REFRAMING FEMALE FITNESS: AN INVESTIGATION OF THE FACTORS THAT INFLUENCE EXERCISE PERSISTENCE IN COLLEGE AGE WOMEN

A dissertation presented by
Shelly-Ann Collins Rawle

Submitted to
The Department of Counseling and Applied Psychology in partial fulfillment of the requirements for the degree of
Doctor of Philosophy
in the field of
Counseling Psychology
Northeastern University
Boston, Massachusetts
April, 2017
Title Page of Abstract
ABSTRACT

The benefits of exercise on physical and psychological health are extensive. Yet, even with the overwhelming evidence of the benefits of exercise fewer women than men engage in recommended levels of physical activity. This quantitative study aimed to understand the factors that impact women’s persistence in physical activity. Exercise persistence among college women was examined using the Health Promotion Model (HPM) with specific attention paid to activity intensity, and the interpersonal influence domain using a relational cultural frame. This study employed a longitudinal quasi-experimental pre-test post-test design with no control group using a convenience sample of one hundred female participants aged 18 to 26. HPM and interpersonal determinants were measured at baseline and at 3 months. Overall, self-efficacy for overcoming barriers to exercise and exercise group connection were both significantly linked with exercise persistence. These relationships were predictive for strenuous exercise alone, not mild or moderate intensity exercise. Additional findings revealed important group differences whereby women who persisted with exercise over the 3 month follow-up period not only scored higher than those who failed to persist on measures of self-efficacy and group connection, but also on measures of enjoyment, perceived barriers/benefits, and interpersonal influence. The implication for these findings are discussed.

Keywords: exercise persistence, interpersonal, relational cultural, college age women
Firstly, I would like to express how extremely grateful I am to my advisor Dr. Christie Rizzo for the continuous support of my PhD study and related research, for her intelligence, motivation, and almost magical patience. Her guidance helped me in the realization of a long held wish, toward the realization of a long held goal. I could not have imagined having a better advisor and mentor for my PhD studies. Dr. Rizzo words cannot describe the depth of my gratitude for how you have spun my straw into gold.

Besides my advisor, I would like to thank the rest of my committee: Dr. Rachel Rodgers and Dr. Jessica Edwards George, for their insightful comments and encouragement, especially their encouragement, but also for the hard questions which prompted me to widen my perspective and be more thorough in my research. Dr. JEG you have been a wonderful mentor and role model. Your positivity and buoyant attitude is an example I wish to always emulate.

My sincere thanks also goes to Dr. Tracy Robinson-Wood who has served as an inspiration and a reason why I entered the doctoral program at Northeastern. It is through her guidance that I have been able to grow as a professional, it is by joining her team that I was granted the opportunity to work on research I found personally meaningful and relevant.

I cannot end without thanking Dr. Laura Plybon for her genius, her encouragement and her support during the times it was most needed. My family, Priscilla and Arthur Rawle, Dr. Christopher Rawle and Richard Rawle who have been a source of strength, love, and guidance. However this achievement could not have been without the precious support of my husband Dave Collins; it would not have been possible to conduct this research, complete this program or enter into internship. It is through his selflessness, his championing, his encouragement and his love that I ultimately am able to fulfil the other half of my dream, the first half of course was marrying him.
# TABLE OF CONTENTS

Abstract \hspace{1.5cm} ii

Acknowledgements \hspace{1.5cm} iv

List of Tables \hspace{1.5cm} vii

List of Figures \hspace{1.5cm} viii

Chapter One: Literature Review

Introduction 3

Background

- Physical Benefits 4
- Psychological Benefits 5
- Early Adulthood 9

Theoretical Model(s)

- Health Promotion Model 11
- Individual Characteristics and Experiences 12
  - Prior Related Behaviors 12
  - Personal Factors 13
- Behavior Specific Cognitions and Affect 20
  - Perceived Barriers & Benefits 20
  - Self-Efficacy 24
  - Activity Related Affect 27
  - Interpersonal Influences 31
  - Situational Influences 31
- Behavioral Change Process 32
- Relational Cultural Theory 33

Conclusion 35

Chapter Two: Reframing Female Fitness

Introduction 37

Statement of the Problem 37

Purpose of the Study 40

Method 41

- Research Design 41
- Procedure 41
- Participants 42
- Measures 43
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Analysis Procedures</td>
<td>48</td>
</tr>
<tr>
<td>Descriptive Statistics</td>
<td>51</td>
</tr>
<tr>
<td>Results</td>
<td>54</td>
</tr>
<tr>
<td>Testing of Hypotheses</td>
<td>54</td>
</tr>
<tr>
<td>Exploratory Analyses</td>
<td>62</td>
</tr>
<tr>
<td>Discussion</td>
<td>66</td>
</tr>
<tr>
<td>References</td>
<td>74</td>
</tr>
<tr>
<td>Appendices</td>
<td>99</td>
</tr>
<tr>
<td>A EBBS Letter of Permission</td>
<td>99</td>
</tr>
<tr>
<td>B Merino Letter of Permission</td>
<td>101</td>
</tr>
<tr>
<td>C IRB Approval</td>
<td>102</td>
</tr>
<tr>
<td>D Recruitment Flyer</td>
<td>103</td>
</tr>
<tr>
<td>E Survey Packet</td>
<td>104</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frequencies and Percentages: Demographic Questions</td>
<td>89</td>
</tr>
<tr>
<td>2. Descriptive Statistics: Health Promotion Model (HPM) Study Variables Time 1</td>
<td>90</td>
</tr>
<tr>
<td>3. Descriptive Statistics: Health Promotion Model (HPM) Study Variables Time 2</td>
<td>90</td>
</tr>
<tr>
<td>4. Correlation Matrix of Study Variables Time 1 and Time 2</td>
<td>91</td>
</tr>
<tr>
<td>5. Hierarchical Logistic Regression: Race and Time 1 HPM Behavior-Specific Cognitions and Affect Variables Predicting Exercise Persistence</td>
<td>93</td>
</tr>
<tr>
<td>6. Hierarchical Logistic Regression: Race and Time 2 HPM Behavior-Specific Cognitions and Affect Variables Predicting Exercise Persistence</td>
<td>93</td>
</tr>
<tr>
<td>7. Hierarchical Logistic Regression: Race and Time 1 HPM Behavior-Specific Cognitions and Affect and Interpersonal Variables Predicting Exercise Persistence</td>
<td>94</td>
</tr>
<tr>
<td>8. Hierarchical Logistic Regression: Race and Time 2 HPM Behavior-Specific Cognitions and Affect and Interpersonal Variables Predicting Exercise Persistence</td>
<td>94</td>
</tr>
<tr>
<td>9. One-way Between-subjects MANOVA: Persisters’ and Nonpersister’ Mean Score Differences on Time 1 HPM Theoretical Factors</td>
<td>95</td>
</tr>
<tr>
<td>10. One-way Between-subjects MANOVA: Persisters’ and Nonpersister’ Mean Score Differences on Time 2 HPM Theoretical Factors</td>
<td>96</td>
</tr>
<tr>
<td>11. Hierarchical Logistic Regression: Race and HPM Behavior-Specific Cognitions and Affect Variables Predicting Strenuous Exercise Persistence</td>
<td>97</td>
</tr>
<tr>
<td>12. Hierarchical Logistic Regression: HPM Behavior-Specific Cognitions and Affect and Interpersonal Variables Predicting Strenuous Exercise Persistence</td>
<td>97</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure

1. Health Promotion Model Components  98

2. Diagram of Health Promotion Model  98
Introduction

The benefits of exercise on physical and psychological health are extensive. They include disease prevention (Eyler & et al., 1999), improved cognitive function (Fox, 1999) slowed age-related decline (Maher et al., 2013), improved satisfaction with life (Elavsky et al., 2005), enhanced mood states and reduced symptoms of anxiety and depression (Cramer, Neiman & Lee, 1991). Yet, even with the overwhelming evidence of the benefits of exercise, fewer women than men engage in recommended levels of physical activity (Moreno & Johnston, 2014). Moreover, the participation of women in exercise decreases with age, with women of minority status exercising even less than their Caucasian counterparts (Heesch, Brown & Blanton, 2008). Research suggest the greatest decline in physical activity occurs during early adulthood (Wallace, Buckworth, Kirby & Sherman, 2000). For this reason, a review of the literature is needed to identify which modifiable factors have actually been found to relate to improved physical activity for women during the young adult years, as well as to identify gaps in the literature that, if addressed, could improve future, targeted interventions for college-age women.

When examining the literature, the definition and measurement of exercise has varied greatly. For these reasons it is important to qualify what is meant when we use the terms exercise or physical activity. According to the Journal of the American Medical Association (JAMA), exercise is a not a synonym for physical activity. Physical activity (PA) is defined by the World Health Organization (WHO) as any bodily movement produced by skeletal muscles that requires energy expenditure. Exercise on the other hand is a physical activity that is planned, structured, repetitive, and purposeful where improvement or maintenance of one or more
components of physical fitness is an objective (Laporte, Montoye and Caspersen, 1985). Due to the inconsistent use of the terms exercise and physical activity (PA) in previous research, the qualification for use of those terms herein, means activity done with the objective of improving or maintaining some component of physical fitness. Physical fitness is defined as the ability to carry out physical activity and includes elements of flexibility, body composition, muscular strength and endurance (Laporte, et al., 1985, Boutcher, 1993).

Physical Benefits

The physical benefits of exercise have been consistently supported. In a randomized trial conducted in Quebec, Canada a sample of 124 women between the ages of 50 and 70 years were asked to complete weight bearing exercises, aerobic dancing and flexibility exercises for 60 minutes, three times a week for 12 months (Bravo et al., 1996). The group that exercised was found to have less reported back pain and spinal bone mineral density stabilization versus the control group (the group not given the exercises) that exhibited a significant decrease in bone mineral density. In addition Blair and colleagues (1996), in their review of existing clinical studies, found consistently that physical activity increased bone mass density for women, which can help protect against osteoporosis.

In 1995, an expert panel was convened by the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) to review scientific evidence on the health benefits associated with regular physical activity. The panel’s review of extant epidemiological research has confirmed that low levels of physical activity are not only correlated with higher mortality rates later in life but have been shown to be associated with
increased risk of colon cancer, diabetes, hypertension, heart disease and osteoporosis (Pate et al., 1995).

Blair, Kohl, Gordon & Paffenbarger (1992) completed a review of population based physical activity studies as well as clinical exercise studies (i.e. studies done among clinical populations). The epidemiologic data reviewed indicated that fitness and exercise reduced the risk of cardiovascular disease, stroke, and reduced mortality and morbidity rates. The clinical exercise studies similarly showed that exercise reduced the risk of hypertension, improved body fat distribution, reduced obesity and improved immunological functioning (Blair, Kohl, Gordon, & Paffenbarger Jr, 1992).

According to Wells (1996) death from chronic disease among racial and ethnic minorities, and disparities in health between men and women, could possibly be resolved by increasing physical activity among women. In her review, Wells (1996) noted that the majority of women, including up to 68% of black women and 56% of white women, reported leading a sedentary lifestyle and suggested that physical inactivity places many American women at risk of death from cardiovascular disease, coronary heart disease, diabetes and certain kinds of cancer (Wells, 1996). More recently, Andy Coghlan (2012) reported on the benefits of exercising, including being a protective factor against Alzheimer’s disease, diabetes, obesity and cancer and its potential to prevent early mortality. All of which, according to Coghlan (2012) could be easily accomplished with 10 minutes of moderate aerobic activity per week.

**Psychological Benefits**

In a small clinical study conducted by Cramer, Neiman & Lee (1990), a sample of sedentary, mildly obese women (N=35) aged 25-45 years were assigned to one of two groups.
The exercise group engaged in moderate exercise (brisk walking for 45 minutes, five times a week for 15 weeks) and the no-exercise group did not participate in exercise training. After 15 weeks, the authors found that the group of women who participated in the exercise training condition reported increased general well-being and energy levels, relative to the no-exercise group. However, even with the psychological benefits reported, participants’ exercise training declined after six weeks. The authors hypothesize that participants may have become discouraged by not losing as much weight as they had expected. These findings, although preliminary and limited by low power, suggest that inaccurate expectations regarding weight loss may offset the psychological benefits of exercise.

Salmon (2001) in his review of both cross-sectional and longitudinal studies of exercise and psychological well-being conducted across diverse age, sex and socio-economic samples found consistent antidepressant and anxiolytic effects. Harmful effects of stress on physical and mental health were buffered by habitual exercise and established physical activity routines. Salmon (2001) concluded that exercise can be valuable as a therapeutic intervention for enhanced well-being.

In a randomized trial of 40 female university students in Turkey, Asci (2003) investigated the effects of a physical fitness program on trait anxiety and self-perception. Participants were volunteers from two university Exercise Psychology courses and were randomly assigned to either the experimental group (one aerobic and two step dance sessions per week for 10 weeks), or the control condition (no regular exercise). Results support previous research that exercise reduces trait anxiety. Thus, in this sample of young women, anxiety reductions took place without other accompanying psychological benefits like improved self-esteem. It is
unknown whether the anxiety benefits alone would lead to sustained exercise practice in these young women into adulthood.

Yeung (1996) noted in his research review that reductions in negative mood states appear to co-occur with most forms of exercise and more recently, Dunn, Trivedi, & O’Neal (2001) in their review of randomized control trials, observational studies and population studies of exercise, found that increased physical activity and light to vigorous exercise was associated with reduced symptoms of Depression (as defined by criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition).

Other studies have looked at exercise in association with quality of life. Elavsky, and McAuley (2004) found that higher levels of quality of life measured by the Satisfaction with Life Scale (SWLS, $\alpha=0.86$) in menopausal women (ages 44 to 60 years) were associated with higher levels of physical activity. A significant main effect was observed for exercise frequency, meaning the frequency and severity of menopausal symptoms were reduced with more frequent physical activity. Malicka, Szczepanska-Giercacha, Jankowska, Wozniewski, and Rymaszewska (2011) evaluated the effects of physical activity on life satisfaction and the adjustment to illness in breast cancer patients. Participants were 36 women with a mean age of 59 years. The authors concluded that dancing as exercise improved the quality of life and attitudes of patients. Dancing also resulted in increased compliance with and a better attitude toward cancer treatment. Although the construct of enjoyment was not measured, participants acknowledged dancing as exercise was pleasurable.

Several studies (Corrigan, et al, 2013; Elavsky & McAuley, 2005; Malicka, et al, 2011; Melin, et al, 2003) have focused on life satisfaction of older adults with few focusing solely on
exercise as a predictor of life satisfaction. Strachan, Brawley, Spink, and Glazebrook (2009) used identity and social cognitive theories to study associations between physical activity (PA), PA identity, social cognitions and satisfaction with life and found that older adults, aged 55 to 95 years of age, with the highest PA identity reported greater satisfaction with life than their counterparts.

Melin, Fugl-Meyer and Fugl-Meyer (2003) studied several predictors including physical activity, in an effort to relate these predictors to life satisfaction. This is one of the few studies that sampled participants from a wide age range. Participants were 18 to 64 years old and researchers defined physical activity as sports or exercise. Authors concluded that participants active in sports or exercise had higher levels of life satisfaction relative to the non-active participants. Additionally Elavsky, McAuley, Motl, and colleagues (2005) found support for physical activity improving self-efficacy, self-esteem and affect, which in turn affected life satisfaction.

A review by Fox (1999) concluded that exercising should be considered a viable intervention for treating depression and anxiety as well as for improving mental well-being. His review reported clinical implications of being physically active as an indirect way of improving well-being.

To date numerous studies of exercise have been conducted. Based on the extensive literature, research has demonstrated that exercise has widespread benefits including improved physical health, psychological health and quality of life. Yet not many people engage in physical activity with fewer women participating or adhering in recommended levels of
activity. Moreover research has suggested that the greatest decline occurs during early adulthood.

**Early Adulthood**

Emerging adulthood has materialized as a distinct period of transition and change for those aged 18 to 25 due to the demographic shifts over the past 50 years (Arnett, 2000). According to Nelson and colleagues (2008), emerging adulthood is a time for the exploration of new ideologies and behaviors which allow individuals to express their individuality and may be an important age for establishing long term health behaviors. The behavioral flux that takes place during early adulthood make college campuses a unique environment to implement health promotion practices and exercise interventions (Wallace, Buckworth, Kirby, & Sherman, 2000).

The steepest rate decline in physical activity is seen between the ages of 18 to 24 years (US Department of Health and Human Services, 2000). Grubbs and Carter (2002) reported this decline in physical activity during late adolescence to early adulthood consequently affected mortality and morbidity rates in the United States. Additional research has supported physical activity, sports, and exercise during the early years (adolescence to young adulthood) lead to direct health benefits in adult life including lowered risk of disease (Bar-Or, 1992).

According to Wallace et al., (2000) although physical activity decreases with age, the level of an individual’s activity can be modified by behavioral interventions. However, most people cease to exercise within six months of starting an exercise routine. Moreover 80.3% of adolescents 13 to 15 years old do not engage in enough physical activity per day, with girls been less active than boys, and reduced levels of activity more common in countries of high
income (Hallal et al., 2012). Thus it is important that research be conducted to better understand the factors involved in engaging and promoting persistence of young adults in exercise.

In a literature review of 19 studies that included more than 35,000 university students, Irwin (2004) found that more than 50% of students from US and Canada did not engage in appropriate levels of physical activity. Studies also showed sex differences in the participation of exercise. Male students were more likely to engage in vigorous activities as well as strength training activities more so than females. However, “university women, and especially African Americans, have been identified as more likely to be insufficiently active than university men” (p. 939, Irwin, 2004). This is concerning as later life effects can include inactivity-related morbidities due to chronic disease.

A Canadian study by Valois and Guay (2015) found college age was an important age range for promoting the engagement and participation of exercise. The authors argued that the impact of routine physical activity had not been researched and more studies were needed to explain determinants for adoption and maintenance of exercise (Lemoyne, Valois, & Guay, 2015).

In a more recent meta-analysis by Keating, Guan, Piñero, & Bridges (2005) the 1995 National College Health Risk Behavior Survey found over 30% of students did not engage in proper amounts of exercise. Researchers of the prior survey investigated to some degree the impacts of PA history and found that the nature (positive or negative) of PA history was related to college students’ PA levels. Those who had positive PA history were more likely to continue their engagement in PA while in higher education. Keating et al., (2005) noted that
understanding factors that contributed to participation in physical activity was key to creating more appropriate strategies to promote exercise engagement. According to his analysis, most research has focused on factors that are personal (age, race, gender) and has not concentrated on other factors that affect engagement, i.e. social (friend, family), cognitive (personality, body-image, self-efficacy) and environmental (facilities, safety) (Keating, Guan, Piñero, & Bridges, 2005).

There is clear indication from past research that establishing a more active life style during early adulthood is associated with behavioral patterns that endure through adulthood, which in turn corresponds to a decreased risk of disease related mortality. Theoretical models of exercise engagement can help to organize research efforts on factors that influence healthy behavior patterns that have lasting effects.

**Theoretical Model**

Understanding why women choose not to participate regularly in exercise or physical activity may be seen as a multi-factorial problem embedded in context. The application of theoretical models furthers our understanding of the contextual and ecological factors that influence young adult women in the engagement and consequent adherence to exercise practices.

**Health Promotion Model**

The Health Promotion Model (HPM; Pender, 2002) attempts to organize the individual and contextual factors that contribute to engagement in healthy behaviors. The HPM (Figure 1) first appeared in the nursing literature in 2002 (Pender, 2002). The model helps to identify factors that can influence health behaviors and in so doing can assist practitioners in helping
clients achieve a healthier lifestyle. The HPM describes three areas that relate to healthy behaviors: 1) an individual’s characteristics (i.e., personality style, body image) and experiences, 2) behavior specific cognitions (i.e., self-efficacy, perceived barriers and benefits) and affect and 3) behavioral outcomes (i.e. improved fitness). The first two areas are considered critical points for intervention with a number of studies supporting the components of health promotion theory, and its impact on exercise engagement among young adult women (Pender, 2002).

