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THE EFFECTS OF SELF-EFFICACY, SOCIAL PHYSIQUE ANXIETY, ATTRIBUTIONS, AND FEELINGS OF MASTERY ON POST-EXERCISE PSYCHOLOGICAL STATE

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THE EFFECTS OF SELF-EFFICACY, SOCIAL PHYSIQUE ANXIETY, ATTRIBUTIONS, AND FEELINGS OF MASTERY ON POST-EXERCISE PSYCHOLOGICAL STATE

by

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Dedication

For my parents, Jim and Pat,

and my brother, Ben

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I would like to thank first, and foremost, my family for the infinite amount of support and encouragement they provided me throughout this process; Mom, words cannot describe all that you have done for me. To my committee members, thank you for your expert guidance. To my advisor, John B. Bartholomew, thank you for your undying patience and leadership. To my friends who helped me in so many different and unique ways, thank you for being there for me and giving me the courage to strive for all that is bigger and better.

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It is well known that acute bouts of exercise are sufficient to improve psychological state. However, a number of different hypotheses exist to explain these changes with little consensus regarding a single mechanism to explain the effects. The mastery hypothesis postulates that the successful completion of an effortful task, such as exercise, results in a feeling of accomplishment or mastery, and those feelings of mastery produce improved psychological states, particularly for those tasks that are considered important to the individual. Thus, the exercise-induced improvement in psychological state will be maximized in those individuals with positive assessments of performance. In addition, given the nature of the environment, dispositional traits like self-efficacy and social physique anxiety will likely impact feelings of mastery. Data was collected in two exercise environments differing in both structure and format in order to maximize differences and create a stronger test of the mastery hypothesis. Overall, social physique anxiety and self-efficacy had little effect on the relationship between mastery and the resulting post-exercise psychological state.

Path analysis supported the viability of the mastery hypothesis as a mechanism to explain the differences in psychological response to exercise. In both exercise conditions, all exercisers reported significant reductions in negatively valenced states, like negative affect and psychological distress. However, high mastery individuals in both conditions experienced significantly greater increases in positively valenced states, like positive affect and positive well-being, compared to the low mastery individuals. However, differences between conditions existed for attributions suggestions that the exercise environment my influence ones belief about their exercise. Participants in the aerobics condition exhibited a larger self-serving bias, which may be due to the environment of the class being more of an achievement situation than the cardiovascular & weight training class. Even though attributional differences existed, the differences had no effect on the resulting mood.

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CHAPTER I

INTRODUCTION

Purpose

This dissertation is designed to develop and test a model of exercise and mood that is based on the mastery hypothesis.

Background

It is well known that acute bouts of exercise are sufficient to improve psychological state (Kennedy, 1997; Thayer, 1987; Maroulakis & Zervas, 1993; Ekkekakis, Hall, VanLanduyt, & Petruzzello, 2000). A minimal exercise stimulus is generally enough to decrease anxiety, depression, and other negative moods while also improving indicators of psychological well-being. Although most people report a uniform reduction in negative states, unfortunately, not all people respond to exercise with improved positive affect. This raises the possibility that different mechanisms exist for the exercise-induced changes in negative and positive states (Bartholomew, 2002). Specifically, the consistent changes in negative states following exercise suggest the presence of a mechanism that is consistently associated with exercise, e.g. distraction or parasympathetic response. In contrast, the variability in the positive affective response to exercise suggests that the mechanism of change is also variably associated with exercise.

Although there are numerous possibilities, one theory that fits the pattern of effects for positive affect is the mastery hypothesis. The basic premise of this theory is that the completion of a challenging task, like exercise, provides a sense of accomplishment. This sense of accomplishment results in improved mood. Clearly, not all exercise experiences would be expected to provide a similar level of challenge and accomplishment. For example, the completion of a more difficult or intense bout of exercise might be considered more challenging and thus result in greater positive affect than would a low intensity or easy bout of exercise. Likewise, a person who struggles with a bout of exercise might experience lessened positive affect following exercise. As a result, if feelings of mastery do contribute to post-exercise positive affect, it is not surprising that feelings of positive affect or well-being would vary considerably following exercise. However, no true model of post exercise mood has been conceptualized that incorporates feelings of mastery. This dissertation is designed to fill this void. Of particular interest is whether the variability in post-exercise affect is due to differences amongst single bouts of exercise or if it might be due to dispositional traits that differ amongst people but are uniformly associated with reduced feelings of accomplishment following exercise. Specifically, because of the numerous self-presentational concerns that are associated with exercise, social physique anxiety is a trait that may act in this fashion. It is also probable to mastery interpretations will depend upon pre-exercise expectations, self-efficacy, and post exercise explanations, or attributions, for performance. As a result, the proposed model will incorporate social physique anxiety, self-efficacy and attributions for success.

Social physique anxiety is a type of anxiety experienced when individuals are in situations where their body can be evaluated (Hart, Leary, & Rejeski, 1989).

Social physique anxiety is considered and assessed as a trait because these negative thoughts elicit a consistent feeling of anxiety that is present whenever the individual is in a social setting. Because of the physical and often public nature of exercise, the body becomes a central focus in exercise settings (Crawford and Eklund, 1994). In addition, the clothing worn during exercise tends to be more revealing which, when combined with the presence of mirrors in the exercise environment, heightens any existing awareness of the physique. Thus, the added attention on the physical self serves to exacerbate any pre-existing physique anxieties. As such, it is reasonable to expect that these factors will also impact a person's perception of the accomplishment achieved through exercise. That is, a person who is high in social physique anxiety, who is therefore concerned about the judgments of others, is likely to be highly critical of their own performance and less likely to experience mastery cognitions.

Though a tenable hypothesis, little data exists to assess this possibility, nor are there sufficient data to assess the basic assumptions of the mastery hypothesis. Thus, although often cited, there are clear issues that have yet to be addressed. For example, there remains disagreement about how self-efficacy fits within the model. Is self-efficacy a form of mastery or is it a predictor of mastery cognitions? Thus, the first specific aim of this dissertation is to examine the moderating effect of social physique anxiety on the relationship amongst post-exercise mastery, self-efficacy and affective states following exercise. Since social physique anxiety, by definition, varies with the environment, its impact on mood is likely to vary with the environment as well. One factor is the group nature of the exercise. As a result, two exercise environments will be utilized: one will utilize group exercise, the other individual exercise.

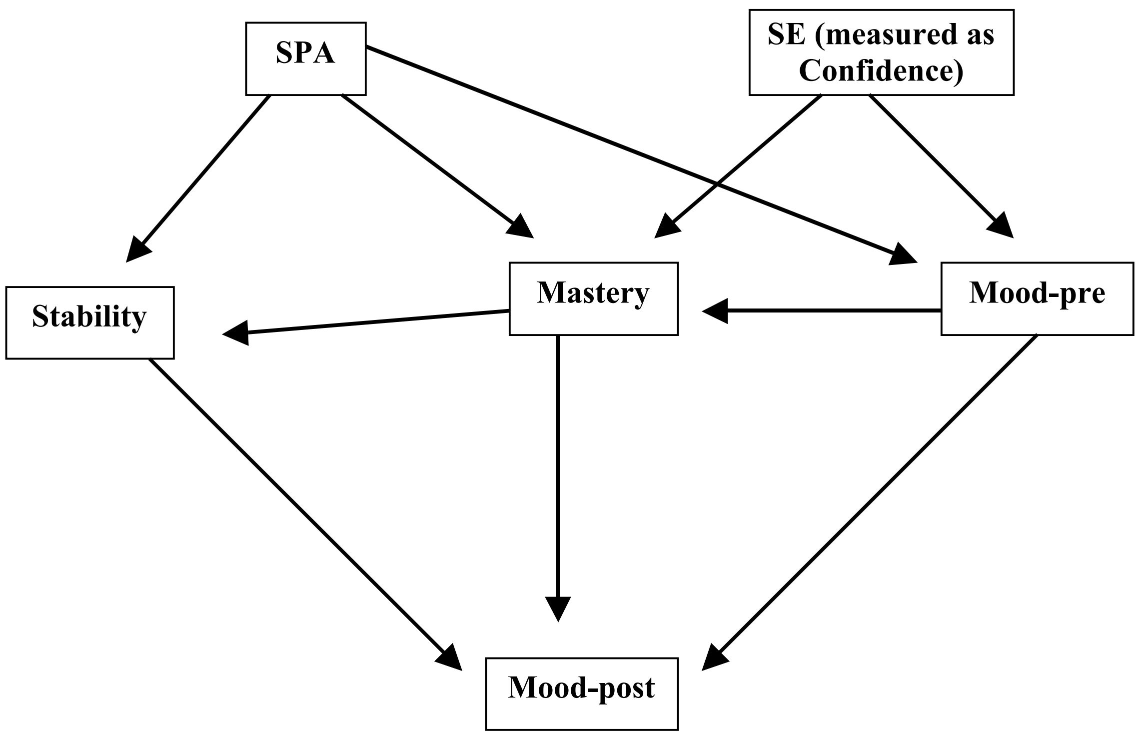
Also left unclear in the model is the role of causal attributions on feelings of mastery. Attribution theory describes how an individual uses information to arrive at causal explanations for given events and outcomes (Weiner et al., 1971). In other words, how do people account for the causes of certain behaviors and outcomes? Given their role in the perception of outcomes, it is clear that attributions are likely to play a role in the impact of perceived mastery in post-exercise affective state. In fact, Weiner makes clear that attributions are expected to drive emotional response to any performance. Following an event, the individual appraises the outcome as either a success or a failure, the individual then seeks a causal explanation for the negative or failure experience. The emotions that follow the outcome are related to this causal attribution, creating a cognition-emotion process that exists in conjunction with any performance (Weiner, 1986).

Three aspects of causality exist: internality, stability and controllability. It is proposed that the three properties of attribution exist as bipolar continuums (Weiner, 1986). Internality divides actions and outcomes into either internal or external locus of causality and influences feelings of accomplishment and self-esteem (Weiner, 2000). For example, outcomes attributed internally are perceived as being caused by the actor's ability and elicit stronger feelings than external attributions, which are often related to task difficulty and luck. Stability, the second aspect of causality, divides actions and outcomes into those that are expected to continue and those that are transient. In other words, is the reason for the outcome likely to be consistent across time? An achievement experience that is believed to be stable is more apt to elicit a more positive affective response than an achievement experience that is believed to be unstable. The final aspect of causality, controllability, divides actions and outcomes that can be influenced by the actor and those that cannot. Controllability is related to the amount of power or volitional control given to the individual. For example, strong effort that leads to a controllable success is praised while a lack of effort that leads to a controllable failure is criticized (Williams & Gill, 2000). These attributions do not necessarily reflect reality. There are, instead, motivational factors that drive attributions in a biased fashion.

Previous research in academics supports the presence and power of a self-serving bias. Miller and Ross (1975) proposed the Ego-Serving-Bias Theory that describes the phenomenon of individuals taking greater amounts of credit for their successes while taking little responsibility for failures. Green, Bailey, Zinser, and Williams (1994) sought to expand the theory by demonstrating a relationship between causal attributions and affective responses. Positive feedback was associated with significantly greater internalization of causality along with greater positive affect compared to the externalization of causality and less positive affect associated with negative feedback. Although attribution theory has received a great deal of attention in the areas of academics and sport, little research has examined its role in post-exercise affect.

Taken together, these constructs would all be expected to be part of a model of post exercise mood that is mediated by feelings of mastery. These relationships are depicted in Figure 1, which constitutes the model to be tested within this dissertation.

Figure 1. Proposed Mastery Hypothesis Model of Post-exercise Affect



Research Study

Purpose

The purpose of the current study is to examine the relationship amongst mastery, self-efficacy, social physique anxiety, attributions, and the resulting post-exercise psychological states following an acute bout of exercise. To strengthen the test of the model and the relationships between variables, data will be collected in both group and individual exercise settings.

Method

Participants will be recruited from PED aerobics (aero) and cardiovascular & weight training (CWT) classes. Each participant will be asked to answer a battery of questionnaires (1) prior to exercise, and (2) 20 minutes post-exercise. The questionnaires will include surveys of psychological state (positive affect, negative affect, positive well-being, psychological distress, fatigue, and anxiety), social physique anxiety, specific exercise self-efficacy (confidence), general exercise self-efficacy, exercise mastery, exercise attribution, and exercise history.

Hypotheses

1. Post-exercise mood will be moderated by feelings of mastery, social physique anxiety, and specific exercise self-efficacy (confidence) in both exercise conditions.
2. Post-exercise mastery will be associated with differences in attributions that suggest a self-serving bias in both exercise conditions.

   a. The differences in attribution will moderate the differences in the positively valenced post-exercise psychological states in both exercise conditions.

3. Confidence will be associated with differences in attributions that suggest a self-serving bias in both exercise conditions.
4. Post-exercise mastery will be predicted by social physique anxiety, confidence, and pre-exercise mood in both exercise conditions.
5. The overall model of the mastery hypothesis will be supported through structural equation modeling in both exercise conditions for all indicators of mood.

Limitations

The proposed study is limited for a number of reasons. First, the study is limited because it is comprised of pre-existing, intact groups. The lack of random assignment limits the ability to infer causality. Although causality is limited, the use of pre-existing groups enhances the generalizability of the results by studying participants in their self-selected exercise setting. This allows natural levels of social physique anxiety to be studied. Second, data are collected in only two exercise environments. The generalizability of the findings will be limited to the two chosen settings, but the environments provide very different challenges to self-presentation and thus serve to maximize the differences in self-presentational threat. Third, the use of only females between the ages of 18 and 35 will also limit the generalizability of the findings. However, the use of this limited population serves to maximize any self-presentational or social physique issues in order to examine existing relationships. Finally, there is a limitation due to the assessment of the constructs. This is particularly true for self-efficacy and mastery. Self-efficacy is assessed with a single item indicator. Although this is normal for the field, it does provide a narrow view of self-efficacy. In addition, mastery is assessed with an item, enjoyment, that is similar to positive affect. This concordance in measurement may produce an artificial relationship between mastery and positive affect. However, mastery was assessed 15 min prior to the assessment of positive affect, which should lessen any spurious relationship.

Delimitations

The participants in this study are delimited to a population of female students between the ages of 18 and 35. The students will be registered for one of a number of aerobics and cardiovascular and weight training classes offered by the Department of Kinesiology and Health Education at The University of Texas at Austin. The outcome measures are delimited to positive affect, negative affect, tiredness, positive well-being, psychological distress, fatigue, and state anxiety because they are the constructs measured by the questionnaires being utilized.

Significance of the study

The study addresses specific limitations in, and seeks to extend the findings of previous research with the mastery hypothesis. Drawing participants from different exercise environments serves to increase the generalizability of the results; as does the use of an exercise specific measure of affect.

Definition of key terms

Aerobics Dance: Coordinated group exercise class led by an instructor and choreographed to music. Classes can also involve the use of additional equipment.

Attribution: Providing a causal explanation for a given outcome.

Calmness: The psychological dimension associated with unactivated, pleasant affect.

Cardiovascular Exercise: Physical activity at an intensity high enough to raise the heart rate to a level where positive changes in the cardiovascular system result.

Cardiovascular & Weight Training: Exercise class that combines cardiovascular exercise on indoor equipment (i.e., treadmill, bike, stairmaster, etc.) with weight training on plate-loaded weight machines.

Confidence: Specific exercise self-efficacy

Energy: The psychological dimension associated with activated, pleasant affect.

Fatigue: Subjective measure of fatigue and tiredness.

Mastery: A perception that one has demonstrated skill or knowledge in a specific realm.

Negative Affect: The psychological state or general dimension of subjective distress.

Positive Affect: The psychological state reflecting pleasurable engagement.

Positive Well-Being: Factor corresponding with the positive pole associated with psychological health.

Post Exercise Mood: The psychological state of the individual following exercise, including positive and negatively-valenced states.

Psychological states: General term used to describe any mental state, including, but not limited to, anxiety, affect, energetic arousal, tense arousal.

Psychological Distress: Factor corresponding with the negative pole associated with psychological health.

Self-efficacy: An individual's belief in their ability to successfully complete the behaviors needed to achieve a given outcome.

Self-presentation: The use of behavior to communicate some information about oneself to others. The two main self-presentational motives are to please the audience and to construct one's public self congruent to one's ideal self.

Self-presentational threat: The threat experienced when an individual is in a situation they feel to be incongruent with their ideal self.

Self-serving Bias: An attributional process in which a person takes a greater amount of credit for successes while denying responsibility for failures.

Social physique anxiety: The type of anxiety experienced when individuals are in situations where their body can be evaluated.

State-Anxiety: Feelings of worry and uneasiness experienced in the present moment.

Tension: The psychological dimension associated with activated, unpleasant affect.

Tiredness: The psychological dimension associated with unactivated, unpleasant affect and fatigue.

CHAPTER II

REVIEW OF LITERATURE

Overview

This dissertation is concerned with the effects of exercise on psychological states. Specifically, it examines the effects of a single bout of exercise on various psychological states, and the role of mastery experiences on the magnitude of these effects. Because perceptions of exercise-related mastery are likely to vary greatly amongst individuals, this dissertation will examine two possible moderators of this effect, social physique anxiety and attributions for success. With this in mind, Chapter 2 of this dissertation will be divided into 2 major sections: (1) predictors of post-exercise mood, and (2) predictors of mastery.

Exercise and Psychological States

It is well documented that single (acute) bouts of aerobic exercise are sufficient to improve psychological state. Acute exercise functions to increase positive psychological states (i.e., positive affect, vigor, energy, calmness, positive engagement, revitalization, and tranquility) while also decreasing negative psychological states (i.e., negative affect, tension, tiredness, anger, and confusion). This beneficial relationship between acute exercise and affect has been supported in both the individual and group exercise settings.

Gauvin and Rejeski (1993) asked 40 participants to complete the Exercise Induced Feeling Inventory before and after a bout of bicycle ergometry in a laboratory environment. All participants exercised at 70% of maximal heart rate reserve, but half of the participants cycled for 25 minutes while the other half cycled for 40 minutes. Results indicated a significant increase in positive engagement, revitalization, and tranquility immediately following exercise for both exercise durations. Another study found similar results. Following 30 minutes of varying exercise intensities on a cycle ergometer, participants reported significantly higher levels of energetic arousal following both exercise conditions (Tate & Petruzzello, 1995). The control condition showed no significant change in arousal. Similar benefits were recorded when participants utilized various exercise modes (Miller, Bartholomew, & Springer, under review). Specifically, participants reported a significant increase in positive affect and energy and a significant reduction in negative affect, tension, and tiredness following the completion of 20 minutes of moderate exercise on a treadmill, stairmaster, rowing ergometer, bike, or cross-country ski machine. Thus, within the confines of a controlled laboratory environment, acute exercise appears to be sufficient to improve numerous psychological states, regardless of the mode of exercise that has been completed.

These relationships also generalize to group exercise settings. Participants reported a significant decrease in negative affect, tension, and tiredness and a significant increase in positive affect and energy after 40 minutes of participation in a self-selected aerobics dance class (Bartholomew & Miller, 2002). Likewise, Kennedy and Newton (1997) asked participants to complete 50 minutes of either high-intensity or low-intensity bench-stepping aerobics. Results indicated a significant decrease in tension, fatigue, and anger along with an increase in vigor regardless of exercise intensity.

In addition to changes in mood and affect, acute bouts of exercise have also been shown to reduce state anxiety for a period of 2 to 4 hours after exercise (Raglin & Morgan, 1987). Tate and Petruzzello (1995) found that state anxiety decreased from pre-test to 30-minutes post-test following 30 minutes of moderate exercise. Focht and Koltyn (1999) compared a 40-minute quiet rest session to a 40-minute exercise session of a self-selected intensity in the preferred mode of cardiovascular exercise (i.e., jogging, racquetball, basketball, swimming, and cycling). State anxiety was significantly reduced following the exercise treatment while the reduction in anxiety following the quiet rest was not significant. The reduction in state anxiety lasted for 3 hours after exercise. Overall, a meta-analysis by Petruzzello and colleagues (1991) found aerobic exercise to be associated with reductions in anxiety across a range of intensities and durations.

In sum, it is clear that exercise is beneficial in improving psychological states. Current research indicates that, independent of mode or intensity, aerobic exercise is associated with increased positive psychological states, decreased negative psychological states, and decreased anxiety. While this pattern of change is generally well understood, a number of different hypotheses exist to explain this pattern of results. Potential mechanisms are both physiological (endorphins, thermogenic changes, and hemispheric activation) and psychological (distraction and mastery) in nature with little consensus regarding a single mechanism to explain these effects.

One physiological theory hypothesizes that the improvement in mood following exercise can be attributed to increasing endorphin levels (Thoren et al., 1990). Endorphins are the body's own, natural pain killer and they are released during times of stress. Exercise is a form of physical stress, and it is hypothesized that the improved mood experienced following exercise is due to the increased endorphin levels. However, empirical evidence does not support this hypothesis as endorphin levels are not correlated with changes in mood. In addition, central endorphin release is limited to repetitive, sub-maximal movement, but mood also improves following resistance exercise (Bartholomew & Linder, 1998).

Another physiological theory for the exercise/mood relationship postulates that it is the elevated body temperature experienced during exercise that impacts the resulting mood (Lox, Martin, & Petruzzello, 2003). The increase in body temperature generates a muscular relaxation response, and the brain interprets the relaxation as a decrease in anxiety. Though it is a possible theory to explain the decreases in anxiety or tension, it does not explain the changes in positive affect or energy; and, overall, it is a theory that requires more investigation.

Hatfield and Landers (1987) suggested that exercise differentially influences the degree of hemispheric activation in the brain. Support for the theory comes from studies that artificially decrease the activation in the right hemisphere resulting in an increase in positive affect and a decrease in anxiety similar to the changes seen following exercise. Petruzzello and Landers (1994) found that the alpha asymmetry was significantly related to state anxiety and predicted 30% of the variance in post-exercise anxiety reduction. Again, it is a possible theory that needs further exploration.

The distraction hypothesis postulates that exercise provides a break from worrisome thoughts and it is this temporary respite that brings about an improvement in mood. This theory has been supported in several studies showing that exercise and an equivalent amount of quiet rest elicit similar reductions in negative states like tension and anxiety (Berger, Friedman, & Eaton, 1988; Brown, Morgan, & Raglin, 1993). However, no evidence exists that simple distraction can bring about the improvements in positive states, like energy, seen following exercise. Thus, even though quiet rest and relaxation serve to reduce negative states, exercise is superior in enhancing positive mood states (Yeung, 1996). Thus, it appears that an alternative hypothesis is required to explain the increase in positive states. One other possible mechanism to explain post-exercise changes in mood is the mastery hypothesis.

Mastery hypothesis

This theory is based on the hypothesis that the successful completion of an effortful task, such as exercise, results in a feeling of accomplishment or mastery. Mastery experiences are expected to produce improved psychological states, particularly for those tasks that are considered important to the individual. Thus, according to this theory, the exercise-induced improvement in psychological state will be maximized in those individuals with positive assessments of their performance. For example, the completion of a bout of exercise that an individual believes to be important and challenging should make the individual feel successful and provides an inherent sense of mastery and accomplishment.

Early research defined performance accomplishments as a function of objective outcome, i.e. winners vs. losers. However, McAuley and Duncan (1989) also argued that objective outcome is not the sole driver of affect and that interpretation of the outcome is critical. For example, Vallerand (1987) found intuitive performance appraisal to be better than objective outcome in predicting post-competition affect. However, the findings are limited because they occurred within a sport setting where the definition of success is more objective and easier to label than it is in the exercise domain. Unlike sports, no direct competition exists in exercise. While some exercisers may perceive "competition," the definition of success is likely to be more subjective and specific to the individuals' expectations for and their experience of exercise. Thus, it is important to be able to measure the exercise related cognitions and perceptions of the individual to truly determine the relationship between task mastery and post-exercise psychological states.

