feedback to ensure proper technique. This process may have increased a participant's sense of physical mastery and competence regarding strength training. The aerobic, interval circuit, and control sessions did not include this kind of instruction due to the nature of those trials. Upon completion of the resistance exercise session, participants through perceived changes in physical strength and muscularity may have felt a greater sense of personal control. The combination of increased personal control, physical mastery, and competence may be underlying resistance exercise's enhanced effect on physical self-efficacy and accordingly, body image.

The positive effect of resistance training on state body image may be related to an increase in body awareness and internal sensations associated with resistance exercise. Unlike the aerobic exercise session where the participant was not cued about their running mechanics, the researcher directing the participant's attention to the movement of her body to perform the lift and the muscles that should have been working during the resistance exercise session. By focusing on the muscle used during the exercise, participants' may have become more aware of the internal sensations that are associated with resistance exercise, like muscle tension and fatigue. Body awareness may have arisen progressively from the participants' increasing capacity to attend selectively to her

specific body parts (Kinsbourne, 2002). In a feminist subgroup of women, a competent body image has been correlated with feeling healthy and an awareness of internal sensations (Thompson et al., 1999). Conceivably by drawing attention to several different areas of one's body and the internal, bodily sensations associated with lifting weights, resistance exercise was able to increase state body satisfaction.

Although not significantly different from the control session after exercise, the aerobic trial partially supporting the research hypotheses by yielding significant improvements in state body image from pre- to post-exercise. The aerobic session improvements in state body image were not large enough to be significantly different from the control condition. The effect size was small to moderate at 0.3 and was only slightly lower than the 0.4 effect size of the resistance exercise session. These findings are reflective of the Fallon and Hausenblas (2005) study results showing that acute aerobic exercise was not able to reduce body dissatisfaction. The present results contrast with McInman and Berger's (1993) findings that participation in an aerobic dance class induced significant positive changes in self-concept as compared to attending a lecture. More recently, Appleton (2012) established that only six sessions of 40 minutes of aerobic exercise can improve body image, without subsequent changes in body weight or shape.

Furthermore, the present results conflict with the findings of the Vocks and colleagues study (2009). Participants felt slightly thinner and were more satisfied with their bodies after the cycling session as compared to reading a newspaper. Similarly, Vocks' participants showed significantly decreased discontent with their body, an attitudinal component of body image, from pre- to post-exercise. The present study's

results show no significant differences between the quiet reading in the control session and the treadmill running in the aerobic session. Perhaps a difference exists in the effects of the different types of aerobic exercise utilized in these two studies.

However, the current results do reflect the findings of Tucker and Mortell's (1993) intervention study that directly compared aerobic and weight training exercise programs over a 12-week period. Tucker and Mortell's results indicated that both groups saw improvements in body image, although the resistance-trained group had significantly greater improvements in body image than the walking group. The authors credited this outcome to strength training's aptitude for generating actual or perceived changes in the body, such as firmer and shapelier muscles. These changes served as mechanisms of positive feedback that strengthened esteem and enhanced psychological welfare, particularly body image. Due to the conflicting results surrounding aerobic exercise, more research is needed to validate and better understand this exercise modality's effect on state body image.

It is important to mention the non-significant results yielded by the interval circuit session. The interval circuit exercise was hypothesized to yield the greatest increases in state body image due to its resistance and aerobic components. The results of this study show that a single session of interval circuit training did not induce any significant changes in state body image and was no different from the control session. These non-significant results may be explained by the interval circuit's inability to induce a great enough intensity to yield positive effects on body image. The RPE data suggests that the interval circuit bout may not have been potent enough to elicit a response. The in-task

RPE for the interval circuit was significantly lower than that of the aerobic and resistance exercise sessions.

In a meta-analytic study, Campbell and Hausenblas (2009) noted that moderate and strenuous-intensity exercise produce comparable, positive effects on body image. It has been recommended that exercise intensities be at least moderate in order to generate body image change (Martin Ginis & Bassett-Gunter, 2011). The interval circuit session for the present study was created to match the other exercise bouts for total time. Typically, interval circuits are high-intensity with little rest breaks. Since the current study's interval circuit consisted of several rest breaks in between exercises and between the different circuit periods, its lack of intensity may have limited its ability to elicit a significant change in state body image. Future research should focus on utilizing practically relevant, higher-intensity training protocols that yield the same total work and cardiovascular benefits accompanying traditional aerobic training.

Mood

Both the resistance and aerobic exercise sessions yielded significant affective increases from pre- to post-exercise. At post-exercise, participants exhibited significantly higher positive affect and lower negative affect as compared to the control session. Mirroring the state body image results, the interval circuit was not potent enough to elicit significant affective results.

The current results support previous findings related to exercise's impact on mood. McInman and Berger (1993) analyzed the effects of participating in a single aerobic dance class compared to attending a university course. The results indicated significant

positive changes in mood and self-concept. It was suggested that aerobic dance was effective in improving mood in female exercisers (McInman & Berger, 1993). LePage and Crowther (2010) found that both high trait and low trait body dissatisfied females exhibit lower negative affect and greater positive affect following self-selected exercise. This study's results mirrored the previous literature and added to the consensus that a single bout of exercise can increase positive mood and decrease negative mood.