**Individual Characteristics and Experience**

Individual characteristics and experiences provide the foundation from which people decide to engage in exercise. This foundation includes sociocultural, psychological and biological contexts that influence and create personal choice (Pender, 2002). In particular, several studies support the relevance of prior exercise experience, an individual’s personality type and perceived body image as having correlations with exercise engagement among young adult women (Cash, et al., 1994, Courneya & Hellsten, 1998; Franzoi & Shields, 1984; Frederick & Morrison, 1996; Lowery, et al., 2005; Rhodes & Smith, 2006).

**Prior Related Behavior.** It is important to examine how childhood physical activity is related to adult physical activity in order to best tailor physical activity-promotion strategies. In a 20 year longitudinal study, over 6,000 youth were surveyed to determine the link between physical activity in childhood and adulthood. Investigators found modest associations between childhood and adult physical activity that varied by domain, age and sex. They suggested that promoting a range of physical activities among children of all ages was warranted (Cleland, Dwyer, Venn, 2012). Similarly, data drawn from the Cardiovascular Risk in Young Finns Study, an international sample, indicated that a high level of physical activity at ages 9 to 18, especially
when continuous, significantly predicted a high level of physical activity in adulthood (Telama, Yang, Viikari, Välimäki, Wanne, Raitakari, 2005). It is worth noting that the physical activity most common during youth involves competitive and non-competitive sports, such as dance, gymnastics, soccer, swim and tennis. Research has suggested that motives to engage in sports may be different for boys and girls. In a study by Kilpatrick, Hebert and Bartholomew (2010), participants were found more likely to report intrinsic motives, such as enjoyment and challenge, for engaging in sport, whereas motivations for exercise were more extrinsic and focused on appearance, weight and stress management. Overall, individuals who were physically active during childhood appear to be modestly more likely to engage in exercise as adults, though the impact of childhood exercise on exercise persistence is unknown.

**Personal Factors.** Personality, defined as dimensions of individual differences in tendencies to show consistent patterns of thoughts, feelings, and actions, is hypothesized to represent a biological influence towards culturally conditioned phenomena, behavior, and life events (McCrae & Costa, 1995). A literature review and meta-analysis conducted by Rhodes and Smith (2006) suggested the recent upsurge in personality research is due to better psychometric measures and increasing evidence that personality is structured similarly across cultures and is stable over time.

In their review of 36 peer reviewed articles, Rhodes and Smith (2006) reported, of the several personality tests used to evaluate the relationship between personality and activity, personality traits of extraversion, neuroticism, openness to experience, and conscientiousness were all correlated with physical activity. These traits were drawn from the five factor model of personality assessment. The Five Factor Model (FFM) has become known as the most
acceptable inventory in assessing personality, especially for health (Courneya, Bobick, & Schinke, 1999). The FFM is based on a five factor taxonomy: neuroticism (N, a tendency to be anxious, vulnerable and self-conscious), extraversion (E, a tendency to be sociable, energetic and assertive), openness to experience (O, a tendency to be reflective, perceptive and creative), agreeableness (A, tendency to be generous, kind, unselfish and cooperative) and conscientious (C, a tendency to be achievement-oriented, focused, self-disciplined and organized) (Rhodes & Smith, 2006).

Gender and personality differences for reasons to exercise were found in a study conducted by Davis, Fox, Brewer & Ratusny (1995) of 106 men and 105 women. Participants completed two questionnaires and an interview for the study. Subscales of weight control, attractiveness, tone, fitness and health, mood and enjoyment from the Reasons for Exercise Inventory were used along with the Eysenck Personality Questionnaire. Women up to the age of 45 reported exercising for weight control more so than their male counterparts however after the age of 45 men were reported to exercise to control their weight more so than women of similar age. An analysis found traits of extroversion to correlate with weight control, appearance and enjoyment. An extraversion by age interaction was seen for fitness and health such that younger people with an extraverted personality were most likely to exercise. In addition, high levels of neuroticism were found to be associated with body image concerns (Davis, Fox, Brewer, & Ratusny, 1995). Study authors did not adequately demonstrate whether personality characteristics influenced adherence or engagement in exercise.

Courneya and Hellsten (1998) conducted one of the few studies that investigated the relationship between exercise motives, barriers, and personality. Undergraduate students
(N=264) completed a self-report survey assessing personality, exercise behavior, exercise motives, exercise barriers and exercise preference. The exercise preference category was comprised of subcategories preferred exercise time, preferred exercise structure, as well as preferred exercise intensity. As expected, they found personality traits of extroversion, neuroticism and conscientiousness to be highly associated with aspects of exercise behaviors, motives, barriers and preference. Consistent with prior studies, high neuroticism was associated with concerns regarding appearance and weight. Another consistent finding was that extraverts preferred not to exercise alone and those who scored high on the Openness factor preferred to exercise outdoors rather than in fitness centers or gyms.

In a subsequent study, Courneya and colleagues (1999) investigated whether the social cognitive constructs contained within the Theory of Planned Behavior (TPB) mediated the association between personality and exercise. Two studies were conducted, the first one used self-report data from 300 undergraduate first year female students and the second study used objective attendance records from 67 female undergraduates, enrolled in structured exercise classes. Both groups were administered surveys measuring personality, the TPB and exercise activity. Results were consistent with previous studies acknowledging personality traits of neuroticism, extraversion and conscientiousness being associated with exercise. However, only partial support was seen from study results of the TBP mediating the relationship between personality and exercise. The authors concluded that the TPB may not possess the relative social-cognitive construct and a better theory to explain the relationship may be needed (Courneya et al., 1999).
Body image issues, according to Cafri, et al. (2005), are the result of sociocultural factors, specifically interpersonal and media influences on the notion of a thin ideal. Body dissatisfaction is a discrepancy between the perceived and ideal body image of an individual, and may be viewed in the context of what is normal, by cultural standards of physical attractiveness (Smith et al., 1998). Research has found notable differences in the reasons men and women exercise, specifically that women exercised for weight reasons and to improve personal appearance (Cash, et al., 1994; Smith, Handley & Eldredge, 1998; Tiggemann & Williamson, 2000; Furham, Badwin & Sneade, 2010).

A number of studies examining both body image and exercise have been conducted with young adults. For example, McDonald and Thompson (1992) conducted a study of 191 participants with a mean age of 22.5 years to explore gender differences of reasons to exercise, types of exercise preferred and body dissatisfaction. They found that women exercised for reasons concerning weight and had higher levels of body dissatisfaction than men (McDonald & Thompson, 1992).

Relatedly, Cash and colleagues (1994) examined the factor structure of the Reason for Exercise Inventory using 101 exercising women from a public university. Of the four factors: Fitness/Health, Appearance/Weight Management, Stress/Mood, and Socializing, the strongest association with frequency of exercise was found to be Appearance/Weight Management as reasons women exercised.

In a study of 344 young women aged 20 to 29 years, surveyed by Soliah et al. (2008) dietary and exercise patterns that persist after graduation were examined. The authors found that the majority of their sample did not engage in appropriate amounts of physical activity and
that only 31% could be classified as “exercisers” (Soliah, L., Walter, J., & Antosh, 2008). Reasons for dieting and physical activity revolved around weight and body size with lack of time reported as the most often stated barrier. Soliah, et al (2008) pointed out however that a negative attitude and a deficit in motivation are also influencers of decisions in what we decide to prioritize. If there is no enjoyment in physical activity one is less motivated to participate (Soliah, L., Walter, J., & Antosh, 2008).

Studies of adolescents mirror those with young adults. Furham, Badwin & Sneade (2010) conducted a study on gender differences in body image dissatisfaction and reasons to exercise. They concluded that girls exercised for weight loss compared to boys who exercised for fitness. In their study of 111 boys and 124 girls with a mean age of 16.8 years they found that girls exercised for negative reasons (weight loss, attractiveness and tone) more so than the boys. No gender difference was found for positive reasons: mood, health, enjoyment, and fitness. Self-esteem was found to correlate with weight control; signifying participants with lower self-esteem exercised more for weight. According to the authors, results suggest that exercising for women may be part of the complex of attitudes and behaviors that make up normative discontent (Furham, Badwin, & Sneade, 2002).

Although body image and weight concerns appear as frequent motivators of exercise engagement, dissatisfaction with one’s body and self-consciousness can also be a deterrent. For example, in a report by Deputy Assistant Secretary for Women’s Health in the U.S., Dr. Wanda Jones (2003) addresses the necessity of understanding the barriers to women engaging in physical activity. The survey sampled women aged 20 to 50 from urban and rural populations and found that by adding the option for respondents to list a health condition as a barrier to
exercise, women reported not engaging due to incontinence, mood disorders, obesity and being overweight. Jones (2003) reported that self-consciousness about body size, breast bounce, and uncomfortable clothing are deterrents to engaging in types of physical activity, such as walking, that generally are carried out in public places.

Body image has not only been examined as a predictor for engaging in exercise, but has also been examined as an outcome. That is, a negative body image including weight and shape concerns may motivate individuals to engage in exercise; however improvements in body image, weight and shape may also be experienced as a benefit of exercise. Lowery et al. (2005) examined the impact of health behaviors on body image in first year male and female college students. Participants were 433 college students between the ages of 17 to 32 who completed a pencil and paper questionnaire. Results of a multivariate analysis used to compare measures between men and women found that women were more dissatisfied and shameful of their bodies and were more concerned with their weight and body image (Lowery et al., 2005). Contrary to study results cited by Hausenblas and Fallon (2006), Lowry, et al.(2005) found that women who exercised did not report being more satisfied with their body than women who did not exercise, indicating that although body image may be an initial motivator for exercise engagement, it may not facilitate persistence with exercise. Therefore improving or maintaining body image may not be relevant to exercise persistence over time.

In a meta-analysis, Hausenblas and Fallon (2006) looked at the effects of exercise on body image using 121 (correlational, intervention and single-group) studies. The authors’ analyses revealed that those who exercised reported lower body dissatisfaction than those who did not exercise although this effect was small and varied by gender, with a stronger
relationship between positive body image and exercise among men compared to women. (Hausenblas & Fallon, 2006).

Similarly, Tiggemann and Williamson (2000) conducted a study to investigate the association between psychological well-being and amount of exercise in a sample of 252 people between the age of 16 and 60 years. In contrast with the majority of research, they found that among young women, amount of exercise was inversely associated with body satisfaction. Their results indicated that women exercised more for muscle tone and weight control than did the men but that most participants reported increased feelings of well-being with exercising. With the sample of young women aged 16 to 21 the opposite was true. They found this sample to report decreased self-esteem and body satisfaction as amount of exercise increased. The authors suggest this could be the result of messages on body image ideals received from the media and social platforms (Tiggemann & Williamson, 2000).

So far, past research has suggested that exercise behavior during childhood and adolescence is a modest predictor of exercise behavior in adulthood. Similarly research of personality style suggests that individuals high in trait neuroticism, extraversion and conscientiousness engage in exercise at higher rates than individuals with differing personality traits. Studies have not examined the impact of either prior exercise behavior or personality style on persistence with exercise overtime. However, since both exercise history and personality style are static, they are unlikely to contribute meaningfully to a study of modifiable factors that influence exercise persistence in young women.

With regard to body image, data reveal that body image concerns appear to motivate many young women to engage in exercise, likely due to the expectation that their weight and
shape will improve with exercise. However research that has examined the impact of exercise on body image has revealed that many women do not see benefits. Although no studies have directly examined the impact of body image on exercise persistence, the finding that women do not perceive improvements in body image as a result of exercise suggests that body image may not be a strong motivator for exercise persistence.

**Behavior Specific Cognitions and Affect**

Behavior specific cognitions and affect have the ability to be modified to reflect behavior change and integrate several components: perceived barriers and benefits to action (perceptions that block or motivate), perceived self-efficacy (confidence in performing the specific action), activity related affect (feelings or emotions), interpersonal influences (social support, family, friends), and situational influences (environment, physical structure) (Grubbs & Carter, 2002).

**Perceived Barriers & Benefits.** A better understanding of the barriers and benefits to exercise is important in understanding and bringing about behavior change (Lovell, El Ansari, & Parker, 2010). In a study conducted by Johnson, Corrigan, Dubbert & Gramling (1990), 300 women aged 18 to 72 were surveyed (over 80% being under the age of 40) to identify perceived barriers to exercise and dieting. Findings revealed women categorized barriers within four general areas: exercise milieu, time expenditure, physical exertion, and family encouragement. More specifically, the majority of women endorsed a lack of finances, lack of proper facilities, time, and not having an exercise partner. More than 20% of respondents cited not liking to exercise or a loss of interest in exercising as to reasons for not engaging in physical activity.
According to the authors the study data suggested that women’s perceptions of not having enough time need to be addressed in order for a successful exercise program to exist.

Perceived barriers to a healthy lifestyle was further investigated in a study of 471 college students between the ages of 18 and 30 years. Findings revealed over 80% of participants endorsed current exercise behaviors as well as past exercise routines before entering college. With 42% stating they were more inactive than before and that lack of time, motivation and willpower were barriers to exercising (Silliman, Rodas-Fortier, & Neyman, 2004).

In 2010, Lovell, Ansari & Parker (2010) found that the greatest barriers for their sample of college age women were physical exertion and time expenditure. Study participants were 200 non-exercising female students enrolled at two universities in England. Each participant completed the Exercise Barriers and Benefits Scale (EBBS). Results indicated the greatest perceived benefits from exercise as physical performance, psychological outlook, preventative health and social interaction. Physical performance was reported as the most perceive benefit and the greatest perceived barriers were reported as physical exertion, time expenditure, exercise milieu and family constraints. Physical exertion was reported as the most significant barrier for this population. Study implications included designing interventions focused on decreasing perceived barriers and on emphasizing benefits. One limitation cited by the authors was not being able to infer causality from cross sectional studies.

Booth, et al. (1997) explored perceived areas of support and barriers to engage in physical activity found in the Pilot Survey of the Fitness of Australians data. These data were collected from a randomly selected sample of over 2000 men and women aged 18 to 78 years.
Results were compared across three separate age groups: 18 to 39, 40 to 59 and 60 to 78. Walking was the favored activity of the 18 to 39 age group, with more than 40% indicating they preferred group activities and more men than women indicting this as their preference. In terms of barriers, the most selected was lack of time and lack of motivation. The authors recommend targeted interventions for walking and other group activities for younger (18 to 39) participants different from what should be suggested for the older age groups.

Racial and ethnic differences in barriers to exercise were explored in a sample of 745 African American, 660 Hispanic, 738 Native American/Native Alaskan and 769 Caucasian women aged 40 years and older residing in the United States (Eyler et al., 1999). Findings suggested that even though some differences existed across groups, most groups consistently cited lack of time and lack of energy as the predominant barriers to exercise. One limitation discussed by the authors included the cultural sensitivity of the scale, which may have resulted in correct classification of respondents to specific stages (Eyler et al., 1999). The authors advise that barriers across ethnic groups are not similar enough to recommend a one size fits all intervention.

Nahas, Goldfine and Collins (2003), used behavioral change theories (for example, Transtheoretical model, Learning Theories, Health Belief Model, Social Cognitive Theory, et al.) to provide an overview of factors that influence physical activity participation and sustainment in adolescents and young adults. In their review, they noted that lack of time was cited by the majority of participants as the number one barrier to exercise, but participants did find time to prioritize television viewing. This puts into perspective that lack of enjoyment may, in fact, be the most notable deterrent in exercising. In their study, they cited a research by Calfas, Sallis,
Lovato & Campbell (1994) which established that barriers to physical activity were reported more often because of dislike for the activity, annoyance and other demands.

Recommendations for improving the effectiveness of interventions of exercise programs that encourage persistence, include increasing social support, teaching skills in goal setting and providing options of positive fun activities (Nahas, Goldfine, & Collins, 2003).

Grubbs and Carter (2002) used a descriptive correlational design to examine exercise behaviors and perceived benefits and barriers to exercise of 147 undergraduate university students. Results indicated that preventative weight gain, stress-relief, enhanced self-esteem and wellbeing were the primary reasons for exercising while time constraints, family responsibilities and embarrassment were the most cited barriers to exercising. Perceived barriers to exercising was the most influential determinant for engaging in exercise and previous and current sports participation was highly correlated with regular exercise habits (Grubbs and Carter, 2002).

Marcus and Forsyth in a 1998 narrative study found interventions tailored to address barriers to physical activity in women would be very effective. According to Marcus and Forsyth (1998), theories that address change, for example cognitive behavioral theory or motivational theory may use interventions which are more successful at engaging women’s readiness for change. Barriers cited by women including social support, activity preferences, environmental (financial cost, safety of the neighborhood) and a women’s developmental or life stage are all important factors to consider when tailoring interventions or designing an exercise program for women in a target population. Research has demonstrated that there are differences in factors
that promote exercise for men and women and that investigating these gender differences to produce tailored interventions may be the key to increasing activity levels among women.

Segar, et al (2002) conducted a mixed methods study of 50 women from a Midwestern town to investigate gender and generation specific barriers to exercise. An intervention was designed using the integration of several theories: social cognitive, objectification, self-inrelation (relational cultural), and empowerment. Authors reported this integration of theories addressed the behavioral and sociopsychological considerations exclusive to women. Study participants completed a self-administered questionnaire at three intervals, at the beginning of the study, at the end and 6 to 9 months after the study ended as follow-up. Results of the study indicated participants increased their physical activity and continued to be active nine months after the study ended, supporting research that interventions are more likely to be effective if they address the needs and interests of the target group (p.344, Segar, Jayaratne, Hanlon, & Richardson, 2002).

In a behavioral medicine review by Moreno and Johnston (2014) they advocate understanding the barriers that affect women in participating in exercise. In their review they cite lack of enjoyment, lack of time, feeling self-conscious and urinary incontinence as specific barriers to physical activity that need to be addressed.

**Self-Efficacy.** Self-efficacy has been reported in several studies to be an effective means of increasing exercise engagement (Williams & French, 2011). According to Bandura (1989) self-efficacy is defined as an individual’s confidence in his or her ability to solve a problem or accomplish a task and is the major determinant of effort, persistence and goal setting. Bandura (2004) states that self-efficacy is a determinant of healthy behavioral practices and is a main
determinant because of its influence on actions and aspirations as well as on other factors such as perceived barriers and benefits of health goals.

In a study done by Parschau, et al. (2013), 193 students recruited from a German university filled out a paper and pencil questionnaire at three different time points assessing the relationship between positive consequences, self-efficacy and physical activity. The average age of study participants was 24 years with the majority of participants being female. Study findings were consistent with revealing a relationship between self-efficacy, positive experiences and physical activity. Individuals with a higher level of self-efficacy, belief in self, and a belief that they were in control of their actions were more apt to engage in physical activity especially when there was a past history of positive experiences (Parschau et al., 2013). Limitations discussed in the study included a reduction in half of the sample dropping out and administration of two types of questionnaires at the different time points to participants (Parschau et al., 2013). Implications reported encourage more research in bringing to light the effects of positive experiences (enjoyment) on behavior change.

In a meta-analysis of 27 studies of self-efficacy and physical activity, Williams and French (2001) reported that interventions that provided the highest self-efficacy leading to increased physical activity incorporated giving feedback on participant’s past performance, reinforced participant’s progress and incorporated time management strategies. A direct relationship was found between action planning (knowing when, how and where a behavior will occur), self-efficacy and physical activity. Action planning produced higher results of self-efficacy and physical activity (Williams & French, 2011).
Luszczynska, et al. (2011) made a distinction between action self- efficacy and recovery self-efficacy when looking at the association between self-efficacy and physical activity. In their study of 25 men and 33 women average age of 48 years they found support for their hypothesis: self-efficacy was important and critical in beginning and maintaining physical activity. Study results demonstrated that participants with low self-efficacy did not take advantage of interventions that promoted physical activity (Luszczynska, Schwarzer, Lippke, & Mazurkiewicz, 2011).

Self-efficacy was found to have a strong influence on exercise behavior in a study conducted by Hagger, Chatziasarantis, & Biddle (2001). This study involved 1152 students aged 12 to 14 years residing in Great Britain and used structural equation modeling to test variables thought to be predictors of physical activity. Study implications add that opportunities for physical activity should be provided to adolescents as soon as possible to foster positive experiences and competence (Hagger, Chatziasarantis, & Biddle, 2001). Authors listed cross-sectional approach as a study limitation.