In support of this hyptothesis, post-exercise feelings of accomplishment have been shown to moderate post-exercise psychological states. McAuley and Duncan (1989) manipulated expectancies for performance to test whether disconfirming outcomes following a competitive bicycle ergometer task influenced affective reactions. Participants received manipulated feedback during their practice sessions. Those individuals in the low expectancy manipulation group lost all of their practice trials while those in the high expectancy condition won consistently. During competition, the outcome was controlled such that those in the high expectancy manipulation lost their trials and those in the low expectancy manipulation won all of their trials. Results indicated a significant difference in affective reactions to the outcome. In general, low expectancy losers tended to be less angry, shameful, depressed, and guilty compared to the high expectancy losers. The low expectancy winners also felt significantly more satisfaction, pride, and confidence following their success compared to the high expectancy individuals who won. Thus, post-exercise cognitions in the form of reflection on the experience influence affective reactions in competitive situations. However, the findings of this study are limited by the competitive nature of the task.

Bartholomew (2002) sought to expand on these findings by manipulating exercise outcome in a situation where the actor was only competing with their personal expectations. Competitive, endurance-trained athletes performed a graded, maximal exercise test. Following exercise, participants received performance feedback that was manipulated relative to their pre-exercise expectations. Some participants were told that their VO_2 max was higher than expected while other participants were told that their VO_2 max was lower than expected. As predicted, at 10 minutes following exercise, psychological state was predicted by performance feedback. Individuals who received low performance feedback reported significantly lower positive states and higher negative states than those who received high performance feedback. However, 40 minutes following exercise, group differences only remained for positive states, with all participants reporting similar reductions in negative states. This experiment provides limited support for the mastery hypothesis in that the low performance feedback was sufficient to prevent the expected improvement in psychological states that occur soon after exercise, with the only lasting effects occurring for positively-valenced states. However, the generalizability of these data are limited because the participants were competitive athletes exercising in a laboratory setting. Thus, although mastery experience can impact post-exercise psychological states it is not clear that these relationships hold in group exercise settings or with non-athletes.

This limitation was addressed by Bartholomew and Miller (2002) with aerobic dance participants. Due to a lack of an objective measure of success in aerobic dance, the individuals were given the opportunity to define what success meant to them following a standard 40-minute cardiovascular aerobics class. Interestingly, only one-half of the participants rated their performance in a positive fashion, and those women who rated their workout as more successful reported greater increases in positive affect than did those women who whose ratings were neutral to negative. There was no difference in the magnitude of the decreases in negative affect or state anxiety between the two groups.

These results have a number of implications. First, it appears that even non-athletes evaluate their exercise performance, some quite critically. Second, these evaluations are sufficient to moderate their positive feelings post-exercise but not their negative feelings. This is particularly interesting as the ratings of success were subjective and that this occurred with self-selected bouts of exercise. Thus, it appears that post-exercise feelings of mastery do relate to psychological states and that this occurs in one of the more popular modes of exercise.

What has yet to be considered are dispositional characteristics, like social physique anxiety, or other constructs, like self-efficacy, that are hypothesized to be a part of the model of exercise and mood, through changes in mastery. The next section of the literature review considers these links in the model.

Social Physique Anxiety

Within the proposed model, social physique anxiety (SPA) is predicted to contribute to both pre-exercise mood and feelings of mastery following exercise. SPA is the apprehension and anxiety that an individual experiences when they feel that others may be evaluating their appearance (Hart, Leary, & Rejeski, 1989). It was originally conceptualized as a longer lasting characteristic that holds over time. Different exercise conditions pose differing levels of threat to the self-presentation of the exerciser. Marquez and McAuley (2001) go so far as to say that individuals are often motivated to exercise in order to create a physical appearance or construct a social image, which is due to self-presentational concerns.

Little empirical research has been done to investigate the relationship between social physique anxiety and changes in psychological states following exercise. However, one study, by Focht and Hausenblas (2003), did examine changes in state anxiety and perceived arousal following exercise in women with high social physique anxiety. Participants exercised in two different exercise environments such that aspects of one environment were manipulated to maximize the perception of evaluative threat through the use of mirrors and other exercisers. The manipulation was supported and confirmed as participants rated the naturalistic exercise setting in front of a mirror with other exercisers present significantly more threatening than the laboratory environment without a mirror or other exercisers. At the very least, it is clear that different environments pose differing levels of threat to the self-presentation of the individual exercisers. The different threat levels, in turn, moderate the levels of SPA experienced by exercisers. Results also indicated that, among women with high SPA, state anxiety responses were influenced by the perceived evaluative threat of the environment such that exercising in the naturalistic setting brought about a significant increase in anxiety during exercise.

Social physique anxiety may also impact exercise adherence by interacting with situational and environmental factors (Vealey, 1992). SPA has been shown to impact the attitudes toward exercise settings (Crawford & Eklund, 1994) so it is possible that insecurities about ones body may dissuade an individual from exercise altogether. Self-presentational concerns manifest themselves in SPA and exercise choice is often compromised when these feelings influence exercise behavior (Eklund & Crawford, 1994).

It is possible that high levels of social physique anxiety could undermine feelings of mastery during exercise because of the threat to self-presentation within the exercise environment. The presence of mirrors and other exercisers creates an environment filled with social comparison, which potentially leads to an increase in self-presentational stress. Thus, given the demonstrated relationship between mastery and post-exercise psychological states, SPA could have an indirect effect on mood following acute exercise via mastery.

Self-efficacy

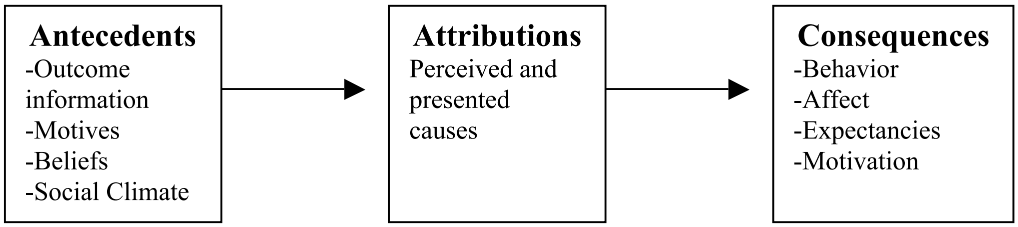
The proposed model posits that pre-exercise mastery cognitions, which have been examined using Bandura's self-efficacy theory (1986), will contribute to both pre-exercise mood and feelings of mastery. Although no data exists that tests this hypothesis, the effects of self-efficacy on exercise are well known. For example, high pre-exercise efficacy participants have consistently responded to exercise with enhanced psychological states relative to low efficacy participants. For example, in a study by Bozoian, Rejeski, and McAuley (1994) individuals with higher self-efficacy prior to exercise reported enhanced feelings of energy and positive enjoyment following an acute bout of exercise than did individuals with lower pre-exercise self-efficacy. Likewise, Tate, Petruzzello, and Lox (1995) found that pre-exercise self-efficacy predicted positive affect following exercise and, in a study of sedentary, middle-aged adults, McAuley and Courneya (1992) found that highly efficacious individuals experienced more positive feeling states during a sub-maximal graded exercise test than did their less efficacious counterparts.

As is the case in the preceding studies, the benefits of self-efficacy have generally been demonstrated in cross-sectional designs. However, there has been one study using true experimental manipulation (McAuley, Talbot, & Martinez, 1999). Self-efficacy was manipulated via bogus performance feedback. Prior to the experimental, exercise bout, participants were asked to complete an initial, sub-maximal fitness test. High efficacy individuals were told that they were in the top 20th percentile for fitness while low efficacy individuals were informed that their performance placed them in the bottom 20th percentile. Following the completion of the subsequent exercise bout, the results indicated significantly different post-exercise affective states between the high and low efficacy groups. Those individuals in the high efficacy condition reported greater increases in positive well-being post-exercise compared to the low efficacy condition, with no differences in psychological distress. The researchers' concluded that feelings of mastery and self-efficacy could contribute to the psychosocial responses to exercise. This supports the notion that responses to exercise are not based solely on physiological changes.

Attribution Theory

Bernard Weiner developed an attributional theory of achievement that postulated that individuals make attributions about their successes and failures and that these attributions affect motivation and behavior (Weiner, 1974). In other words, individuals search for causal explanations for given events and these explanations drive their resulting mood and subsequent behaviors (Fiske & Taylor, 1991). A model of these effects are presented in Figure 2. Although related to behavior, affect, expectancies and motivation, my comments will be limited to the relationship between attributions and affect/mood as this is the focus of the dissertation.

Figure 2. Attribution Model



(Brawley, L.R., 1984)

Three aspects of causality exist to describe attribution. The first classification domain divides actions into either internal or external determinants. For example, determinants that are internal to the individual are constructs like ability and effort which are a direct reflection of the person. External constructs, like task difficulty, are outside of the individual. Thus, depending upon the outcome, internality is related to feelings of pride and shame, with internal attributions eliciting stronger feelings than external attributions. The second dimension separates the actions into stable and unstable constructs. For example, stable constructs, like ability, are believed to be long lasting with little opportunity to change; and unstable constructs, like effort, are believed to be short lived. The final dimension separates actions into controllable and uncontrollable causes. Clearly, all external causes are uncontrollable, but not all internal causes are controllable. For example, effort is internal and subject to volitional control of the individual, but fatigue, an internal cause, is not under direct control of the individual.

A self serving bias is the tendency for an individual to take credit for success and deny responsibility for failure (Gordon, Holley, & Shaffer, 1990). For example, a student who receives an ‘A’ on an exam might attribute the grade internally to an above average intelligence or hard work they put in studying for the test. Another student, who performs poorly on the same exam, might attribute their failure externally to the mediocre lecturing skills of the instructor. The first student feels good about their grade and they feel even better when they believe they controlled their success. However, the second student protects his ego by placing the blame for his failure on an external source, thereby relieving himself of personal responsibility. Although all three forms of attributions have been hypothesized to underlie a self-serving bias, only stability has consistently been supported within exercise and sport.

Empirical research demonstrates a link between outcome, appraisal, and emotion in academic (Forsyth & McMillan, 1981) and sport (McAuley, Russel, & Gross, 1983) arenas. McAuley and Duncan (1990) sought to expand previous findings to determine whether causal dimensions contributed to affective responses above the effects of the initial appraisal in a physical activity setting. Participants were asked to evaluate their performance and make causal attributions for their performance following the completion of a graded gymnastics routine. Affective reactions were also measured, but the data were only collected at one time point immediately after their performance. Results indicated that the stability dimension showed the strongest relationship with affect. In this particular study, the stability dimension had the strongest predictive effect on general affective states like depression, happiness, and satisfaction. Overall, it therefore appears that reflective appraisal or causal attribution has the power to moderate some of the differences in affective outcome.

Research was expanded further when Courneya and McAuley (1993) included self-efficacy and attributions in a model of post-exercise mood. The overarching purpose of the study was to determine whether self-efficacy influenced feelings of success and causal attributes after exercise and whether post-exercise affect differed as a function of those feelings. Using older adults in a structured exercise program, they found that the participants engaged in a self serving bias when thinking about their performance. Individuals who were more efficacious made attributions that were more personally controllable and stable compared to those who were less efficacious about the exercise. In addition, perceptions of self-efficacy influenced how the individuals felt immediately following exercise as participants who perceived themselves as more capable also reported more positive affect. Overall, results indicated that both perceived success and causal attributions were important in predicting post-exercise positive affect. These findings must be interpreted with caution as the age of the sample (M=54 years) and the use of a graded exercise test as an exercise protocol are considered limitations of the study. The use of a graded exercise test as the means of exercise imparts an objective measure to the outcome, which increases the competitive nature of the task. In addition, positive affect was only measured at one time point, immediately following exercise where researchers prompted responses by asking participants to indicate their affective reactions "as a function of the exercise test." Using such language unnecessarily makes the affective responses consciously tied to the exercise experience.

A more recent study of attribution, perceived success, and affect (Courneya and McAuley, 1996) followed a structured 12-week exercise program. The study concluded that perceived outcome plays a significantly more important role in the attribution process than does objective outcome. Results also indicated an interaction between perceived success, attribution, and the resulting changes in affect. Following a perceived success, personally controllable attributions were associated with higher positive affect. In contrast, with a perceived failure, personally controllable attributions were associated with lower positive affect. Likewise, individuals who made external attributions following perceived failure had greater expectations for success compared to those who attributed their perceived failures internally.

The internal attribution of success functions as an ego enhancing strategy while the attribution of failures externally serves an ego protecting function. Employing a self-serving bias maximizes feelings of pride while minimizing feelings of shame (Williams & Gill, 2000). Courneya and McAuley (1996) identified the consistent attribution of failures externally as a possible problem for lasting exercise motivation. The inability of the individual to take responsibility for their failures makes it difficult to address the actual problem or reason for the failure, leading to continued poor performances. However, it appears that a self-serving bias may provide a benefit for the resulting psychological state, which may also have motivational implications.

Thus, for the purposes of this dissertation, the important aspect of physical activity attribution is the effect that cognitions have on the generation of affect. From the review above, it is clear that stability is the dimension of causal attributions that has most consistently been associated with the self-serving bias in exercise and with post exercise mood. As a result, the model of post exercise mood will be limited to the stability dimension causal attributions.

Both reflective and intuitive appraisals are implicated in the generation of post-exercise affect (McAuley, 1992), and attributions function as guidelines for future behavior (McArthur, 1972). Thus, it is important to consider those factors that impact these reflective and intuitive appraisals. Clearly, social physique anxiety and feelings of mastery appear to function in this fashion. In addition, self-efficacy is important to the model because it has been shown to significantly influence perceptions of success and attributions (Courneya & McAuley, 1993).

The only study to examine the relationship between efficacy, attributions, and affect in the exercise domain was done with older adults following a submaximal graded exercise test on a cycle ergometer (Courneya & McAuley, 1993). Though the model supported the use of attribution theory in the exercise domain, several limitations suggest that the findings should be interpreted with caution. First, the use of a single, 1-item measure of mastery fails to tap into the multidimensional nature of the construct. Second, mood measures were limited to achievement-related affects that were, by nature of the survey design, tied directly back to the exercise test performance. In addition, overall affect was collapsed to one score by subtracting the sum of the negative affects from the sum of the positive affects. More recent literature supports the notion that positive and negative affect are separate and independent constructs (Bartholomew & Miller, 2002), and collapsing within a single construct unnecessarily biases the output. Finally, the model utilized only one dispositional measure (i.e., self-efficacy). Using additional dispositional measures that have been shown to impact exercise cognitions, like social physique anxiety, might further strengthen the model.

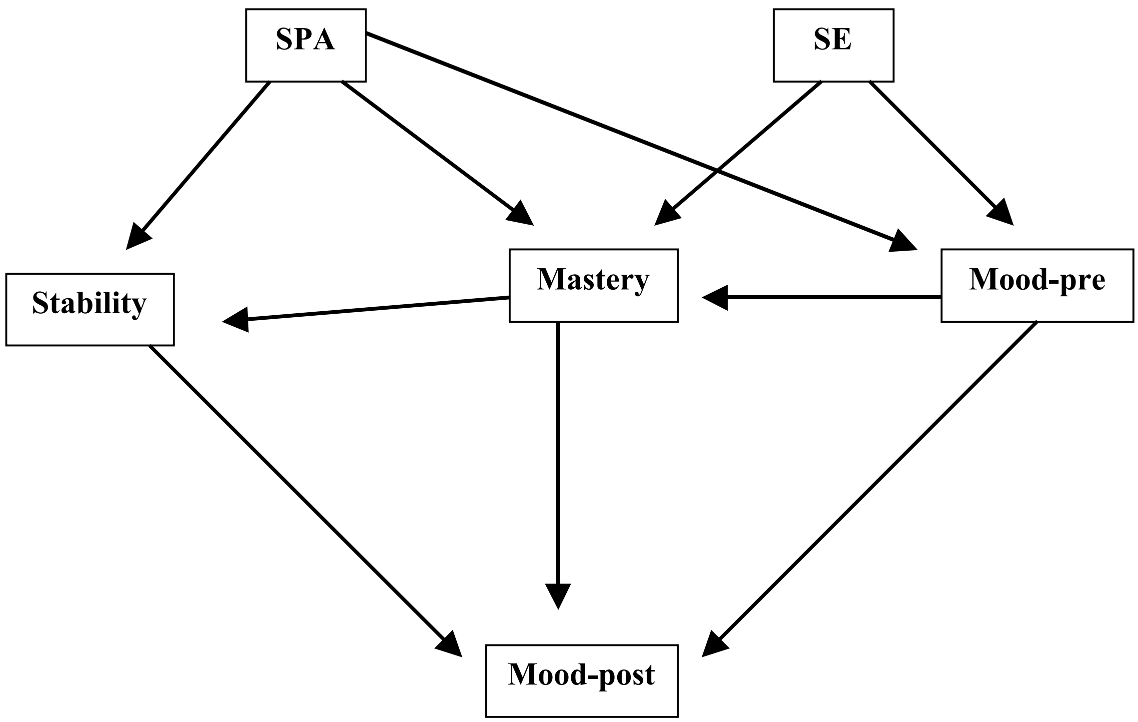
Current Pilot Work

Pilot data were collected in aerobics classes to examine the general impact of social physique anxiety, general exercise self-efficacy, and attributions on post-exercise psychological states. Dispositional data like social physique anxiety and general exercise self-efficacy were collected prior to class. Psychological states (positive affect, negative affect, energy, tension, tiredness, calmness, and anxiety) were measured before and after a regular, 40-minute exercise class. Mastery and attribution data were also collected just after the completion of the aerobics class. Findings supported the previous research demonstrating a relationship between mastery and mood. However, the impact of mastery was greater for positive psychological states like energy and positive affect. Though all participants saw some increase in positive mood, those individuals in the high mastery group reported greater increases in positive affect and energy following exercise compared to the low mastery individuals. In general, all participants, regardless of mastery level, experienced reductions in negative states (i.e., negative affect, tension, and state anxiety).

Feelings of mastery were also shown to influence the post-exercise attributions. High mastery individuals attributed their "success" as being more internal and stable while the low mastery individuals attributed their lack of success to external, temporary factors. The findings follow theory that argues that individuals use attribution to help protect the image of the self. Specifically, this pattern of effects appears to occur because the ego is protected when negative or unsuccessful experiences can be reasoned away using unstable aspects outside the individual. On the other hand, self-perception can be enhanced when positive experiences or successes are explained with permanent factors considered aspects of the individual.

General exercise self-efficacy, another important variable within the model, was also shown to be related to mastery. In fact, both self-efficacy and social physique anxiety were shown to be significant predictors of mastery. In sum, the preliminary analyses suggest the following model. (See Figure 3)

Figure 3. Proposed Mastery Hypothesis Model of Post-exercise Affect



It is important, however, to keep in mind that these relationships have only been supported within the single exercise environment of aerobics classes, and thus they must be interpreted with caution. Aerobics classes offer a unique exercise experience in which individuals are placed in an environment where a group of participants completes the same routine in front of large mirrors allowing for a great amount of social comparison and high self-presentational stress (Katula & McAuley, 1998). Although this provides a useful situation in which to test the relationships amongst these variables, this setting limits the generalizability of the results. It is important to expand this research to other exercise environments that differ in structure, composition, and self-presentational stress. In addition, the pilot study failed to utilize an exercise-specific indicator of psychological state. It has been argued that these are superior to general affective measures because they were developed with the specific intent of assessing psychological changes that are a direct response to a given exercise stimulus (McAuley & Courneya, 1994). Finally, these data utilized a general indicator of self-efficacy, i.e. the ability to maintain an exercise program over time. Other researchers have used more specific exercise self-efficacy scales, i.e. the ability to meet one's exercise goals (Fontaine & Shaw, 1995).

Thus, although these results were promising, there are a number of limitations. This dissertation is, therefore, designed to overcome the stated limitations by including a multidimensional measure of mastery, using additional, more robust, measures of affect, and including an additional dispositional measure of specific exercise confidence.

CHAPTER III

METHODS

This dissertation utilized self-reported levels of psychological states prior to and following an acute bout of exercise. Two different exercise domains, hypothesized to vary in self-presentational stress, were used in order to create a stronger test of the proposed model.

Hypotheses

1. Post-exercise mood will be moderated by feelings of mastery, social physique anxiety, and specific exercise self-efficacy (confidence) in both exercise conditions.
2. Post-exercise mastery will be associated with differences in attributions that suggest a self-serving bias in both exercise conditions.
    a. The differences in attribution will moderate the differences in the positively valenced post-exercise psychological states in both exercise conditions.
3. Confidence will be associated with differences in attributions that suggest a self-serving bias in both exercise conditions.
4. Post-exercise mastery will be predicted by social physique anxiety, confidence, and pre-exercise mood in both exercise conditions.

5. The overall model of the mastery hypothesis will be supported through structural equation modeling in both exercise conditions for all indicators of mood.

Participants

Participants were 237 healthy, university females between the ages of 17 and 31 recruited from the PED 106c aerobics and cardiovascular & weight training classes. The mean age of the participant was 20.5 years (SD=2.1); 51.9% were White, 21.5% were Hispanic, 15.6% were Asian-Pacific Islander, 6.3% were African American, and the final 1.2% designated their ethnicity as "Other." On average, participants exercised 3 to 4 days a week for 40-60 minutes each session. The majority of the participants were considered experienced exercisers, as 88.6%% of the sample indicated they had been exercising at the current level for more than 3 months and 70.9% of the sample indicated they had been exercising at the current level for more than 1 year. The participants had an average BMI of 22.7 (SD = 3.5).

Experimental Design

The study was a mixed factorial, cross-sectional design in which Participants were sampled 10-12 weeks into the semester. Exercise condition served as the between subjects factor and pre and post time served as the within subjects factor. Comparison groups were determined through median splits on grouping variables.

Operational definitions for important Dependent and Independent Variables

- Attribution: Providing a causal explanation for a given outcome.

- Confidence: Specific exercise self-efficacy
- Fatigue: Subjective measure of fatigue and tiredness.
- Mastery: A perception that one has demonstrated skill or knowledge in a specific realm.
- Negative Affect: The psychological state or general dimension of subjective distress.
- Positive Affect: The psychological state reflecting pleasurable engagement.
- Positive Well-Being: Factor corresponding with the positive pole associated with psychological health.
- Psychological Distress: Factor corresponding with the negative pole associated with psychological health.
- Self-efficacy: An individual's belief in their ability to successfully complete the behaviors needed to achieve a given outcome.
- Social physique anxiety: The type of anxiety experienced when individuals are in situations where their body can be evaluated.
- State-Anxiety: Feelings of worry and uneasiness experienced in the present moment.

Instrumentation

Social physique anxiety (SPA) was measured using the Social Physique Anxiety Scale (SPAS; Hart, Leary, & Rejeski, 1989). The SPAS is a 12-item survey that asks participants to indicate the degree to which the given statement is characteristic of themselves (e.g., I wish I wasn't so uptight about my physique/figure; Unattractive features of my physique/figure make me nervous in certain social settings, etc.). A 5-point Likert-type scale is used with responses ranging from “Not at All” (1) to “Extremely Characteristic” (5). Responses to the 12 questions are summed; thus, SPAS scores range from 12 (very low social physique anxiety) to 60 (very high social physique anxiety). The 12-item SPAS showed good internal consistency reliability in this sample (□ = .89).

Specific exercise self-efficacy (Confidence) was measured using a 1-item question that asked participants how confident they were that they could meet their exercise goals today.