Mood-related improvements have been linked to adherence rates. Williams and colleagues (2012) analyzed whether the affective valence of participants currently in a physical activity promotion intervention during and immediately following a brief walk would predict concurrent and future physical activity. The results showed that mood during a treadmill walk was predictive of concurrent and future minutes of physical activity reported per week. The likelihood that females will choose and adhere to an exercise program to improve body image may be dependent upon exercise's mood-related benefits. Future research should examine the relationship between exercise-induced changes in body image and mood.

Limitations

Several limitations within the current research exist. Because the participants consisted of low-risk, non-body image disturbed, female university students who were interested in fitness and health, the results may only be generalizable to this group. Findings from the current study cannot be extrapolated to other age groups, individuals with body image disturbance, or men. It should be noted that the sample population was recruited primarily from exercise psychology courses, elective exercise courses, such as

boot camp and aerobic dance, and online personal wellness and nutrition courses. It is evident that the sample population had some interest in fitness and health. In a meta-analytic study, Hausenblas and Fallon (2006) indicated that exercisers had a more positive body image than non-exercisers and that exercise interventions cause participants to report better body image throughout and at the conclusion of the interventions when compared to non-exercising participants. Because the current study relies on perceptual increases in body image as opposed to actual increases in fitness or body composition, the sample population's interest in health and fitness may have influenced their perceptions of the efficacy of exercise to induce affective and body-image-related changes.

Due to the presence of menstrual cycles, the present female-only population's state body image scores may have varied dependent upon each individual participant's stage within her cycle. Thompson and colleagues (1999) noted that the menstrual cycle is associated with many physical changes, such as fluid retention, neurotransmitter modifications, and blood sugar perturbations that may affect state body image. It was further reported that body image dissatisfaction is worsened both immediately prior to and during menstruation.

Physical activity experience may also impact state body image due to a person's advanced or limited exposure to exercise and its associated attire. It may be the case with novice exercisers that the wearing of exercise clothes and prevalence of sweat will induce negative body image, whereas experienced exercisers are accustomed to the environment, attire and bodily changes that occur with exercise. On the other hand, changes in body image may be more potent in novice exercisers. Inexperienced exercisers tend to have

greater improvements in body image from an exercise program because their perceived and objective improvements in fitness and self-efficacy can be fairly drastic (Martin Ginis & Bassett-Gunter, 2011).

The lab atmosphere where the study took place may have limited the ecological validity of the study. The current study was conducted in a small, secluded room with only the researchers and participant present. A traditional gym atmosphere may include other gym goers, the presence of music and mirrors, and an increase in exercise modality choice. All of these factors may affect the resultant state body image post-exercise. Furthermore, other outside factors, such as exams or eating behaviors, were not considered in the current design and may have had an impact on state body image.

Future Research

Future research should consider utilizing several different populations and exercise manipulations. Male participants, older and younger participants, clinical populations, stratification of body satisfaction (high vs. low trait body satisfaction), stratification of exercise experience, and populations stratified by weight class or BMI should be considered.

The current study standardized exercise manipulations based upon time and recognized RPE recommendations for moderate exercise (Garber et al., 2011). Future research should consider standardizing their exercise modalities on work or percentages of peak oxygen consumption for aerobic exercise and one-repetition maximums for resistance exercise. Matching exercise trials based upon time may not be optimal for some modalities like interval training. Short-term sprint interval training, like that in

Gibala and colleagues (2006) may take as little as 18 minutes to complete a single session. The sprint interval training used in Gibala's study induced skeletal muscle and performance adaptations comparable to endurance training. Utilizing training protocols that stimulate the same cardiovascular or skeletomuscular enhancements would be optimal to standardize exercise modalities. Exercise manipulations should also consider allowing the use of personal music, being located in a typical gym environment versus the lab atmosphere and utilizing different activities, such as sports or group exercise.

In order to investigate the possibility of an accumulation effect, acute sessions and chronic exercise interventions should be conducted in conjunction with one another. Over the duration of a chronic exercise intervention study, state body image ought to be measured before and after each exercise session in order to analyze the time necessary for the manipulation to impact trait body image. Utilizing this sort of method may also lend information regarding a possible relationship between state body image and exercise adherence. Appleton (2012) has suggested that a focus on body image improvements as an outcome of an exercise program may result in improved adherence and prolonged commitment.

Finally, future research should focus on the mechanisms underlying exercise-induced changes in state body image. Dependent variables should include actual changes in fitness, perceived changes in fitness, self-efficacy, and in-task mood and enjoyment. Utilizing these variables would allow the researcher to test the efficacy of Sonstroem and Morgan's (1997; 1989) expanded Exercise and Self-Esteem model to explain exercise-related improvements in state body image.

Conclusions

Body image describes the self-perceptions and self-attitudes that reflect how people feel, think, and behave toward their bodies, especially its appearance (Cash, 2004). The current study examined the effects of three different exercise modalities (resistance, aerobic, and interval circuit) on state body image. The findings from the current study partially supported the hypotheses, with participation in the aerobic and resistance sessions significantly improving body image from pre- to post-exercise. Resistance exercise was the only research modality that yielded significantly higher post-exercise state body image as compared to the control session. Thus, a single resistance exercise session may help individuals to improve their state body image.

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