Von Ah, et al. (2004) completed a study comprising of a 161 students from the University of Alabama. Participants were majority female (73%) with a mean age of 19.7 years. The aim of the study was to examine the effects of self-efficacy, perceived stress and social support on various health behaviors. Of most interest was the effect of perceived self-efficacy on physical activity. Analyses was conducted to investigate direct effects of predictors and if perceived barriers, threat and benefits mediated or moderated the effects of predictors. Authors concluded that self-efficacy was the most significant influence for increased physical
activity and that higher levels of self-efficacy were correlated to lower perceived barriers to exercise (Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004).

**Activity Related Affect.** Numerous studies (Corrigan, et al, 2013; Cramer, Neiman & Lee, 1991; Elavsky & McAuley, 2005; Malicka, et al, 2011; Melin, et al, 2003) link exercise to improved mood and reductions in mental health symptoms. However, less research has been conducted to explore the impact of affect during exercise on engagement and adherence to exercise practices. Indeed, enjoyment has been shown to be a primary motivator in engagement (Wankel, 1985; Kimiecik & Harris, 1996). However very minimal research has focused on this area of study (Wankel, 1985; Bell & Petruzzello, 2008) and even fewer studies have been done with women in mind.

In a study conducted by Puente and Anshiel (2010), enjoyment in exercise practices was related to the interactional style of the fitness instructor. Questionnaires were administered to 238 college students, 103 males and 135 females with a mean age of 20.4 years. Results indicated that instructor style was related to individual competence, which in turn, had a direct influence on participant enjoyment and positive affect (Puente and Anshiel, 2010). Because study participants were at various levels of exercise engagement, results cannot be generalized to other populations, for example, how to get sedentary individuals to engage in exercise participation.

Leadership style and exercise choreography was found to have impact on enjoyment in a study conducted by Bray, et al. (2004). In their study Bray et al. (2004) selected 96 women, mean age 20 years who identified as novice exercisers, i.e. women who did not engage in exercise and would be considered inactive. The study engaged all participants in a 40 minute
step aerobics routine. Results concluded that participants’ enjoyment was influenced by leadership style and by varied choreography. Results however could not conclude that these factors would influence persistence in exercise over time. Implications for future research suggest better efforts in identifying factors that influence exercise enjoyment (Bray, et al., 2004).

Enjoyment was positively predicted in a study conducted by Muricia, et al. (2008) on the influence of peer climate on self-determined motivation. The study comprised of 394 participants, 156 women and 238 men aged 16 to 54 years old, who exercised non-competitively as little as occasionally or as much as three or more days a week. Participants were assessed using scales measuring motivational factors of competence, autonomy and relatedness and its effect on self-determination and consequently enjoyment. Results indicated that contact with peers positively predicts competence, autonomy and relatedness (self-determined motivation) which in turn predicted sense of enjoyment with exercisers. Researchers suggest further studies should investigate the relationship between trainer (instructor) and peer influence on exercise enjoyment. (Muricia, et al., 2008)

Instructor’s competence and training has been mentioned in research as an influential factor on student’s enjoyment (Wininger, 2002). In a study conducted by Wininger (2002) the relationship between exercise enjoyment and instructor characteristics and type of exercise class was examined. Women (N=296) average age 22 years, enrolled in university aerobic classes were sampled using the Physical Activity Enjoyment Scale (PACES). A stepwise multiple regression analysis was conducted which revealed instructor’s level of fitness, instructor’s ability to communicate instruction and liking others in the class positively predicted enjoyment
(Wininger, 2002). However, these factors only contributed to 17% of the total variance signifying that other factors not studied could add more to the model. Further studies indicated the need to examine other factors, for example music, that would contribute to participants’ enjoyment. In a follow-up study conducted a year later, Wininger & Parbman (2003) assessed factors that were thought to contribute to exercise enjoyment: satisfaction of music heard during exercise, satisfaction with the instructor and exercise role identity (EIS), defined as how much a participant views themselves as an exerciser. The study had 282 females (mean age 21 years) from two large universities who were sampled using questionnaires before the beginning of their exercise class. Findings indicated that satisfaction with music was more relevant to participants over satisfaction with the instructor or EIS, however, all three factors positively predicted exercise enjoyment (Wininger & Parbman, 2003).

Correlations between enjoyment and exercise levels were found in a study conducted by Hagberg, Lindahl, Nyberg and Helle´nius (2009). Participants were 120 patients recruited from two medical clinics and were at least 19 years or older. Participants were assigned to one of two groups, control group or intervention and were assessed at baseline, and after 3, 6 and 12 months (Hagberg, Lindahl, Nyberg and Helle´nius, 2009). The intervention group received three weekly session, consultations and support, the control group was only given advice and locations of health centers. Results revealed a relationship between enjoyment and exercise level with enjoyment predicting the likelihood of participants continuing to exercise. At follow-up, enjoyment was 25% higher in the intervention group than the control group. Self-efficacy and social support were thought to be possible mediators of the effects observed in the study,
illustrating future roads for research (Hagberg, Lindahl, Nyberg and Hellénius, 2009). More information as to what makes exercise enjoyable was mentioned as an under researched area.

Ruby, Dunn, Perrino, Gillis and Viel (2011) conducted four studies investigating forecast bias of negative and positive perceptions of enjoyment and exercise. In their fourth study of 154 participants, mean age 24, results indicated that enhancing participants’ expected enjoyment in exercising increasing the intention of future exercise behavior (Ruby, Dunn, Perrino, Gillis & Viel, 2011). A study limitation was not assessing past exercise behavior (Ruby, Dunn, Perrino, Gillis & Viel, 2011). Engaging in exercise as a means for enjoyment was confirmed in a study conducted by Kilpatrick, Hebert and Bartholomew (2005). In the study, motivation to exercise was compared to motivation to engage in sports for a sample of 233 college students, 132 female and 101 males, with an average age of 22 years. Findings indicated that enjoyment was more important to men engaging in sports, than for women; as well as being somewhat important for both sport and exercise participation for women. Study limitations included needing a better measure to discern differences in motivation, specifically factors for enjoyment (Kilpatrick, Hebert and Bartholomew, 2005).

In a study conducted by McArthur and Raedeke (2009), enjoyment was viewed as one of the primary reasons college students engage in exercise. Participants were 636 undergraduates, 395 female, 241 male with 80% white and 14% black respondents, all between the ages of 17 and 50 years. No significant race or sex differences emerged for intrinsic motives of exercise engagement (McArthur & Raedeke, 2009). Enjoyment in exercise and self-management skills were most correlated to activity level. Students who performed exercise for physical and mental health, and intrinsic motivation, reported more enjoyment, male students reported
higher levels of enjoyment (McArthur & Raedeke, 2009). In sum, research of exercise enjoyment appears to be an important construct to further explore in models of exercise persistence.

**Interpersonal Influences.** This category of the HPM is designed to account for the influence of social norms on health promoting behavior, as well as the role of social support (family, peers, health providers) and role models on engagement in health promoting behaviors (Pender, 2002). A considerable amount of research has established the beneficial effects of social support on health and well-being (Fraser & Spink, 2002; Rhodes, et al., 1999; Spink & Carron, 1993; Von Ah, et al., 2004). However, relatively little work has focused on identifying those processes by which social support influences exercise. The vast majority of studies have focused on the influence of social support by family and friends. Wallace and colleagues (2000) applied Social Cognitive Theory (SCT) and the Stages of Change Model (SCM) to determine what personal and environmental characteristics were associated with exercise behavior among undergraduate university students (N = 937). Among females, exercise self-efficacy and family social support for physical activity were the best predictors of stage of exercise behavior change. Findings pointed to gender differences whereby family support did not predict exercise for males. Research has also suggested that females received more support from peers regarding healthy diet and exercise practices (Gruber, 2008).

**Situational Influences.** Situational influences refer to experiences at specific points in time (Guèrin & Fortier, 2013) or to the surrounding environment which can increase or decrease an individual’s motivation or engagement in physical activity. Situational variables can include coaching and leadership considerations (Robinson & Carron, 1982), perceived social
support, environmental factors of neighborhood safety, access to parks and recreation centers (McArthur & Raedeke, 2009) or aesthetics (the look and feel of a particular place). Robinson and Carrion (1982) conducted a study examining the personal (motivational) and situational factors that affected participants’ decision to persist or drop out of competitive team sports. In this study, 98 high school aged athletes (football players) filled out questionnaires and were assigned to three groups: sport dropouts (n = 26), sport starters (n = 33) and sport survivors (n = 39) (Robinson and Carrion, 1982). Findings revealed that group participation was influenced by both personal and situational factors (encouragement received from fathers, encouragement received from teachers, self-efficacy, and perception of the coach). Study limitations acknowledge results cannot be generalized to female athletes or to athletes of other sports and suggest those areas as possible avenues of study.

**Behavior Change Process**

Now that the primary predictors outlined in the HPM have been examined with relation to exercise behavior, the final process of behavior change in the HPM (Figure 2) will be described. According to Pender (2002), *Behavior Specific Cognitions and Affect*, influenced by *Prior Related Behavior* and *Personal Factors*, determine whether or not a *Commitment to a Plan of Action* takes place. Commitment to a plan of action is the individual’s capacity to identify strategies that enable them to successfully engage and adhere to exercise behaviors (Pender, Murdaugh, & Parsons, 2002). Once a commitment to action is made, the *Behavioral Outcome* (e.g. exercise persistence) can occur. Behavioral outcomes are the desired end result whereby an individual makes a decision and carries out a plan of action for engaging in health promoting behaviors (Pender, 2002). As reviewed above, data indicate that young women who
engage in exercise are often looking for the following benefits: stress-reduction, appearance, weight management, mental health, fitness and health. It is important to note that the strength of the relationship between commitment to a plan and behavior change is impacted by Immediate Competing Demands. A competing demand is an alternative behavior that derails intention to exercise just prior to initiation. Individual often have little control or ability to resist competing demands (Shin, et al., 2009). According to Pender, et al., (2002) commitment to exercise is less likely to occur if other more attractive options are preferred, whereas commitment to exercise is significantly enhanced if exercise is enjoyable to the individual.

Six domains of the HPM have been examined 1) perceived benefits of action; 2) perceived barriers to action; 3) self-efficacy; 4) activity-related affect; 5) interpersonal influences; and 6) situational influences. Studies have examined aspects of all six categories with regard to exercise engagement and suggest that the HPM is a promising model to also explain the process of exercise persistence. However, the domain of interpersonal influence has been narrowly specified to include family, peer and provider influences on health promoting behaviors with no attention to other aspects of the interpersonal experience that may influence behavior. This appears to be a gap in the model. Given this gap, it is necessary to explore another theoretical model, Relational Cultural Theory, which better explicates the complexity of interpersonal factors involved in motivating behavior for women.

Relational Cultural Theory

The relational cultural theory developed at the Stone Center conceptualizes gender differences in psychological development. This theory also helps us understand the factors that affect enjoyment for women. Relational cultural theory brings an awareness of the contextual
and relational experiences of women, especially within diverse racial and ethnic groups (Comstock, et al., 2008). Relational cultural theory asserts three main concepts: the influence of cultural contexts; the importance of relationships as the central feature in women’s development; and pathways to growth, acknowledging women’s relational qualities and activities as potential strengths that provide pathways to healthy growth and development. According to this theory, women value relationships and connection with others and these interpersonal experiences are central to women’s development (Jordan, 2001). Based on this theory, women may be more inclined to persist with exercise when their exercise routine fosters a connection with others and when the environment is conducive to these goals as well.

A small literature on gender based fitness, exercise options specifically geared to women, supports the assertion that interpersonal factors are central to engaging women in exercise. Indeed, a study done by Segar et al. (2002) found that tailoring interventions to address specific populations (e.g., women) not only increased activity level but maintained their exercise engagement after the study was complete. Programs that attract women to exercise have grown over the past few years with women-only gyms the fastest growing segment of the fitness industry (Craig & Liberti, 2007). Aerobic exercise, usually practiced as a group exercise, has an overwhelming large amount of participants being women (Collins, 2002). In a qualitative study done by Collins (2002) women who participate in aerobics were interviewed. In these women’s experiences the benefits gained from their activity incorporated a nonjudgmental and empowering environment, being able to set personal goals, confidence building, socializing with other members, enjoyment and the aesthetics of the facility (Collins, 2002).
In another qualitative study, Craig and Liberti (2007) found that establishing an organizational culture that provides a nonjudgmental and comfortable environment for women to work out was an important factor in getting women to exercise. Additional factors that encouraged women to commit to engaging were not requiring specific clothing to work out in, pleasing décor, “warmth of the instructor” and the friendly environment (Craig & Liberti, 2007). Furthermore, Marcus & Forsyth (1998) noted that tailoring gyms to women may help to attract women to physical activity, particularly if women feel that the messages and strategies being promoted are relevant to them.

**Conclusion**

To date, a sizable literature has examined factors that impact the likelihood of individuals engaging in exercise. The Health Promotion Model attempts to integrate relevant factors into a unitary predictive model of behavior initiation. However, this model is not gender-informed, does not account for the relevance of social connections or contexts that support behavior, and has not been examined with regard to exercise persistence. Thus, in order to better understand the factors that can promote exercise persistence for young women, relational cultural dynamics will need to be studied in conjunction with HPM variables significant in predicting health promoting behaviors (Shin, et al., 2006). Specifically, perceived self-efficacy, perceived barriers, perceived benefits, prior behavior, perceived enjoyment of the exercise experience, coupled with the social and interpersonal nature of the exercise environment need to be considered. Adapting the HPM to better predict exercise persistence among young women may have multiple benefits. First, future studies could then examine whether tailored programs to women, that is, those that account for the interpersonal needs of
women and ways in which the environment can support those needs, may lead to greater persistence in exercise habits over time. This goal is crucial as behavioral patterns set in young adulthood tend to continue into the adult years. Young women who engage and persist in exercise will be more likely to continue that healthy habit and reap both the physical and psychological benefits for years to come.
Reframing Female Fitness: An Investigation of RCT Principles in Predicting Exercise Persistence in College Age Women

The benefits of exercise and physical fitness for physical and psychological health are extensive. They include disease prevention (Eyler et al., 1999), improved cognitive function (Fox, 1999), slowed age-related physical decline (Maher et al., 2013), improved satisfaction with life (Elavsky et al., 2005), enhanced mood states and reduced symptoms of anxiety and depression (Cramer, Neiman, & Lee, 1991). Yet, even with the overwhelming evidence for the benefits of exercise, fewer women than men engage in recommended levels of physical activity (Moreno & Johnston, 2014), which according to the American College of Sports Medicine (ACSM) and the Center for Disease Control and Prevention (CDC) is at least 150 minutes of moderate intensity activity weekly (Martin et al., 2000; Thompson et al., 2013). Moreover, the participation of women in exercise decreases with age, and minority women are less likely to engage in and persist with exercise than their Caucasian counterparts (Heesch, Brown, & Blanton, 2008). Previous research has indicated that the greatest decline in physical activity occurs during early adulthood (Wallace, Buckworth, Kirby, & Sherman, 2000). These findings are particularly problematic, as early adulthood is also a time to establish behavioral patterns that will likely continue into adulthood. Thus, individuals who do not engage in and persist with an exercise routine during young adulthood will be less likely to exercise in later adult years.

Statement of the Problem

Data have indicated that young women who do engage in exercise, do so to achieve benefits such as stress and weight reduction, and improved appearance, mood, fitness, and health (Cramer, Neiman, & Lee, 1991; Elavsky et al., 2005; Eyler et al., 1999; Fox, 1999; Maher
et al., 2013; Tiggemann & Williamson, 2000). However, many young women do not exercise regularly (Kimm et al., 2002; Moreno & Johnston, 2014; Segar, Jayaratne, Hanlon, & Richardson, 2002). Research aiming to understand patterns of exercise among young women has often focused exclusively on exercise engagement, that is the act of initiating exercise, and paid little attention to exercise persistence, that is adhering to an exercise routine over time (White, Randsdell, Vener, & Flohr, 2005). Persistence is an important focus, as adhering to exercise practices over time (rather than sporadic engagement in exercise) is necessary to obtain long-term health benefits. Therefore persistence, rather than engagement, is a more appropriate outcome of interest when considering exercise from a public health perspective. As such, a primary goal of this study was to understand the factors that contribute to exercise persistence among young women.

Theoretical models of behavior change such as the Health Promotion Model (HPM; Pender et al, 2002), have been previously used as guiding frameworks in studies examining exercise engagement among men and women. Based on the HPM, the following three components should predict exercise engagement: 1) Individual characteristics and experiences, such as prior exercise behavior, personal factors (biological, psychological, sociocultural) and general characteristics of the individual that influence health behavior such as age, personality structure, race, ethnicity, and socioeconomic status; 2) behavior-specific cognitions and affect, such as perceived benefits and barriers to action, perceived self-efficacy, activity-related affect, interpersonal influences, and situational influences and 3) behavioral outcomes, such as competing time demands and the impact of the exercise itself.
Studies evaluating the usefulness of the HPM in predicting behavior have found prior experience, perceived self-efficacy, perceived benefits, and perceived barriers to be significant variables influencing behavioral outcomes (exercise engagement) (Pender et al., 2002; Shin et al., 2006; Wu & Pender, 2002). However, the HPM model has not yet been applied to exercise persistence, which is an important gap in the literature. Furthermore, data from other domains such as health care engagement suggest that numerous aspects of the interpersonal process beyond the influence of family/peers/providers may be central (Hagberg et al., 2009), yet these factors have not been extensively researched. Indeed, relational cultural theory (Jordan, 2001) indicates that certain environmental and personal experience characteristics, such as the perceived \textit{social connectedness} to people in the environment and \textit{relational experiences such as “an attitude of relatedness, of mutuality... of participating in experience”} (Jordan, 2001, p. 97), may be particularly important for women (Bloom et al., 2002; Comstock et al., 2008; Frey, 2013). If this is the case, examining social connectedness, sense of belonging and relational experiences in the exercise environment may improve our understanding of exercise persistence among young women and expand our understanding of the interpersonal characteristics domain within the Health Promotion Model.

Recommendations made by the ACSM, CDC, WHO, and The American Heart Association, (Garber et al., 2011) specify exercise intensity as an important aspect of exercise. However, very few studies have looked at exercise intensity, and in a meta-analysis conducted by Ekkekakis, Parfitt, and Petruzzello, (2011) it was noted that exercise intensity may be an understudied factor associated with persistence (Ekkekakis, Parfitt, & Petruzzello, 2011; Standage, Sebire, & Loney, 2008). Intensity has been in fact shown in a few studies to be a
significant component in understanding adherence and according to the ACSM higher intensity exercise may lower persistence (Ekkekakis, Parfitt, & Petruzzello, 2011; Martin et al., 2000; Thompson et al., 2013). To date this is an understudied area that could prove important in understanding predictors of exercise persistence in college-aged women.

**Purpose of the Study**

The empirical literature (e.g., Frey, 2013; Hagberg et al., 2009; Shin et al., 2006) has consistently and effectively utilized Pender et al.’s (2002) health belief model (HPM) as a means to introduce pertinent constructs that predict exercise engagement. It is therefore surprising that few studies have utilized the HPM to explain exercise persistence, or further investigate the influence of exercise intensity on persistence. Furthermore, relational cultural models explaining behavior (Bloom et al., 2002; Frey 2013; Jordan, 2001), suggest that women may identify interpersonal factors (e.g., exercising in groups, receiving social feedback, using the exercise environment as a social meet-up) as a primary motivator for exercise persistence. The overarching goal of this study was to address several gaps in literature, that is (a) the lack of empirical examination as to whether HPM constructs (i.e., barriers/benefits to action, self-efficacy, activity-related affect, and interpersonal and situation influences) significantly predict exercise persistence among early adult female participants; (b) whether exercise intensity impacts exercise persistence; and (c) to better specify the interpersonal influence domain as specified by relational cultural theory.