Psychological states were measured using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) and the Subjective Exercise Experiences Scale (SEES; McAuley & Courneya, 1994). The PANAS is a 20-item questionnaire with positive (interested, excited, alert, etc.) and negative (guilty, nervous, upset, etc.) affect subscales. It is scored on a 5-point Likert-type scale anchored with “very slightly or not at all” and “extremely.” The PANAS showed good internal consistency reliability for both positive (□ = .90) and negative (□ = .82) affect. The SEES is a 12-item questionnaire including 3 sub-scales measuring positive well-being (great, strong, etc.), psychological distress (awful, discouraged, etc.), and fatigue (drained, tired, etc.). It was scored on a 7-point scale anchored with “very much so” and “not at all.” All three subscales showed consistent internal consistency reliability within this sample: positive well-being (□ = .87), psychological distress (α = .90), and fatigue (α = .92). State anxiety was measured using the State-Trait Anxiety Inventory (STAI; Spielberger, 1970). The STAI is a 10-item questionnaire (I am tense, I am worried, I feel nervous, etc.) measured on a 4-point scale anchored with "not at all" and "very much so." The STAI showed high internal consistency reliability in this sample (α = .87).

Causal attributions were measured using the Causal Dimension Scale (CDSII; McAuley, Duncan, & Russell, 1992). The CDSII is comprised of 4 attributional subscales: (1) locus of causality, (2) external control, (3) stability, and (4) personal control. Participants are asked to identify the cause or causes of their performance based upon the 12-items of the scale (i.e., Is the cause(s) something: inside you-outside you, other people can regulate-other people cannot regulate, permanent-temporary, or manageable by you-not manageable by you). The responses are scored on a 9-point scale and summed (3 questions per subscale) to produce sub-scale scores. The individual subscales showed acceptable internal consistency reliability for this sample (stability α = .78; locus of causality α = .75; external control α = .85; personal control α =.85).

Mastery was measured using 3 performance-related questions scored on a 5-point Likert-type scale with question specific anchors. The three aspects of performance measured by the 1-item questions include: overall performance (very poor, very well), enjoyment (very little, very much), and effort (very weak, very strong). The Mastery Scale showed good internal consistency reliability in this sample (α = .87).

Test Administration

The experimenter attended classes during the 3rd month of the semester to solicit volunteers. This was done to ensure that all participants had sufficient experience with the exercise class to accurately complete all information requested. For some classes, participation in the study was used to make-up a class absence. In such cases, participation in the study was one of a number of activities that students could have utilized to make up an absence. During the initial recruitment, participants were provided informed consent and completed the subject information sheet, SPA scale and the general exercise self-efficacy scale, along with other, unrelated questionnaires. In total, the surveys required no more than 20 minutes to complete.

The exercise testing session took place during a class 2-4 weeks following the initial recruitment. At that time, specific exercise self-efficacy, psychological states, mastery, and attribution were measured. Specific exercise self-efficacy was measured just prior to the beginning of the exercise bout. Psychological states, including the PANAS, SEES, and STAI, were measured at two time-points: prior to exercise and 20 minutes after exercise. Mastery and attributions were assessed immediately following exercise. At that time, participants were asked to rate their exercise based on performance, effort, and enjoyment. In addition, the participants were asked to interpret causes for their performance using the CDSII immediately post-exercise.

Statistical Analyses

Independent, grouping, variables. Grouping variables were calculated via median splits on grouping variables (mastery, stability, and specific exercise self-efficacy). Median splits were utilized rather than the continuous metric for three reasons. First, this is the traditional analysis for these constructs with the existing literature. Thus, a median split allows for the closest comparison to previous data. Second, median splits allow for ease in interpretation when multiple dependent variables are utilized, especially when a triple interaction and a series of two-way interactions are being tested. Finally, the final analysis utilizes path analysis, which keeps the variables in their continuous metric. Thus, any compromise experienced by the initial MANOVAs will be overcome by the final path analysis.

To get a true test of conditional effects, grouping variables were split specific to the groups and ranges for "high" and "low," which may differ slightly between conditions. Ranges and sample sizes are shown in Table 1.

Table 1. Grouping variables by exercise conditions.

Aerobics			**Cardiovascular & Weight Training**		
	Group (n)	**Range**		**Group (n)**	**Range**
Mastery	Low (65)	3-11	Mastery	Low (38)	4-10
	High (46)	12-15		High (43)	11-15
Social Physique Anxiety (SPA)	Low (66)	16-39	Social Physique Anxiety (SPA)	Low (52)	12-40
	High (61)	40-60		High (54)	41-57
Confidence	Low (68)	2-4	Confidence	Low (50)	2-4
	High (33)	5		High (21)	5
Stability	Low (56)	3-10	Stability	Low (44)	3-9
	High (56)	11-23		High (37)	10-23

A Multivariate Analysis of Variance was used with the first four hypotheses to (1) determine whether differences existed between conditions, aerobics v. cardiovascular & weight training, and (2) determine whether significant relationships existed between grouping variables (mastery, social physique anxiety, confidence, and stability) and dependent mood variables. When Condition differences were not significant, the resulting analysis was collapsed for Condition. Once the independent relationships were established, regression analyses and structural equation modeling, in the form of path analysis, were employed to further test the proposed model. Data were examined to determine both the overall fit of the model and the ability of the model to explain variance in post-exercise psychological states. Separate path analyses were used to test the proposed model for each measure of psychological state in each exercise condition (6 subscales x 2 exercise conditions = 12 models). The benefit of testing the model via path analysis is that it allows the variables to remain in their continuous metric and the relationships between variables are tested simultaneously. Data were entered into the original model and then non-significant paths were trimmed until all remaining paths were significant at $p < .05$. Because the analysis provided several indices of fit, the present study will be limited to the chi-square statistic (χ^2), the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean square error of approximation (RMSEA) as overall measures of model fit. For the chi-square statistic, a good fit was indicative of a small chi-square value relative to degrees of freedom which results in a $p > .05$. Other indices of fit, CFI and TLI, greater than .90 indicated acceptable fit while indices greater than .95 were considered a close fit. A RMSEA index below .08 indicates good fit.

CHAPTER IV

RESULTS

Table 2 shows the descriptive statistics for all dependent and independent variables used for the following analyses.

Table 2: Descriptives of model variables by experimental condition

	N	Range	Mean (SD)	Variance
Mastery				
Aerobics	111	3-15	10.73 (2.69)	7.235
CWT	81	4-15	10.57 (2.63)	6.898
Total Sample	192	3-15	10.66 (2.66)	7.063
SPA				
Aerobics	127	16-60	39.00 (8.63)	74.429
CWT	106	12-57	39.93 (9.67)	93.548
Total Sample	233	12-60	39.42 (9.11)	82.978
Confidence				
Aerobics	112	2-5	3.91 (.93)	.857
CWT	79	2-5	4.09 (.70)	.492
Total Sample	191	2-5	3.98 (.84)	.710
Stability				
Aerobics	112	3-23	11.27 (5.93)	35.171
CWT	81	3-23	10.48 (5.05)	25.478
Total Sample	193	3-23	10.94 (5.58)	31.100
Positive Affect - pre				
Aerobics	112	11-45	25.54 (7.73)	59.818
CWT	81	11-42	25.83 (7.56)	57.145
Total Sample	193	11-45	25.66 (7.64)	58.412
Positive Affect - post				
Aerobics	107	11-50	30.93 (8.21)	67.366
CWT	79	11-50	30.65 (7.72)	59.539
Total Sample	186	11-50	30.82 (7.98)	63.725
Negative Affect - pre				
Aerobics	112	10-42	14.01 (4.95)	24.477
CWT	81	10-29	14.16 (4.34)	18.811
Total Sample	193	10-42	14.07 (4.69)	21.995

	N	Range	Mean (SD)	Variance
Negative Affect – post				
Aerobics	110	10-33	11.77 (3.16)	10.012
CWT	81	10-22	12.40 (3.02)	9.092
Total Sample	191	10-33	12.04 (3.11)	9.667
State Anxiety - pre				
Aerobics	109	10-35	18.85 (5.73)	32.793
CWT	79	10-33	18.03 (5.39)	29.076
Total Sample	188	10-35	18.51 (5.59)	31.325
State Anxiety - post				
Aerobics	110	10-33	16.15 (4.70)	22.052
CWT	80	10-29	16.47 (3.71)	13.979
Total Sample	190	10-33	16.28 (4.30)	18.551
Positive Well-being - pre				
Aerobics	112	6-28	15.89 (4.82)	23.196
CWT	79	7-27	16.20 (4.23)	17.882
Total Sample	191	6-28	16.02 (4.57)	20.915
Positive Well-being - post				
Aerobics	110	7-28	18.60 (5.01)	25.105
CWT	80	10-28	18.65 (4.23)	17.851
Total Sample	190	7-28	18.62 (4.68)	21.940
Psychological Distress - pre				
Aerobics	111	4-27	9.07 (5.46)	29.758
CWT	80	4-22	7.57 (4.07)	16.551
Total Sample	191	4-27	8.45 (4.97)	24.659
Psychological Distress - post				
Aerobics	110	4-20	6.32 (3.36)	11.265
CWT	80	4-18	5.85 (2.99)	8.965
Total Sample	190	4-20	6.12 (3.21)	10.297
Fatigue - pre				
Aerobics	112	4-28	14.95 (6.89)	47.529
CWT	79	4-28	13.16 (6.39)	40.832
Total Sample	191	4-28	14.21 (6.73)	45.303
Fatigue - post				
Aerobics	112	4-26	10.89 (5.12)	26.187
CWT	80	4-27	10.53 (5.78)	33.392
Total Sample	192	4-27	10.74 (5.39)	29.063

Hypothesis 1. Post-exercise mood will be moderated by feelings of mastery, social physique anxiety, and specific exercise self-efficacy in both exercise conditions.

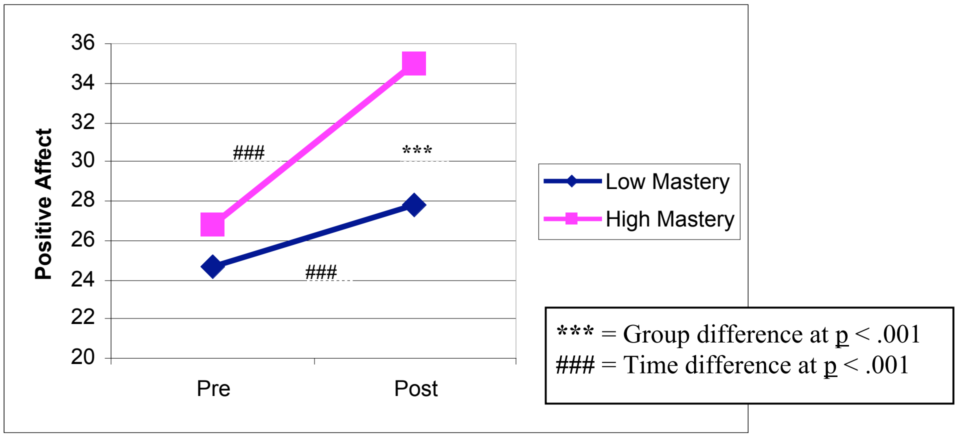
Mastery. This hypothesis was tested using a 2 Group (low Mastery, high Mastery) x 2 Condition (Aero, CWT) x 2 Time (pre, post) MANOVA where Groups were determined by a median split of post-exercise mastery, and the variables included positive affect, negative affect, anxiety, positive well-being, psychological distress, and fatigue. Overall, there was a non-significant Group x Condition x Time interaction, F (6,164) = 1.861, p = .09. There were, however, significant 2-way multivariate interactions for Group x Time, F (6,164) = 4.977, p < .001, and Group x Condition, F (6,164) = 2.260, p < .05. Univariate interactions of Group x Time were significant for positive affect, F (1,169) = 14.254, p < .001, and fatigue, F (1,169) = 4.883, p < .05. Univariate interactions of Group x Condition were significant for negative affect, F (1,169) = 9.940, p < .01, anxiety, F (1,169) = 8.627, p < .01, psychological distress, F (1,169) = 6.348, p < .05, and fatigue, F (1,169) = 7.355, p < .01. These interactions will be decomposed below.

Significant main effects existed for Time, F (6,164) = 29.314, p < .001, and Group, F (6,164) = 6.840, p < .001. The univariate effects of time were significant for all dependent variables: positive affect, F (1,169) = 124.699, p < .001, negative affect, F (1,169) = 68.373, p < .001, anxiety, F (1,169) = 49.982, p < .001, positive well-being, F (1,169) = 80.592, p < .001, psychological distress, F (1,169) = 63.400, p < .001, and fatigue, F (1,169) = 60.650, p < .001. In all cases, this was due to a significant improvement in each of the dependent variables (increase in positive states and decrease in negative states). The univariate effects of Group (high, low mastery) were significant for positive affect, $\underline{F}$ (1,169) = 31.639, $\underline{p} < .001$, positive well-being, $\underline{F}$ (1,169) = 33.418, $\underline{p} < .001$, psychological distress, $\underline{F}$ (1,169) = 7.938, $\underline{p} < .01$, and fatigue, $\underline{F}$ (1,169) = 5.422, $\underline{p} < .05$. For positive affect and positive well-being, this was due to a significantly more positive state for the high mastery participants both prior to and following exercise.

Overall, post-exercise mood was moderated by feelings of mastery. Feelings of mastery interacted with Time and exercise Condition. These interactions will be decomposed below into their univariate, simple-effects by exercise Condition.

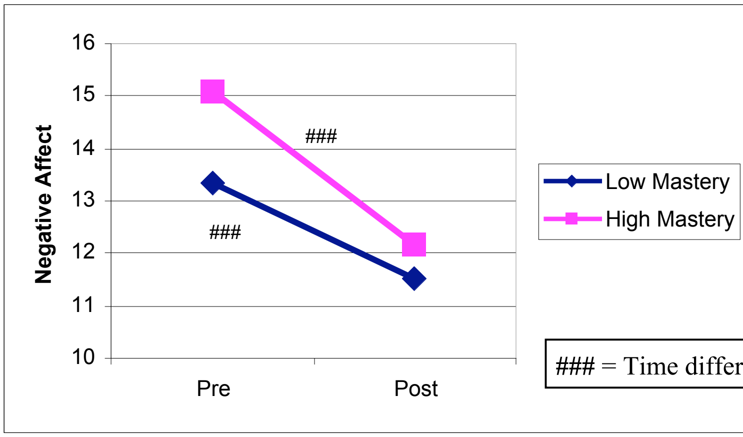
<u>Mastery – Aerobics Condition</u>. Significant univariate effects were found for the mastery Group by Time interaction for positive affect, $\underline{F}$ = 15.569 (1,99), $\underline{p} < .001$, negative affect, $\underline{F}$ = 4.246 (1,99), $\underline{p} < .05$, and positive well-being, $\underline{F}$ = 4.324 (1,99), $\underline{p} < .05$. See Figures 4, 5, and 6 for graphs of significant univariate effects.

Figure 4. Changes in Positive Affect across time in Aerobics Condition by Mastery Group



Both Groups reported significant increases in positive affect following the acute bout of exercise, high mastery, F (1,43) = 80.538, p < .001, ES = 1.02, and low mastery, F (1,56) = 17.996, p < .001, ES = .44. Prior to exercise the mastery groups showed no significant difference in positive affect, but the high mastery Group reported significantly greater levels of positive affect at 20-minutes post-exercise compared to the low mastery Group, F (1,104) = 24.573, p < .001, ES = .96.

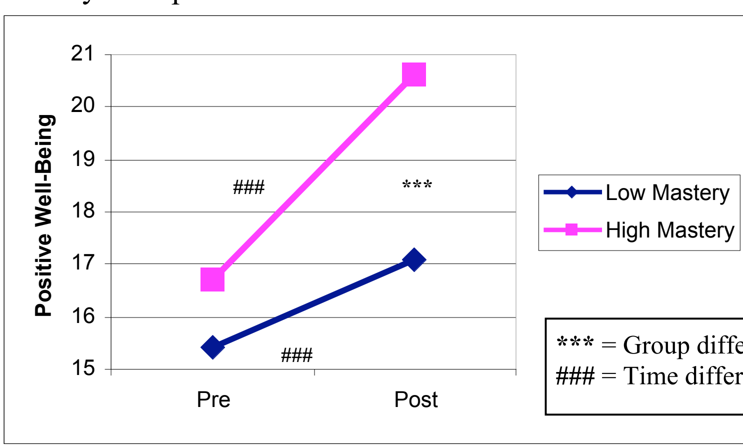
Figure 5. Changes in Negative Affect across time in Aerobics Condition by Mastery Group



= Time difference at p < .001

Both mastery groups reported significant decreases in negative affect following exercise, high mastery, F (1,43) = 23.910, p < .001, ES = -.48, low mastery, F (1,56) = 24.182, p < .001, ES = -.52. However, at the pre-test the high mastery participants reported slightly greater levels of negative affect, ES = .50, relative to the low mastery participants. Those Group differences decreased at the post-test, ES = .27.

Figure 6. Changes in Positive Well-Being across time in Aerobics Condition by Mastery Group



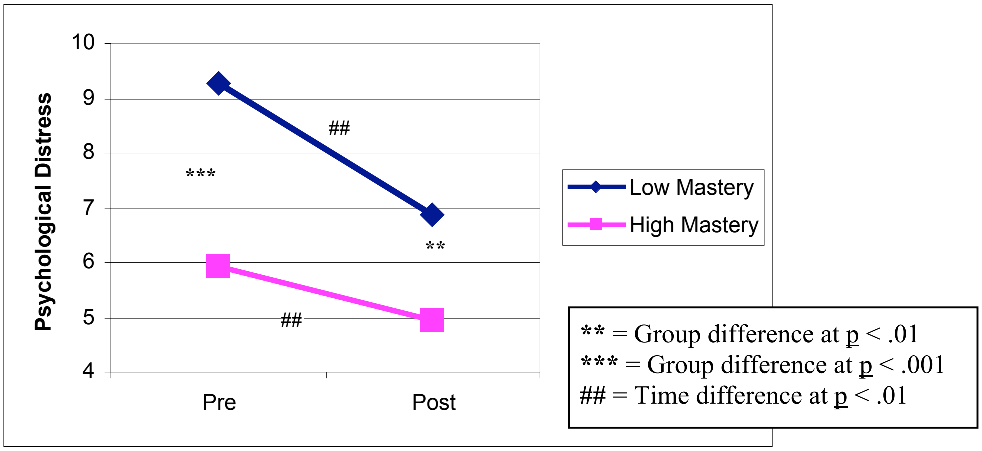
*** = Group difference at p < .001
= Time difference at p < .001

Both Groups reported significant increases in positive well-being, high mastery, $\underline{F}$ (1,43) = 40.055, $\underline{p} < .001$, $\underline{ES} = .81$, and low mastery, $\underline{F}$ (1,56) = 15.347, $\underline{p} < .001$, $\underline{ES} = .42$. At the pre-test, no differences existed between groups, but at the post-test the high mastery Group reported significantly greater levels of positive well-being compared to the low-mastery Group, $\underline{F}$ (1,107) = 14.977, $\underline{p} < .001$, $\underline{ES} = .74$.

All other variables showed significant Time effects. Effect sizes are reported for the changes from pre-test to 20-minutes post, state anxiety $\underline{ES}$=-.47, psychological distress $\underline{ES}$=-.53, and fatigue $\underline{ES}$=.60. The significant findings suggest that in an aerobics class feelings of mastery have a greater impact on positively valenced psychological states (positive affect and positive well-being) following an acute bout of exercise. Negatively valenced psychological states (state anxiety, psychological distress, and fatigue) were reduced following exercise, but the change was not impacted by feelings of mastery. For a complete list of means and standard deviations for psychological states by mastery group for the aerobics condition, see Table 3 at the end of the chapter.

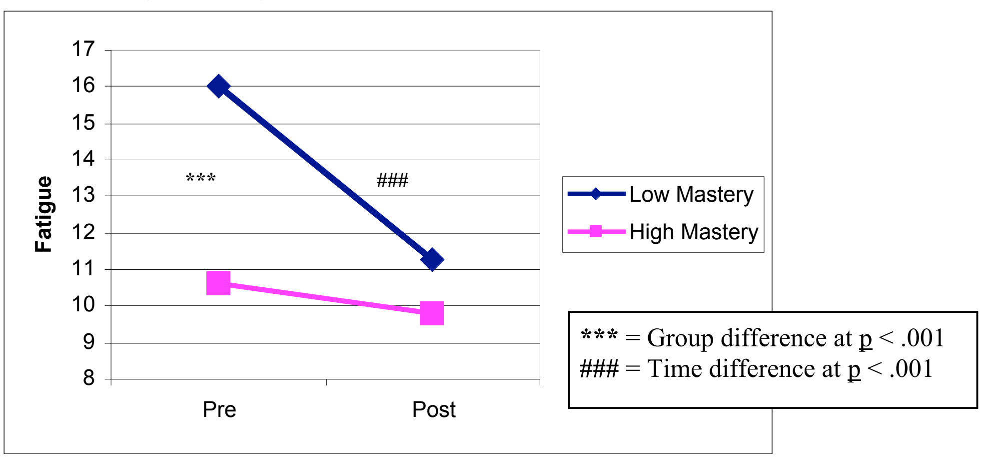
Mastery - Cardiovascular & Weight Training Condition. Significant univariate Group by Time interactions were found for psychological distress, $\underline{F}$ = 3.926 (1,70), $\underline{p} = .05$, and fatigue, $\underline{F}$ = 11.520 (1,70), $\underline{p} < .01$. See Figures 7 and 8 for graphs of significant univariate effects.

Figure 7. Changes in Psychological Distress across time in Cardiovascular & Weight Training Condition by Mastery Group



For psychological distress, the low mastery group reported significantly higher levels at baseline, $F = 13.905$ (1,78), $p < .001$, and at 20 minutes post-exercise, $F = 8.724$ (1,78), $p < .01$. However, both high mastery (ES=-.46) and low mastery (ES=-.50) showed significant decreases over time.

Figure 8. Changes in Fatigue across time in Cardiovascular & Weight Training Condition by Mastery Group



Baseline levels of fatigue for the low mastery group were significantly higher than baseline levels for the high mastery group, $F = 16.794$ (1,77), $p < .001$. The low mastery group experienced a significant decrease in fatigue following exercise, F = 33.818 (1,32), p < .001, while the high mastery group showed no significant change, F = 0.180 (1,38), p > .65.

All other variables showed significant time effects. Results are reported for the changes from pre-test to 20-minutes post, positive affect ES=.56, negative affect ES=-.40, state anxiety ES=-.29, and positive well-being ES=.56. Only fatigue and psychological distress were impacted by mastery, and changes in psychological distress were only slightly related to mastery. The significant findings suggest that in a cardiovascular & weight training class feelings of mastery have only a minimal impact on psychological states. For a complete list of means and standard deviations for psychological states by mastery group for the cardiovascular & weight training condition, see Table 4 at the end of the chapter.

Social Physique Anxiety (SPA). The hypothesis was tested using a 2 Group (low SPA, high SPA) x 2 Condition (Aero, CWT) x 2 Time (pre, post) MANOVA where Groups were determined by a median split of social physique anxiety, and the variables included positive affect, negative affect, anxiety, positive well-being, psychological distress, and fatigue. Overall, the Group x Condition x Time interaction was not significant, F (6,162) = .257, p > .95. in addition, none of the 2-way interactions were significant, Condition x Time, F (6,162) = 1.196, p > .30, Group x Time, F (6,162) = 1.002, p > .40, or Group x Condition, F (6,162) = .097, p > .99. In addition to the main effect for Time, the main effect for Group, F (6,162) = 2.179, p < .05, was also significant. Univariate effects of SPA Group for all dependent variables, except fatigue, reached the level of statistical significance. Individuals in the high SPA group reported significantly lower levels of positive affect, $\underline{F}$ (1,167) = 8.167, $\underline{p}$ < .01, higher levels of negative affect, $\underline{F}$ (1,167) = 4.597, $\underline{p}$ < .05, higher levels of anxiety, $\underline{F}$ (1,167) = 5.115, $\underline{p}$ < .05, lower levels of positive well-being, $\underline{F}$ (1,167) = 4.101, $\underline{p}$ < .05, and higher levels of psychological distress, $\underline{F}$ (1,167) = 4.352, $\underline{p}$ < .05.

Overall, psychological state was moderated by social physique anxiety, for SPA had a main effect on five of the six dependent variables, however, this effect did not interact with time or condition. Thus, neither the exercise manipulation nor the exercise setting had any effect on the group differences. For a complete list of means and standard deviations for psychological states by SPA group for the aerobics condition and the cardiovascular & weight training condition, see Tables 5 and 6 at the end of the chapter.

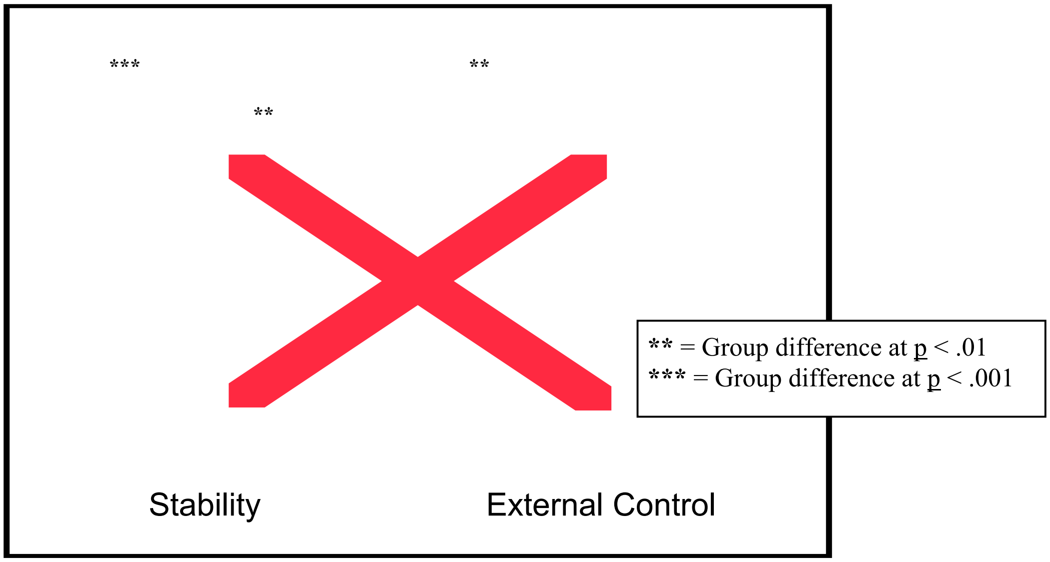
Confidence. The hypothesis was tested using a 2 Group (low Conf, high Conf) x 2 Condition (Aero, CWT) x 2 Time (pre, post) MANOVA where Groups were determined by a median split of confidence, and the variables included positive affect, negative affect, anxiety, positive well-being, psychological distress, and fatigue. Overall, the Group x Condition x Time interaction was not significant, $\underline{F}$ (6,163) = .300, $\underline{p}$ > .90. Two of the 2-way interactions were not significant, Condition x Time, $\underline{F}$ (6,163) = .798, $\underline{p}$ > .55, Group x Time, $\underline{F}$ (6,163) = .703, $\underline{p}$ > .60. However, the Group x Condition, $\underline{F}$ (6,163) = 2.089, $\underline{p}$ = .057, approached significance, but none of the univariate effects were significant.

Overall, post-exercise mood was not moderated by confidence. For a complete list of means and standard deviations for psychological states by confidence group for the aerobics condition and the cardiovascular & weight training condition, see Tables 7 and 8 at the end of the chapter.

Hypothesis 2. Post-exercise mastery will be associated with differences in attributions that suggest a self-serving bias in both exercise conditions.

Attributions. The hypothesis was tested using a 2 Group (low Mastery, high Mastery) x 2 Condition (Aero, CWT) MANOVA where Groups were determined by a median split of post-exercise mastery, and the variables included locus of causality, stability, external control, and personal control. Overall, there was a significant Group x Condition interaction, $\underline{F}$ (4,178) = 3.740, $\underline{p} < .01$. Significant univariate interactions of Group x Condition were found for stability, $\underline{F}$ (1,181) = 4.714, $\underline{p} < .05$, and external control, $\underline{F}$ (1,181) = 9.647, $\underline{p} < .01$. See Figure 9.

Figure 9. Attribution scores by Mastery Group by Condition

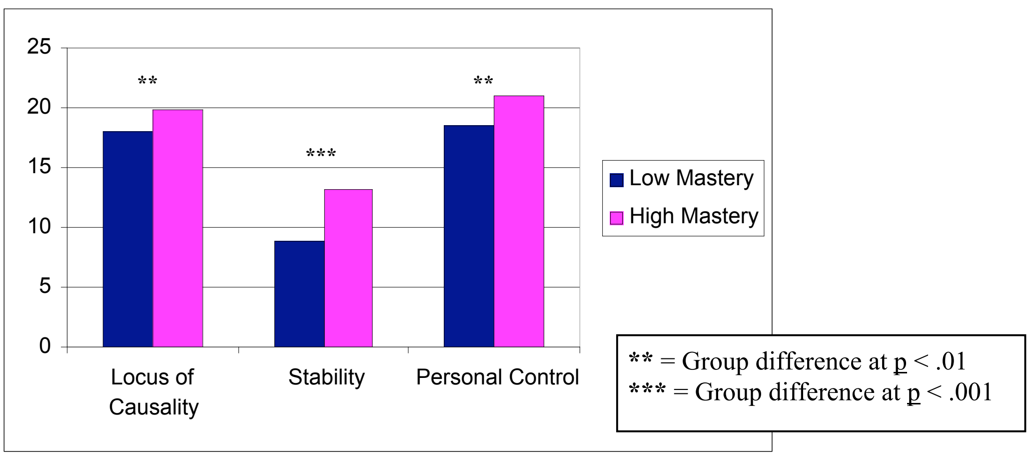


Both conditions reported significant differences in stability between mastery groups such that high mastery participants made more stable attributions than low mastery participants, aerobics, F (1,109) = 37.726, $p < .001$, and CWT, F (1,79) = 7.663, $p < .01$. However, for external control, only the aerobics condition had significant group differences, F (1,107) = 10.393, $p < .01$.

The overall main effects were also significant for both exercise Condition, F (4,178) = 4.637, $p = .001$, and mastery Group, F (4,178) = 9.271, $p < .001$. Significant univariate effects for Condition were only found for external control, F (1,181) = 7.229, $p < .01$, ES=.36; while significant univariate effects for mastery Group existed for locus of causality, F (1,181) = 6.773, $p = .01$, ES=.35, stability, F (1,181) = 30.913, $p < .001$, ES=.90, and personal control, F (1,181) = 8.904, $p < .01$, ES=.44.

The univariate effect of Condition on external control indicates that aerobics participants attributed the outcome to something “over which others have control” while CWT participants attributed the outcome to something “other people cannot regulate.” This difference is likely a function of the structure of the aerobics class being teacher led while the CWT class is based on students performing individual, unique workouts on their own. The univariate effects of mastery Group on locus of causality, stability, and personal control clearly indicate a self-serving bias. See Figure 10 for significant differences between conditions for attribution.

Figure 10. Attribution scores by Mastery Group collapsed for Condition



The high mastery participants, regardless of Condition, made attributions about their exercise performance that were “internal,” “permanent,” and “manageable by the individual” while low mastery participants made attributions that were “external,” “temporary,” and “unable to regulate.”

Hypothesis 2a. The differences in attribution will moderate the relationship between mastery and post-exercise psychological states in both exercise conditions.

Attribution. The assumption was tested using a 2 Group (low Mastery, high Mastery) x 2 Group (low Stability, high Stability) MANOVA where Groups were determined by a median split of post-exercise mastery and stability, and the variables included positive affect, negative affect, anxiety, positive well-being, psychological distress, and fatigue. Stability was chosen as the measure of attribution because it was a significant variable in the previous analyses and the literature supports the strength of the stability dimension as it relates to affect (McAuley and Duncan, 1990). The overall interaction of mastery Group x stability Group x Time was not significant, F (6,164) = .824, $p > .50$. In addition, the 2-way interaction of mastery Group and stability Group was also non-significant, F (6,164) = 1.164, $p > .30$. The main effect of stability on post-exercise mood also failed to reach the level of significance, F (6,164) = 1.788, $p > .10$. Thus, it appears that attribution failed to impact post-exercise mood either directly or through an interaction with mastery. For a complete list of means and standard deviations for psychological states by stability group for the aerobics condition and the cardiovascular & weight training condition, see Tables 9 and 10 at the end of the chapter. However, because stability was the most consistent predictor of a self-serving bias here and in previous literature based in sport and exercise, the proposed model will be limited to the stability dimension of causal attribution as a predictor of post exercise mood.

Hypothesis 3. Specific exercise self-efficacy (confidence) will be associated with differences in attribution that suggest a self-serving bias in both exercise conditions.

Confidence. The assumption was tested using a 2 Group (low Confidence, high Confidence) MANOVA where Groups were determined by a median split of confidence, and the variables included locus of causality, stability, external control, and personal control. The hypothesis was not supported because the multivariate effect was not significant F (4,179) = 1.201, $p > .30$.

Hypothesis 4. Post-exercise mastery will be predicted by social physique anxiety, self-efficacy, and pre-exercise mood in both exercise conditions.

SPA and Confidence Regression. Because no significant differences existed between exercise conditions for either SPA or confidence, the results will be collapsed for condition. The assumption was tested using a regression analysis. Using variables in their original, continuous metric, SPA and Confidence were regressed onto mastery. Results were significant, F (1,185) = 16.108, $p < .001$, where Confidence, □ = .890, $p < .001$, was found to be significant predictors of post-exercise mastery. Confidence explained 8% of the variance in mastery as $R^2 = .080$. SPA was not found to be a significant predictor of post-exercise mastery, □ = -.054, $p > .40$. Table 11 shows the correlations between the regression variables.

Table 11. Correlations for regressions – Total Sample

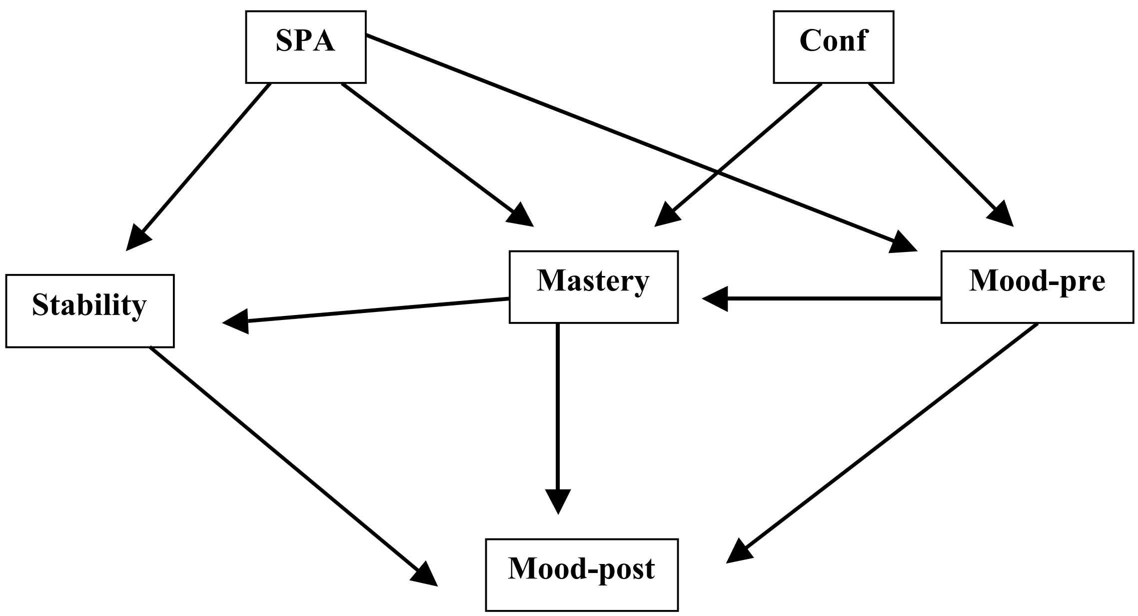
Mastery	1.000		
SPA	-.093	1.000	
Confidence	.283***	-.139*	1.000

* $\underline{p} < .05$
*** $\underline{p} < .001$

Hypothesis 5. The overall model of the mastery hypothesis will be supported through structural equation modeling in both exercise conditions for all indicators of mood.

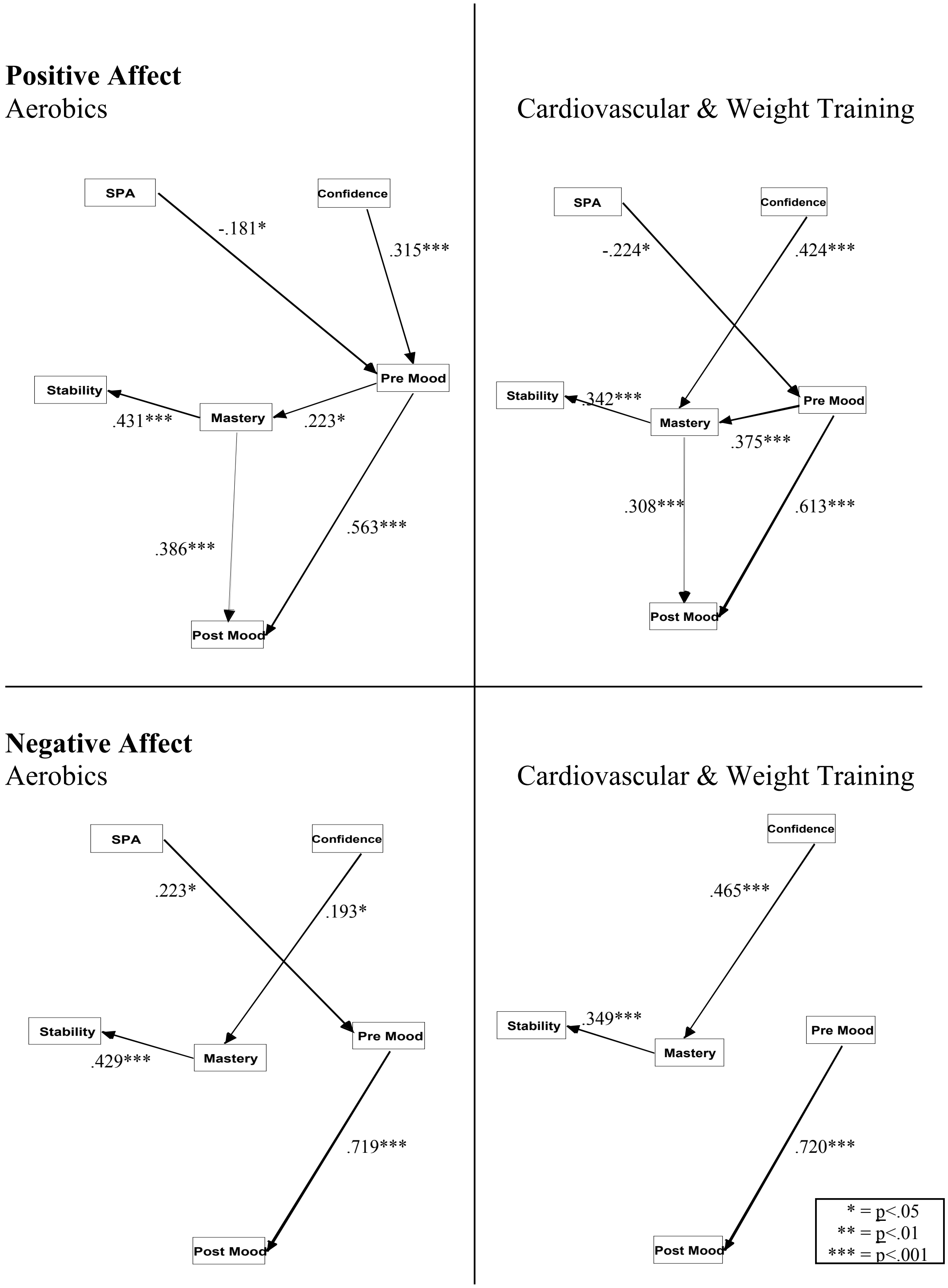
Previous research highlighted several significant relationships amongst social physique anxiety, self-efficacy, pre-exercise mood, mastery, and post-exercise mood. See Tables 11 and 12 at the end of the chapter for correlation tables of all model variables. The relationships suggested an overall model of post-exercise psychological state. See Figure 8 for the original model of the Mastery Hypothesis that was derived from the pilot data. A comparison of the fit indices for all original and trimmed models is shown in Tables 13 and 14 at the end of the chapter. All original path diagrams are included in the appendix while trimmed models, with only significant paths shown, will be presented, by exercise condition, in text.

Figure 11. Original model of the Mastery Hypothesis



Data were entered into the original model (See Figure 11) and then non-significant paths were trimmed until all remaining paths were significant at $p < .05$. Because the analysis provided several indices of fit, the present study will be limited to the chi-square statistic (χ^2), the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean square error of approximation (RMSEA) as overall measures of model fit. For the chi-square statistic, a good fit was indicative of a small chi-square value relative to degrees of freedom which results in a $p > .05$. Other indices of fit, CFI and TLI, greater than .90 indicated acceptable fit while indices greater than .95 were considered a close fit. A RMSEA index below .08 indicates good fit. Figure 12 shows a comparison of the trimmed models for positive affect and negative affect by exercise condition.

Figure 12. Path analysis models for PA and NA by exercise condition



The Aerobics Positive Affect model only showed a moderately acceptable fit, χ^2 (9) = 17.927, $p < .05$, CFI = .932, TLI = .841, and RMSEA = .088. The model explained 56.3% of the variance in post-exercise positive affect. The CWT Positive Affect model showed a very good fit, χ^2 (9) = 5.002, $p > .80$, CFI = 1.000, TLI = 1.087, and RMSEA = .000, and explained 61.2% of the variance in post-exercise mood. The trimmed models differed slightly in that confidence served as a predictor of mastery for the Aerobics model but a predictor of pre-exercise PA for the Cardiovascular & Weight Training model. Beta weights for the significant paths were of similar magnitude between conditions and mastery remained as a predictor of post-exercise positive affect even with the presence of the stability path from pre-exercise positive affect. The Aerobics Negative Affect model showed a very good fit, χ^2 (11) = 11.198, $p > .40$, CFI = .998, TLI = .996, and RMSEA = .012, and it explained 51.7% of the variance in post-exercise mood. The CWT Negative Affect model also showed a very good fit, χ^2 (7) = 3.701, $p > .60$, CFI = 1.000, TLI = 1.044, and RMSEA = .000, explaining 51.8% of the variance. Again, the trimmed models differed slightly as SPA was a predictor of pre-exercise negative affect in the Aerobics condition and it completely dropped out of the model in the Cardiovascular & Weight Training condition. The two Negative Affect models were similar to each other in that the only direct predictor of post-exercise NA is pre-exercise NA. The major difference between the Negative Affect and the Positive Affect models is the impact of Mastery on post-exercise psychological state, for Mastery has no impact on post-exercise NA in either condition. See Figure 13 for the trimmed models for Anxiety by exercise condition.

Figure 13. Path analysis models for State Anxiety by exercise condition

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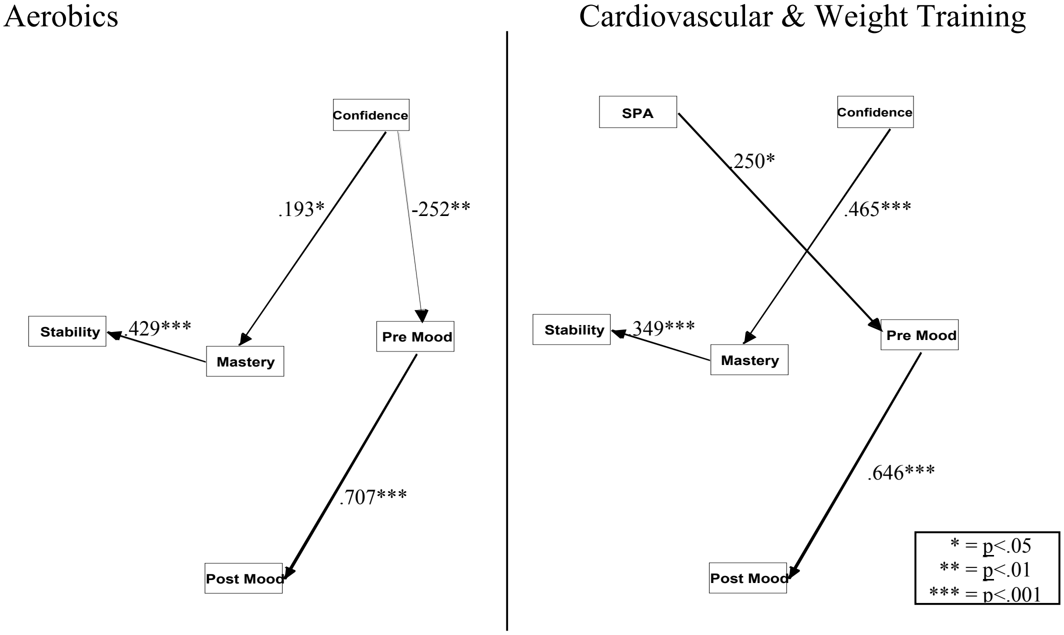
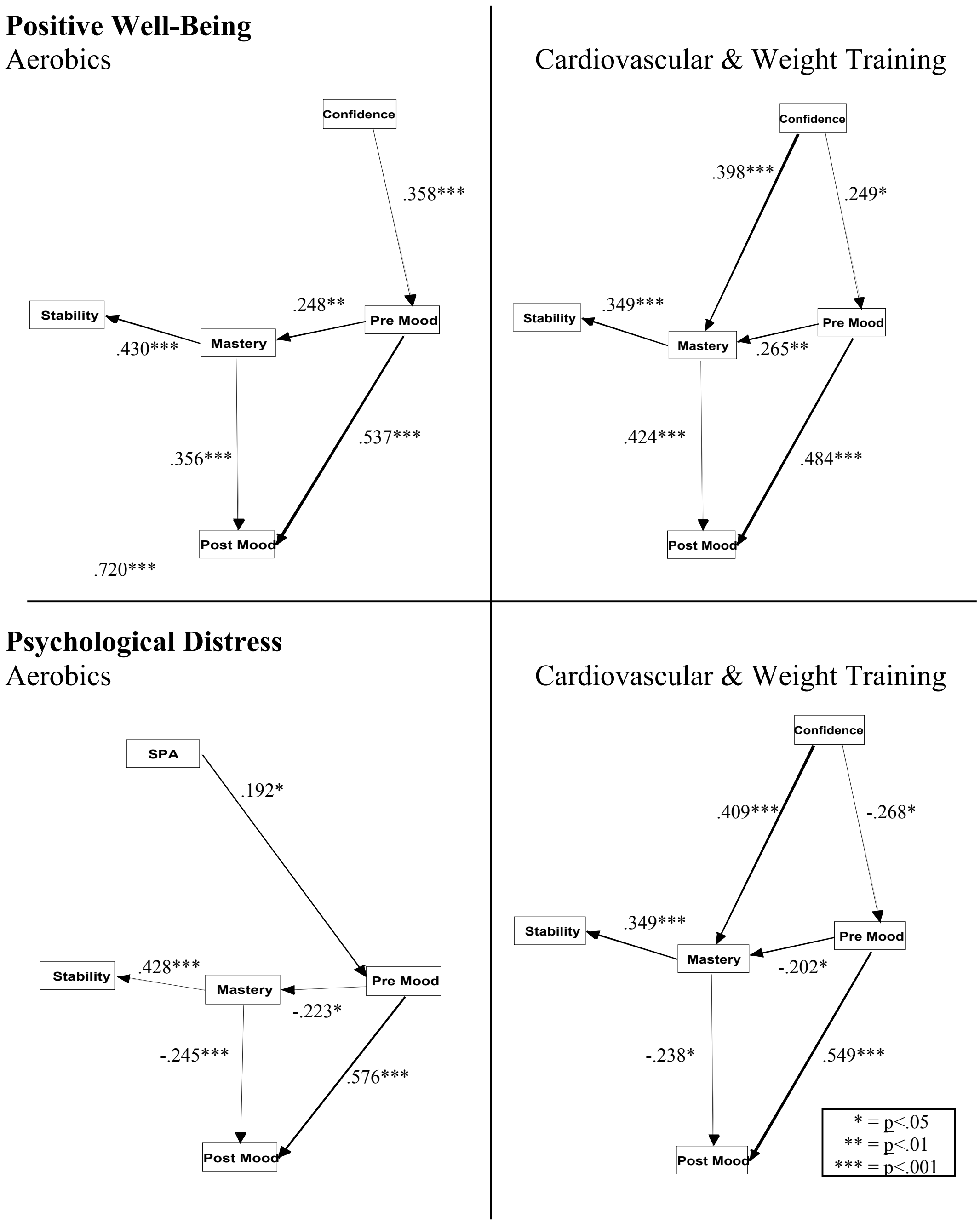
Aerobics | Cardiovascular & Weight Training



The Aerobics State Anxiety model only showed an excellent fit, χ^2 (6) = 6.695, p > .30, CFI = .990, TLI = .976, and RMSEA = .035, explaining 50% of the variance in mood. While the CWT State Anxiety model showed a good fit, χ^2 (11) = 8.552, p > .65, CFI = 1.000, TLI = 1.072, and RMSEA = .000, explaining 41.7% of the variance in post-exercise mood. The two State Anxiety models differed in the strength of SPA and Confidence to predict pre-exercise mood and Mastery. The models were similar to the Negative Affect models with pre-exercise mood not having a significant impact on Mastery and Mastery failed to impact post-exercise State Anxiety. See Figure 14 for the trimmed models of Positive Well-Being and Psychological Distress by exercise condition.