In accordance with previous research, we hypothesized that (1) core components of the HPM (barriers and benefits to exercise, self-efficacy, activity related affect, etc.) measured at baseline would be positively associated with exercise persistence over a 3 month follow-up
period, (2) higher scores on measures of interpersonal connectedness in the exercise environment would be positively associated with exercise persistence over a 3 month follow-up period, and (3) interpersonal connectedness in the exercise environment would add significantly to the prediction of exercise persistence, above and beyond the contribution of HPM components. Lastly we hypothesized group differences whereby young women who report persisting (based on ACSM guidelines) with an exercise program over a 3 month follow-up period would also report higher scores on measures of the HPM and interpersonal factors at follow-up, as compared to those women who did not persist. The 3 month follow up period of the study fit neatly within the time frame of the academic semester.

**Method**

**Research Design**

The research design for this study was a longitudinal, quasi-experimental pre-test post-test design with no control group. HPM and interpersonal determinants were measured at baseline and at 3 months.

**Procedure**

Female college students aged 18 to 26, were recruited at the beginning of the Spring 2016 semester using posters and flyers posted at the Merino and Cabot Fitness Centers, in campus resident halls, social media sites (i.e., University-related Facebook and Instagram groups), the MyNEU website, and in the main student center on Northeastern University’s campus. All posted material had this investigator’s email address so that potential participants could obtain additional information about the study. Those who responded were among the
Northeastern students who expressed interest after having seen the study advertised in the fitness and student centers, and via online sites like MyNEU, Facebook and Instagram. Respondents were emailed an invitation and link to the study that included an informed consent form and a Qualtrics survey. Those who chose to participate were also asked to provide an email address so that they could be contacted to complete a second survey at the 3-month follow-up. Participants who completed both surveys had their names entered into a raffle for a chance to win an incentive (a VISA gift card valued at $140) for participating. The winner was notified by email.

Of the 200 students who were emailed the consent form and 20 minute survey, 27 failed to respond. One hundred and seventy three participants provided consent via an online form, 161 students completed the baseline survey, 29 did not meet criteria for study inclusion (not female or between 18 and 26 years), and 103 women completed the survey at time 2. Therefore 103 participants who completed surveys at both time points were included in the final analyses. No significant differences were found on demographic variables and HPM model characteristics (all p’s= ns) between women who completed surveys at time 1 and time 2 with those who completed surveys at baseline only (time 1).

Participants

On average, female participants were 20.81 years old (SD = 2.00; range 18 – 26) with a mean BMI of 23.7. They were predominately White (n =60, 58%), with the remaining students being Asian (n =28, 27%), Black/African American (n =9, 9%), Hispanic/Latina (n =3, 3%) and other (n =3, 3%). The majority were college level freshmen (n =25, 24%) with the remaining students being graduate (n =23, 22%), junior (n =19, 18%), sophomore (n =18, 18%), senior (n
They mostly lived off campus (n = 54, 52%) with 49 (48%) indicating they lived on campus. Most participants (n = 61, 59%) were single, 41 (40%) were in a romantic relationship, and only 1 (1%) indicated they were married. Forty-three (42%) worked part time, 33 (32%) full time and 27 (26%) did not work.

Measures

The following surveys were selected to measure components of the Health Promotion Model (HPM), as well as the interpersonal processes specified by Relational Cultural Theory. All measures were administered at time one (T1) and time two (T2) with the exception of the demographic questionnaire and the question regarding prior sport and/or exercise behavior, which were only administered at T1.

Demographics questionnaire. Data were collected regarding age, race/ethnicity, height/weight (to calculate body mass index [BMI]), university status (e.g. freshman), living situation (e.g. on campus), relationship status, and employment status, previous or sports/exercise experience.

HPM constructs. Prior related behavior. Participants answered one question inquiring about whether they had prior sport experience, previous exercise experience, both sport and exercise experience or no experience at all.

Perceived benefits and barriers to action. The Exercise Benefits/Barriers Scale$^1$ (EBBS) is a 43-item self-report measure developed by Sechrist et al. (1987) to explore perceived benefits.

---

$^1$ Permission to use this scale was given by Karen R. Sechrist, PhD, RN, FAAN for Pender/Walker/Sechrist (see Appendix A).
and barriers to exercise and is based on the Health Promotion Model. The 29-item Benefits Scale has been found to have a high internal consistency of $\alpha = .95$ and the 14-item Barriers Scale has been found to have an internal consistency of $\alpha = .87$ (Grubbs & Carter, 2002; Sechrist, Walker, & Pender, 1987). Test-retest reliability was found to be $\alpha = .89$ on the total instrument, $\alpha = .89$ on the Benefits Scale and $\alpha = .77$ on the Barriers Scale (Sechrist, Walker, & Pender, 1987; Grubbs & Carter, 2002). Examples of scale items include “I am too embarrassed to exercise” and “exercise improves the way my body looks.” The instrument has a four-response, forced-choice Likert-type format with responses ranging from 1 (strongly disagree) to 4 (strongly agree). The higher the score, the more positively the individual perceives exercise. For the present study the EBBS total scale score was used. The EBBS was found to have moderate stability over three months, $r (103) =0.68, p < 0.01$. The total score also demonstrated good internal consistency at Time 1, $\alpha =.82$ and Time 2, $\alpha =.79$.

**Perceived self-efficacy.** The Exercise Self-Efficacy scale (ESE) is a five item scale that measures exercise barriers including “I am confident I can participate in regular exercise when I am tired” or “I am confident I can participate in regular exercise when I am on vacation” (Marcus et al., 1998; Marcus et al., 1992). The Likert rating scale ranges from 1 (strongly disagree) to 5 (strongly agree) with higher scores indicating higher self-efficacy. Previous studies have found this scale to have an internal consistency of $\alpha = .82$ (Marcus et al., 1998). In the present sample, the ESE was found to have adequate stability over three months, $r (103) =0.50, p < 0.01$, and good internal consistency at Time 1, $\alpha =.70$ and Time 2, $\alpha =.71$.

The Exercise Scheduling Self-Efficacy (ESSE) was also used to assess participants’ confidence to schedule their activity. These items were taken from previous research
investigating scheduling self-efficacy for exercise (Wilson, Spink & Priebe, 2011). Item examples include “I am confident that I can arrange my schedule to be active no matter what” and “I am confident that I can make up times when I have missed my regular exercise.” The measure consists of three items on a Likert based scale ranging from 1 (strongly disagree) to 5 (strongly agree), higher scores indicating higher self-efficacy. Internal consistency was calculated and found to be adequate at $\alpha = .84$ (Wilson, Spink & Priebe, 2011). In the present sample, the ESSE was found to have adequate stability over three months, $r_{(103)} = 0.52$, $p < 0.01$, and good internal consistency at Time 1, $\alpha = .79$ and Time 2, $\alpha = .85$.

Activity related affect. The Physical Activity Enjoyment Scale (PACES) was used to measure exercise enjoyment. It includes 18 items that examine various aspects of physical activity enjoyment rated on a continuum (e.g., I enjoy it, I hate it; I feel bored, I feel interested). Examples of items include “It makes me depressed,” “It’s not at all stimulating,” and “It’s very pleasant.” Responses are provided on a five point Likert-type scale with the 11 negatively phrased items being reverse scored. An overall enjoyment score is obtained with higher scores signifying more enjoyment (Motl et al., 2001). The PACES internal consistency has been found to be $\alpha = .96$ (Hu et al., 2007; Kendzierski & DeCarlo, 1991; Motl et al., 2001). The test-retest reliability coefficient ranges from .60 to .93 (Hu et al., 2007; Kendzierski & DeCarlo, 1991; Motl et al., 2001). The PACES was used to measure exercise enjoyment traits (exercise enjoyment in general, most of time) by using tailored instructions. The instruction for the trait measure of exercise enjoyment items was “Please rate how you feel about most types of physical activity in general, most of the time”. In the present sample, the PACES was found to have moderate
stability over three months, \( r(103) = 0.65, p < 0.01 \), and good internal consistency at Time 1, \( \alpha = .84 \) and Time 2, \( \alpha = .86 \).

**Interpersonal and situational influences.** A modified version of the Group Exercise Questionnaire (GEQ) was used to measure perceived cohesion in the fitness environment and has been used previously with a similar sample (Blanchard et al., 2000; Heinrich et al.; Courneya & McAuley, 1995; Spink & Carron, 1993). The GEQ is based on a model that depicts cohesion as a multidimensional construct consisting of four dimensions: group integration-social, group integration-task, individual attraction to the group-social, and individual attraction to the group-task. These four dimensions are combined to compute one cohesion score (Courneya & McAuley, 1995; Eastabrooks & Carron, 2000; Spink & Carron, 1993). Perceived belonging and satisfaction is seen as a sense of connection and support with others in an activity setting (Allen, 2006). Items include “For me the person/people I work out with is/are an important social community to which I belong” and “Some of my best friends are the people I work out with.” Each item is scored on a 7-point Likert type scale ranging 1 (strongly disagree) and 7 (strongly agree), with scores averaged for each subscale such that higher scores indicate higher cohesion. The internal consistency of this modified questionnaire has been found to be \( \alpha = .77 \), \( \alpha = .62 \), \( \alpha = .71 \), and \( \alpha = .77 \) for or the four scales, respectively (Spink & Carron, 1993). The calculation of a total cohesion score was used for the present study. We found the GEQ to have adequate stability over three months, \( r(103) = 0.49, p < 0.01 \), and to demonstrate good internal consistency at both time points (Time 1, \( \alpha = .96 \); Time 2, \( \alpha = .97 \)).

The Exercise Environment questions (EEQ) was developed for this study to measure interpersonal and situational influences including sense of belonging in the exercise
environment, the use of technology to encourage exercise, and companionship and group connection as motivators to exercise. Items were organized into three scales. EEQ-SG (Sense of Belonging to Group) items included: “In exercise situations I feel supported,” “In exercise situations I feel like I belong there;” EEQ-T (Technology) items included: “I use technology to monitor my activity,” “I use technology to motivate me to exercise;” and EEQ-F (Friend) items included: “I usually exercise with another person,” “I usually do group fitness exercises.” Scale items were moderately stable over time, r’s range .58 -.67. The EEQ-SG and EEQ-F scales had good internal consistency at both time points (Time 1, \( \alpha \) range .68-.90; Time 2, \( \alpha \) range .68-.90); however the EEQ-T (technology) scales at Time 1 and 2 had poor inter-item reliability, with \( \alpha \) of .59 for the EEQ-T scale at Time 1 and .60 at Time 2 (see Tables 2 and 3). As the removal of the first item of the scale would increase the values of the alphas to acceptable levels, the EEQT scales were recomputed as 2-item scales, with alphas of .78 and .70 respectively.

**Exercise intensity and persistence.** In accordance with recommendations from the relevant literature (Irwin & Thompson, 2016; Laitakari, Vuori, & Oja, 1996; Lee & Owen, 1986; Wasserkampf & Kleinert, 2016), exercise persistence was defined as length of time spent exercising in consideration of the level of intensity of exercise and was informed by the distribution of the data collected from study participants over the three month period.

Using American College of Sports Medicine (ACSM) guidelines (Martin et al., 2000; Thompson et al., 2013), specifically: (a) a minimum of 20 hours per month of mild/light exercise; (b) a minimum of 10 hours per month, of moderate exercise; or (c) a minimum of 5 hours per month, of vigorous/strenuous exercise, participants were asked to report the number of hours per month that they engaged in each of these three exercise levels (mild, moderate and/or
vigorous exercise) during the prior 3 month period. Participants were provided with examples of activities within each category (i.e., mild = yoga, stretching, easy walking; moderate = dancing, volleyball, pilates; vigorous = high impact aerobics, running, vigorous cycling). To assist with accurate recall of exercise activity during the 3 month follow-up period, participants were encouraged to record on a weekly basis the total number of hours engaged in mild, moderate and/or vigorous intensity activities, by using a smart phone calendar, notes app, or diary. Participants were then asked to report a monthly average across the three month period for each category of intensity (mild, moderate, and vigorous/strenuous).

The Godin Leisure Time Exercise Questionnaire (LTEQ) (Amireault & Godin, 2015; Godin & Shepard, 1985) measured self-reported intensity of exercise. This is a three-item self-report that measures the number of times a person engages in mild (minimal effort), moderate (not exhausting), and vigorous (heart beats rapidly) exercise of at least 30 minutes in duration in a typical week. Acceptable reliability of $\alpha = .74$ has been demonstrated for this measure (Amireault & Godin, 2015; Godin & Shepard, 1985). Items were moderately stable over time, $r (103) = 0.62, p < 0.01$, and had adequate internal consistency at both time points (Time 1, $\alpha = .60$ and Time 2, $\alpha = .61$). Alphas were however lower than expected which served as a limitation of this measure.

Data Analysis Procedures

The purpose of the following paragraphs is to review the data cleaning and preparation procedures and provide information on the computation of relevant variables. Results from statistical testing of assumptions and covariates follow in addition to presentations of the descriptive statistics for the study participants and study variables.
**Data cleaning and preparation.** Once the data set was transferred from an Excel spreadsheet to an SPSS 24.0 data set, substantial time was spent cleaning, organizing, and preparing the data set for analysis. The computation of frequencies for all survey items allowed for the determination of entry errors; none were found. Cronbach’s alphas, indicators of inter-item reliability, were calculated for the study scales (Tables 2 and 3), and total scores for study scales were computed (descriptive information of study scales were presented earlier).

The data were reviewed for missing data. No data were missing in the data set at Time 1, and the exercise self-efficacy, benefits/barriers to exercise, and physical enjoyment of exercise variables had no missing data at Time 2. In contrast, the ESSE exercise scheduling self-efficacy and the EEQ-SG interpersonal group influences variables had one missing data point each, and the EEQ-T interpersonal technology influence variable had two missing data points at Time 2. Notably, the GEQ exercise group cohesion variable had 12 missing data points at Time 2 (missing at random across participants). Conventional methods of dealing with missing data are the deletion of cases: listwise (or casewise) deletion removes cases from a dataset if they have any missing data while pairwise deletion excludes cases with missing data on an analysis by analysis basis (Baraldi & Enders, 2010; Johnson & Young, 2011). However, a consequence of deletion, especially listwise deletion, is the loss of power (Johnson & Young, 2011). An alternative to deletion of cases is imputation, in which the missing value is replaced by a derived value (Johnson & Young, 2011). Marginal mean imputation (i.e., replacing the missing value with a mean derived from the non-missing variable values) was utilized to replace the 12 missing Time 2 GEQ data points as well as the few missing data points for the other variables.
The GEQ had a response selection labeled as ‘don’t know’, whilst the EEQ scales (Sense of Belonging to Group, Technology, and Friends) contain a ‘not applicable’ response choice. Advances in statistical software that enhance the ease of imputation of data in conjunction has led to extensive examination of how to address not only missing data, but data coded as ‘don’t know’ or ‘not applicable’ while maintaining the statistical rigor of the study (Vaillant, Dever, & Kreuter, 2013). In this study, median imputation was used to replace the ‘don’t know’ and ‘not applicable’ responses. A strength of this imputation method is that it decreases the bias of using “a non-probability convenience sample” (Salgado, Azavedo, Proença, & Vieira, 2016, p. 145).

The study was initially comprised of 103 female participants. However, three study participants (cases 1, 5, and 6) had data that were was substantially skewed, i.e. deemed outliers, for the exercise benefits/barriers, physical enjoyment of exercise, and exercise environment (social) variables. The data were substantially improved (i.e., scales had skewness z-values less than the critical value of 1.96, see Tables 2 and 3) by the removal of these three cases.

Operationalization of exercise persistence/nonpersistence. Exercise persistence is a measure of sustained effort over time. The various types of exercise examined in the research literature coupled with the empirical testing of numerous theoretical framework are two of many factors that necessitate the need for consistency and psychometric soundness of exercise constructs, including exercise persistence (Raxon & Tenenbaum, 2014; Standage & Vallerand, 2014). The current study measured exercise persistence by incorporating three key components defined in the literature. These include sustained time (hours/month) spent
exercising at a particular level of intensity (light, moderate, strenuous) over a specific timeframe (3 months) (Irwin & Thompson, 2016; Laitakari, Vuori, & Oja, 1996; Lee & Owen, 1986; Wasserkampf & Kleinert, 2016).

The minimal requirements across exercise intensity categories used in this study were defined by the CDC, WHO, The American Heart Association, and The American College of Sports Medicine (Garber et al., 2011), specifically: (a) a minimum of 1.25 hours per week, or 5 hours per month, of strenuous exercise; (b) a minimum of 2.50 hours per week, or 10 hours per month, of moderate exercise; or (c) a minimum of 5 hours per week, or 20 hours per month, of light exercise. The number of hours spent engaging in strenuous, moderate, and light (mild) exercise informed the development of the operational definition of exercise persistence, which was developed as a categorical variable. Participants had to meet or exceed the minimum number of hours of exercise per month across the 3 month follow-up period (i.e., three months prior, two months prior, and one month prior) to be classified as persisters. If participants did not meet or exceed the minimal requirements, they were categorized as nonpersisters. Thus, our persistence variable was computed using T2 LTEQ data and was dichotomous. The results showed that for both time-points, 65 participants were classified as persisters while 35 participants were classified as nonpersisters.

**Descriptive Statistics**

**Study participants.** The final data set contained data from 100 participants. The study survey contained demographic questions, which were answered by all 100 participants. Demographic data are presented in Table 1. The mean age of study participants was 20.79 years (SD = 1.94 years), and ages ranged from 18 to 24 years (please refer to Table 1 for
additional information on age of study participants). Almost a quarter of participants were freshman in college \((n = 24, 24.0\%)\), and slightly fewer participants were graduate students \((n = 24, 24.0\%)\), juniors \((n = 19, 19.0\%)\), or sophomores \((n = 17, 17.0\%)\). A small number of students gave their college class status as ‘other’ \((n = 6, 6.0\%)\). The majority of participants \((n = 58, 58.0\%)\) identified as White/Caucasian, while almost a third of participants \((n = 28, 28.0\%)\) identified as Asian American. Fewer participants stated their race/ethnicity as Black/African American \((n = 9, 9.0\%)\), ‘Other’ \((n = 3, 3.0\%)\), or Hispanic \((n = 2, 2.0\%)\). Equivalent numbers of students lived on and off campus, \(n = 47 (47.0\%)\) and \(n = 53 (53.0\%)\), respectively. The majority of participants were single \((n = 59, 59.0\%)\) while 41 \((41.0\%)\) participants reported being in a relationship. Most participants worked part-time \((n = 42, 42.0\%)\) or did not work \((n = 25\), 25.0\%) while 33 \((33.0\%)\) participants reported having full-time employment.

Ninety-seven percent of the 100 participants reported having prior sports experience \((n = 9, 9.0\%)\), prior exercise experience \((n = 19, 19.0\%)\) or both \((n = 69, 69.0\%)\). Only three \((3\%)\) participants reported having no previous sports/exercise experiences. The greatly unequal sample size of participants who did and did not have prior sports/exercise experience precluded the ability to test the theoretical construct, prior related behavior.

**Testing assumptions.** Assumption 1: scales are measured without error. One assumption that must be met in studies regardless of the type of parametric statistic used in hypothesis testing is that scale data must show conceptual and thus statistical overlap, or inter-item reliability. Cronbach’s alphas determine the inter-item reliability of scales; an alpha from .70 to .79 is good, .80 to .89 very good, and .90 or higher, excellent (Garson, 2012). All but the
EEQ-T scales had good to excellent inter-item reliabilities, with the EEQ-T achieving adequate reliability with one item removed (see measures above).

Assumption 2: Scale normality. $Z_{\text{skewness}}$ values less than 1.96 are indicative of scale score normality (Garson, 2012). All scales showed normality based on these values. This assumption was met.

Assumption 3: Lack of multicollinearity. Pearson bivariate correlations (Table 4) determined that no predictor variables were associated with one another at the $r \geq .80, p < .001$ level. The assumption of lack of multicollinearity was met.

**Testing of covariates.** Two types of statistical analyses were conducted to determine if any demographic variables (i.e., race/ethnicity, living situation, relationship status, employment status, year in school, age, BMI) were significantly associated with the dependent variable of exercise persistence. Chi-square tests of independence were conducted with the demographic variables of race/ethnicity, living situation, relationship status, employment status, and year in school acting as independent variables and exercise persistence acting as the dependent variable. Only one significant result was found, and the finding pertained to race/ethnicity and exercise persistence. There were significantly more White participants ($n = 48, 73.8\%$) who were classified as persisters than there were non-White persisters ($n = 10, 28.6\%$) classified as persisters, $\chi^2(1) = 19.14, p < .001$.