Figure 14. Path analysis models for Positive Well-Being and Psychological Distress by exercise condition.

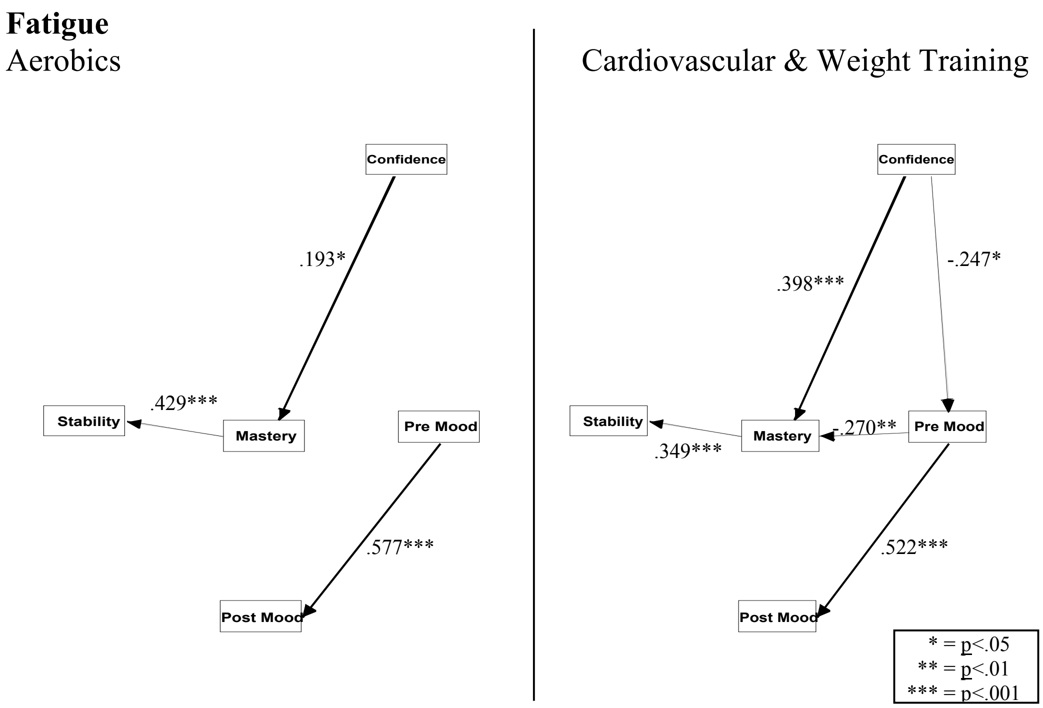


The Aerobics Positive Well-Being model showed a good fit, $\chi^2 (5) = 8.343$, $p > .10$, CFI = .971, TLI = .914, and RMSEA = .072. The model explained 51.1% of the variance in post-exercise positive well-being. While the CWT Positive Well-Being model also showed a good fit, $\chi^2 (4) = 3.579$, $p > .45$, CFI = 1.000, TLI = 1.017, and RMSEA = .000, and it explained 56.3% of the variance in mood. The trimmed models differed slightly in that confidence served only as a predictor of pre-exercise Positive Well-Being for the Aerobics model while it was a significant predictor of both pre-exercise Positive Well-Being and Mastery for the Cardiovascular & Weight Training model. Beta weights for the significant paths were all of similar magnitude between conditions and mastery remained as a predictor of post-exercise Positive Well-Being even with the presence of the stability path from pre-exercise Positive Well-Being. The Aerobics Psychological Distress model showed a good fit, $\chi^2 (5) = 6.192$, $p > .25$, CFI = .986, TLI = .958, and RMSEA = .043. It explained 45.4% of the variance in psychological distress. The CWT Psychological Distress model showed an acceptable fit, $\chi^2 (4) = 6.774$, $p > .10$, CFI = .964, TLI = .865, and RMSEA = .081, explaining 43.9% of the variance.

Again, the trimmed models differed slightly as SPA was a predictor of pre-exercise Psychological Distress in the Aerobics condition and it completely dropped out of the model in the Cardiovascular & Weight Training condition. Confidence dropped out of the Aerobics model, but it remained as a significant predictor of both pre-exercise Psychological Distress and Mastery in the Cardiovascular & Weight

Training model. The two Psychological Distress models were similar to each other in that pre-exercise mood predicted both Mastery and post-exercise mood, and Mastery remained as a significant predictor of post-exercise Psychological Distress even with the presence of the stability path from pre-exercise Psychological Distress. See Figure 15 for the trimmed models for Fatigue by exercise condition.

Figure 15. Path analysis models for Fatigue by exercise condition



The Aerobics Fatigue model only showed a good fit, χ^2 (7) = 4.134, p > .75, CFI = 1.000, TLI = 1.101, and RMSEA = .000. However, the model explained only 33.3% of the variance in post-exercise fatigue. The CWT Fatigue model showed a good fit, χ^2 (5) = 2.320, p > .80, CFI = 1.000, TLI = 1.147, and RMSEA = .000, and explained only 27.2% of the variance in mood. The two Fatigue models differed in the strength of Confidence as a predictor as it predicted only Mastery in the Aerobics model and it predicted both Mastery and pre-exercise Fatigue in the Cardiovascular & Weight Training model. In the Pre-exercise Fatigue was the only predictor of post-exercise Fatigue in both models, but pre-exercise Fatigue was also a significant predictor of Mastery in the CWT model. Mastery failed to have a significant impact on post-exercise Fatigue in either model.

Table 3. Means and standard deviations for psychological states pre and post-exercise by mastery group for aerobics class (low mastery n=57, high mastery n=44)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low Mastery	24.53 (7.67)	27.91 (7.36)
High Mastery	26.64 (7.97)	34.80 (7.46)
Total	25.45 (7.83)	30.91 (8.13)
Negative Affect		
Low Mastery	12.93 (3.23)	11.26 (2.15)
High Mastery	15.30 (6.33)	12.25 (4.12)
Total	13.96 (4.95)	11.69 (3.18)
Anxiety		
Low Mastery	17.88 (5.13)	15.88 (4.01)
High Mastery	19.80 (5.99)	16.30 (5.23)
Total	18.71 (5.58)	16.06 (4.56)
Positive Well Being		
Low Mastery	15.23 (4.98)	17.32 (4.36)
High Mastery	16.75 (4.62)	20.50 (4.71)
Total	15.89 (4.86)	18.70 (4.77)
Psychological Distress		
Low Mastery	9.04 (5.44)	6.46 (3.39)
High Mastery	9.34 (5.59)	5.82 (2.81)
Total	9.17 (5.59)	6.18 (3.15)
Fatigue		
Low Mastery	14.70 (6.90)	10.72 (5.13)
High Mastery	15.27 (7.26)	10.77 (4.95)
Total	14.95 (7.03)	10.74 (5.02)

Table 4. Means and standard deviations for psychological states pre and post-exercise by mastery group for cardio weight training (low mastery n=33, high mastery n=39)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low Mastery	22.82 (6.85)	26.03 (6.98)
High Mastery	29.08 (7.04)	34.26 (6.71)
Total	26.21 (7.58)	30.49 (7.94)
Negative Affect		
Low Mastery	15.24 (4.61)	13.30 (3.30)
High Mastery	13.26 (4.00)	11.64 (2.69)
Total	14.17 (4.38)	12.40 (3.08)
Anxiety		
Low Mastery	19.85 (5.41)	17.33 (4.07)
High Mastery	16.15 (4.92)	15.36 (3.27)
Total	17.85 (5.44)	16.26 (3.77)
Positive Well Being		
Low Mastery	14.00 (4.15)	16.18 (3.85)
High Mastery	18.31 (3.28)	20.90 (3.31)
Total	16.33 (4.27)	18.74 (4.26)
Psychological Distress		
Low Mastery	9.58 (4.91)	7.12 (3.94)
High Mastery	5.85 (2.08)	4.90 (1.54)
Total	7.56 (4.08)	5.92 (3.08)
Fatigue		
Low Mastery	16.67 (6.74)	11.85 (6.61)
High Mastery	10.36 (4.37)	9.95 (5.14)
Total	13.25 (6.38)	10.82 (5.89)

Table 5. Means and standard deviations for psychological states pre and post-exercise by SPA group for aerobics class (low SPA n=52, high SPA n=47)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low SPA	26.52 (7.36)	32.67 (7.32)
High SPA	24.09 (8.27)	28.87 (8.73)
Total	25.36 (7.86)	30.87 (8.20)
Negative Affect		
Low SPA	13.40 (3.18)	11.04 (2.10)
High SPA	14.70 (6.37)	12.45 (3.99)
Total	14.02 (4.98)	11.71 (3.21)
Anxiety		
Low SPA	18.15 (5.34)	15.10 (4.01)
High SPA	19.34 (5.91)	17.09 (4.87)
Total	18.72 (5.62)	16.04 (4.53)
Positive Well Being		
Low SPA	16.06 (4.76)	19.60 (4.69)
High SPA	15.62 (5.03)	17.89 (4.77)
Total	15.85 (4.87)	18.79 (4.78)
Psychological Distress		
Low SPA	8.56 (5.03)	5.63 (2.72)
High SPA	10.02 (6.15)	6.87 (3.52)
Total	9.25 (5.61)	6.22 (3.17)
Fatigue		
Low SPA	14.71 (6.66)	10.67 (4.89)
High SPA	15.36 (7.56)	10.96 (5.25)
Total	15.02 (7.07)	10.81 (5.04)

Table 6. Means and standard deviations for psychological states pre and post-exercise by SPA group for cardiovascular & weight training (low mastery n=33, high mastery n=39)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low SPA	27.53 (7.13)	32.42 (6.23)
High SPA	24.89 (7.89)	28.56 (9.03)
Total	26.21 (7.58)	30.49 (7.94)
Negative Affect		
Low SPA	13.56 (4.17)	11.94 (2.97)
High SPA	14.78 (4.55)	12.86 (3.16)
Total	14.17 (4.38)	12.40 (3.08)
Anxiety		
Low SPA	17.00 (5.64)	15.58 (3.52)
High SPA	18.69 (5.16)	16.94 (3.93)
Total	17.85 (5.44)	16.26 (3.77)
Positive Well Being		
Low SPA	16.81 (4.36)	19.81 (3.74)
High SPA	15.86 (4.18)	17.67 (4.53)
Total	16.33 (4.27)	18.74 (4.26)
Psychological Distress		
Low SPA	7.17 (3.64)	5.28 (2.12)
High SPA	7.94 (4.50)	6.56 (3.74)
Total	7.56 (4.08)	5.92 (3.08)
Fatigue		
Low SPA	13.00 (6.56)	10.67 (5.90)
High SPA	13.50 (6.28)	10.97 (5.97)
Total	13.25 (6.38)	10.82 (5.89)

Table 7. Means and standard deviations for psychological states pre and post-exercise by specific exercise self-efficacy group for aerobics class (low self-efficacy n=68, high self-efficacy n=33)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low Confidence	23.78 (7.19)	29.49 (7.75)
High Confidence	28.88 (8.07)	33.85 (8.21)
Total	28.45 (7.83)	30.91 (8.13)
Negative Affect		
Low Confidence	14.26 (5.20)	11.69 (2.50)
High Confidence	13.33 (4.39)	11.70 (4.30)
Total	13.96 (4.95)	11.69 (3.18)
Anxiety		
Low Confidence	19.51 (4.96)	16.50 (4.03)
High Confidence	17.06 (6.44)	15.15 (5.46)
Total	18.71 (5.58)	16.06 (4.56)
Positive Well Being		
Low Confidence	15.07 (4.58)	17.88 (4.41)
High Confidence	17.58 (5.07)	20.39 (5.09)
Total	15.89 (4.86)	18.70 (4.77)
Psychological Distress		
Low Confidence	9.62 (5.34)	6.43 (3.31)
High Confidence	8.24 (6.05)	5.67 (2.77)
Total	9.17 (5.59)	6.18 (3.15)
Fatigue		
Low Confidence	15.22 (6.81)	10.49 (5.10)
High Confidence	14.39 (7.54)	11.27 (4.90)
Total	14.95 (7.03)	10.74 (5.02)

Table 8. Means and standard deviations for psychological states pre and post-exercise by specific exercise self-efficacy (confidence) group for cardiovascular & weight training class (low confidence n=50, high confidence n=21)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low Confidence	26.20 (7.94)	30.16 (8.47)
High Confidence	26.24 (7.06)	31.43 (6.82)
Total	26.21 (7.64)	30.54 (7.99)
Negative Affect		
Low Confidence	14.52 (4.57)	12.64 (3.13)
High Confidence	13.24 (3.94)	11.86 (3.02)
Total	14.14 (4.40)	12.41 (3.10)
Anxiety		
Low Confidence	18.14 (5.53)	16.40 (3.91)
High Confidence	17.00 (5.34)	15.95 (3.57)
Total	17.80 (5.46)	16.27 (3.79)
Positive Well Being		
Low Confidence	15.84 (4.14)	18.24 (4.48)
High Confidence	17.52 (4.52)	19.95 (3.61)
Total	16.34 (4.30)	18.75 (4.29)
Psychological Distress		
Low Confidence	8.00 (3.94)	6.44 (3.51)
High Confidence	6.52 (4.42)	4.62 (1.07)
Total	7.56 (4.11)	5.90 (3.10)
Fatigue		
Low Confidence	14.26 (6.38)	11.56 (6.06)
High Confidence	11.00 (6.04)	9.10 (5.37)
Total	13.30 (6.41)	10.83 (5.94)

Table 9. Means and standard deviations for psychological states pre and post-exercise by stability group for aerobics (low stability n=55, high stability n=54)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low Stability	25.09 (7.54)	29.36 (7.24)
High Stability	26.06 (7.90)	32.40 (8.88)
Total	25.58 (7.70)	30.88 (8.21)
Negative Affect		
Low Stability	13.91 (4.06)	11.60 (2.61)
High Stability	14.26 (5.82)	11.96 (3.69)
Total	14.08 (4.99)	11.78 (3.18)
Anxiety		
Low Stability	18.64 (5.74)	16.15 (4.64)
High Stability	19.04 (5.86)	16.30 (4.87)
Total	18.84 (5.78)	16.22 (4.74)
Positive Well Being		
Low Stability	15.04 (4.54)	17.41 (4.64)
High Stability	16.89 (4.94)	19.73 (5.17)
Total	15.97 (4.82)	18.58 (5.03)
Psychological Distress		
Low Stability	9.09 (5.22)	6.19 (3.02)
High Stability	9.09 (5.76)	6.24 (3.35)
Total	9.09 (5.48)	6.21 (3.18)
Fatigue		
Low Stability	15.39 (6.97)	11.07 (4.94)
High Stability	14.45 (6.90)	10.64 (5.34)
Total	14.93 (6.92)	10.86 (5.13)

Table 10. Means and standard deviations for psychological states pre and post-exercise by stability group for cardio weight training (low stability n=43, high stability n=36)

	Pre	20 minutes post
	M (SD)	M (SD)
Positive Affect		
Low Stability	25.67 (8.00)	30.53 (8.25)
High Stability	26.36 (6.99)	30.78 (7.14)
Total	25.99 (7.51)	30.65 (7.72)
Negative Affect		
Low Stability	14.11 (3.64)	12.50 (3.11)
High Stability	14.22 (5.10)	12.27 (2.93)
Total	14.16 (4.34)	12.40 (3.02)
Anxiety		
Low Stability	17.07 (5.21)	16.37 (4.10)
High Stability	19.03 (5.47)	16.54 (3.33)
Total	17.95 (5.38)	16.45 (3.75)
Positive Well Being		
Low Stability	16.16 (4.16)	18.70 (4.76)
High Stability	16.46 (4.25)	18.71 (3.54)
Total	16.29 (4.18)	18.71 (4.23)
Psychological Distress		
Low Stability	7.02 (3.45)	5.79 (2.98)
High Stability	8.06 (4.62)	5.94 (3.09)
Total	7.49 (4.03)	5.86 (3.01)
Fatigue		
Low Stability	13.09 (6.56)	10.67 (6.49)
High Stability	13.31 (6.35)	10.26 (4.88)
Total	13.19 (6.43)	10.49 (5.79)

Table 12. Correlation Table – Aerobics Classes

	Mastery	SPA	SE	Conf	Stability	PA-pre	NA-pre	STAI-pre	POSWB-pre	PSYCH-pre	Fatigue-pre
Mastery	1.000										
SPA	-.052	1.000									
SE	-.111	.104	1.000								
Conf	.194*	-.188	.184	1.000							
Stability	.429**	-.124	.041	.124	1.000						
PA-pre	.220*	-.242*	.075	.345**	.145	1.000					
NA-pre	-.006	.228*	.013	-.147	.065	-.232	1.000				
STAI-pre	.104	.167	.055	-.260**	.097	-.421**	.684**	1.000			
POSWB-pre	.248**	-.194*	.098	.358**	.249**	.720**	-.222*	-.423**	1.000		
PSYCH-pre	-.201*	.217*	.047	-.151	.029	-.458**	.465**	.416**	-.513**	1.000	
Fatigue-pre	-.123	.157	.111	.053	.072	-.560**	.410**	.457**	-.483**	.639**	1.000

* = p < .05, ** = p < .01

Table 13. Correlation Table – Cardiovascular & Weight Training Classes

	Mastery	SPA	SE	Conf	Stability	PA-pre	NA-pre	STAI-pre	POSWB-pre	PSYCH-pre	Fatigue-pre
Mastery	1.000										
SPA	-.148	1.000									
SE	.253*	-.070	1.000								
Conf	.468**	-.073	.387**	1.000							
Stability	.349**	.000	.154	.067	1.000						
PA-pre	.423**	-.228*	.084	.134	.110	1.000					
NA-pre	-.141	.189	-.181	-.108	-.027	-.285**	1.000				
STAI-pre	.179	.248*	-.109	-.114	.078	-.340**	.763**	1.000			
POSWB-pre	.379**	-.167	.176	.253*	.074	.665**	-.404**	-.450**	1.000		
PSYCH-pre	-.315**	.180	-.224*	-.276*	.100	-.441**	.595**	.641**	-.571**	1.000	
Fatigue-pre	-.381**	.124	-.173	-.253*	-.033	-.423**	.362**	.564**	-.471**	.684**	1.000

* = $p < .05$, ** = $p < .01$

Table 14. Aerobics Class: Comparison of Goodness of Fit Statistics for Original and Trimmed Models

Model	χ^2	**df**	**p**	$\Delta\chi^2$	Δ**df**	**CFI**	**NFI**	**TLI**	**RMSEA**
Positive Affect – Original	14.681	5	.012			.926	.903	.690	.123
Positive Affect – Trimmed	17.927	9	.036	3.246	4	.932	.882	.841	.088
Negative Affect – Original	6.735	5	.241			.983	.945	.929	.052
Negative Affect – Trimmed	11.198	11	.427	4.463	6	.998	.909	.996	.012
Anxiety – Original	5.729	5	.334			.993	.954	.970	.034
Anxiety – Trimmed	6.965	6	.324	1.236	1	.990	.940	.976	.035
Positive Well-being – Original	14.646	5	.012			.921	.897	.667	.122
Positive Well-being – Trimmed	8.343	5	.138	-6.646	0	.971	.936	.914	.072
Psychological Distress – Original	7.818	5	.167			.969	.929	.868	.066
Psychological Distress – Trimmed	6.192	5	.288	-1.626	0	.986	.939	.958	.043
Fatigue – Original	4.652	5	.460			1.000	.944	1.023	.000
Fatigue – Trimmed	4.134	7	.764	-0.518	2	1.000	.945	1.101	.000

Table 15. Cardiovascular and Weight Training: Comparison of Goodness of Fit Statistics for Original and Trimmed Models

Model	χ^2	**df**	**p**	$\Delta\chi^2$	**Δdf**	**CFI**	**NFI**	**TLI**	**RMSEA**
Positive Affect – Original	2.463	5	.782			1.000	.981	1.100	.000
Positive Affect – Trimmed	5.002	9	.834	2.539	4	1.000	.961	1.087	.000
Negative Affect – Original	1.686	5	.891			1.000	.983	1.181	.000
Negative Affect – Trimmed	5.387	7	.613	3.701	2	1.000	.942	1.044	.000
Anxiety – Original	3.015	5	.698			1.000	.965	1.129	.000
Anxiety – Trimmed	8.552	11	.663	5.537	6	1.000	.900	1.072	.000
Positive Well-being – Original	5.833	5	.323			.991	.950	.964	.040
Positive Well-being – Trimmed	3.579	4	.466	-2.304	-1	1.000	.968	1.017	.000
Psychological Distress – Original	8.246	5	.143			.957	.915	.821	.078
Psychological Distress – Trimmed	6.774	4	.148	-1.472	-1	.964	.926	.865	.081
Fatigue – Original	3.728	5	.589			1.000	.949	1.102	.000
Fatigue – Trimmed	2.320	5	.803	-1.408	0	1.000	.967	1.147	.000

CHAPTER V

DISCUSSION

In general, many of the benefits of exercise, like improvements in cardiovascular health and decreased weight, tend to be long term in nature while many of the costs of exercise, like sore muscles and loss of free time, are short term. One exception to the short-term cost and long-term benefit dilemma is the improvements in mood generally experienced immediately after exercise. Following an acute bout of exercise, negatively valenced mood states (i.e., negative affect, tension, psychological distress, state anxiety, etc.) generally decrease while positively valenced mood states (i.e., positive affect, energy, positive well-being, etc.) generally increase. Maximizing the short term positive effects of exercise, in the form of mood, could serve to override the many short term costs of exercise which, in the long-term, serve to increase exercise adherence and, with it, improve overall health.

As a result, the purpose of this dissertation was to determine factors that might contribute to the magnitude of mood improvement post-exercise. The specific focus was the extent to which social physique anxiety and attributional style influence perceived exercise mastery and post-exercise psychological states. This dissertation was conducted to expand on previous research by addressing specific limitations of earlier studies. A multidimensional measure of mastery, additional, more robust, measures of affect, the measurement of exercise specific self-efficacy in the form of confidence, and the utilization of a diverse exercise sample all serve to broaden the impact of the research findings and increase generalizability of the results. The discussion will be organized as follows: first, variability of the psychological responses between exercise conditions; second, simple relationships between dispositional measures and mastery; third, path analysis of the overall mastery model, looking at predictors of mastery and predictors of mood; and fourth, conclusions and summary of condition differences.