Two independent samples $t$-tests were conducted to determine if age or BMI differed across exercise persisters and non-persisters, and the results were not significant. The only variable included as a covariate in analyses for hypothesis testing was race/ethnicity.
Results

This section introduces and discusses the study findings, both descriptive and inferential in addition to presenting findings with regard to proposed study hypotheses. The study posed four null hypotheses (and associated alternative hypotheses). The determination as to whether to reject or retain the first through third null hypotheses was based on the results of hierarchical binary logistic regressions (HBLR), which were conducted with Time 1 and Time 2 HPM variables as predictors and exercise persistence as the outcome. The decision to reject or retain the fourth hypothesis was based on results from a one-way between-subjects MANOVA that determined if Time 1 and Time 2 HPM variables significantly differed between exercise persisters and nonpersisters.

Testing of Hypotheses

To address the first three study hypotheses, hierarchical logistic regressions were conducted for Time 1 and Time 2 HPM constructs. The hierarchical logistic regression analyses for the first hypothesis had two models, the first with the covariate of race/ethnicity entered as a predictor of exercise persistence, followed by HPM cognitive and affective constructs on the second model as predictors of exercise persistence. Analyses to test the second and third hypothesis were three model hierarchical logistic regression analyses, with the dependent variable of exercise persistence. Race/ethnicity entered in the first model, the HPM cognitive and affective constructs entered on the second model, and the HPM interpersonal constructs entered on the third model. The fourth hypothesis was addressed by two one-way MANOVAs, with exercise persistence as the independent variable and Time 1 and Time 2 HPM constructs as the dependent variables.
Hypothesis 1. The study’s first hypothesis was that the core behavior-specific cognitions and affect constructs of the HPM (i.e., barriers/benefits to exercise, exercise self-efficacy, activity related affect, etc.) would predict exercise persistence in college age women. To address the first study hypothesis, two hierarchical logistic regression analyses were conducted with Time 1 and Time 2 data and with race/ethnicity entered on the first model (step) of the hierarchical logistic regression analyses.

Results from the hierarchical logistic regression conducted for the Time 1 behavior-specific cognitions and affect constructs of the HPM is presented in Table 5. Results from the first model were significant, omnibus model $\chi^2(1) = 19.47$, Wald $\chi^2 = 17.39 \ p < .001$, Nagelkerke $R^2 = .244$, a large effect size. Based on the odds ratio, White participants were 14.2% (95% CI: 5.7%-35.5%) more likely to be classified as exercise persisters than were non-White participants.

Results from the second model were also significant, omnibus model $\chi^2(4) = 13.28$, $p = .010$, Nagelkerke $R^2 = .385$, a large effect size. Two variables in the model were significant. Race/ethnicity was again significant, Wald $\chi^2 = 13.97$, $p < .001$, with White participants being 14.7% (95% CI: 5.4%-40.1%) more likely to be classified as exercise persisters than were non-White participants. Exercise self-efficacy (ESE) was also a significant predictor of exercise persistence, Wald $\chi^2 = 5.16$, $p = .023$. Participants with higher levels of exercise self-efficacy were 1.20 (95% CI: 1.03-1.41) times more likely to be classified as exercise persisters in comparison to participants with lower levels of exercise self-efficacy.

While exercise self-efficacy was a significant predictor of exercise persistence, it was the only HPM cognitive and affective construct that was. The lack of significance for the HPM
variables of benefits/barriers to exercise (EBBS), exercise scheduling self-efficacy (ESSE), and physical enjoyment of exercise (PACES) precluded the ability to fully accept the first study hypothesis; instead, this hypothesis was partially supported.

Results from the hierarchical logistic regression conducted with race/ethnicity and the Time 2 behavior-specific cognitions and affect constructs of the HPM predicting exercise persistence is presented in Table 6. Results from the first model were significant, omnibus model $\chi^2(1) = 18.99, \text{Wald } \chi^2 = 16.98, p < .001$, Nagelkerke $R^2 = .240$, a large effect size. Based on the odds ratio, White participants were 14.5% (95% CI: 5.8%-36.3%) more likely to be classified as exercise persisters than were non-White participants.

Results from the second model were not significant, omnibus model $\chi^2(4) = 5.52, p = .238$. However, race/ethnicity was significant, Wald $\chi^2 = 12.80, p < .001$, with White participants being 17.5% (95% CI: 6.8%-45.5%) more likely to be classified as exercise persisters than were non-White participants. This was the only significant finding.

The lack of significance for the HPM variables of benefits/barriers to exercise (EBBS), exercise self-efficacy (ESE), exercise scheduling self-efficacy (ESSE), and physical enjoyment of exercise (PACES) precluded the ability to fully accept this hypothesis for Time 2 HPM theoretical variables.

**Hypotheses 2 and 3.** The second and third study hypotheses were that higher scores on measures of interpersonal connectedness in the exercise environment – namely, the interpersonal exercise group cohesion (GEQ), interpersonal influence: sense of belonging in group (EEQG), interpersonal influence: technology (EEQT), and situational influence: friends (EEQF) variables - will be positively associated with exercise persistence for college age women
and that the addition of these measures to the model will increase the model’s ability to predict exercise persistence among college age women (significant increase in predicted variance).

Hierarchical logistic regressions were conducted to address the second and third hypotheses. In these analysis, after controlling for race at the first model (step), the second model (step) included the entry of the four behavior-specific cognition and affect variables (i.e., EBBS, ESE, ESSE, and PACES) at Time 1 and Time 2, respectively. The third model (step) included the four interpersonal influences variables (i.e., GEQ, EEQSG, EEQT, and EEQF) at Time 1 and Time 2, respectively.

Results from the hierarchical logistic regression conducted for the Time 1 HPM variables is presented in Table 7. Results are presented for the second and third models, as results from the first model were replicated those found in the hierarchical logistic regression for the first hypothesis. That is, the first model was significant, omnibus model χ²(1) = 19.47, Wald χ² = 17.39 p < .001, Nagelkerke R² = .244, a large effect size. Based on the odds ratio, White participants were 14.2% (95% CI: 5.7%-35.5%) more likely to be classified as exercise persisters than were non-White participants.

Results from the second model were significant, omnibus model χ²(1) = 13.28, p = .010, Nagelkerke R² = .385, a large effect size. Two variables in the model were significant. Race/ethnicity was significant, Wald χ² = 13.97, p < .001, with White participants being 14.7% (95% CI: 5.4%-40.1%) more likely to be classified as exercise persisters than were non-White participants. Exercise self-efficacy (ESE) was also a significant predictor of exercise persistence, Wald χ² = 5.16, p = .023. Participants with higher levels of exercise self-efficacy were 1.20 (95%
CI: 1.03-1.41) times more likely to be classified as exercise persisters in comparison to
participants with lower exercise self-efficacy.

Results from the third model were not significant, omnibus model $\chi^2(1) = 5.87, p = .209$.
Despite the lack of model significance, two variables in the model were, in fact, significant.
Race/ethnicity was significant, Wald $\chi^2 = 14.18, p < .001$, with White participants being 11%
(95% CI: 3.5%-34.7%) more likely to be classified as exercise persisters than were non-White
participants. Exercise self-efficacy (ESE) was also a significant predictor of exercise persistence,
Wald $\chi^2 = 4.52, p = .033$. Participants with higher levels of exercise self-efficacy were 1.01 (95%
CI: .811-1.25) times more likely to be classified as exercise persisters than were participants
with lower exercise self-efficacy.

The first model, with the variable of race/ethnicity, was significant. The second model,
in which the HPM cognitions and affect variables were entered as predictors of exercise
persistence, was also significant. However, only exercise self-efficacy emerged as a significant
predictor of exercise persistence. The third model, in which the four interpersonal influences
variables were entered as predictors of persistence, was not significant. However,
race/ethnicity and exercise self-efficacy did remain significant predictors of exercise
persistence. Based on the lack of significant findings for all HPM variable, however, the second
and third hypotheses were not supported for the Time 1 HPM variables.

Results from the hierarchical logistic regression conducted for the Time 2 HPM variables
is presented in Table 8. Results are presented for the second and third models. The first model
was significant, omnibus model $\chi^2(1) = 19.00$, Wald $\chi^2 = 16.98, p < .001$, Nagelkerke $R^2 = .240$, a
large effect size. Based on the odds ratio, White participants were 14.5% (95% CI: 5.8%-36.3%) more likely to be classified as exercise persisters than were non-White participants.

Results from the second model were not significant, omnibus model $\chi^2(4) = 5.52, p = .238$. Despite lack of significance for the overall model, two variables in the model were significant. Race/ethnicity was significant, Wald $\chi^2 = 13.97, p < .001$, with White participants being 14.7% (95% CI: 5.4%-40.1%) more likely to be classified as exercise persisters than were non-White participants. Exercise self-efficacy (ESE) was also a significant predictor of exercise persistence, Wald $\chi^2 = 5.16, p = .023$. Participants with higher levels of exercise self-efficacy were 1.20 (95% CI: 1.03-1.41) times more likely to be classified as exercise persisters in comparison to participants with lower self-efficacy in this domain.

The third model, in which the four interpersonal influences variables were entered as predictors of persistence, was not significant, omnibus model $\chi^2(4) = 9.08, p = .059$. However, race/ethnicity remained a significant predictor of exercise persistence, Wald $\chi^2 = 14.72, p < .001$, with White participants being 10.5% (95% CI: 3.3%-33.2%) more likely to be classified as exercise persisters than were non-White participants. Interpersonal exercise-group cohesion was also a significant predictor of exercise persistence, Wald $\chi^2 = 5.56, p = .018$. Participants with higher levels of interpersonal exercise-group cohesion were 1.03 (95% CI: 1.01-1.06) times more likely to be exercise persisters than were participants with lower levels of interpersonal exercise-group cohesion.

The first model, with the variable of race/ethnicity, was significant. The second model and third models were however not significant, despite race/ethnicity for the second and third model and interpersonal exercise-group cohesion for the third model being significant. Based
on the lack of significant findings for all HPM variables, however, the second and third hypotheses were rejected for the Time 2 HPM variables.

**Hypothesis 4.** The fourth hypothesis posed in this study was that young women who persist with an exercise program will report higher scores on measures of the HPM and interpersonal factors at follow-up compared to those who did not persist. To address this question, a one-way between-subjects MANOVA was conducted to determine if exercise persisters and nonpersisters had significantly different Time1 and Time 2 mean scores on measures of HPM behavior-specific cognitions and affect and interpersonal influences theoretical constructs.

The one-way MANOVA for Time 1 HPM constructs was first conducted, with results presented in Table 9. Results of the MANOVA showed that the data met the assumption of equality of error variances, as indicated by non-significant Levene’s tests for each dependent variable, and the assumption of equality of covariances, Box’s $M = 38.57, p = .529$.

Multivariate and univariate results for the one-way between-subjects MANOVA, with exercise persistence as the independent variable are presented in Table 9. The between-groups multivariate model was significant, Wilks $\lambda = .803, F(8,91) = 2.79, p = .008$, with $\eta^2_p = .197$, a medium effect size. There were significant univariate model effects for all of the HPM behavior-specific cognition and affect variables. Persisters had a significantly higher Time 1 EBBS perceived benefits/barriers mean score ($n = 65, M = 142.15$) than did nonpersisters ($n = 35, M = 133.74$), $F(1,98) = 8.44, p = .005$, $\eta^2_p = .079$. Persisters had a significantly higher Time 1 ESE exercise self-efficacy mean score ($n = 65, M = 17.05$) than did nonpersisters ($n = 35$, Time 1 ESE $M = 13.77$), $F(1,98) = 16.39, p < .001$, $\eta^2_p = .143$. They also had a significantly higher Time 1
ESSE exercise scheduling self-efficacy mean score \((n = 65, M = 10.75)\) than did nonpersisters \((n = 65, M = 9.60)\), \(F(1,98) = 4.09, p = .046, \eta^2_p = .040\). There was a significant difference between persisters and nonpersisters with regard to Time 1 PACES physical enjoyment of exercise mean scores, \(F(1,98) = 4.49, p = .020, \eta^2_p = .054\), with persisters having a higher PACES mean score \((n = 65, M = 101.00)\) in comparison to nonpersisters \((n = 35, M = 93.29)\). Results showed that exercise persisters and nonpersisters had significantly different mean scores on one HPM interpersonal construct, EEQ-SG interpersonal influence: group cohesion, \(F(1,98) = 9.32, p = .003, \eta^2_p = .087\). Persisters had a significantly higher Time 1 EEQ-SG mean score \((n = 65, 28.52)\) as compared to nonpersisters \((n = 35, M = 25.54)\). As one-way MANOVA results were significant for all HPM behavior-specific cognition and affect variables as well as one interpersonal factors, the fourth hypothesis for Time 1 variables was supported.

A second one-way between-subjects MANOVA was conducted to determine if exercise persisters and nonpersisters had significantly different Time 2 mean scores on measures of HPM behavior-specific cognitions and affect and interpersonal influences theoretical constructs. Results of the one-way MANOVA showed that the data met the assumption of equality of error variances, as indicated by non-significant Levene’s tests for each dependent variable, and the assumption of equality of covariances, Box’s \(M = 35.94, p = .642\).

Multivariate and univariate results for the one-way between-subjects MANOVA are presented in Table 10. The between-groups multivariate model was significant, Wilks’s \(\lambda = .768, F(8.91) = 3.45, p = .002, \eta^2_p = .232, a\) medium effect size. There were significant univariate model effects. Persisters had a significantly higher Time 2 EBBS perceived benefits/ barriers mean score \((n = 65, M = 141.03, SD = 12.81)\) than did nonpersisters \((n = 35, M = 130.39, SD = 14.66)\),
$F(1,98) = 14.18, p < .001, \eta_p^2 = .126$. Persiers had a significantly higher Time 2 ESE exercise self-efficacy mean score ($n = 65, M = 16.91, SD = 3.86$) than did nonpersisters ($n = 35, M = 11.42, SD = 2.30$). They also had a significantly higher Time 2 ESSE exercise scheduling self-efficacy mean score ($n = 65, M = 10.11, SD = 2.22$) than did nonpersisters ($n = 65, M = 7.44, p = .008, \eta_p^2 = .071$. There was a significant difference between persisters and nonpersisters with regard to the PACES physical enjoyment of exercise mean scores, $F(1,98) = 8.83, p = .004, \eta_p^2 = .083$, with persisters having a higher PACES mean score ($n = 65, M = 97.85, SD = 17.48$) in comparison to nonpersisters ($n = 35, M = 86.71 SD = 18.59$).

Two interpersonal factors were significantly different between persistence groups. Persisters’ ($n = 65$) Time 2 GEQ perceived exercise group cohesion mean score ($M = 71.77, SD = 26.27$) was over 15 points higher than the Time 2 GEQ mean ($M = 55.09, SD = 25.07$) for nonpersisters ($n = 35$), $F(1,98) = 9.47, p = .003, \eta_p^2 = .088$. Finally, persisters had a significantly higher EEQ-SG group situational influence mean score ($M = 27.31, SD = 4.49$) in comparison to nonpersisters ($n = 35, M = 24.77, SD = 4.73$), $F(1,98) = 7.00, p = .010, \eta_p^2 = .067$. Based on the significant differences found in this analysis - for both HPM behavior-specific cognition and affective factors as well as interpersonal factors – the fourth study hypothesis was supported.

Given that hypotheses 1-3 yielded non-significant findings, we hypothesized that a lack of variability in the data may have limited our ability to examine persistence in the regression models. We therefore conducted the following exploratory analyses.

**Exploratory Analyses using Strenuous, Moderate, and Mild Exercise Categories.**
Given that our hypotheses predicting exercise persistence based on HPM characteristics yielded non-significant findings and that we did observe significant variability in the total number of hours exercising across categories of intensity, we decided to explore how HPM characteristics may relate to level of exercise engagement at Time 2. To do this, the T2 data specific to number of hours exercised per week in the past month was used. We dichotomized the Time 2 LTI scores by intensity category: strenuous, moderate, and mild exercise, using median split (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015); this allowed for an equal number of groups (n = 50) into low and high categories. The median value for the strenuous exercise category was 8 hours of exercise in the past month, while the values of 9 and 7 hours were the median values for the moderate and mild exercise variables.

We then examined whether the core behavior-specific cognitions and affect constructs of the HPM (i.e., barriers/benefits to exercise, exercise self-efficacy, activity related affect, etc.) were linked to strenuous, moderate, and mild exercise activity at T2. Three hierarchical logistic regression analyses were conducted for each exercise group (e.g., strenuous, moderate, and mild). Only one hierarchical logistic regression showed significance, and it was the analysis conducted to predict strenuous exercise classification.

Results from the hierarchical logistic regression conducted for the strenuous exercise dependent variable are presented in Table 11. Results from the first model were significant, omnibus model $\chi^2 (1) = 20.68$, Wald $\chi^2 = 18.17$, $p < .001$, Nagelkerke $R^2 = .249$. Based on the odds ratio, White individuals were 14% more likely to be classified as engaging in strenuous exercise in comparison to non-White individuals. Results from the second model were also significant, omnibus model $\chi^2 (4) = 15.17$, $p = .004$, Nagelkerke $R^2 = .402$. The overall model
significance was primarily driven by one variable, ESSE exercise scheduling self-efficacy, Wald $\chi^2 = 6.51, p = .011$. The odds ratio indicated that individuals with higher levels of exercise scheduling self-efficacy were 1.33 times more likely to be classified as engaging in strenuous exercise in comparison to individuals with lower self-efficacy in this domain. The lack of significance for all HPM variables precluded the ability to fully accept the first exploratory study hypothesis; instead, this hypothesis was partially supported.

We then conducted additional analyses to examine (1) whether higher scores on measures of interpersonal connectedness in the exercise environment – namely, the GEQ, EEQ-SG, EEQ-T, and EEQ-F variables - would be positively associated with strenuous, moderate, and mild exercise and (2) whether the addition of these measures to the model would increase the model’s ability to predict exercise among college age women (significant increase in predicted variance). The entry of the respective variables into the hierarchical logistic regressions conducted for the first study hypothesis addressed these two hypotheses. In this analysis, after controlling for race in the first model (step), the second model (step) included the entry of the four behavior-specific cognition and affect variables (i.e., EBBS, ESE, ESSE, and PACES). The third model (step) included the four interpersonal influences variables (i.e., GEQ, EEQ-SG, EEQ-T, and EEQ-F).

Results from all exploratory analyses showed significant effects for strenuous exercise only. Results from this model are presented in Table 12. The second model of the hierarchical logistic regression, which included the entry of the four behavior-specific cognition and affect variables as predictors of strenuous exercise, was significant, omnibus model $\chi^2(4) = 15.17, p = .004$, Nagelkerke $R^2 = .402$. The second model was significant due to one variable, ESSE exercise...
scheduling self-efficacy, Wald $\chi^2 = 6.51$, $p = .011$. The odds ratio for this variable indicated that individuals who experienced higher levels of exercise scheduling self-efficacy were 1.33 times (95% CI: 1.07-1.66) more likely to be classified as engaging in strenuous exercise in comparison to those experiencing lower levels of exercise scheduling self-efficacy. The third model of the hierarchical logistic regression was also significant, omnibus model $\chi^2 (4) = 10.58$, $p = .032$, Nagelkerke $R^2 = .495$. The third model was significant as a result of two variables: ESSE exercise scheduling self-efficacy, Wald $\chi^2 = 5.85$, $p = .016$ and EEQ-SG sense of belonging to group (situational influence), Wald $\chi^2 (1) = 5.35$, $p = .021$. The odds ratio for this variable indicated that individuals who experienced higher levels of exercise scheduling self-efficacy were 1.34 times (95% CI: 1.06-1.71) more likely to be classified as engaging in strenuous exercise in comparison to those experiencing lower levels of exercise scheduling self-efficacy. The odds ratio for the sense of belonging variable indicated that individuals who experienced higher levels of sense of belonging to the exercise group were 1.17 times (95% CI: 1.02-1.33) more likely to be classified as engaging in strenuous exercise in comparison to those experiencing lower levels of sense of belonging to the exercise group. Based on these findings, the second exploratory hypothesis was partially supported.

The Nagelkerke $R^2$ increased by .093 points, from .402 to .495, with the entry of the HPM interpersonal influence variables in the third model. The increase in the Nagelkerke $R^2$ with the addition of HPM interpersonal influence variables provides support for the third exploratory study hypothesis, which stated that the addition of these measures to the model would increase the model’s ability to predict exercise engagement among college age women (significant increase in predicted variance).
Discussion

This study’s aim was to investigate factors that influence exercise persistence in college age women. Previous studies aiming to understand patterns of exercise among young women has often focused exclusively on exercise engagement, but paid scant attention to exercise persistence or intensity. Providing new information on what promotes persistence in exercise is an important aspect of public health research. Participating in regular physical activity has been shown to have many positive physical and psychological effects (Elavsky et al., 2005, Cramer, Neiman & Lee, 1991, Eyler et al., 1999, Fox, 1999, Maher et al., 2013). Even though this is widely known, the majority of Americans do not engage in regular physical activity and many persons who start an exercise program drop out shortly thereafter. With women and minorities showing the highest rates of physical inactivity compared to other subgroups (Marcus & Forsyth, 1998). In addition, regular exercise in youth can establish positive lifestyle patterns that track into adulthood (Pate, Baranowski, Dowda, & Trost, 1996) and moderate to vigorous intensity in exercising has been a recommendation in the WHO and ACSM guidelines (Martin et al., 2000; Thompson et al., 2013). Therefore, assessing strategies that promote exercise persistence among women is an important public health goal.

Previous research using constructs of the Health Promotion Model (HPM) such as self-efficacy, perceived benefits and barriers to exercise, activity-related affect, and interpersonal and situation influences has shown evidence that these constructs significantly predict exercise engagement. This study was designed to contribute to our understanding of whether components of the HPM also leads to exercise persistence. A strength of this study was using well researched components of the HPM that were significantly associated to exercise
engagement and investigating the understudied impact of intensity level. The study also assessed whether adding interpersonal connectedness to the exercise environment to the HPM would provide a more robust predictor of exercise persistence among women. As relational cultural models explaining behavior (Bloom et al., 2002; Frey 2013; Jordan, 2001), suggest that women may identify interpersonal factors (e.g., exercising in groups, receiving social feedback, using the exercise environment as a social meet-up) as a primary motivator for exercise persistence.

The first aim of this study was to examine whether core behavior-specific cognitions and affect constructs of the HPM (i.e., barriers/benefits to exercise, exercise self-efficacy, activity related affect, etc.) would predict exercise persistence in college age women. Results of this analysis provide partial acceptance of this first hypothesis. The findings showed evidence at time 1 (baseline) that women reporting higher levels of self-efficacy were 1.20 times more likely to be classified as exercise persisters in comparison to women reporting lower self-efficacy. This is similar to previous research indicating that self-efficacy was a significant predictor in exercise engagement (Eyler, et al., 2002; Hu, Motl, McAuley, & Konopack, 2007; Marcus & Forsyth, 1998; Von Ah et al., 2004); and corresponds with Parschau, et al.’s (2013) research demonstrating that individuals with higher levels of self-efficacy, belief in self, and a belief that they were in control of their actions were more apt to engage in physical activity especially when there was a past history of positive experiences.

Contrary to expectations however, other components of the HPM failed to reach significance in this study (i.e. benefits/barriers to exercise, exercise scheduling self-efficacy, and physical enjoyment of exercise); in addition to a lack of significance being found at time 2 for all
HPM components. This is inconsistent with previous research that has found barriers and benefits to exercise to be the most influential determinant for engaging in exercise and in bringing about behavior change (Grubbs and Carter, 2002; Lovell, El Ansari, & Parker, 2010); and in contradiction to research by Hu, Motl, McAuley & Konopack (2007) that posited enjoyment and self-efficacy as determinants associated with engagement and adherence of exercise behavior.

The second and third study hypotheses explored whether higher scores on measures of interpersonal connectedness in the exercise environment would be positively associated with exercise persistence for college age women, as well as whether the addition of these measures to the model would increase the model’s ability to predict exercise persistence among college age women. Based on the findings, significance was only achieved at time 2 (follow up) for one of the four interpersonal influences. Interpersonal exercise group cohesion (GEQ) was predictive of participants with higher levels of interpersonal exercise-group cohesion being 1.03 times more likely to be exercise persisters than participants with lower levels of interpersonal exercise-group cohesion. This finding is consistent with research by Fraser and Spink (2001), Segar, Jayaratne, Hanlon, & Richardson (2002) and Spink and Carron (1993) wherein group cohesion and social support were associated with increased exercise adherence. Even with this finding the second and third hypotheses were not supported as the overall model did not reach significance and the four interpersonal influence variables did not add to the model’s overall predictive power.

Despite the drawbacks of several non-significant findings, this study found important group differences in the HPM characteristics of women who persisted in exercise versus those
that did not. Women who persisted in exercise at time 1 and time 2 scored higher on measures of self-efficacy, enjoyment, perceived barriers/benefits, interpersonal influence and group connection than those who failed to persist. This overall finding supports the fourth study hypothesis that women who persist with exercise will report higher score for both HPM behavior specific cognition and affective factors as well as interpersonal factors. Therefore, although the non-significant regression models indicate that these characteristics are not predictive of persistence over time, findings of significantly higher scores on HPM and interpersonal measures ultimately suggest that these characteristics were more prevalent among college-age women who persist.

Undeterred by these initial findings, i.e., that none of the predictive models were supported, results of the cross-sectional, exploratory analyses regarding links between the HPM and level of exercise intensity suggest some important relationships. These findings show evidence that women reporting higher levels of exercise scheduling self-efficacy were 1.33 times more likely to be classified as engaging in strenuous exercise in comparison to women reporting lower exercise scheduling self-efficacy. Furthermore, we found that women with higher levels of perceived sense of belonging to group were 1.17 times more likely to be classified as engaging in strenuous exercise in comparison to those reporting lower levels of perceived sense of belonging to group. Interpersonal influences due to group environment was also found to add significantly to the model, over and above the core HPM factors. These findings suggests that the social experience of group fitness is likely important when understanding strenuous exercise engagement.
Our findings also highlighted racial differences among exercisers; more White participants (approximately 74%) were classified as persisters than were nonwhite participants, with White women 14% more likely to be classified as strenuous exercisepersisters in comparison to their non-White counterparts. This finding is similar to previous research that found minority women to be less persistent in exercise than their White counterparts (Eyler, et al., 2002; Heesch, Brown & Blanton, 2008; McArthur & Raedeke, 2009) and previous findings by Kimm et al., (2002) of race to be factor in the decline of activity level. Other factor’s included parent’s education level, behavioral risk factors of pregnancy in black girls (Kimm et al., 2002), and barriers such as sweating and “peer non acceptance due to cultural beliefs” (p. 249, Eyler, et al., 2002). This study (Eyler et al., 2002) also found that minority women saw low income to be a barrier to activity. These factors may support findings by demonstrating a lack of early access and interest in fitness for minority women. It may be that white women are more heavily exposed to strenuous exercise prior to college which increases their likelihood of engaging in this level of exercise on an ongoing basis. This may relate to socioeconomic status and access to early fitness experiences (Eyler, et al., 2002; Kimm et al., 2002). Given that our measure of prior exercise did not gather details regarding exercise intensity, a future study would be needed to explore this hypothesis. These findings are important because they highlight the need for research that specifically explores the racial and ethnic disparities in exercise persistence. For example, exploring whether there are group differences in how the HPM model applies to exercise persistence such that factors are more or less relevant depending on racial/ethnic identity and whether additional factors, not previously specified may be needed to fully understand these disparities.
Several limitations to this study should be noted. Although the participants in this study were representative of college-age women in general, the responses were collected by convenient sampling method which may have yielded an overly homogenous sample, with participants who may not necessarily reflect the greater population. Additionally, a larger sample could have helped with being more reflective of the greater population, as well as statistically increasing predictive power, specifically, for each level of our independent variable, we had less than 40 participants.

It is possible that our restricted sample, representing only college students attending fitness facilities on a Northeast college campus, did not allow us to capture enough variability in exercise behavior or interpersonal contexts and experiences, to adequately explore these questions. All measures where self-report and were vulnerable to recall bias. In addition, the interpersonal influence scales’ demonstrated poor internal consistency, with a Cronbach’s alpha of 0.60. Increasing the alpha by removing scale items possibly changes the interpretation of the data and may indicate that we did not measure what we wanted to. Future studies could refine the measurement by including objective measures of exercise behavior such as gym attendance records and psychophysiology data. Data could also be gathered from a larger, more heterogeneous sample.

In addition, it is possible that our measures of barriers/benefits to exercise and activity related affect failed to adequately capture the full range of factors within these domains in order to determine their significance in understanding how the HPM related to exercise persistence among early adult women. For example, barriers relating to illness, mental health, school schedule, and finances were not measured. Previous studies have also found enjoyment
in exercise to be related to the interactional style of the fitness instructor (Puente and Anshiel, 2010), leadership style and choreography (Bray, et al., 2004) and peer climate (Murcia, et al., 2008) giving some indication that these factors may have not been the experience of the participants of this study.

It is also possible that our brief, three-month follow-up was not long enough to capture the persistence of exercise behavior. Furthermore, our analytic approach utilized national recommendations to define physical activity. Although these are relevant to the population as a whole, it may be that these cutoffs should have been interpreted more conservatively for a college age population that is likely more active than the population as a whole. Future studies could explore more strict definitions of exercise engagement that can then inform ratings of persistence at the follow-up. Finally, it is possible that the HPM factors are most relevant for exercise engagement and do not specifically relate to persistence behaviors.

However, even with these limitations there are definite strengths to this study. First we employed a comprehensive assessment (and subsequent testing) of health promotion model (HPM) constructs as they pertained to exercise (Pender et al., 2002). Second, we utilized a longitudinal design in an attempt to more accurately measure exercise persistence by asking participants to keep track of their weekly exercise prospectively. Third, we examined exercise persistence across levels of intensity.

In sum, factors that impact exercise persistence are complicated and varied (Buckworth & Nigg, 2004, Lippke & Ziegelmann, 2006; Speck & Harrell, 2003) and include a wide variety of variables that have been inconsistently studied (Sallis et al., 2001). Although findings from our initial analyses did not support our hypothesis that HPM factors would significant predict
exercise persistence over 3 months, our exploratory findings add to the research by identifying interpersonal influence and connection to the exercise environment as linked to short-term (3-month) persistence in strenuous exercise activity among early adult women. These findings are consistent with relational cultural theory in that interpersonal factors are posited to be particularly important for women (Marcus & Forsyth, 1998; Segar, Jayaratne, Hanlon, & Richardson, 2002). Results support the impact of interpersonal factors on persistence to more intense fitness regiments and prompts the need for additional research in elucidating the components of connection and interpersonal interactions so that they are more fully understood.
References


Williams, S., & French, D. (2011). What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour—and are they the same? *Health Education Research, 26*(2), 308-322.


Table 1

**Frequencies and Percentages: Demographic Questions (N = 100)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 years of age</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>19 years of age</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>20 years of age</td>
<td>14</td>
<td>14.0</td>
</tr>
<tr>
<td>21 years of age</td>
<td>13</td>
<td>13.0</td>
</tr>
<tr>
<td>22 years of age</td>
<td>18</td>
<td>18.0</td>
</tr>
<tr>
<td>23 years of age</td>
<td>14</td>
<td>14.0</td>
</tr>
<tr>
<td>24 years of age</td>
<td>9</td>
<td>9.0</td>
</tr>
<tr>
<td><strong>College Class Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>24</td>
<td>24.0</td>
</tr>
<tr>
<td>Sophomore</td>
<td>17</td>
<td>17.0</td>
</tr>
<tr>
<td>Junior</td>
<td>19</td>
<td>19.0</td>
</tr>
<tr>
<td>Senior</td>
<td>12</td>
<td>12.0</td>
</tr>
<tr>
<td>Graduate</td>
<td>22</td>
<td>22.0</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>58</td>
<td>58.0</td>
</tr>
<tr>
<td>Black/African American</td>
<td>9</td>
<td>9.0</td>
</tr>
<tr>
<td>Asian American</td>
<td>28</td>
<td>28.0</td>
</tr>
<tr>
<td>Hispanic/Latina</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Living Situation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On campus</td>
<td>47</td>
<td>47.0</td>
</tr>
<tr>
<td>Off campus</td>
<td>53</td>
<td>53.0</td>
</tr>
<tr>
<td><strong>Relationship Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>59</td>
<td>59.0</td>
</tr>
<tr>
<td>In a Relationship</td>
<td>41</td>
<td>41.0</td>
</tr>
<tr>
<td><strong>Employment Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>33</td>
<td>33.0</td>
</tr>
<tr>
<td>Part-time</td>
<td>42</td>
<td>42.0</td>
</tr>
<tr>
<td>Do not work</td>
<td>25</td>
<td>25.0</td>
</tr>
</tbody>
</table>

*Note.* For statistical analyses conducted for hypothesis testing, the race/ethnicity variable was recoded into a two-category variable of White participants \(n = 58\) = 1, and non-White participants \(n = 42\) = -1.
Table 2

Descriptive Statistics: Health Promotion Model (HPM) Study Variables Time 1 (N = 100)

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Zsk</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBBS Benefits/Barriers to Exercise</td>
<td>139.21</td>
<td>14.32</td>
<td>106.00</td>
<td>168.00</td>
<td>-0.79</td>
<td>.82</td>
</tr>
<tr>
<td>ESE Exercise Self-efficacy</td>
<td>15.90</td>
<td>4.15</td>
<td>7.00</td>
<td>25.00</td>
<td>-0.04</td>
<td>.70</td>
</tr>
<tr>
<td>ESSE Exercise Scheduling Self-efficacy</td>
<td>10.35</td>
<td>2.76</td>
<td>5.00</td>
<td>15.00</td>
<td>-0.63</td>
<td>.79</td>
</tr>
<tr>
<td>PACES Physical Enjoyment of Exercise</td>
<td>98.30</td>
<td>15.93</td>
<td>65.00</td>
<td>125.00</td>
<td>-1.38</td>
<td>.84</td>
</tr>
<tr>
<td>GEQ Interpersonal Exercise Group Cohesion</td>
<td>64.76</td>
<td>28.72</td>
<td>17.00</td>
<td>119.00</td>
<td>0.97</td>
<td>.96</td>
</tr>
<tr>
<td>EEQSG Interpersonal Influence: Group</td>
<td>27.48</td>
<td>4.84</td>
<td>18.00</td>
<td>35.00</td>
<td>-1.08</td>
<td>.90</td>
</tr>
<tr>
<td>EEQT Interpersonal Influence: Technology</td>
<td>7.97</td>
<td>3.40</td>
<td>3.00</td>
<td>15.00</td>
<td>0.13</td>
<td>.59</td>
</tr>
<tr>
<td>EEQT&lt; Interpersonal Influence: Technology (recoded)</td>
<td>6.04</td>
<td>2.86</td>
<td>2.00</td>
<td>10.00</td>
<td>0.46</td>
<td>.78</td>
</tr>
<tr>
<td>EEQF Situational Influence: Friends</td>
<td>7.67</td>
<td>3.35</td>
<td>3.00</td>
<td>15.00</td>
<td>0.63</td>
<td>.68</td>
</tr>
</tbody>
</table>

Note. Potential range of scores for study scales: (a) 43-item EBBS: 43-172; (b) ESE: 5-25; (c) ESSE: 3-15; (d) PACES: 18-126; (e) GEQ: 17-119; (f) EEQ-SG: 7-35; (g) EEQ-T: 3-15; (h) EEQ-T<: 2=10; EEQ-F: 3-15.

Table 3

Descriptive Statistics: Health Promotion Model (HPM) Study Variables Time 2 (N = 100)

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Zsk</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBBS Benefits/Barriers to Exercise</td>
<td>137.31</td>
<td>14.35</td>
<td>107.00</td>
<td>170.00</td>
<td>-0.38</td>
<td>.79</td>
</tr>
<tr>
<td>ESE Exercise Self-efficacy</td>
<td>15.94</td>
<td>4.15</td>
<td>7.00</td>
<td>24.00</td>
<td>-0.54</td>
<td>.71</td>
</tr>
<tr>
<td>ESSE Exercise Scheduling Self-efficacy</td>
<td>10.96</td>
<td>2.35</td>
<td>6.00</td>
<td>15.00</td>
<td>-1.29</td>
<td>.85</td>
</tr>
<tr>
<td>PACES Physical Enjoyment of Exercise</td>
<td>98.30</td>
<td>15.93</td>
<td>65.00</td>
<td>125.00</td>
<td>-1.38</td>
<td>.86</td>
</tr>
<tr>
<td>GEQ Interpersonal Group Exercise Cohesion</td>
<td>65.93</td>
<td>26.94</td>
<td>23.00</td>
<td>119.00</td>
<td>0.33</td>
<td>.97</td>
</tr>
<tr>
<td>EEQSG Interpersonal Influence: Group</td>
<td>26.42</td>
<td>4.71</td>
<td>16.00</td>
<td>35.00</td>
<td>-1.17</td>
<td>.90</td>
</tr>
<tr>
<td>EEQT Interpersonal Influence: Technology</td>
<td>7.89</td>
<td>3.09</td>
<td>3.00</td>
<td>15.00</td>
<td>0.67</td>
<td>.60</td>
</tr>
<tr>
<td>EEQT&lt; Interpersonal Influence: Technology (recoded)</td>
<td>6.01</td>
<td>2.56</td>
<td>2.00</td>
<td>10.00</td>
<td>0.04</td>
<td>.70</td>
</tr>
<tr>
<td>EEQF Interpersonal Influence: Friends</td>
<td>7.24</td>
<td>3.01</td>
<td>3.00</td>
<td>14.00</td>
<td>1.21</td>
<td>.68</td>
</tr>
</tbody>
</table>

Note. Potential range of scores for study scales: (a) 43-item EBBS: 43-172; (b) ESE: 5-25; (c) ESSE: 3-15; (d) PACES: 18-126; (e) GEQ: 17-119; (f) EEQ-SG: 7-35; (g) EEQ-T: 3-15; (h) EEQ-T<: 2=10; EEQ-F: 3-15.
### Table 4