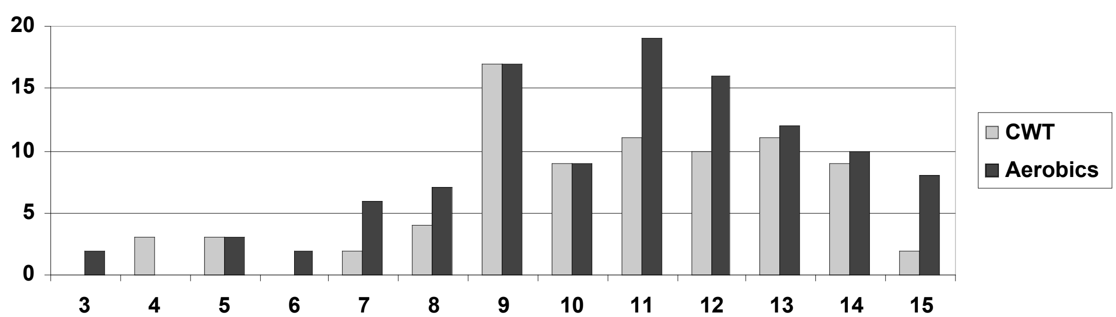
For the individuals participating in the aerobics classes, the Analysis of Variance results replicated the findings of several previous research studies (Bartholomew & Miller, 2002; Miller & Bartholomew, in prep). All participants, regardless of mastery perceptions, reported significant decreases in negatively valenced mood states. However, mastery impacted the magnitude of the positive psychological responses to exercise in such a way that high mastery participants reported significantly greater improvements in positive affect and positive well-being at 20 minutes post-exercise compared to low mastery participants. The continued consistency of these results further supports the importance and moderating effects of mastery on positive psychological states following acute exercise. Interestingly, these effects were not so robust in the cardiovascular weight training classes. Here, there was an overall main effect for Time that was equivalent for the high and low mastery participants. Simple Time x Mastery Group effects were significant for psychological distress and fatigue only. Thus, there appears to be an effect for exercise setting on the mastery-mood relationship.

Results for the 12 path analysis models also demonstrated differences between exercise conditions. The dispositional measures of social physique anxiety and confidence had differing effects on pre-exercise mood and mastery between the aerobics and CWT classes. Confidence generally had a stronger effect on pre-mood and/or mastery in the cardiovascular & weight training classes. This finding was also supported through the regression analysis that found that confidence explained a greater amount of the variance in mastery in the CWT condition compared to the aerobics condition.

Clearly, aerobics classes offer a unique exercise experience. The group of exercisers is led in a synchronized workout routine, and the class is usually located in a large room with mirrors lining at least one of the walls. With each individual executing the same routine in front of mirrors, it is easy to make performance comparisons, conscious or unconscious. This limitation led to the need to test the relationships in a different exercise environment. Cardiovascular & weight training (CWT) classes were selected because they were similar to the aerobics classes in that they were cardiovascular in nature. However, the difference between the two environments lies in both the overall structure and location of the class. The CWT class allows participants to workout individually and independent of the other students in the class in an environment that is nearly void of mirrors. The facility where the CWT classes took place had mirrors, but they were not in close proximity to the cardiovascular exercise equipment. Previous research has shown that performing in front of a mirror (Focht & Hausenblas, 2003) impacts psychological state levels following exercise. Thus, participants in the CWT class were able to exercise without watching themselves in the mirror.

The difference between conditions suggests that something else is driving the relationship between exercise, mastery, and mood. It is possible that the differing results between the aerobic and CWT condition settings is due to the variable amount of cardiovascular exercise performed during the CWT classes as each student determines their exercise regimen. However, the time spent exercising cardiovascularly (vs. lifting weights) was unrelated to the change in mood. Additionally, one might expect this to also produce differences in the distribution of feelings of mastery. However, both CWT and aerobics have similar variability in mastery scores: see Figure 16, but the aerobics mastery scores have a more significant influence on post-exercise mood.

Figure 16. Frequency distribution of mastery scores for cardiovascular & weight training and aerobics.



A separate explanation for the difference between settings lies in the notion that the aerobics class is more of an achievement situation than the cardiovascular and weight training class and this pressure for achievement increases the power and strength of mastery feelings. It is generally believed that 4 basic constructs define an achievement situation: (1) task must be challenging, (2) known standards of success, (3) public verification, and (4) acceptance of responsibility. Given the 4 standards, aerobics classes constitute an achievement situation to a much greater degree than do CWT classes. See Table 16 for a comparison of the exercise environments.

Table 16. Components of an achievement situation

	Aerobics	CWT
Challenge	**X**	**X**
Known standards of success	**X**	
Public verification	**X**	
Acceptance of responsibility	**X**	**X**

Both aerobics and CWT classes provide a challenge, physically and mentally. And, in both exercise conditions, individuals are in a position where they generally accept responsibility for their actions. The major difference between the two exercise environments with regard to achievement situations is the presence of publicly verifiable standards of success. Individuals who participate in an aerobics class perform the identical routine as led by the instructor and this routine is usually executed in front of a mirror. Individuals have the ability to view and monitor the performance of the other class members. Any misstep or wrong move would be obvious to those in the class and anyone else watching which survives the test of public verifiability. In addition, because participants complete identical routines, the bar is set for the standard of success. The nature of the aerobics class and the choreographed routine make the standard of success blatantly obvious and publicly verifiable.

The achievement situation of the aerobics class, thus, drives the weight of the feelings of mastery and the impact of those feelings on post-exercise psychological state. The achievement situation is setting the individual up to make those assessments of success and failure that, in turn, drive their mood states. This interpretation is supported by an examination of the difference in self-serving bias between exercise settings.

The current study demonstrated a relationship between mastery and attributions in a way that supported the presence of a self-serving bias. Overall, high mastery individuals attributed their perceived successes as being more stable and internal. The low mastery individuals attributed their perceived lack of success as being more unstable and external. Interestingly, the magnitude of these effects differed as a function of the exercise setting. The self-serving bias was much greater in the aerobics condition as the difference in reported stability was significantly greater between mastery groups relative to the reported stability in the CWT condition. Clearly, the biased attributions serve an ego-enhancing function in the high mastery individuals and an ego-protecting function in the low mastery individuals, and the aerobics setting elicits an even stronger difference. As a result, the difference in magnitude suggests that participation in aerobic exercise carries with it greater ego relevance. It may be that the public nature and clear criterion of success (instructor's actions) within aerobics classes creates more self-presentational stress and, as a result, a greater need for ego protection than in individual exercise.

Given these effects, it was surprising that the biased attributions had no effect on the resulting mood. It may be that the mood assessment occurred too early to demonstrate these effects. Bartholomew (2001) found strong outcome dependent emotions shortly after completion of exercise, with more subtle effects occurring on at 40 minutes post-exercise. Although the differences in attribution did not moderate the mood enhancing effects of exercise, they may have important effects, particularly for adherence rates. For example, individuals who perceived their exercise bout as less successful and internalized the causes for the failure would be unlikely to return for another exercise session. However, if the low mastery individual can reason that their lack of success is outside of their control or temporary, then they would be more willing to engage in exercise again. Future research should examine the long-term effects of the self-serving bias to determine the extent to which these biases impact adherence.

Overall, confidence had no direct impact on post-exercise psychological state in either exercise environment. These results duplicate the findings of previous research with general exercise self-efficacy (Miller & Bartholomew, in prep). The fact that self-efficacy, generalized or specific, has no impact on mood when mastery does, lends further support the notion that self-efficacy and mastery are theoretically different.

Unlike the pilot study that showed a strong relationship between both social physique anxiety and general exercise self-efficacy, the current study did not find those same relationships. Using both regression and path analysis, social physique anxiety failed to be a significant predictor of mastery in both exercise conditions. However, confidence was shown to be a significant predictor of mastery, but the predictive power of the construct differed between conditions. Regression analysis indicated that confidence explained only 4% of the variance in mastery in the aerobics class while in the cardiovascular & weight training classes, confidence explained 22% of the variance in mastery. Because the aerobics class is instructor led, the individual is not allowed to set and meet individual goals in the same way that an individual could in the CWT condition. Thus, it is possible that confidence and self-efficacy have a greater impact on situations that require an individual to set their own goals to drive their own exercise sessions.

Once the simple effects of the independent variables were identified and narrowed, findings were combined with suggested relationships from the literature into an overall model. The advantage of testing the whole model via path analysis is that the variables remain in their original, continuous metric and the relationships between all variables are analyzed simultaneously. Trimmed models were compared between the exercise conditions for each psychological state measure. Mastery came through as a significant predictor of stability for both conditions explaining 12% of the variance in attribution in the CWT classes and 18% of the variance in the aerobics classes. For positive affect, positive well-being, and psychological distress, mastery was a significant predictor of post-exercise mood state, and this relationship was demonstrated in both exercise conditions. This finding is significant because mastery impacted post-exercise mood over and above the effect of pre-exercise mood. For negative affect, state anxiety, and fatigue, mastery had no effect on the variance in post-exercise mood, and again, these relationships held between both conditions. The effects of social physique anxiety and confidence varied between mood states and conditions without showing a consistent pattern of effect. Thus, it is difficult to draw any strong conclusions from the given findings.

Mastery continues to demonstrate stronger predictive power with positively valenced mood states, which, in this study, included positive affect and positive well-being. Both the simple analysis of variance and the path analysis supported the predictive power of mastery for those positively valenced states. These results support the mastery hypothesis as a theory explaining the differing responses to exercise. Overall, this dissertation has 2 major findings. First, path analysis further strengthened the support for the mastery hypothesis. Second, simple analysis of variance tests showed significant differences between the exercise conditions.

Limitations

First, the study was limited because the samples were comprised of pre-existing intact groups. Even though this increases the generalizability of the findings, the lack of random assignment limits the ability to infer causality. Second, the data was only collected in 2 exercise environments. The two chosen settings were quite different in their structure and environment, but they still represent a limited view of exercise. Third, the study utilized a single indicator of confidence. The use of the one-item measure of confidence was necessary as a validated measure of specific exercise self-efficacy did not exist, however, it does provide a limited view of self-efficacy. Fourth, the use of enjoyment as an indicator of mastery could confound the assessment of positive mood states. Clearly, if someone is experiencing a positive state they are likely to interpret situations as more enjoyable. Thus, the relationship between positive affect and mastery may be due to spurious relationship between the single-item, enjoyment, and positive affect. However, the internal consistency reliability was quite high for the mastery measure, which suggests that there was not a great deal of independent variability due to the enjoyment item. In addition, mastery and positive affect were assessed at different time points, which should reduce the spurious nature of the relationship. Finally, the use of a limited population (females aged 18-35) limits the overall generalizability. However, the use of the limited population maximized any self-presentational concerns in the given exercise settings.

Future Research

Future research should continue to look at the relationship between general exercise self-efficacy, situation specific confidence, and mastery in exercise settings that differ in context, environment, and organization. Expanding the types of exercise environments will strengthen the plausibility of the mastery hypothesis as an explanation for the changes in post-exercise psychological states. It will also be important to test the model using male subjects to determine whether all the significant relationships were just an artifact of gender.

Another future direction is to determine how mastery and self-efficacy/confidence are related to exercise adherence. Given that confidence has a lesser impact on mastery in group exercise settings like aerobics, it may be possible to prescribe group exercise as a way to help build the confidence of an individual before they begin an individual program. As the confidence grows, it would be assumed that mastery would also increase.

APPENDIX A
SUBJECT INFORMATION

Name: ____

Age: _________

Gender: _____Male
_____Female

Height: _____feet _____inches

Weight: ______lbs.

Class Format: Aerobics:
_____Step
_____Sculpting
_____Kickboxing
_____High Impact/Floor
_____Boot Camp/Sports Cond.
_____Circuit Training
_____Other

OR _____Cardio/Weight Training

Time of Class: ____________

Race:
_____White
_____African American
_____Hispanic
_____Asian/Pacific Islander
_____Other

How long have you been a regular exerciser? _____________

Types of Exercise that you currently engage in (check all that apply):
_____Aerobics or Group Exercise Classes
_____Martial Arts/Boxing
_____Weight Training/Resistance Training
_____Hiking/Outdoor Activities
_____Mind-Body Exercise (yoga, tai chi, etc)
_____Spinning/Indoor Cycling
_____Indoor Cardiovascular Equipment (stairmaster, elliptical cross-trainer, rower, etc)
_____Other: ____
_____Running
_____Biking/Cycling
_____Aerobic Walking
_____Swimming
_____Rowing

Current, Average Exercise Routine:
_____More than 5 days/week
_____5 days/week
_____4 days/week
_____3 days/week
_____2 days/week
_____Less than 2 days/week

Average Duration of Current Exercise Routine:
_____ > 80 minutes
_____ 60-80 minutes
_____ 40-60 minutes
_____ 20-40 minutes
_____ < 20 minutes

Using the following scale, rate the Average Intensity of Current Exercise Routine by checking the most appropriate number:

__ 6		__ 11	fairly light	__ 16	
__ 7	very, very light	__ 12		__ 17	very hard
__ 8		__ 13	somewhat hard	__ 18	
__ 9	very light	__ 14		__ 19	very, very hard
__ 10		__ 15	hard		

How long have you been exercising at this level?
_____ > 2 years
_____ 1-2 years
_____ 1 year
_____ 3-6 months
_____ < 3 months

SPA

Instructions: For each item, please indicate the degree to which the statement is characteristic of you.

	Not At All	Slightly	Moderately	Very	Extremely
1. I am comfortable with the appearance of my physique/figure.	1	2	3	4	5
2. I would never worry about wearing clothes that might make me look too thin or overweight.	1	2	3	4	5
3. I wish I wasn't so uptight about my physique/figure.	1	2	3	4	5
4. There are times when I am bothered by thoughts that other people are evaluating my weight or muscular development.	1	2	3	4	5
5. When I look in the mirror, I feel good about my physique/figure.	1	2	3	4	5
6. Unattractive features of my physique/figure make me nervous in certain social settings.	1	2	3	4	5
7. In the presence of others, I feel apprehensive about my physique/figure.	1	2	3	4	5
8. I am comfortable with how fit my body appears to others.	1	2	3	4	5
9. It would make me uncomfortable to know others were evaluating my physique/figure.	1	2	3	4	5
10. When it comes to displaying my physique/figure to others, I am a shy person.	1	2	3	4	5
11. I usually feel relaxed when it is obvious that others are looking at my physique/figure.	1	2	3	4	5
12. When in a bathing suit, I often feel nervous about the shape of my body.	1	2	3	4	5

SEES-pre

By circling a number on the scale next to each of the following items, please indicate the degree to which you are experiencing each feeling *now*, at this point in time, *prior to* exercising.

	Not at all			Moderately			Very much so
1. Great	1	2	3	4	5	6	7
2. Awful	1	2	3	4	5	6	7
3. Drained	1	2	3	4	5	6	7
4. Positive	1	2	3	4	5	6	7
5. Crummy	1	2	3	4	5	6	7
6. Exhausted	1	2	3	4	5	6	7
7. Strong	1	2	3	4	5	6	7
8. Discouraged	1	2	3	4	5	6	7
9. Fatigued	1	2	3	4	5	6	7
10. Terrific	1	2	3	4	5	6	7
11. Miserable	1	2	3	4	5	6	7
12. Tired	1	2	3	4	5	6	7

STAI-pre

A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Not at all	Somewhat	Moderately	Very much
1.	I feel calm	O	O	O	O
2.	I am tense	O	O	O	O
3.	I feel frightened	O	O	O	O
4.	I feel nervous	O	O	O	O
5.	I am relaxed	O	O	O	O
6.	I am worried	O	O	O	O
7.	I feel at ease	O	O	O	O
8.	I am jittery	O	O	O	O
9.	I feel steady	O	O	O	O
10.	I am presently worrying about possible misfortunes	O	O	O	O

PANAS-pre

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel right now, that is, at the present moment. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

1. interested	_____	11. irritable	_____
2. distressed	_____	12. alert	_____
3. excited	_____	13. ashamed	_____
4. upset	_____	14. inspired	_____
5. strong	_____	15. nervous	_____
6. guilty	_____	16. determined	_____
7. scared	_____	17. attentive	_____
8. hostile	_____	18. jittery	_____
9. enthusiastic	_____	19. active	_____
10. proud	_____	20. afraid	_____

____

Think about the exercise bout your are about to participate in. . .

1. Using Borg's RPE scale, what intensity do you expect to maintain during your workout <u>today</u>? *(please check <u>one</u> number between 6 and 19)*

__ 6		__ 11	fairly light	__ 16	
__ 7	very, very light	__ 12		__ 17	very hard
__ 8		__ 13	somewhat hard	__ 18	
__ 9	very light	__ 14		__ 19	very, very hard
__ 10		__ 15	hard		

2. Using the following scale, please circle the number indicating how confident are you that you can meet your exercise goals during your workout <u>today</u>?

Not at all confident		**Somewhat confident**		**Extremely confident**
1	2	3	4	5

SEES-post

By circling a number on the scale next to each of the following items, please indicate the degree to which you are experiencing each feeling *now*, at this point in time, *following* exercise.

	Not at all			Moderately			Very much so
13. Great	1	2	3	4	5	6	7
14. Awful	1	2	3	4	5	6	7
15. Drained	1	2	3	4	5	6	7
16. Positive	1	2	3	4	5	6	7
17. Crummy	1	2	3	4	5	6	7
18. Exhausted	1	2	3	4	5	6	7
19. Strong	1	2	3	4	5	6	7
20. Discouraged	1	2	3	4	5	6	7
21. Fatigued	1	2	3	4	5	6	7
22. Terrific	1	2	3	4	5	6	7
23. Miserable	1	2	3	4	5	6	7
24. Tired	1	2	3	4	5	6	7

STAI-post

A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Not at all	Somewhat	Moderately	Very much
1.	I feel calm	O	O	O	O
2.	I am tense	O	O	O	O
3.	I feel frightened	O	O	O	O
4.	I feel nervous	O	O	O	O
5.	I am relaxed	O	O	O	O
6.	I am worried	O	O	O	O
7.	I feel at ease	O	O	O	O
8.	I am jittery	O	O	O	O
9.	I feel steady	O	O	O	O
10.	I am presently worrying about possible misfortunes	O	O	O	O

PANAS-post

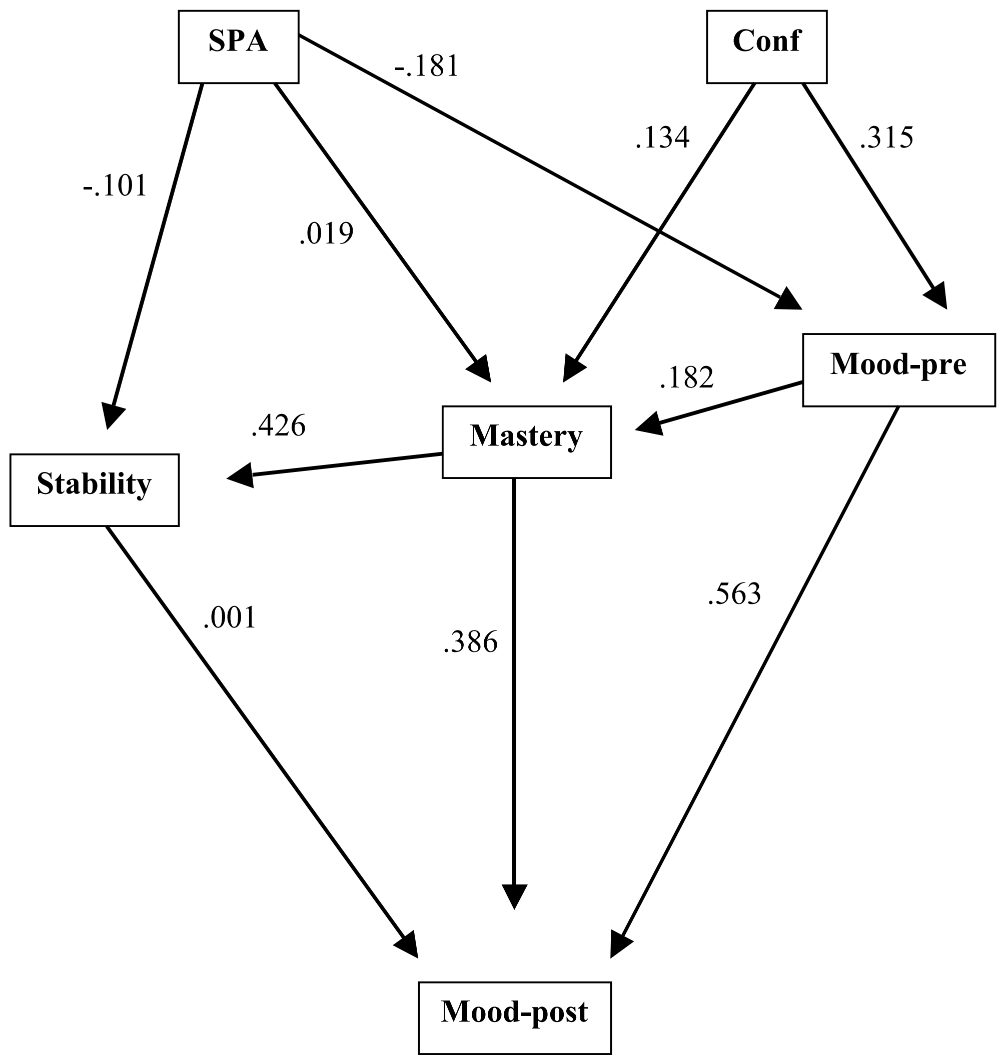
This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel right now, that is, at the present moment. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

1. interested	_____	11. irritable	_____
2. distressed	_____	12. alert	_____
3. excited	_____	13. ashamed	_____
4. upset	_____	14. inspired	_____
5. strong	_____	15. nervous	_____
6. guilty	_____	16. determined	_____
7. scared	_____	17. attentive	_____
8. hostile	_____	18. jittery	_____
9. enthusiastic	_____	19. active	_____
10. proud	_____	20. afraid	_____

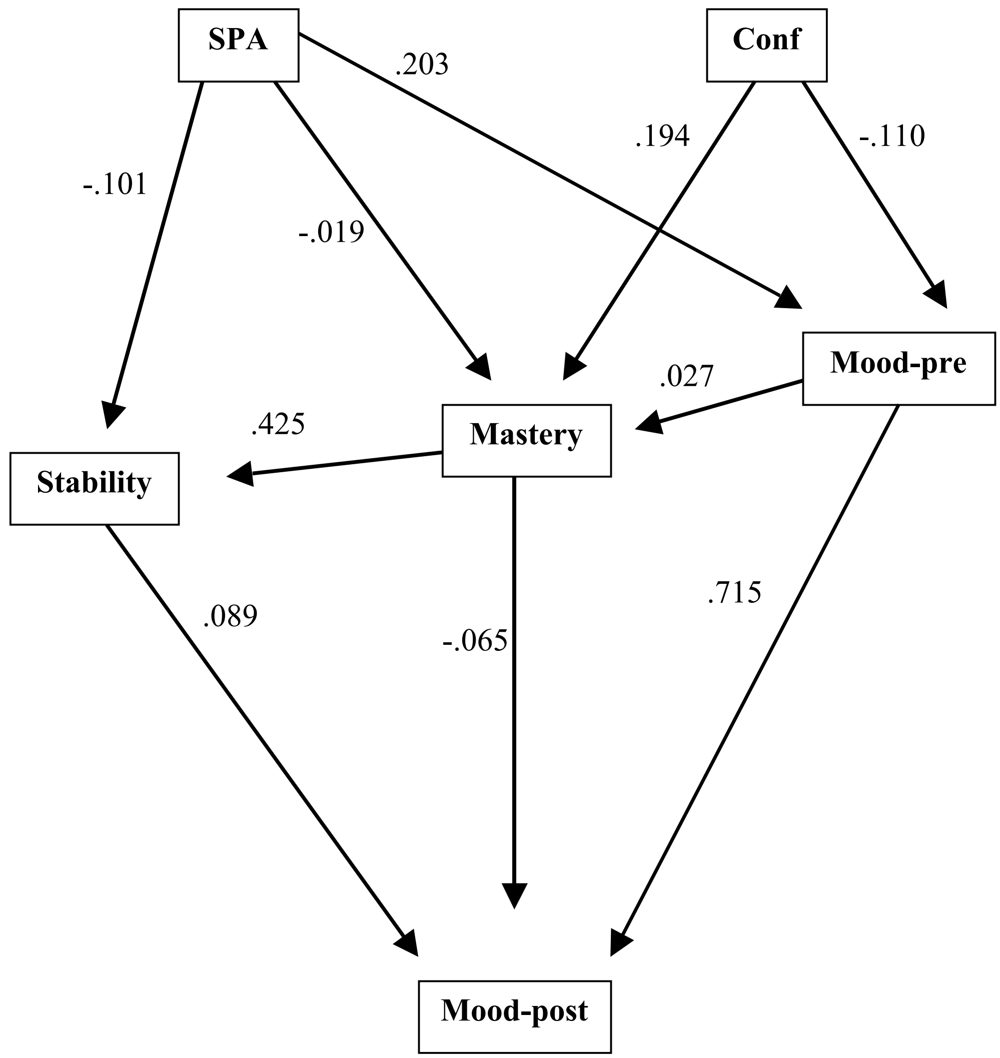
APPENDIX B

Full, Original Model: Aerobics Condition, Positive Affect



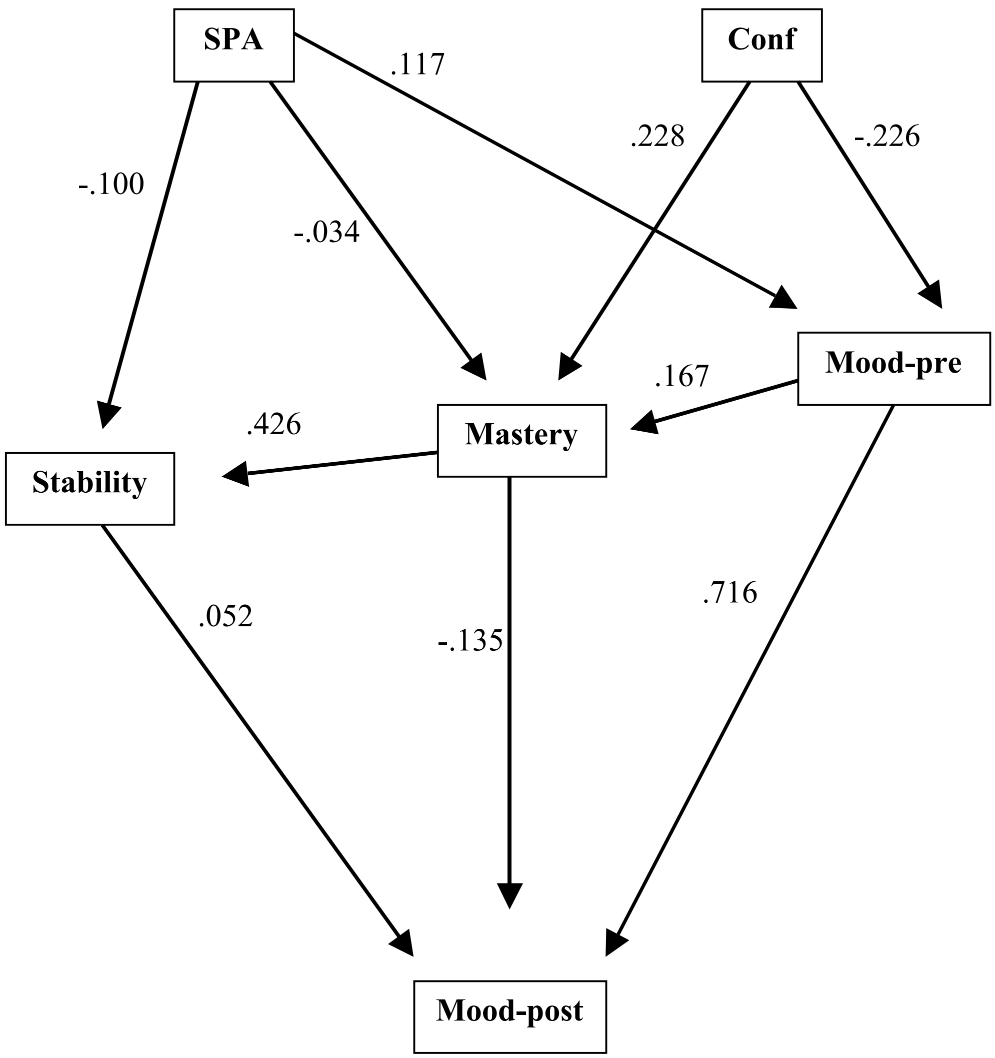
χ^2 (5) = 14.681, p = .012
CFI = .926
TLI = .690
RMSEA = .123
% Variance explained = 56.2%

Full, Original Model: Aerobics Condition, Negative Affect



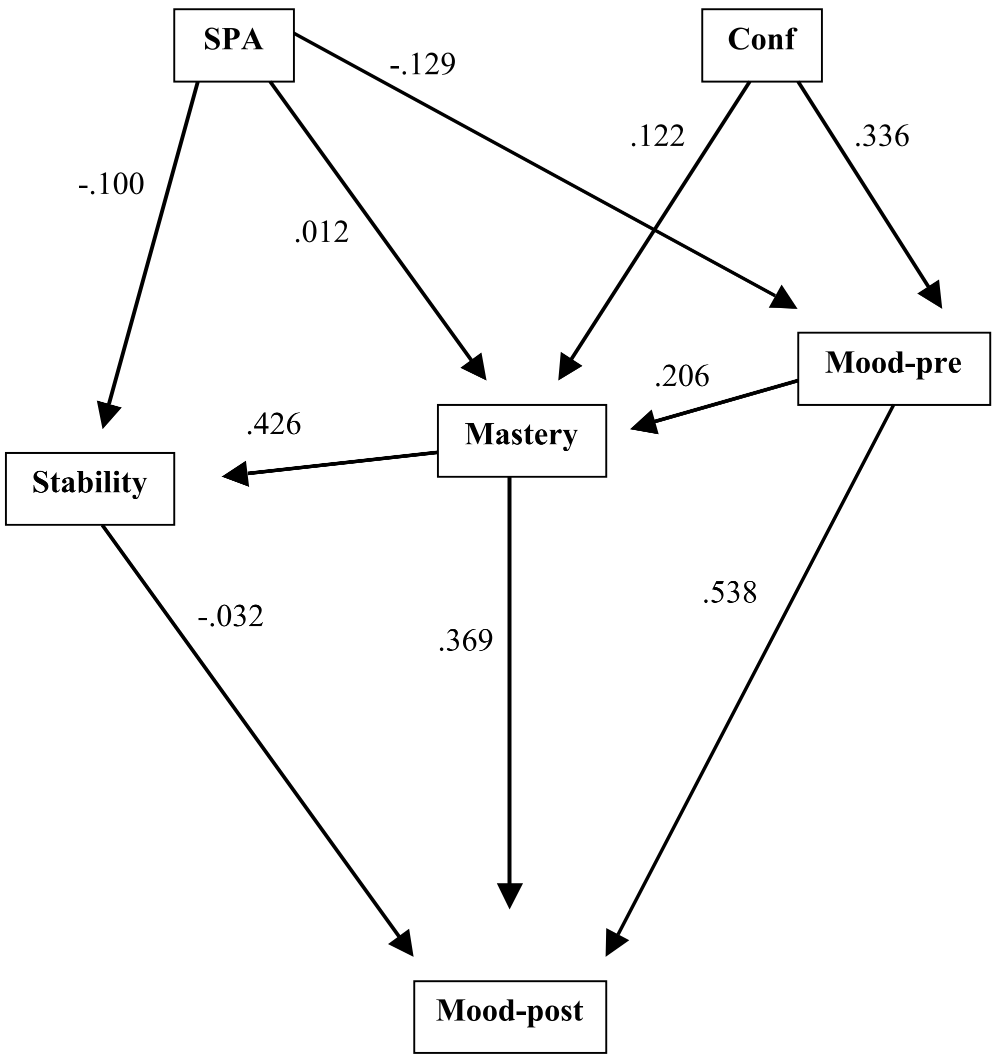
χ^2 (5) = 6.735, p = .241
CFI = .983
TLI = .929
RMSEA = .052
% Variance explained = 51.6%

Full, Original Model: Aerobics Condition, Anxiety



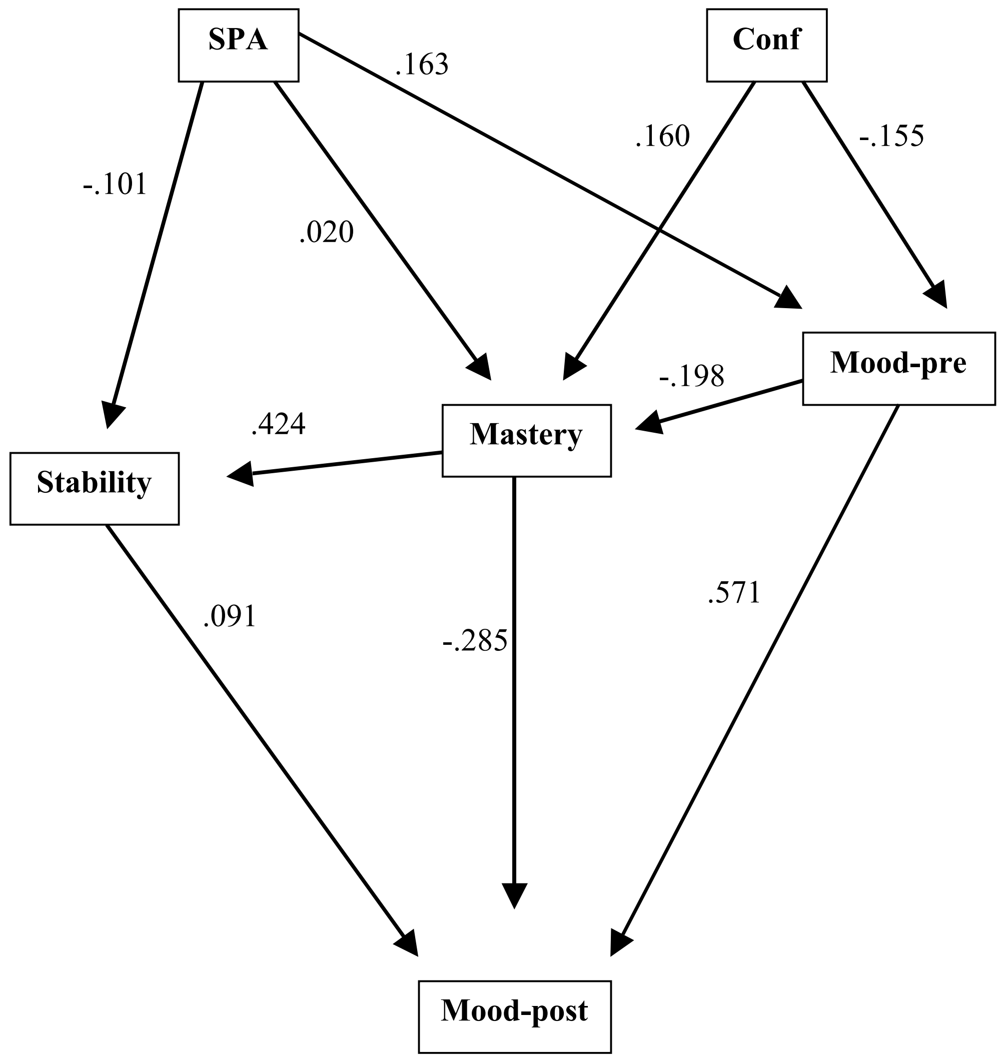
χ^2 (5) = 5.729, p = .334
CFI = .993
TLI = .970
RMSEA = .034
% Variance explained = 50.8%

Full, Original Model: Aerobics Condition, Positive Well-Being



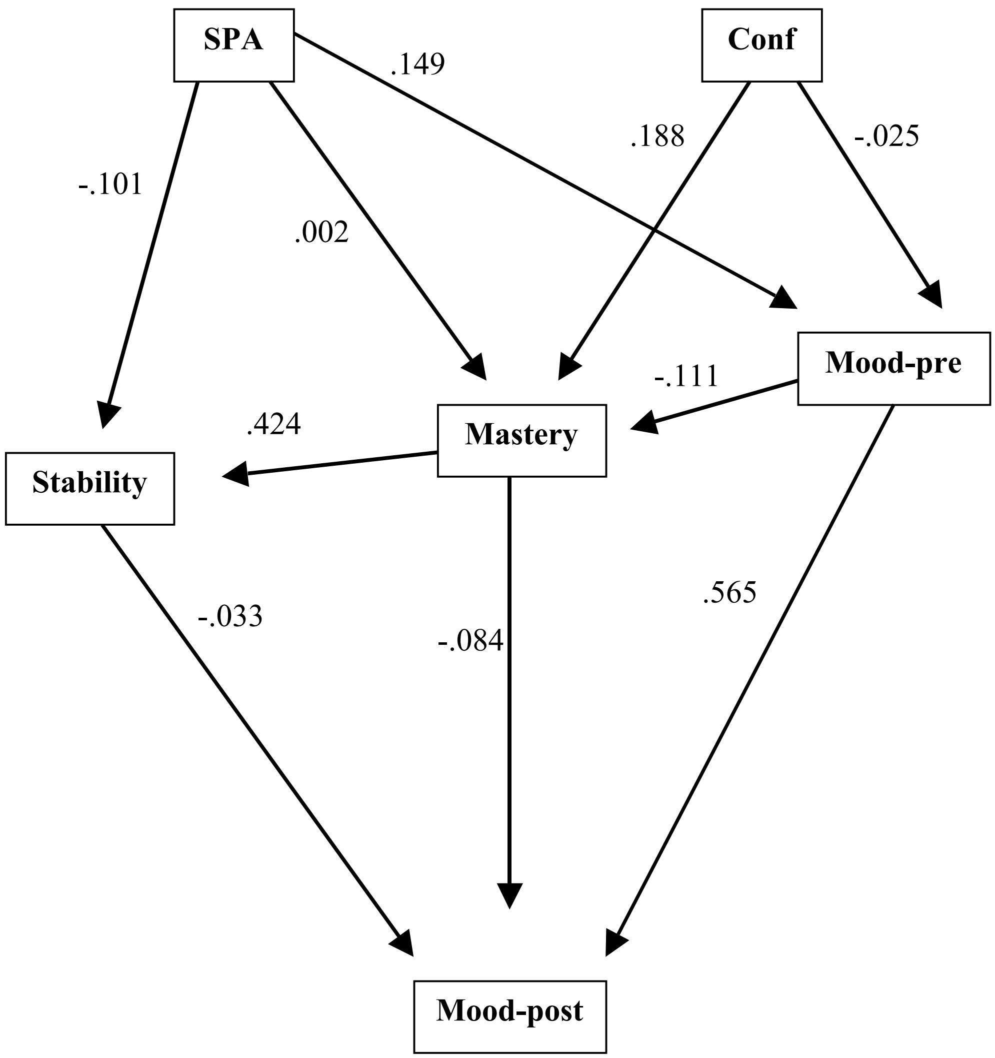
χ^2 (5) = 14.646, p = .012
CFI = .921
TLI = .667
RMSEA = .122
% Variance explained = 51.0%

Full, Original Model: Aerobics Condition, Psychological Distress



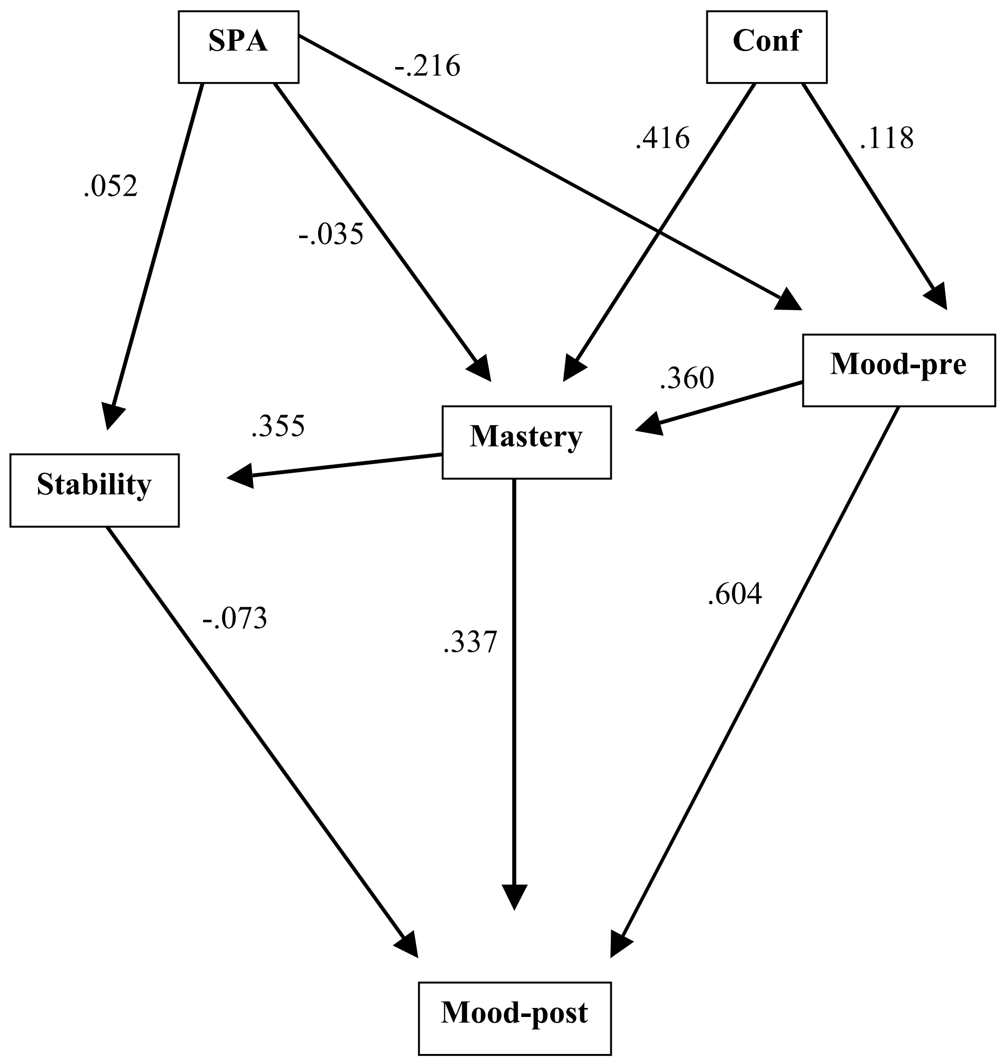
χ^2 (5) = 7.818, p = .167
CFI = .969
TLI = .868
RMSEA = .066
% Variance explained = 45.5%

Full, Original Model: Aerobics Condition, Fatigue



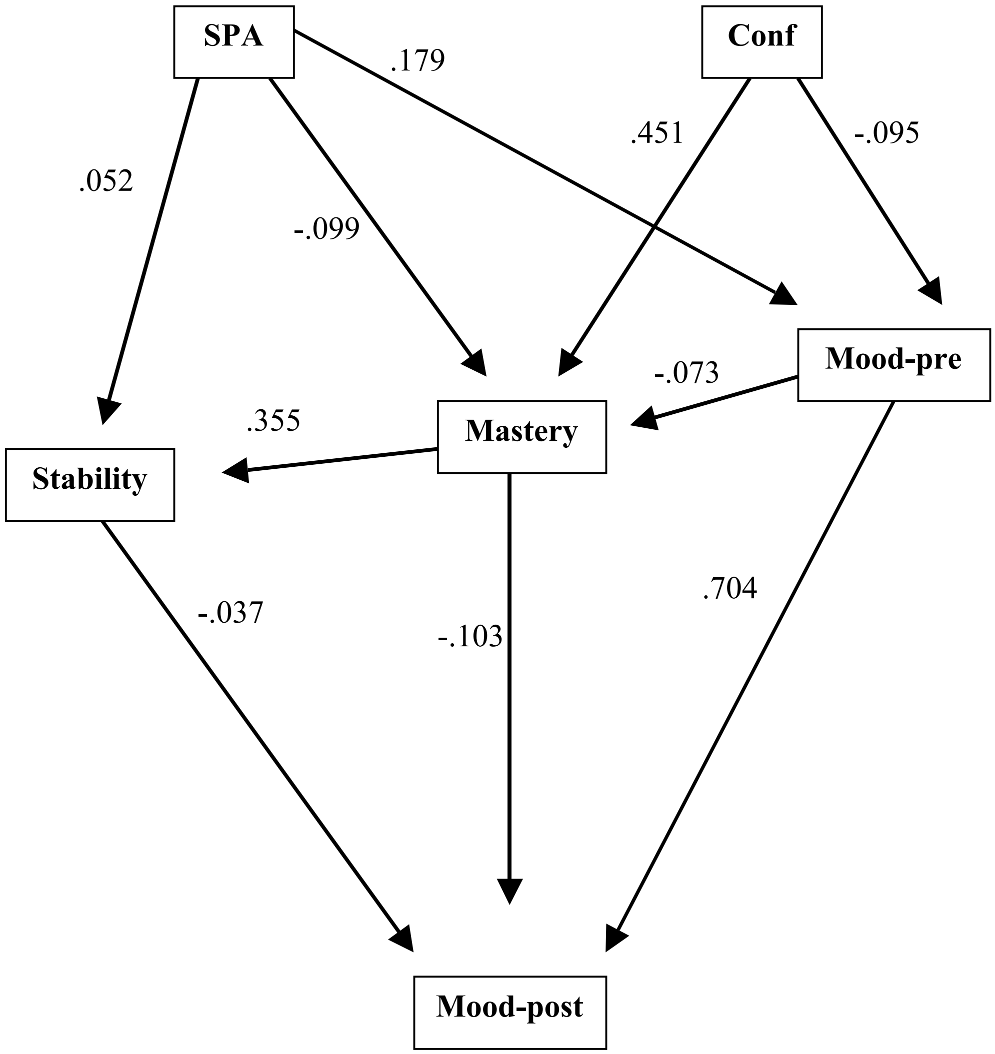
χ^2 (5) = 4.652, p = .460
CFI = 1.000
TLI = 1.023
RMSEA = .000
% Variance explained = 34.3%

Full, Original Model: Cardiovascular & Weight Training Condition, Positive Affect



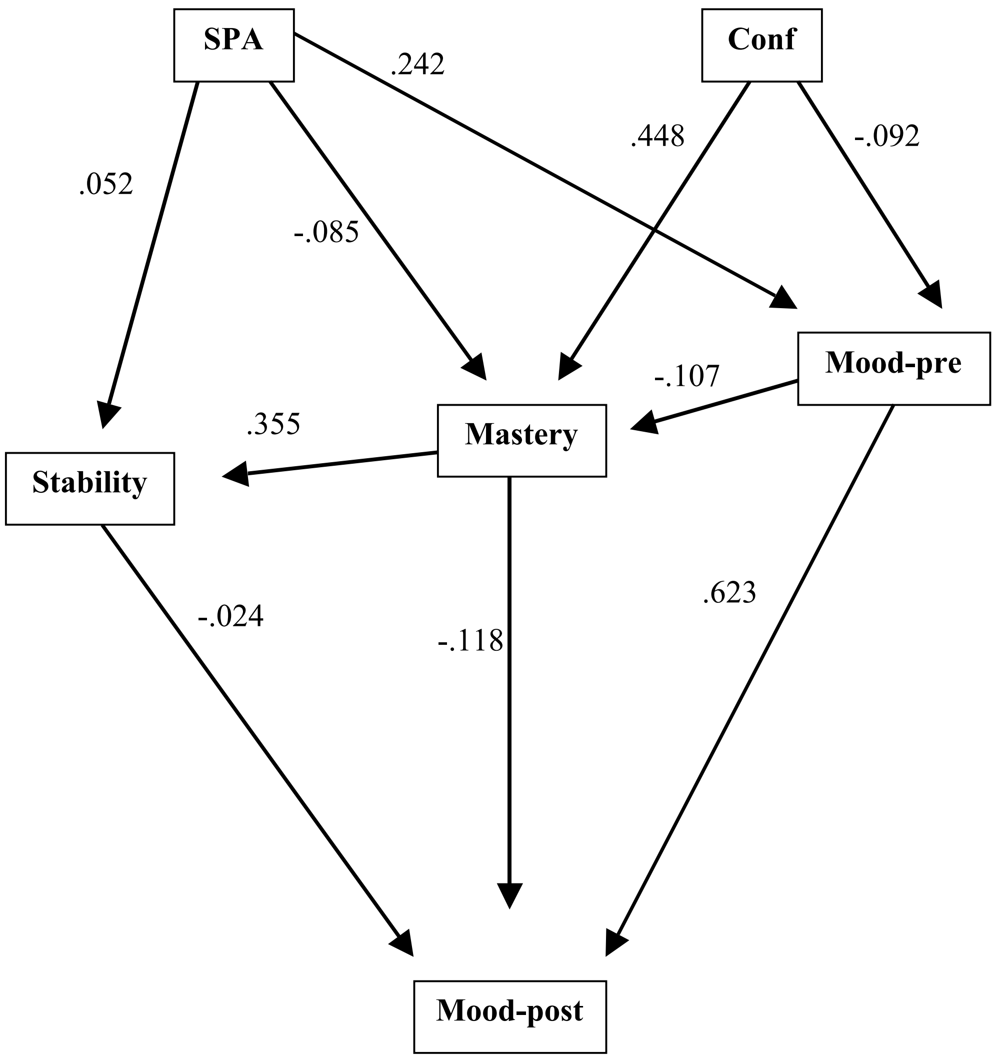
χ^2 (5) = 2.463, p = .782
CFI = 1.000
TLI = 1.100
RMSEA = .000
% Variance explained = 62.4%

Full, Original Model: Cardiovascular & Weight Training Condition, Negative Affect



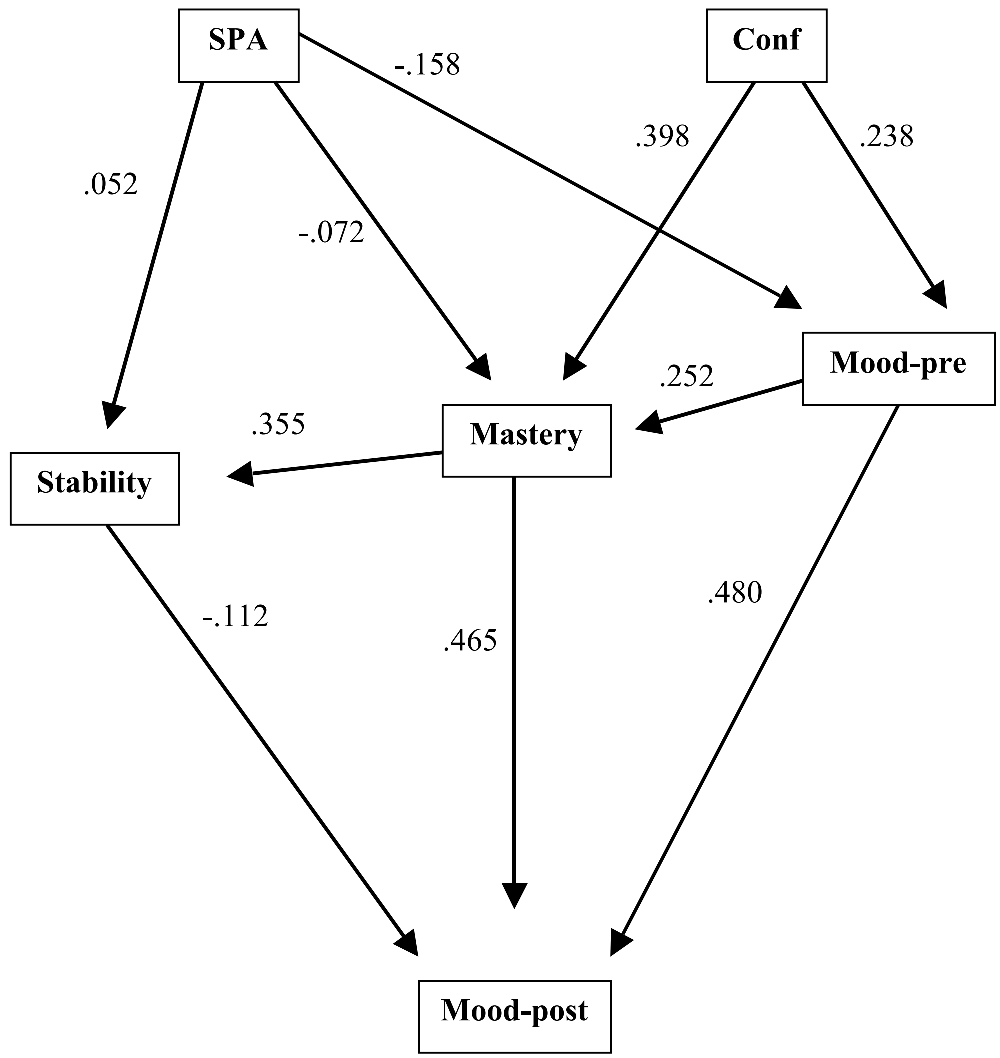
χ^2 (5) = 1.686, $\underline{p}$ = .891
CFI = 1.000
TLI = 1.181
RMSEA = .000
% Variance explained = 53.1%

Full, Original Model: Cardiovascular & Weight Training Condition, Anxiety



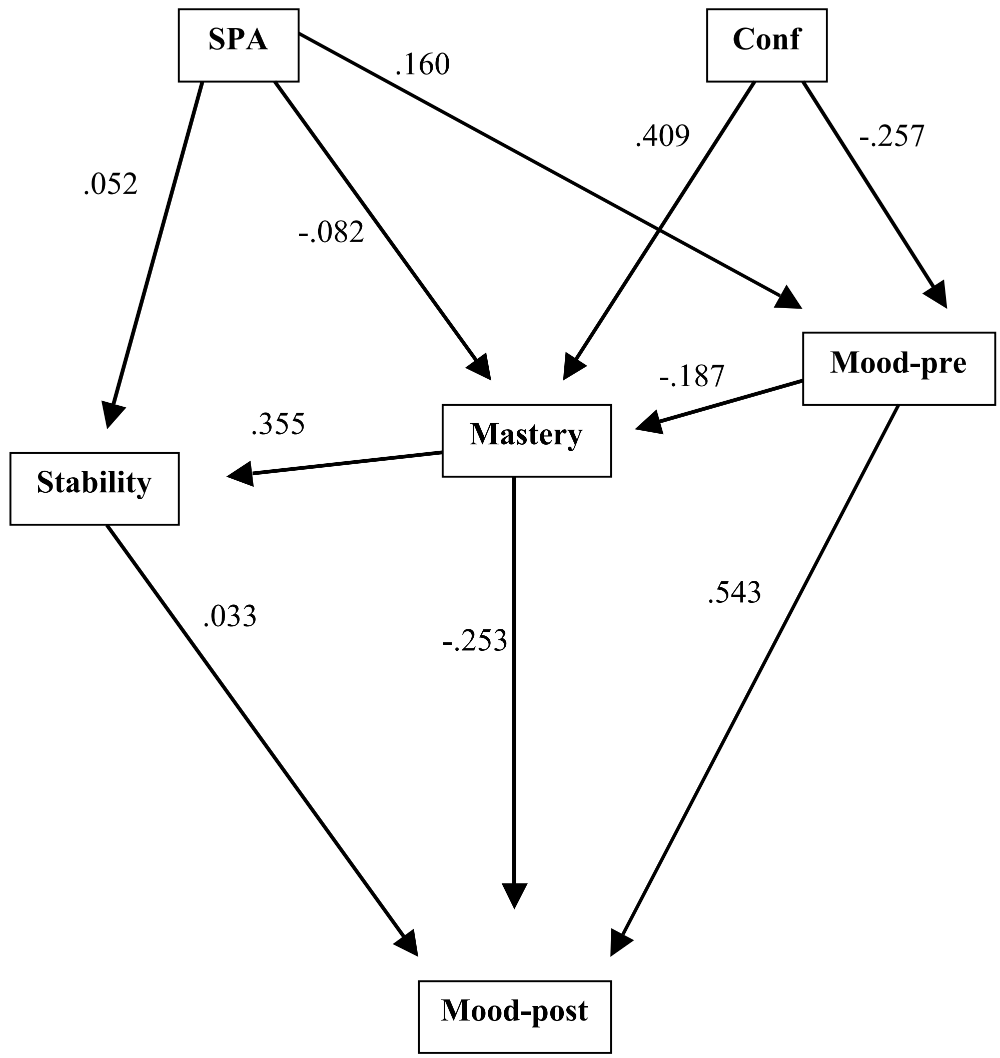
χ^2 (5) = 3.015, p = .698
CFI = 1.000
TLI = 1.129
RMSEA = .000
% Variance explained = 43.1%

Full, Original Model: Cardiovascular & Weight Training Condition, Positive Well-Being



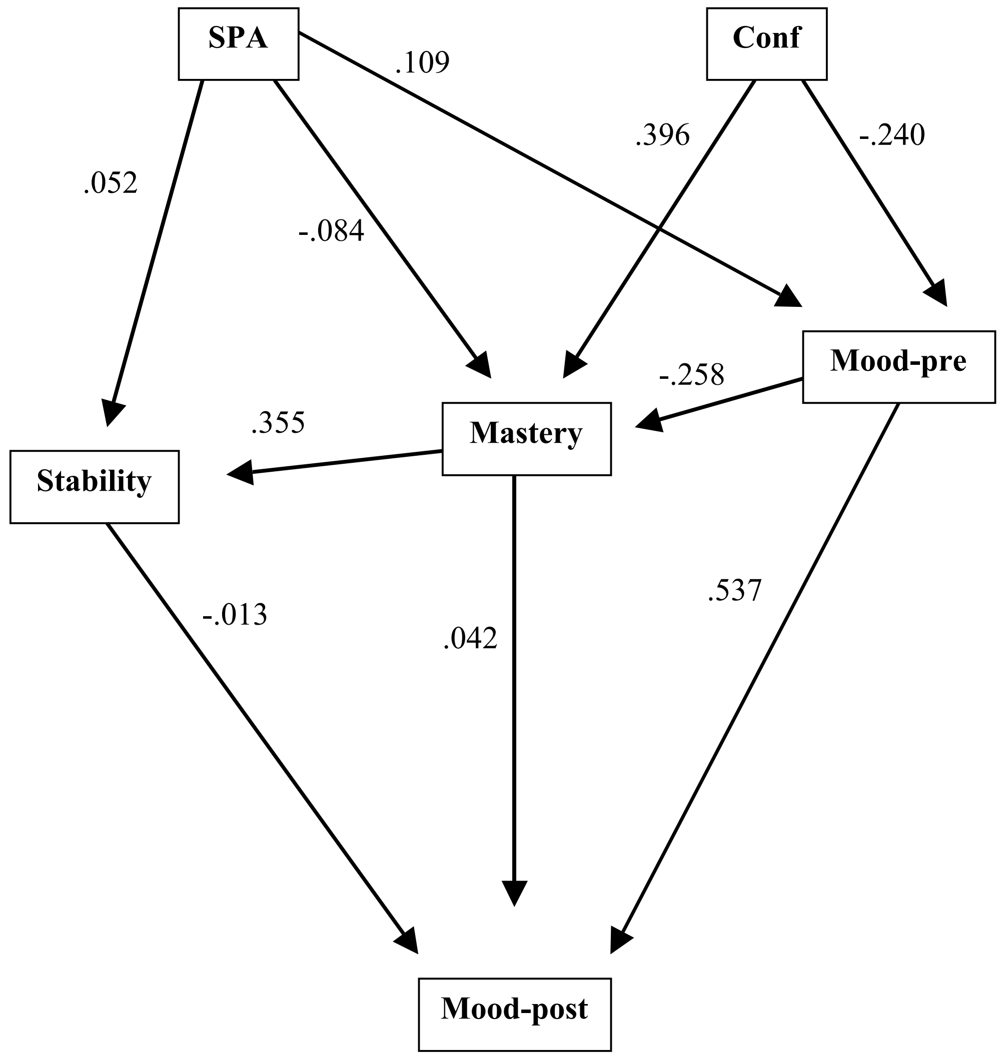
χ^2 (5) = 5.833, p = .323
CFI = .991
TLI = .964
RMSEA = .040
% Variance explained = 57.0%

Full, Original Model: Cardiovascular & Weight Training Condition, Psychological Distress



χ^2 (5) = 8.246, p = .143
CFI = .957
TLI = .821
RMSEA = .078
% Variance explained = 43.3%

Full, Original Model: Cardiovascular & Weight Training Condition, Fatigue



χ^2 (5) = 3.728, p = .589
CFI = 1.000
TLI = 1.102
RMSEA = .000
% Variance explained = 27.5%

APPENDIX C

Aerobics, Original, Full Model: Positive Affect

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Positive Affect - pre	.132	-.181 (.043)	SPA
		.315 (.001)	Conf
Mastery	.065	.019 (ns)	SPA
		.134 (ns)	Conf
		.182 (.066)	PA-pre
Stability	.193	-.101 (ns)	SPA
		.426 (.001)	Mastery
Positive Affect - post	.562	.563 (.001)	PA-pre
		.001 (ns)	Stability
		.386 (.001)	Mastery

Aerobics, Trimmed Model: Positive Affect

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Positive Affect - pre	.132	-.181 (.043)	SPA
		.315 (.001)	Conf
Mastery	.050	.223 (.016)	PA-pre
Stability	.186	.431 (.001)	Mastery
Positive Affect - post	.563	.563 (.001)	PA-pre
		.386 (.001)	Mastery

Aerobics, Original, Full Model: Negative Affect

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Negative Affect - pre	.053	.203 (.030) -.110(ns)	SPA Conf
Mastery	.037	-.019 (ns) .194 (.039) .027 (ns)	SPA Conf NA-pre
Stability	.192	-.101 (ns) .425 (.001)	SPA Mastery
Negative Affect - post	.516	.715 (.001) .089 (ns) -.065 (ns)	NA-pre Stability Mastery

Aerobics, Trimmed Model: Negative Affect

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Negative Affect - pre	.050	.223 (.017)	SPA
Mastery	.037	.193 (.039)	Conf
Stability	.184	.429 (.001)	Mastery
Negative Affect - post	.517	.719 (.001)	NA-pre

Aerobics, Original, Full Model: State Anxiety

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
State Anxiety - pre	.065	.117 (ns)	SPA
		-.226 (.014)	Conf
Mastery	.062	-.034 (ns)	SPA
		.228 (.016)	Conf
		.167 (ns)	STAI-pre
Stability	.193	-.100 (ns)	SPA
		.426 (.001)	Mastery
State Anxiety - post	.508	.716 (.001)	STAI-pre
		.052 (ns)	Stability
		-.135 (ns)	Mastery

Aerobics, Trimmed Model: State Anxiety

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
State Anxiety - pre	.064	-.252 (.006)	Conf
Mastery	.037	.193 (.039)	Conf
Stability	.184	.429 (.001)	Mastery
State Anxiety - post	.500	.707 (.001)	STAI-pre

Aerobics, Original, Full Model: Positive Well-being

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Positive Well-being - pre	.130	-.129 (ns)	SPA
		.336 (.001)	Conf
Mastery	.073	.012 (ns)	SPA
		.122 (ns)	Conf
		.206 (.036)	POSWB-pre
Stability	.193	-.100 (ns)	SPA
		.426 (.001)	Mastery
Positive Well-being - post	.510	.538 (.001)	POSWB-pre
		-.032 (ns)	Stability
		.369 (.001)	Mastery

Aerobics, Trimmed Model: Positive Well-being

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Positive Well-being - pre	.128	.358 (.001)	Conf
Mastery	.062	.248 (.007)	POSWB-pre
Stability	.185	.430 (.001)	Mastery
Positive Well-being - post	.511	.537 (.001)	POSWB-pre
		.356 (.001)	Mastery

Aerobics, Original, Full Model: Psychological Distress

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Psychological Distress - pre	.051	.163 (.083)	SPA
		-.155 (ns)	Conf
Mastery	.074	.020 (ns)	SPA
		.160 (ns)	Conf
		-.198 (.035)	PSYCH-pre
Stability	.191	-.101 (ns)	SPA
		.424 (.001)	Mastery
Psychological Distress - post	.455	.571 (.001)	PSYCH-pre
		.091 (ns)	Stability
		-.285 (.001)	Mastery

Aerobics, Trimmed Model: Psychological Distress

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Psychological Distress - pre	.037	.192 (.042)	SPA
Mastery	.050	-.223 (.016)	PSYCH-pre
Stability	.183	.428 (.001)	Mastery
Psychological Distress - post	.454	.576 (.001)	PSYCH-pre
		-.245 (.001)	Mastery

Aerobics, Original, Full Model: Fatigue

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
Fatigue - pre	.023	.149 (ns)	SPA
		-.025 (ns)	Conf
Mastery	.049	.002 (ns)	SPA
		.188 (.043)	Conf
		-.111 (ns)	FTG-pre
Stability	.191	-.101 (ns)	SPA
		.424 (.001)	Mastery
Fatigue - post	.343	.565 (.001)	FTG-pre
		-.033 (ns)	Stability
		-.084 (ns)	Mastery

Aerobics, Trimmed Model: Fatigue

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
Mastery	.037	.193 (.039)	Conf
Stability	.184	.429 (.001)	Mastery
Fatigue - post	.333	.577 (.001)	FTG-pre

Cardiovascular & Weight Training, Original, Full Model: Positive Affect

Dependent Variable	R^2	Standardized β ($p <$)	Predictor
Positive Affect - pre	.060	-.216 (.047)	SPA
		.118 (ns)	Conf
Mastery	.344	-.035 (ns)	SPA
		.416 (.001)	Conf
		.360 (.001)	PA-pre
Stability	.125	.052 (ns)	SPA
		.355 (.001)	Mastery
Positive Affect - post	.624	.604 (.001)	PA-pre
		-.073 (ns)	Stability
		.337 (.001)	Mastery

Cardiovascular & Weight Training, Trimmed Model: Positive Affect

Dependent Variable	R^2	Standardized β ($p <$)	Predictor
Positive Affect - pre	.050	-.224 (.041)	SPA
Mastery	.321	.424 (.001)	Conf
		.375 (.001)	PA-pre
Stability	.117	.342 (.001)	Mastery
Positive Affect - post	.612	.613 (.001)	PA-pre
		.308 (.001)	Mastery

Cardiovascular & Weight Training, Original, Full Model: Negative Affect

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Negative Affect - pre	.041	.179 (ns)	SPA
		-.095 (ns)	Conf
Mastery	.228	-.099 (ns)	SPA
		.451 (.001)	Conf
		-.073 (ns)	NA-pre
Stability	.125	.052 (ns)	SPA
		.355 (.001)	Mastery
Negative Affect - post	.531	.704 (.001)	NA-pre
		-.037 (ns)	Stability
		-.103 (ns)	Mastery

Cardiovascular & Weight Training, Trimmed Model: Negative Affect

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Mastery	.216	.465 (.001)	Conf
Stability	.122	.349 (.001)	Mastery
Negative Affect - post	.518	.720 (.001)	NA-pre

Cardiovascular & Weight Training, Original, Full Model: State Anxiety

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
State Anxiety - pre	.067	.242 (.027)	SPA
		-.092 (ns)	Conf
Mastery	.233	-.085 (ns)	SPA
		.448 (.001)	Conf
		-.107 (.296)	STAI-pre
Stability	.125	.052 (ns)	SPA
		.355 (.001)	Mastery
State Anxiety - post	.431	.623 (.001)	STAI-pre
		-.024 (ns)	Stability
		-.118 (ns)	Mastery

Cardiovascular & Weight Training, Trimmed Model: State Anxiety

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
State Anxiety - pre	.063	.250 (.022)	SPA
Mastery	.216	.465 (.001)	Conf
Stability	.122	.349 (.001)	Mastery
State Anxiety - post	.417	.646 (.001)	STAI-pre

Cardiovascular & Weight Training, Original, Full Model: Positive Well-being

Dependent Variable	R^2	Standardized β (p≤)	Predictor
Positive Well-being - pre	.082	-.158 (ns)	SPA
		.238 (.029)	Conf
Mastery	.280	-.072 (ns)	SPA
		.398 (.001)	Conf
		.252 (.012)	POSWB-pre
Stability	.125	.052 (ns)	SPA
		.355 (.001)	Mastery
Positive Well-being - post	.570	.480 (.001)	POSWB-pre
		-.112 (ns)	Stability
		.465 (.001)	Mastery

Cardiovascular & Weight Training, Trimmed Model: Positive Well-being

Dependent Variable	R^2	Standardized β (p≤)	Predictor
Positive Well-being - pre	.062	.249 (.023)	Conf
Mastery	.282	.398 (.001)	Conf
		.265 (.007)	POSWB-pre
Stability	.122	.349 (.001)	Mastery
Positive Well-being - post	.563	.484 (.001)	POSWB-pre
		.424 (.001)	Mastery

Cardiovascular & Weight Training, Original, Full Model: Psychological Distress

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
Psychological Distress - pre	.092	.160 (ns)	SPA
		-.257 (.017)	Conf
Mastery	.253	-.082 (ns)	SPA
		.409 (.001)	Conf
		-.187 (.067)	PSYCH-pre
Stability	.125	.052 (ns)	SPA
		.355 (.001)	Mastery
Psychological Distress - post	.433	.543 (.001)	PSYCH-pre
		.033 (ns)	Stability
		-.253 (.008)	Mastery

Cardiovascular & Weight Training, Trimmed Model: Psychological Distress

Dependent Variable	**R^2**	**Standardized □ (p□)**	**Predictor**
Psychological Distress - pre	.072	-.268 (.014)	SPA
Mastery	.253	.409 (.001)	Conf
		-.202 (.045)	PSYCH-pre
Stability	.122	.349 (.001)	Mastery
Psychological Distress - post	.439	.549 (.001)	PSYCH-pre
		-.238 (.007)	Mastery

Cardiovascular & Weight Training, Original, Full Model: Fatigue

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Fatigue - pre	.069	.109 (ns)	SPA
		-.240 (.029)	Conf
Mastery	.284	-.084 (ns)	SPA
		.396 (.001)	Conf
		-.258 (.009)	FTG-pre
Stability	.125	.052 (ns)	SPA
		.355 (.001)	Mastery
Fatigue - post	.275	.537 (.001)	FTG-pre
		-.013 (ns)	Stability
		.042 (ns)	Mastery

Cardiovascular & Weight Training, Trimmed Model: Fatigue

Dependent Variable	R^2	Standardized □ (p□)	Predictor
Fatigue - pre	.061	-.247 (.025)	Conf
Mastery	.284	.398 (.001)	Conf
		-.270 (.006)	FTG-pre
Stability	.122	.349 (.001)	Mastery
Fatigue - post	.272	.522 (.001)	FTG-pre

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