**Correlation Matrix of Study Variables Time 1 and Time 2 (N = 100)**

<table>
<thead>
<tr>
<th></th>
<th>EBBS T1</th>
<th>EBSE T1</th>
<th>ESSE T1</th>
<th>PACES T1</th>
<th>GEQ-T1</th>
<th>EEQ-F T1</th>
<th>EBBS T2</th>
<th>EBSE T2</th>
<th>ESSE T2</th>
<th>PACES GEQ T2</th>
<th>GEQ- SG T2</th>
<th>EEQ- T2</th>
<th>EEQ-F T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBBS T1 Pearson Correlation</td>
<td>1</td>
<td>0.428** .410** .688** .184</td>
<td>0.391** .088 .152 .682** .250* .407** .488** .242* .407** .196</td>
<td>0.166</td>
<td>0.164</td>
<td>0.323** .479** .600** .267** .520** .164</td>
<td>0.190</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.066</td>
<td>.000</td>
<td>.382</td>
<td>.131</td>
<td>.000</td>
<td>.012</td>
<td>.000</td>
<td>.015</td>
<td>.000</td>
<td>.005</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>ESE T1 Pearson Correlation</td>
<td>0.428** 1</td>
<td>0.488** .466** .146</td>
<td>0.299** .122</td>
<td>0.145</td>
<td>.320**</td>
<td>0.495**</td>
<td>.365**</td>
<td>.309**</td>
<td>.142</td>
<td>0.277**</td>
<td>0.109</td>
<td>0.038</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.146</td>
<td>0.003</td>
<td>0.226</td>
<td>0.149</td>
<td>0.001</td>
<td>0.000</td>
<td>0.002</td>
<td>0.159</td>
<td>0.005</td>
<td>0.278</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>ESSE T1 Pearson Correlation</td>
<td>0.410**</td>
<td>0.488**</td>
<td>0.389**</td>
<td>0.126</td>
<td>0.188</td>
<td>0.269**</td>
<td>0.134</td>
<td>0.275**</td>
<td>0.355**</td>
<td>0.523**</td>
<td>0.226**</td>
<td>0.195</td>
<td>0.278**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.213</td>
<td>0.061</td>
<td>0.007</td>
<td>0.185</td>
<td>0.006</td>
<td>0.000</td>
<td>0.024</td>
<td>0.051</td>
<td>0.005</td>
<td>0.008</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>PACES T1 Pearson Correlation</td>
<td>0.688**</td>
<td>0.466**</td>
<td>0.389**</td>
<td>1</td>
<td>0.197*</td>
<td>0.480**</td>
<td>0.142</td>
<td>0.234*</td>
<td>0.592**</td>
<td>0.305**</td>
<td>0.440**</td>
<td>0.651**</td>
<td>0.311**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.490</td>
<td>0.000</td>
<td>0.157</td>
<td>0.019</td>
<td>0.000</td>
<td>0.002</td>
<td>0.000</td>
<td>0.002</td>
<td>0.000</td>
<td>0.012</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>GEQ T1 Pearson Correlation</td>
<td>0.184</td>
<td>0.146</td>
<td>0.126</td>
<td>0.197**</td>
<td>1</td>
<td>0.291**</td>
<td>0.042</td>
<td>0.596**</td>
<td>0.142</td>
<td>0.178</td>
<td>0.145</td>
<td>0.264**</td>
<td>0.490**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.066</td>
<td>0.146</td>
<td>0.213</td>
<td>0.049</td>
<td>0.003</td>
<td>0.677</td>
<td>0.000</td>
<td>0.157</td>
<td>0.076</td>
<td>0.150</td>
<td>0.008</td>
<td>0.000</td>
<td>0.028</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>EEQ-SG T1 Correlation</td>
<td>0.391**</td>
<td>0.299**</td>
<td>0.188</td>
<td>0.480**</td>
<td>0.291**</td>
<td>1</td>
<td>0.131</td>
<td>0.131</td>
<td>0.349**</td>
<td>0.247*</td>
<td>0.234*</td>
<td>0.405**</td>
<td>0.317**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.000</td>
<td>0.003</td>
<td>0.061</td>
<td>0.000</td>
<td>0.003</td>
<td>0.195</td>
<td>0.195</td>
<td>0.000</td>
<td>0.013</td>
<td>0.019</td>
<td>0.000</td>
<td>0.001</td>
<td>0.361</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>EEQ-T T1 Correlation</td>
<td>0.088</td>
<td>0.122</td>
<td>0.269**</td>
<td>0.142</td>
<td>0.042</td>
<td>0.131</td>
<td>1</td>
<td>0.055</td>
<td>0.018</td>
<td>0.070</td>
<td>0.128</td>
<td>0.011</td>
<td>0.307**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.382</td>
<td>0.226</td>
<td>0.007</td>
<td>0.157</td>
<td>0.677</td>
<td>0.195</td>
<td>0.585</td>
<td>0.857</td>
<td>0.489</td>
<td>0.204</td>
<td>0.916</td>
<td>0.002</td>
<td>0.919</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>EEQ-F T1 Correlation</td>
<td>0.152</td>
<td>0.145</td>
<td>0.134</td>
<td>0.234**</td>
<td>0.596**</td>
<td>0.131</td>
<td>0.055</td>
<td>1</td>
<td>0.166</td>
<td>0.148</td>
<td>0.141</td>
<td>0.186</td>
<td>0.449**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.131</td>
<td>0.149</td>
<td>0.185</td>
<td>0.019</td>
<td>0.000</td>
<td>0.195</td>
<td>0.585</td>
<td>0.100</td>
<td>0.141</td>
<td>0.162</td>
<td>0.064</td>
<td>0.000</td>
<td>0.393</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>EBBS T2 Pearson Correlation</td>
<td>0.682**</td>
<td>0.320**</td>
<td>0.275**</td>
<td>0.592**</td>
<td>0.142</td>
<td>0.349**</td>
<td>0.018</td>
<td>0.166</td>
<td>1</td>
<td>0.323**</td>
<td>0.479**</td>
<td>0.600**</td>
<td>0.267**</td>
</tr>
<tr>
<td></td>
<td>Pearson</td>
<td>Correlati</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-----------</td>
<td>-----------------</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESE T2</td>
<td>.250&lt;sup&gt;<strong>&lt;/sup&gt; .495&lt;sup&gt;</strong>&lt;/sup&gt; .355&lt;sup&gt;<strong>&lt;/sup&gt; .305&lt;sup&gt;</strong>&lt;/sup&gt; .178</td>
<td>.247&lt;sup&gt;<strong>&lt;/sup&gt; .070 .148 .323&lt;sup&gt;</strong>&lt;/sup&gt; 1</td>
<td>.543&lt;sup&gt;<strong>&lt;/sup&gt; .346&lt;sup&gt;</strong>&lt;/sup&gt; .328&lt;sup&gt;<strong>&lt;/sup&gt; .321&lt;sup&gt;</strong>&lt;/sup&gt; .045 .258&lt;sup&gt;**&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.012 .000 .000 .002 .076</td>
<td>.013 .489 .141 .001</td>
<td>.000 .000 .001 .001 .659 .010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESSE T2</td>
<td>.407&lt;sup&gt;<strong>&lt;/sup&gt; .365&lt;sup&gt;</strong>&lt;/sup&gt; .523&lt;sup&gt;<strong>&lt;/sup&gt; .440&lt;sup&gt;</strong>&lt;/sup&gt; .145</td>
<td>.234&lt;sup&gt;<strong>&lt;/sup&gt; .128 .141 .479&lt;sup&gt;</strong>&lt;/sup&gt; .543&lt;sup&gt;**&lt;/sup&gt; 1</td>
<td>.398&lt;sup&gt;<strong>&lt;/sup&gt; .329&lt;sup&gt;</strong>&lt;/sup&gt; .294&lt;sup&gt;**&lt;/sup&gt; .133 .238&lt;sup&gt;*&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.000 .000 .000 .000 .150</td>
<td>.019 .204 .162 .000</td>
<td>.000 .000 .001 .003 .188 .017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACES T2</td>
<td>.488&lt;sup&gt;<strong>&lt;/sup&gt; .309&lt;sup&gt;</strong>&lt;/sup&gt; .226&lt;sup&gt;<strong>&lt;/sup&gt; .651&lt;sup&gt;</strong>&lt;/sup&gt; .264&lt;sup&gt;<strong>&lt;/sup&gt; .405&lt;sup&gt;</strong>&lt;/sup&gt; .011</td>
<td>.186 .600&lt;sup&gt;<strong>&lt;/sup&gt; .346&lt;sup&gt;</strong>&lt;/sup&gt; .398&lt;sup&gt;**&lt;/sup&gt; 1</td>
<td>.337&lt;sup&gt;<strong>&lt;/sup&gt; .510&lt;sup&gt;</strong>&lt;/sup&gt; .179&lt;sup&gt;<strong>&lt;/sup&gt; .307&lt;sup&gt;</strong>&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.000 .002 .024 .000 .008</td>
<td>.000 .916 .064 .000</td>
<td>.000 .000 .001 .007 .048 .002</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEQ T2</td>
<td>.242&lt;sup&gt;<strong>&lt;/sup&gt; .142 .195 .311&lt;sup&gt;</strong>&lt;/sup&gt; .490&lt;sup&gt;<strong>&lt;/sup&gt; .317&lt;sup&gt;</strong>&lt;/sup&gt; .307&lt;sup&gt;<strong>&lt;/sup&gt; .449&lt;sup&gt;</strong>&lt;/sup&gt; .267&lt;sup&gt;<strong>&lt;/sup&gt; .328&lt;sup&gt;</strong>&lt;/sup&gt; .329&lt;sup&gt;<strong>&lt;/sup&gt; .337&lt;sup&gt;</strong>&lt;/sup&gt; 1</td>
<td>.309&lt;sup&gt;<strong>&lt;/sup&gt; .275&lt;sup&gt;</strong>&lt;/sup&gt; .623&lt;sup&gt;**&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.015 .159 .051 .002 .000</td>
<td>.001 .002 .000 .007</td>
<td>.001 .001 .001 .002 .006 .000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-SG T2</td>
<td>.407&lt;sup&gt;<strong>&lt;/sup&gt; .277&lt;sup&gt;</strong>&lt;/sup&gt; .278&lt;sup&gt;<strong>&lt;/sup&gt; .464&lt;sup&gt;</strong>&lt;/sup&gt; .220&lt;sup&gt;<strong>&lt;/sup&gt; .575&lt;sup&gt;</strong>&lt;/sup&gt; .010 .086 .520&lt;sup&gt;<strong>&lt;/sup&gt; .321&lt;sup&gt;</strong>&lt;/sup&gt; .294&lt;sup&gt;<strong>&lt;/sup&gt; .510&lt;sup&gt;</strong>&lt;/sup&gt; .309&lt;sup&gt;**&lt;/sup&gt; 1</td>
<td>.074 .162</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.000 .005 .005 .000 .028</td>
<td>.000 .919 .393 .000</td>
<td>.001 .003 .000 .002 .463 .108</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-T T2</td>
<td>.196 .109 .263&lt;sup&gt;<strong>&lt;/sup&gt; .249&lt;sup&gt;</strong>&lt;/sup&gt; .196 .092 .603&lt;sup&gt;<strong>&lt;/sup&gt; .202&lt;sup&gt;</strong>&lt;/sup&gt; .164</td>
<td>.045 .133 .179&lt;sup&gt;<strong>&lt;/sup&gt; .275&lt;sup&gt;</strong>&lt;/sup&gt; .074 1</td>
<td>.246&lt;sup&gt;**&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.050 .278 .008 .012 .050</td>
<td>.361 .000 .044 .102</td>
<td>.659 .188 .074 .006 .463 .014</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-F T2</td>
<td>.184 .038 .129 .211&lt;sup&gt;<strong>&lt;/sup&gt; .405&lt;sup&gt;</strong>&lt;/sup&gt; .257&lt;sup&gt;<strong>&lt;/sup&gt; .184 .669&lt;sup&gt;</strong>&lt;/sup&gt; .190</td>
<td>.258&lt;sup&gt;<strong>&lt;/sup&gt; .238&lt;sup&gt;</strong>&lt;/sup&gt; .307&lt;sup&gt;<strong>&lt;/sup&gt; .623&lt;sup&gt;</strong>&lt;/sup&gt; .162 .246&lt;sup&gt;**&lt;/sup&gt; 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.066 .705 .200 .035 .000</td>
<td>.010 .066 .000 .058</td>
<td>.010 .017 .002 .000 .108 .014</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Table 5

Hierarchical Logistic Regression: Race and Time 1 HPM Behavior-Specific Cognitions and Affect Variables Predicting Exercise Persistence (N = 100)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald $\chi^2$</td>
<td>$P$</td>
<td>Odds Ratio</td>
<td>95% CI for Odds Ratio</td>
<td>Wald $\chi^2$</td>
<td>$P$</td>
</tr>
<tr>
<td>Race</td>
<td>17.39</td>
<td>&lt;.001</td>
<td>.142</td>
<td>.057</td>
<td>.355</td>
<td>13.97</td>
</tr>
<tr>
<td>EBBS</td>
<td>0.63</td>
<td>.427</td>
<td>1.02</td>
<td>.973</td>
<td>1.07</td>
<td></td>
</tr>
<tr>
<td>ESE</td>
<td>5.16</td>
<td>.023</td>
<td>1.20</td>
<td>1.03</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>ESSE</td>
<td>0.02</td>
<td>.887</td>
<td>1.02</td>
<td>.826</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>PACES</td>
<td>2.87</td>
<td>.090</td>
<td>1.00</td>
<td>.961</td>
<td>1.05</td>
<td></td>
</tr>
</tbody>
</table>

Note. Significant findings are in italics.

Table 6

Hierarchical Logistic Regression: Race and Time 2 HPM Behavior-Specific Cognitions and Affect Variables Predicting Exercise Persistence (N = 100)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald $\chi^2$</td>
<td>$P$</td>
<td>Odds Ratio</td>
<td>95% CI</td>
<td>Wald $\chi^2$</td>
<td>$P$</td>
</tr>
<tr>
<td>Race</td>
<td>16.98</td>
<td>&lt;.001</td>
<td>.145</td>
<td>.058</td>
<td>.363</td>
<td>12.8</td>
</tr>
<tr>
<td>EBBS</td>
<td>0.04</td>
<td>.849</td>
<td>.996</td>
<td>.954</td>
<td>1.04</td>
<td></td>
</tr>
<tr>
<td>ESE</td>
<td>1.00</td>
<td>.318</td>
<td>1.07</td>
<td>.934</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td>ESSE</td>
<td>0.23</td>
<td>.629</td>
<td>1.07</td>
<td>.822</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>PACES</td>
<td>1.18</td>
<td>.277</td>
<td>1.02</td>
<td>.986</td>
<td>1.05</td>
<td></td>
</tr>
</tbody>
</table>

Note. Significant findings are in italics.
### Table 7

**Hierarchical Logistic Regression: Race and Time 1 HPM Behavior-Specific Cognitions and Affect and Interpersonal Variables Predicting Exercise Persistence (N = 100)**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 2</th>
<th></th>
<th>Model 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald $\chi^2$</td>
<td>$p$</td>
<td>Odds Ratio</td>
<td>95% CI</td>
<td>Wald $\chi^2$</td>
</tr>
<tr>
<td>Race</td>
<td>13.97</td>
<td>&lt;.001</td>
<td>.147</td>
<td>.054 .401</td>
<td>14.18</td>
</tr>
<tr>
<td>EBBS</td>
<td>.632</td>
<td>.427</td>
<td>1.02</td>
<td>.973 1.07</td>
<td>.390</td>
</tr>
<tr>
<td>ESE</td>
<td>5.16</td>
<td>.023</td>
<td>1.20</td>
<td>1.03 1.41</td>
<td>4.53</td>
</tr>
<tr>
<td>ESSE</td>
<td>.020</td>
<td>.887</td>
<td>1.02</td>
<td>.826 1.25</td>
<td>.003</td>
</tr>
<tr>
<td>PACES</td>
<td>.014</td>
<td>.905</td>
<td>1.00</td>
<td>.961 1.05</td>
<td>.216</td>
</tr>
<tr>
<td>GEQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.603</td>
</tr>
<tr>
<td>EEQSG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.00</td>
</tr>
<tr>
<td>EEQT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.21</td>
</tr>
<tr>
<td>EEQF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.304</td>
</tr>
</tbody>
</table>

*Note.* Significant results are in italics.

### Table 8

**Hierarchical Logistic Regression: Race and Time 2 HPM Behavior-Specific Cognitions and Affect and Interpersonal Variables Predicting Exercise Persistence (N = 100)**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 2</th>
<th></th>
<th>Model 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald $\chi^2$</td>
<td>$p$</td>
<td>Odds Ratio</td>
<td>95% CI</td>
<td>Wald $\chi^2$</td>
</tr>
<tr>
<td>Race</td>
<td>12.80</td>
<td>&lt;.001</td>
<td>.175</td>
<td>.068 1.455</td>
<td>14.72</td>
</tr>
<tr>
<td>EBBS</td>
<td>.036</td>
<td>.849</td>
<td>1.00</td>
<td>.954 1.04</td>
<td>.062</td>
</tr>
<tr>
<td>ESE</td>
<td>1.00</td>
<td>.318</td>
<td>1.07</td>
<td>.934 1.23</td>
<td>.150</td>
</tr>
<tr>
<td>ESSE</td>
<td>.234</td>
<td>.629</td>
<td>1.07</td>
<td>.822 1.38</td>
<td>.004</td>
</tr>
<tr>
<td>PACES</td>
<td>1.18</td>
<td>.277</td>
<td>1.02</td>
<td>.986 1.05</td>
<td>.375</td>
</tr>
<tr>
<td>GEQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.56</td>
</tr>
<tr>
<td>EEQSG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td>EEQT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.056</td>
</tr>
<tr>
<td>EEQF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.004</td>
</tr>
</tbody>
</table>

*Note.* Significant results are in italics.
Table 9
One-way Between-subjects MANOVA: Persisters’ and Nonpersister’ Mean Score Differences on Time 1 HPM Theoretical Factors (N = 100)

<table>
<thead>
<tr>
<th></th>
<th>Wilks λ</th>
<th>F</th>
<th>Df</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between-Subjects Multivariate Model</td>
<td>.803</td>
<td>2.79</td>
<td>8.91</td>
<td>.008</td>
<td>.197</td>
</tr>
<tr>
<td>Persisters versus Nonpersisters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBBS Perceived Benefits/Barriers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>133.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>142.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESE Exercise Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>13.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>17.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESSE Exercise Scheduling Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>9.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>10.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACES Physical Enjoyment of Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>93.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>101.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEQ Exercise Group Cohesion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>57.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>68.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-SG Interpersonal Influence: Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>25.54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>28.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-T Interpersonal Influence: Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>5.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>6.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-F Interpersonal Influence: Friends</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>7.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>7.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 10

One-way Between-subjects MANOVA: Persisters’ and Nonpersister’ Mean Score Differences on Time 2 HPM Theoretical Factors (N = 100)

<table>
<thead>
<tr>
<th></th>
<th>Wilks $\lambda$</th>
<th>F</th>
<th>Df</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between-Subjects Multivariate Model</strong></td>
<td>.768</td>
<td>3.45</td>
<td>8,91</td>
<td>.002</td>
<td>.232</td>
</tr>
<tr>
<td><strong>Persisters versus Nonpersisters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBBS Perceived Benefits/Barriers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>130.9</td>
<td>14.18</td>
<td>1,98</td>
<td>&lt;.001</td>
<td>.126</td>
</tr>
<tr>
<td>Persisters</td>
<td>141.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESE Exercise Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>14.14</td>
<td>11.11</td>
<td>1,98</td>
<td>.001</td>
<td>.102</td>
</tr>
<tr>
<td>Persisters</td>
<td>16.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESSE Exercise Scheduling Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>10.11</td>
<td>7.44</td>
<td>1,98</td>
<td>.008</td>
<td>.071</td>
</tr>
<tr>
<td>Persisters</td>
<td>11.41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACES Physical Enjoyment of Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>86.71</td>
<td>8.83</td>
<td>1,98</td>
<td>.004</td>
<td>.083</td>
</tr>
<tr>
<td>Persisters</td>
<td>97.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEQ Exercise Group Cohesion</td>
<td></td>
<td>9.47</td>
<td>1,98</td>
<td>.003</td>
<td>.088</td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>55.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>71.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-SG Interpersonal Influence: Group</td>
<td></td>
<td>7.00</td>
<td>1,98</td>
<td>.010</td>
<td>.067</td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>24.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>27.31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-T Interpersonal Influence: Technology</td>
<td></td>
<td>0.00</td>
<td>1,98</td>
<td>.958</td>
<td>.000</td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>6.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>6.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEQ-F Interpersonal Influence: Friends</td>
<td></td>
<td>0.63</td>
<td>1,98</td>
<td>.430</td>
<td>.006</td>
</tr>
<tr>
<td>Nonpersisters</td>
<td>6.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persisters</td>
<td>7.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 11

Hierarchical Logistic Regression: Race and HPM Behavior-Specific Cognitions and Affect Variables Predicting Strenuous Exercise Persistence (N = 100)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald $\chi^2$</td>
<td>p</td>
<td>Odds Ratio</td>
<td>95% CI for Odds Ratio</td>
<td>Wald $\chi^2$</td>
<td>p</td>
</tr>
<tr>
<td>Race</td>
<td>18.17</td>
<td>&lt;.001</td>
<td>0.14</td>
<td>0.06</td>
<td>0.35</td>
<td>16.95</td>
</tr>
<tr>
<td>EBBS</td>
<td>1.67</td>
<td>.196</td>
<td>0.97</td>
<td>0.92</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>ESE</td>
<td>2.89</td>
<td>.089</td>
<td>1.13</td>
<td>0.98</td>
<td>1.31</td>
<td></td>
</tr>
<tr>
<td>ESSE</td>
<td>6.51</td>
<td>.011</td>
<td>1.33</td>
<td>1.07</td>
<td>1.66</td>
<td></td>
</tr>
<tr>
<td>PACES</td>
<td>0.02</td>
<td>.901</td>
<td>1.00</td>
<td>0.96</td>
<td>1.04</td>
<td></td>
</tr>
</tbody>
</table>

Note. Significant findings are in italics.

Table 12

Hierarchical Logistic Regression: HPM Behavior-Specific Cognitions and Affect and Interpersonal Variables Predicting Strenuous Exercise Persistence (N = 100)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 2</th>
<th></th>
<th></th>
<th>Model 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald $\chi^2$</td>
<td>p</td>
<td>Odds Ratio</td>
<td>95% CI for Odds Ratio</td>
<td>Wald $\chi^2$</td>
<td>p</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>U</td>
<td>L</td>
<td>U</td>
<td>L</td>
<td>U</td>
</tr>
<tr>
<td>EBBS</td>
<td>1.67</td>
<td>.196</td>
<td>0.97</td>
<td>0.92</td>
<td>1.01</td>
<td>1.98</td>
</tr>
<tr>
<td>ESE</td>
<td>2.89</td>
<td>.089</td>
<td>1.13</td>
<td>0.98</td>
<td>1.31</td>
<td>2.61</td>
</tr>
<tr>
<td>ESSE</td>
<td>6.51</td>
<td>.011</td>
<td>1.33</td>
<td>1.07</td>
<td>1.66</td>
<td>5.85</td>
</tr>
<tr>
<td>PACES</td>
<td>0.02</td>
<td>.901</td>
<td>1.00</td>
<td>0.96</td>
<td>1.04</td>
<td>1.43</td>
</tr>
<tr>
<td>GEQ</td>
<td>0.72</td>
<td>.396</td>
<td>0.99</td>
<td>0.97</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>EEQ-SG</td>
<td>5.35</td>
<td>.021</td>
<td>1.17</td>
<td>1.02</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>EEQ-T</td>
<td>2.15</td>
<td>.143</td>
<td>1.16</td>
<td>0.95</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>EEQ-F</td>
<td>3.17</td>
<td>.076</td>
<td>1.20</td>
<td>0.98</td>
<td>1.46</td>
<td></td>
</tr>
</tbody>
</table>

Note. Significant results are in italics. Model 1 effects for the covariate of race are not included in this table. Race did remain a significant predictor of strenuous exercise persistence, Wald $\chi^2$ (1) = 18.17, p < .001.
**Figure 1.** Health Promotion Model Components

**Figure 2.** Diagram of the Health Promotion Model (Fortaleza, 2002 taken from Guedes, et al., 2009)
Appendix A

EBBS Letter of Permission

From: Karen Sechrist <krsech@pacbell.net>
Sent: Wednesday, February 17, 2016 11:35 AM
To: Shelly Collins
Subject: Re: Using the EBBS for research

Dear Ms. Collins:

The Exercise Benefits/Barrier Scale (EBBS) is located at
http://deepblue.lib.umich.edu/handle/2027.42/85354. You will find a letter of permission to
use the EBBS and scoring information in the "EBBS Information" file.

The EBBS was originally developed to evaluate behavior for the Health Promotion Model
(HPM). If you want additional information on the HPM, please go to:
http://deepblue.lib.umich.edu/browse?type=author&order=ASC&rpp=20&value=Pender%2C+Nola+J. Please note that the HPM link may not work correctly from the e-mail. Please copy and
paste the link into your browser address bar to include the "period" at the end.

Best wishes with your research,

Dr. Karen Sechrist

for Drs. Sechrist/Walker/Pender
Hello Dr. Sechrist,

I am a third year PhD student in the Counseling and Applied Psychology program at Northeastern. I would like to conduct a study for my dissertation on factors that promote fitness among college-age women. I am requesting permission to use the Exercise Benefits and Barriers Scale in my study.

The main purpose of this study is to determine whether interpersonal factors are important in determining which young women persist with exercise over time. Specifically, we will examine self-efficacy for exercise, perceived barriers & benefits, prior behavior, enjoyment of the exercise experience, coupled with the social and interpersonal nature of the exercise environment.

Our main study goal is crucial as behavioral patterns set in young adulthood tend to continue into the adult years. Young women who engage and persist in exercise will be more likely to continue that healthy habit and reap both the physical and psychological benefits for years to come.

Sincerely,
Shelly-Ann Collins
Dear Ms. Collins,

On behalf of the Merino Sports Complex, we are excited that you have decided to conduct a research project to better understand gender-specific factors that explain which women engage in a consistent practice of physical activity and fitness. Our staff is aware of the many mental and physical health benefits of physical activity and believe it is extremely important to understand how to better engage women in staying healthy through fitness. We understand that you will be posting flyers about your study in the women’s locker room and at the entrance to our facility. We also understand that interested fitness instructors may provide brochures to students in their class.

It is our pleasure to work with you on this novel and important research endeavor.

Sincerely,

Pamela Wetherbee-Metcalf
Senior Associate Athletics Director
Appendix C

Not a PDF, but text content:

Date: February 11, 2016
IRB #: 16-01-10

Principal Investigator(s): Christie Rizzo
Shelly-Ann Collins

Department: Department of Applied Psychology

Address: 437 International Village
Northeastern University

Title of Project: Reframing Female Fitness: an Investigation of the Factors that Influence Exercise Persistence in College Age Women

Participating Sites: N/A

Informed Consent: One (1) unsigned consent form for online surveys (pre and post)

As per CFR 45 46.117(c)(2) signed consent is being waived as the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required.

DHHS Review Category: Expedited #7

Monitoring Interval: 12 months

APPROVAL EXPIRATION DATE: FEBRUARY 10, 2017

Investigator's Responsibilities:

1. Informed consent form bearing the IRB approval stamp must be used when recruiting participants into the study.
2. The investigator must notify IRB immediately of unexpected adverse reactions, or new information that may alter our perception of the benefit-risk ratio.
3. Study procedures and files are subject to audit any time.
4. Any modifications of the protocol or the informed consent as the study progresses must be reviewed and approved by this committee prior to being instituted.
5. Continuing Review Approval for the proposal should be requested at least one month prior to the expiration date above.
6. This approval applies to the protection of human subjects only. It does not apply to any other university approvals that may be necessary.

C. Randall Colvin, Ph.D., Chair
Northeastern University Institutional Review Board

Nan C. Regina
Director, Research Integrity

Northeastern University FWA #: 4630
A chance to win a $140 VISA gift card

ARE YOU FEMALE BETWEEN THE AGE OF 18 AND 25? THEN YOU ARE ELIGIBLE TO PARTICIPATE IN AN ONLINE RESEARCH STUDY ON FITNESS PRACTICES.

Contact Shelly Collins
Collins.she@husky.neu.edu

Estimated survey completion time 20 to 30 minutes

Northeastern University
Bouvé College of Health Sciences

Principal Investigator: Dr. Christie Rizzo, Assistant Professor, Dept. of Applied Psychology
  c.rizzo@neu.edu

Student Investigator: Shelly Ann Collins, collins.she@husky.neu.edu
Online Consent Document  
Reraming Female Fitness

You are invited to participate in a research study on factors that promote regular exercise in young women. This study is conducted by Shelly-Ann Collins (doctoral student) and Dr. Christie Rizzo (Northeastern faculty) from the Department of Applied Psychology at Northeastern University.

As part of this study you will be asked to complete an online survey about your habits, feelings, expectations, and experiences with exercise. The online survey will take approximately 40 minutes of your time and you will be asked to complete it twice: today and 3 months from today. You will receive an email reminder with a link to the 3 month survey when it is time to complete it.

Your decision to participate or decline participation in this study is completely voluntary and you have the right to terminate your participation at any time without penalty. You may skip any questions you do not wish to answer. If you want do not wish to complete this survey just close your browser.

Your participation in this research will be completely confidential and data will be averaged and reported in aggregate. Possible outlets of dissemination may be conferences and journals focused on psychology and public health. Although your participation in this research may not benefit you personally, it will help us understand what factors relate to regular exercise practice among college women.

You will not be paid for your participation in this study; however as a token of our appreciation for completing the survey, your name will be entered into a raffle to receive a VISA gift card valued at $140. The raffle will be conducted after the study is complete. You will be contacted by email if you are selected as the raffle winner.

There are no risks to individuals participating in this survey beyond those that exist in daily life. Your decision to participate, decline, or withdraw from participation will have no effect on your current status or future relations with Northeastern University.

If you have any questions regarding electronic privacy, please feel free to contact Mark Nardone, NU’s Director of Information Security via phone at 617-373-7901, or via email at privacy@neu.edu.

If you have any questions about this study, please feel free to contact Shelly-Ann Collins at collins.she@husky.neu.edu, the person mainly responsible for the research. You can also contact Dr. Christie Rizzo at c.rizzo@neu.edu, the Principal Investigator.

If you have any questions regarding your rights as a research participant, please contact Nan C. Regina, Director, Human Subject Research Protection, 490 Renaissance Park, Northeastern University, Boston, MA 02115. Tel: 617.373.4588, Email: n.regina@neu.edu. You may call anonymously if you wish.

This study has been reviewed and approved by the Northeastern University Institutional Review Board.

Please print a copy of this consent form for your records, if you so desire.

I have read and understand the above consent form, I certify that I am 18 years old or older and, by clicking the submit button to enter the survey, I indicate my willingness voluntarily take part in the study.

SUBMIT

APPROVED
NU IRB# 8-01-10
VALID 2/14/16
THROUGH 2/10/17
Final Online Survey
Reframing Female Fitness

As a reminder you were invited to participate in a research study approximately 12 weeks ago on factors that promote regular exercise in young women.

We appreciate your following through on the initial survey questions. Please follow the link to complete the final portion of the online survey about your habits, feelings, expectations, and experiences with exercise. The online survey will take approximately 40 minutes of your time and will constitute the final piece of the study requirement.

Your decision to participate or decline participation in this study is completely voluntary and you have the right to terminate your participation at any time without penalty. You may skip any questions you do not wish to answer. If you want do not wish to complete this survey just close your browser.

If you have any questions about this study, please feel free to contact Shelly-Ann Collins at collins.she@husky.neu.edu, the person mainly responsible for the research. You can also contact Dr. Christie Rizzo at c.rizzo@neu.edu, the Principal Investigator.

SUBMIT
Initial screening questions:

1) Are you between the ages of 18 and 24? [Yes/No]

2) Are you female? [Yes/No]

Demographics Section

Instructions: Please read each of the following questions carefully and indicate the best response. Please respond to each item.

1. How old are you?

2. Year at school?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
   e. Graduate student
   f. Other _______

3. How do you identify yourself racially or ethnically?
   a. Caucasian/European
   b. Black or African American
   c. Hispanic or Latino(a)
   d. American Indian or Alaska Native
   e. Asian
   f. Native Hawaiian or other Pacific Islander
   g. Other: Please specify _______

4. My weight __________ pounds; my height __________ inches.

5. Living situation?
   a. On campus
   b. Off campus

6. Relationship status?
   a. Single
   b. Married
   c. In a relationship (not married)

7. Employment status?
   a. Full time
   b. Part time
   c. I do not work
8. Previous sports/exercise experience?
   a. Previous sports experience (e.g. played on a team)
   b. Previous exercise experience
   c. Both sports and exercise experience
   d. No previous history
During each of the past 3 months, how many hours were you engaged in the following kinds of exercise during your free time? For example, if you spent 1 ½ hours engaging in moderate exercise in month 1, you would enter 1.5.

**Month 1 (beginning 3 months ago)**

Strenuous Exercise (Heart Beats Rapidly)  
(e.g. running, jogging, vigorous bicycling, high impact aerobics, squash, vigorous swimming, circuit training classes)  
________________________ Hours

Moderate Exercise (Not Exhausting)  
(e.g. fast walking, tennis, easy cycling, volleyball, dancing, badminton, volleyball, pilates, moderate impact aerobics)  
________________________ Hours

Mild Exercise (Minimal Effort)  
(e.g. yoga, stretch classes, archery, bowling, easy walking, gentle exercise classes, golf)  
________________________ Hours

**Month 2 (beginning 2 months ago)**

Strenuous Exercise (Heart Beats Rapidly)  
(e.g. running, jogging, vigorous bicycling, high impact aerobics, squash, vigorous swimming, circuit training classes)  
________________________ Hours

Moderate Exercise (Not Exhausting)  
(e.g. fast walking, tennis, easy cycling, volleyball, dancing, badminton, volleyball, pilates, moderate impact aerobics)  
________________________ Hours

Mild Exercise (Minimal Effort)  
(e.g. yoga, stretch classes, archery, bowling, easy walking, gentle exercise classes, golf)  
________________________ Hours

**Month 3 (this past month)**

Strenuous Exercise (Heart Beats Rapidly)  
(e.g. running, jogging, vigorous bicycling, high impact aerobics, squash, vigorous swimming, circuit training classes)  
________________________ Hours

Moderate Exercise (Not Exhausting)  
(e.g. fast walking, tennis, easy cycling, volleyball, dancing, badminton, volleyball, pilates, moderate impact aerobics)  
________________________ Hours

Mild Exercise (Minimal Effort)  
(e.g. yoga, stretch classes, archery, bowling, easy walking, gentle exercise classes, golf)  
________________________ Hours
SELF-EFFICACY

Looking back over the past 3 months please endorse each item using a five point Likert scale from 1 “not at all confident” to 5 “very confident”.

I am confident I can participate in regular exercise when:

1. I am tired.
2. I am in a bad mood
3. I feel I don’t have the time.
4. I am on vacation.
5. It is raining or snowing.

I am confident that I can

6. Arrange my schedule to be active no matter what.
7. Overcome obstacles that prevent me from being active regularly.
8. Make up times when I have missed my regular exercise.
EXERCISE BENEFITS/BARRIERS SCALE

DIRECTIONS: Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for strongly agree, A for agree, D for disagree, or SD for strongly disagree.

<p>| 1. I enjoy exercise.             | SA | A | D | SD |
| 2. Exercise decreases feelings of stress and tension for me. | SA | A | D | SD |
| 3. Exercise improves my mental health. | SA | A | D | SD |
| 4. Exercising takes too much of my time. | SA | A | D | SD |
| 5. I will prevent heart attacks by exercising. | SA | A | D | SD |
| 6. Exercise tires me. | SA | A | D | SD |
| 7. Exercise increases my muscle strength. | SA | A | D | SD |
| 8. Exercise gives me a sense of personal accomplishment. | SA | A | D | SD |
| 9. Places for me to exercise are too far away. | SA | A | D | SD |
| 10. Exercising makes me feel relaxed. | SA | A | D | SD |
| 11. Exercising lets me have contact with friends and persons I enjoy. | SA | A | D | SD |
| 12. I am too embarrassed to exercise. | SA | A | D | SD |
| 13. Exercising will keep me from having high blood pressure. | SA | A | D | SD |
| 14. It costs too much to exercise. | SA | A | D | SD |
| 15. Exercising increases my level of physical fitness. | SA | A | D | SD |
| 16. Exercise facilities do not have convenient schedules for me. | SA | A | D | SD |
| 17. My muscle tone is improved with exercise. | SA | A | D | SD |
| 18. Exercising improves functioning of my cardiovascular system. | SA | A | D | SD |
| 19. I am fatigued by exercise. | SA | A | D | SD |
| 20. I have improved feelings of well being from exercise. | SA | A | D | SD |
| 21. My spouse (or significant other) does not encourage exercising. | SA | A | D | SD |</p>
<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Exercise increases my stamina.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>23</td>
<td>Exercise improves my flexibility.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>24</td>
<td>Exercise takes too much time from family relationships.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>25</td>
<td>My disposition is improved with exercise.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>26</td>
<td>Exercising helps me sleep better at night.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>27</td>
<td>I will live longer if I exercise.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>28</td>
<td>I think people in exercise clothes look funny.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>29</td>
<td>Exercise helps me decrease fatigue.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>30</td>
<td>Exercising is a good way for me to meet new people.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>31</td>
<td>My physical endurance is improved by exercising.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>32</td>
<td>Exercising improves my self-concept.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>33</td>
<td>My family members do not encourage me to exercise.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>34</td>
<td>Exercising increases my mental alertness.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>35</td>
<td>Exercise allows me to carry out normal activities without becoming tired.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>36</td>
<td>Exercise improves the quality of my work.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>37</td>
<td>Exercise takes too much time from my family responsibilities.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>38</td>
<td>Exercise is good entertainment for me.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>39</td>
<td>Exercising increases my acceptance by others.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>40</td>
<td>Exercise is hard work for me.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>41</td>
<td>Exercise improves overall body functioning for me.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>42</td>
<td>There are too few places for me to exercise.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>43</td>
<td>Exercise improves the way my body looks.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
</tbody>
</table>
## Physical Activity Enjoyment State Scale

Looking back over the past 3 months, please rate how you felt **about the physical activity you have done**. Circle your response to each of the following items.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I enjoy it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>I feel bored</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>I dislike it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>I find it pleasurable</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>I am very absorbed in this activity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>It’s not fun at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>I find it energizing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>It makes me depressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>It’s very pleasant</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>I feel good physically while doing it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>11</td>
<td>It’s very invigorating invigorating</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>12</td>
<td>I am very frustrated</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>13</td>
<td>It’s very gratifying</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>It’s very exhilarating</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>15</td>
<td>It’s not at all stimulating</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>16</td>
<td>It gives me a strong sense of accomplishment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>17</td>
<td>It’s very refreshing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>18</td>
<td>I felt as though I would rather be doing something else</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
Group Exercise Questionnaire (Modified)

The questionnaire is designed to assess your perception of the people you work out with. There are no wrong or right answers, so please give your immediate reaction.

Looking back over the past 3 months, please select a number from 1 to 7 to indicate your level of agreement with each of these statements - 1 “strongly disagree” to 7 “strongly agree”.

1. I enjoy my time with the people I work out with.
2. I like the type of exercise I do with the people I work out with.
3. I enjoy the social interactions I have with the people I work out with.
4. I would miss the people I work out with if the program ended.
5. I am happy with the amount of progress I make towards my health and fitness goals with the people I work out with.
6. I am happy with the fitness community’s level of desire to achieve our health and fitness goals.
7. The people I work out with give me enough opportunities to make progress toward my health and fitness goals.
8. If the people I work out with have problems with the workout everyone wants to help them.
9. For me this gym is an important social community to which I belong.
10. The people I work out with are united in trying to reach our health and fitness goals.
11. The people I work out with communicate freely about each other’s progress toward their goals.
12. The people I work out with spend time socializing before or after workouts.
13. The people I work out with have similar aspirations for the community’s overall health and fitness.
14. The people I work out with would like to spend time together even if the program was to end.
15. Some of my best friends are the people I work out with.
16. The people I work out with hang out together outside of the gym.
17. The people I work out with would rather go out together than go out on their own.
Exercise Environment Questionnaire

Looking back over the past 3 months please endorse each item using a five point Likert scale from 1 “not true for me” to 5 “very true for me”.

1. In exercise situations I feel accepted
2. In exercise situations I feel supported
3. In exercise situations I feel like I belong there
4. I feel isolated when I exercise
5. I don’t feel like I fit in when I exercise
6. I feel out of place when I exercise
7. In exercise situations I feel different from everyone else
8. I post information (images/text) about my exercise activities through social media
9. I use technology to monitor my activity (e.g. fit bit, mobile/online exercise apps
10. I use technology to motivate me to exercise, e.g. challenges from friends through mobile/online apps, social media or fit bit like devices.
11. I usually exercise alone
12. I usually exercise with another person(s)
13. I usually do group fitness exercises.
Over the last 3 months please indicate which of the following exercises you participated in. Check all that apply.

- Boxing
- Treadmill
- Rowing
- Weight Training
- Handball
- Walking for exercise
- Cycling
- Jogging or running
- Aerobics
- Swimming
- Baseball, softball
- Dance
- Football
- Badminton
- Jump Rope
- Soccer
- Hockey
- Volleyball
- Pilates
- Basketball
- Ice skating
- Barre
- TRX
- Martial Arts
- Kickboxing
- Step
- Yoga
- Other: