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EXPLORING GENDER DIFFERENCES IN MUSCLE STRENGTHENING AND AEROBIC PHYSICAL ACTIVITY AMONG COLLEGE STUDENTS USING THE INTEGRATIVE BEHAVIOR MODEL

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EXPLORING GENDER DIFFERENCES IN MUSCLE STRENGTHENING AND AEROBIC PHYSICAL ACTIVITY AMONG COLLEGE STUDENTS USING THE INTEGRATIVE BEHAVIOR MODEL

A THESIS APPROVED FOR THE
DEPARTMENT OF HEALTH AND EXERCISE SCIENCE

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Abstract

Chronic diseases have become a serious problem for the people in the United States causing decreased quality of life, premature death, and rising health care costs (Bauer, et al. 2014). A primary way to lessen the risk of chronic disease is for individuals to participate in the government-recommended amount of aerobic and muscle strengthening physical activity (Bauer, et al. 2014). However, in 2013, only 50% of the adult population met the aerobic physical activity requirements, less than 30% met the muscle strengthening physical activity requirements, and barely 20% met the recommended amount for both types of activity (CDC, 2016b). Reports demonstrate that physical activity participation decreases across the lifespan with females participating in less physical activity than males (Beville, et al. 2014 & Hutchins, Drolet, and Ogletree, 2010). Aerobic physical activity has been the primary behavior observed in reported research, and researchers rarely focus on both aerobic and muscle strengthening physical activity together. Evaluating theory-based determinants of both types of physical activity among the college student population can provide insight to why this sub-population of adults does not meet both physical activity recommendations. The Integrative Behavior Model (IBM), which incorporates many well-known behavioral theories, has emerged as a promising novel theory that has not been extensively used in health behavior research. Therefore, the purpose of this study was to explore the differences in aerobic and muscle strengthening behaviors between male and female college students using the IBM.

Researchers developed the instrument used in this study, using guidance from the authors of the IBM, Icek Ajzen and Martin Fishbein. After the survey was

developed, it was sent via email to all students at the University of Oklahoma currently enrolled in at least one credit hour. Pearson's correlations were used to determine linear correlations between the IBM constructs, ANOVA's were used to observe gender differences in demographics, multiple-linear regression models were used to analyze the determinants of intentions (attitudes, perceived behavioral control, and perceived norms), and logistic regression models were used to analyze the determinants of each physical activity behavior (intentions, skills, environmental constraints, and perceived behavioral control).

Contrary to what was expected, there were no significant differences between males and females with regards to meeting either of the physical activity requirements. Intentions was the only significant predictor for meeting either of the physical activity recommendations. The three primary constructs used to predict intentions, perceived behavioral control (PBC), perceived norms, and attitudes, were all significant. The sub-constructs experiential attitudes, instrumental attitudes, injunctive norms, descriptive norms, capacity, and autonomy all had different levels of influence on intentions that sometimes varied with gender. The determinants of attitudes, perceived norms, and PBC using indirect measures varied some between genders.

Using research based methods to understand one's intentions and what drives them will help health professionals to develop programs, interventions, and policies that could be significant in changing behavior. The IBM is one of the newest and most comprehensive theories available for understanding health behaviors and how to influence them. This current study provides insight to ways of targeting intentions in

this population of college students at the University of Oklahoma, which could be used to increase their physical activity behavior and therefore improve their overall health.

Chapter 1: Introduction

Chronic Disease and the Importance of Exercise

Over the last century, chronic diseases such as obesity, hypertension, cardiovascular disease and many others, have replaced infectious diseases as the primary causes of death among individuals in the United States (Bauer, et al. 2014). Currently, chronic diseases are responsible for almost 70% of deaths around the world (Bauer, et al. 2014). Additionally, most healthcare costs in the US are spent on treating chronic diseases. As a result, the Centers for Disease Control and Prevention (CDC, 2016a) initiated a plan to help decrease the harmful effects of chronic disease by targeting modifiable determinants of health, which include malnutrition, a sedentary lifestyle, obesity, hypertension, hyperlipidemia, tobacco use, and excessive alcohol intake (Bauer, et al. 2014). Participation in physical activity is one way to improve many of these determinants of health.

Physical activity can be defined as any type of activity that puts a body in motion. There are two major components of physical activity: aerobic and muscle strengthening (CDC, 2016b). Aerobic exercise includes endurance exercises that increases one's cardiovascular health, such as running and swimming, while muscle strengthening exercise involves activities that strengthen one's muscles (CDC, 2016b). For over 20 years, government organizations have published guidelines pertaining to the minimal amount of physical activity needed to help prevent disease. The most recent recommendations were published in 2008 by the Office of Disease Prevention and Health Promotion (ODPHP) (2016), which stated that adults (age 18 to 64 years) need at least 150 minutes of moderate intensity cardiorespiratory exercise per week, such as

walking or water aerobics, or 75 minutes of vigorous intensity cardiorespiratory exercise each week, such as running or swimming, or some combination of both moderate and vigorous. The ODPHP (2016) also concluded that adults should participate in muscle strengthening exercises that strengthen all major muscle groups, which include hips, back, arms, legs, chest, shoulders, and abdominal muscles, at least 2 days a week. Benefits for participating in the recommended amount of aerobic physical activity include acute increases in metabolism, decreased blood pressure, decreased glucose intolerance, improved insulin resistance, and weight loss when paired with healthy changes in diet (Garber, et al. 2011). Benefits for participating in the recommended amount of muscle strengthening physical activity include chronic increases in metabolism, decreased risks for death, cardiovascular disease, and physical disabilities, improved immunity, increased bone mineral density, and many of the same benefits as aerobic exercise (Garber et al., 2011).

According to the ODPHP (2016), although many American adults are familiar with the health benefits of exercise in general, many do not meet the recommended amounts of either aerobic or muscle strengthening exercise. To illustrate, in 2013 approximately half (50.2%) of the American population met the minimal recommended amount of aerobic physical activity, while less than 30% met the recommendations for muscle strengthening physical activity. Together, only about 20 percent of Americans meet the minimum recommendations set by ODPHP for both aerobic and muscle strengthening physical activity (CDC, 2016b).

Purpose of the Study

Over the life span participation in physical activity decreases, and the largest decrease transpires during the high school and young adulthood transitions (Beville, et al. 2014). Therefore, targeting physical activity through behavioral interventions in this stage of life would be ideal for increasing the likelihood of continued aerobic and muscle strengthening exercise into adulthood. In addition, there may be a need to intervene using gender-tailored approaches. Previous literature has described differences between male and female college students meeting the government recommendations for physical activity. In one study, researchers found a significant difference in physical activity between genders, with men participating in more minutes (55.71 minutes +/- 25.40; p=.018) and more days (8.15 days +/-2.98; p = .016) of physical activity within a two-week period compared to women (48.75 minutes +/- 26.57; 7.29 days +/- 3.33) (Hutchins, Drolet, and Ogletree, 2010). Concurrently, some studies in the last 15 years have focused on using theory to describe why men and women do or do not participate and/or meet the recommended amount of physical activity necessary for health benefits, such as the Theory of Reasoned Action/Theory of Planned Behavior (TRA/TPB) and more recently the Integrative Behavior Model. While some studies have observed men's and women's intentions towards physical activity and found significant differences between groups, most have only measured physical activity as aerobic activity, and have failed to expand the definition for both aerobic and muscle strengthening physical activity. Therefore, the purpose of this study was to explore the differences in aerobic and muscle strengthening behaviors between male and female college students using the Integrative Behavior Model (IBM).

The Integrative Behavior Model

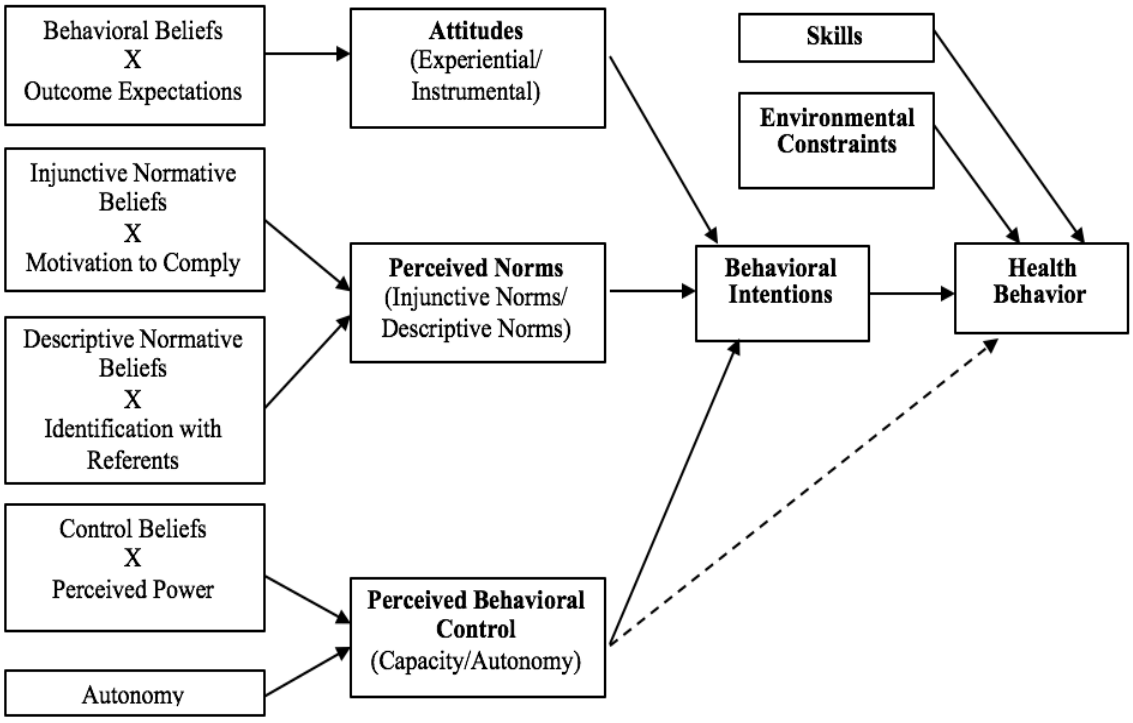
The development of the IBM began in 1991 by a group of theorists, including Albert Bandura, Marshall Becker, Martin Fishbein, Frederick Kanfer, and Harry Triandis, to integrate a number of common theories and work towards a universal or integrative theory to predict and change health behaviors (Fishbein & Ajzen, 2010). Results from the workshop led to the agreement on eight fundamental variables that affect behavior, which are: One has a strong intention to engage in the behavior, no environmental barriers exist to keep one from engaging in the behavior, one has the abilities to engage in the behavior, one believes that the positives outweigh the negatives associated with engaging in the behavior, one "perceives more social pressure" to engage in the behavior than to not engage in it, one believes that engaging in the behavior is consistent with one's self-image, one expects a more positive emotional experience engaging in the behavior rather than a negative one, and one believes he or she is capable of engaging in the behavior despite obstacles that may arise (Fishbein & Ajzen, 2010). After the workshop, Fishbein and Ajzen continued working on the IBM, and utilizing the model through their own reasoned action approach. The IBM currently stands as an updated version of the Theory of Planned Behavior (Fishbein & Ajzen, 2010). Much like its predecessors, the IBM is a value expectancy theory, which means it is centered on the idea that individuals behave in a way that maximizes gains and minimizes costs, by expecting certain outcomes to occur as a result of a behavior and placing value on those outcomes (Beville, et al. 2014). This novel theory has not been extensively used in research or practice.

According to the IBM, behavioral intentions are the main determinant of a behavior, barring any deficiencies in skills or environmental constraints (Fishbein & Ajzen, 2010). Behavioral intentions are a summation of factors that motivate a person to engage in a behavior, and are determined by three constructs: attitudes towards a behavior (or attitudes), perceived norms and perceived behavioral control (Fishbein & Ajzen, 2010). Attitudes are described as one's favorable or unfavorable feelings towards a behavior, and consists of both experiential attitude and instrumental attitude (Fishbein & Ajzen, 2010). Experiential attitude involves the emotional feelings brought on by engaging in a behavior, whereas instrumental attitude constitutes more cognitive feelings or beliefs about a behavior (Fishbein & Ajzen, 2010). There are also two indirect measures of attitudes; behavioral beliefs, which are one's beliefs about what attributes are associated with a behavior, and outcome evaluations, which are one's positive or negative appraisals of those attributes (Fishbein & Ajzen, 2010). Perceived norms are one's perception of social pressure to engage in a certain behavior and consists of injunctive norms and descriptive norms (Fishbein & Ajzen, 2010). Injunctive norms are what one feels others important to them believe about whether a behavior should be done, while descriptive norms are what one perceives others like them to be doing, in terms of the behavior (Fishbein & Ajzen, 2010). The indirect measures of perceived norms are: Injunctive normative beliefs, which are one's beliefs about whether or not people or groups that are important to them think they should engage in a behavior; motivation to comply, which is the extent to which one cares about whether or not the people or groups think they should engage in the behavior; descriptive normative beliefs, which are one's beliefs about whether or not the people

around them are engaging in the behavior; and identification with referents, which is the extent to which one wants to identify with or be like the people around them (Fishbein & Ajzen, 2010). Finally, perceived behavioral control (PBC), is one's belief in his or her ability to perform a certain behavior and his or her control over the behavior, and consists of autonomy and capacity (Fishbein & Ajzen, 2010). Autonomy refers to one's belief in his or her control over the behavior, and capacity refers to one's belief in his or her ability to perform a behavior (Fishbein & Ajzen, 2010). The indirect measures of PBC are control beliefs, which are one's beliefs about what factors exist that could facilitate or inhibit the performance of a behavior, and power of control factors, which is one's beliefs about the extent to which each factor could facilitate or inhibit the performance of a behavior (Fishbein & Ajzen, 2010).

Another important aspect of the IBM that is used in this study is the TACT (target, action, context, and time-frame) concept, which defines the behavior in question (Fisbein & Ajzen, 2010). The action that is executed must have a target at which it is aimed within a context and time-frame in which it occurs. For this study, the target is aerobic and muscle strengthening exercise, the action is engaging in the recommended amounts of aerobic and muscle strengthening exercise, the context is college students, and the time-frame is every week.

Figure 1.1: Integrative Behavior Model



Research Hypotheses

After reviewing the importance of both types of physical activity, aerobic and muscle strengthening, targeting college students, gender differences, and the IBM with its many constructs, the following hypotheses were developed for this study:

Hypothesis 1: Male college students will meet the recommended amount of aerobic physical activity per week significantly more than female college students.

Alternate Hypothesis 1: Female college students will meet the recommended amount of aerobic physical activity per week significantly more than male college students.

Null Hypothesis 1: There will not be a significant difference in meeting the recommended amount of aerobic physical activity between male and female college students.

Hypothesis 2: Male college students will meet the recommended amount of muscle strengthening physical activity per week significantly more than female college students.

Alternate Hypothesis 2: Female college students will meet the recommended amount of muscle strengthening physical activity per week significantly more than male college students.

Null Hypothesis 2: There will not be a significant difference in meeting the recommended amount of muscle strengthening physical activity between male and female college students.

Hypothesis 3: Male college students will meet the recommended amounts of both aerobic and muscle strengthening physical activity per week significantly more than female college students.

Alternate Hypothesis 3: Female college students will meet the recommended amounts of both aerobic and muscle strengthening physical activity per week significantly more than male college students.

Null Hypothesis 3: There will not be a significant difference in meeting the recommended amounts of both aerobic and muscle strengthening physical activity between male and female college students.

Hypothesis 4: There will be a significant difference in behavioral intentions, skills, and environmental constraints towards meeting the recommended amount of aerobic activity between male and female college students.

Null Hypothesis 4: There will not be a significant difference in behavioral intentions, skills, and environmental constraints towards meeting the recommended amount of aerobic activity between male and female college students.

Hypothesis 5: There will be a significant difference in behavioral intentions, skills, and environmental constraints towards meeting the recommended amount of muscle strengthening activity between male and female college students.

Null Hypothesis 5: There will not be a significant difference in behavioral intentions, skills, and environmental constraints towards meeting the recommended amount of muscle strengthening activity between male and female college students.

Hypothesis 6: There will be a significant difference in attitudes, perceived norms and perceived behavioral control towards meeting the recommended amount of aerobic activity between male and female college students.

Null Hypothesis 6: There will not be a significant difference in attitudes, perceived norms and perceived behavioral control towards meeting the recommended amount of aerobic activity between male and female college students.

Hypothesis 7: There will be a significant difference in attitudes, perceived norms and perceived behavioral control towards meeting the recommended amount of muscle strengthening activity between male and female college students.

Null Hypothesis 7: There will not be a significant difference in attitudes, perceived norms and perceived behavioral control towards meeting the recommended amount of muscle strengthening activity between male and female college students.

Hypothesis 8: Intentions, perceived behavioral control, skills, and environment will collectively have a significant relationship towards the behavior of meeting the recommended amount of aerobic activity for male and female college students.

Null Hypothesis 8: Intentions, perceived behavioral control, skills, and environment will not collectively have a significant relationship towards the behavior of meeting the recommended amount of aerobic activity for male and female college students.

Hypothesis 9: Intentions, perceived behavioral control, skills, and environment will collectively have a significant relationship towards the behavior of meeting the recommended amount of muscle strengthening activity for male and female college students.

Null Hypothesis 9: Intentions, perceived behavioral control, skills, and environment will not collectively have a significant relationship towards the behavior of meeting the recommended amount of muscle strengthening activity for male and female college students.

Hypothesis 10: Attitudes, perceived norms, and perceived behavioral control will collectively have a significant relationship with behavioral intention for meeting the recommended amount of aerobic activity for male and female college students.

Null Hypothesis 10: Attitudes, perceived norms, and perceived behavioral control will not collectively have a significant relationship with behavioral intention for meeting the recommended amount of aerobic activity for male and female college students.

Hypothesis 11: Attitudes, perceived norms, and perceived behavioral control will collectively have a significant relationship with behavioral intention for meeting the

recommended amount of muscle strengthening activity for male and female college students.

Null Hypothesis 11: Attitudes, perceived norms, and perceived behavioral control will not collectively have a significant relationship with behavioral intention for meeting the recommended amount of muscle strengthening activity for male and female college students.

Hypothesis 12: The product of each behavioral belief and outcome evaluation will have a significant relationship with attitudes for meeting the recommended amount of aerobic activity for male and female college students.

Null Hypothesis 12: The product of each behavioral belief and outcome evaluation will not have a significant relationship with attitudes for meeting the recommended amount of aerobic activity.

Hypothesis 13: The product of each behavioral belief and outcome evaluation will have a significant relationship with attitudes for meeting the recommended amount of muscle strengthening activity for male and female college students.

Null Hypothesis 13: The product of each behavioral belief and outcome evaluation will not have a significant relationship with attitudes for meeting the recommended amount of muscle strengthening activity for male and female college students.

Hypothesis 14: The product of each injunctive normative belief and motivation to comply will have a significant relationship with perceived norms for meeting the recommended amount of aerobic activity for male and female college students.

Null Hypothesis 14: The product of each injunctive normative belief and motivation to comply will not have a significant relationship with perceived norms for meeting the recommended amount of aerobic activity for male and female college students.

Hypothesis 15: The product of each injunctive normative belief and motivation to comply will have a significant relationship with perceived norms for meeting the recommended amount of muscle strengthening activity for male and female college students.

Null Hypothesis 15: The product of each injunctive normative belief and motivation to comply will not have a significant relationship with perceived norms for meeting the recommended amount of muscle strengthening activity for male and female college students.

Hypothesis 16: The product of each descriptive normative belief and identification with referent will have a significant relationship with perceived norms for meeting the recommended amount of aerobic activity for male and female college students.

Null Hypothesis 16: The product of each descriptive normative belief and identification with referent will not have a significant relationship with perceived norms for meeting the recommended amount of aerobic activity for male and female college students.

Hypothesis 17: The product of each descriptive normative belief and identification with referent will have a significant relationship with perceived norms for meeting the recommended amount of muscle strengthening activity for male and female college students.

Null Hypothesis 17: The product of each descriptive normative belief and identification with referent will not have a significant relationship with perceived norms for meeting

the recommended amount of muscle strengthening activity for male and female college students.

Hypothesis 18: The product of each control belief and perceived power will have a significant relationship with perceived behavioral control for meeting the recommended amount of aerobic activity for male and female college students.

Null Hypothesis 18: The product of each control belief and perceived power will not have a significant relationship with perceived behavioral control for meeting the recommended amount of aerobic activity for male and female college students.

Hypothesis 19: The product of each control belief and perceived power will have a significant relationship with perceived behavioral control for meeting the recommended amount of muscle strengthening activity for male and female college students.

Null Hypothesis 19: The product of each control belief and perceived power will not have a significant relationship with perceived behavioral control for meeting the recommended amount of muscle strengthening activity for male and female college students.

Significance of the Research Problem

There are many consequences for being physically inactive, most involving the development of chronic disease. As previously mentioned, while there are two major types of physical activity (aerobic and muscle strengthening), each having its own set of benefits, most studies only evaluate physical activity as it is related to aerobic activity and overlook muscle strengthening exercise. Also, there are reported gender differences in meeting physical activity recommendations that have not been explored. Evaluating theory-based determinants of both types of physical activity and intentions of the

college student population can provide an insight to why this sub-population of adults are not meeting both recommendations and provide evidence for modifiable constructs to base future health promotion programs upon. Finally, the IBM has not been widely operationalized for health promotion research, therefore this study aims to add to this body of literature.

Delimitations

- At least 300 male and female college students from the University of Oklahoma.
- Individuals who are capable of participating in aerobic and muscle strengthening physical activity without any physical or mental debilitations.
- An approved survey based on the Integrative Behavior Model to directly and indirectly measure individuals' intentions towards the aerobic and muscle strengthening physical activity recommendations. (Given via email.)
- A separate version of the survey, in paper and pencil, given manually with a 2 week long interim between pre and post-test to assess the stability of the survey tool.
- Age of participants were between 18 and 24.

Limitations

- Participants were a convenience sample from only the University of Oklahoma.
- Participants were both traditional and non-traditional college students.

Assumptions

- The survey tool was valid and reliable in measuring direct and indirect intentions of aerobic and muscle strengthening behavior.
- The survey questions were easy to read and understand.

- The participants answered the survey questions honestly and to the best of their ability.
- Current behavior was a sufficient predictor of future behavior.

Operational Definitions

Aerobic Exercise – Defined by the CDC as endurance exercise that increases one's cardiovascular health. Examples include:

Aerobic Exercise Requirements – According to the CDC, the average adult should participate in at least 2 hours and 30 minutes of moderate-intensity cardio exercise each week, or at least 1 hour and 15 minutes of vigorous-intensity cardio exercise each week, or some combination of the two each week.

Muscle strengthening Exercise – Defined by the CDC as resistance exercises that strengthen one's muscles and do not include endurance exercises. Examples include:

Muscle strengthening Exercise Requirements – According to the CDC, the average adult should participate in muscle strengthening exercises for at least 2 days a week, for all major muscles groups, which includes the legs, hips, back, abdomen, chest, shoulders, and arms.

Chronic Disease – According to the CDC, chronic diseases are long-lasting diseases that develop over time, and unlike infectious disease, is not transmittable. Examples include cancer, cardiovascular disease, obesity (which is also a predecessor of other chronic diseases), hypertension and many others.

Integrative Behavior Model Constructs (Fishbein & Ajzen, 2010)

- Attitudes – One's favorable or unfavorable feelings towards a behavior. (A direct measure of behavioral intentions).

    - Direct measures of attitudes
        - Instrumental Attitudes – The cognitive feelings or beliefs about a behavior.
        - Experiential Attitudes – The emotional feelings brought on by doing a behavior.
    - Indirect measures of attitudes
        - Behavioral Beliefs – One's beliefs about advantages and disadvantages that are associated with a behavior.
        - Outcome Evaluations – One's positive or negative appraisals of those attributes defined as behavioral beliefs.
- Perceived Norms – One's perception of social pressure to engage in a certain behavior. (A direct measure of behavioral intentions).
    - Direct measures of perceived norms
        - Injunctive Norms – What one feels others important to them believe about whether a behavior should be done.
        - Descriptive Norms – What one perceives others like them doing, in terms of the behavior.
    - Indirect measures of perceived norms
        - Injunctive Normative Beliefs – One's beliefs about whether or not people or groups that are important to them think they should engage in a behavior.
        - Motivation to Comply – The extent to which one cares about whether or not the people or groups think they should engage in the behavior.

        - Descriptive Normative Beliefs – One's beliefs about whether or not the people around them are engaged in the behavior.
        - Identification with Referent – The extent to which one wants to identify with or be like the people around them.
- Perceived Behavioral Control – One's belief in his or her ability to perform a certain behavior and his or her control over the behavior. (A direct measure of behavioral intentions).
    - Direct measures of perceived behavioral control
        - Capacity – One's belief in his or her ability to perform a behavior.
        - Autonomy – One's belief in his or her control over the behavior.
    - Indirect measures of perceived behavioral control
        - Control Belief Strength – One's beliefs about what factors exist that could facilitate or inhibit the performance of a behavior.
        - Power of Control Factors – One's beliefs about the extent to which each factor could facilitate or inhibit the performance of a behavior.
- Intentions – A combination of factors that determine an individual's willingness to do or not do a behavior.
- Skills - The knowledge and abilities one possesses to perform a behavior.
- Environmental Constraints – Barriers that conflict with the ability to perform a behavior.
- Cardio physical activity behavior – Engaging in at least 2 hours and 30 minutes of moderate-intensity cardio exercise each week, or at least 1 hour and 15 minutes of

vigorous-intensity cardio exercise each week, or some combination of the two each week, in the past month.

- Muscle strengthening physical activity behavior – Engaging in muscle strengthening exercises for at least 2 days a week, for all major muscles groups in the past month.

Physical Activity – Defined by the CDC as any type of activity that puts a body in motion. (Synonymous with exercise).

Chapter 2: Literature Review

Introduction

The purpose of this study was to explore differences in theory-based predictors of aerobic and muscle strengthening behavior amongst male and female college students using the Integrative Behavior Model (IBM). The first part of this chapter will be a review of physical activity (aerobic and muscle strengthening), the history of importance of different types of physical activity, and disparities that exist with engaging in different types of physical activity. Next, is a brief review of the IBM, its components, and its importance in understanding behavior. Since the IBM is a newer health behavior theory that has not been used extensively in research, the review of physical activity in literature will cover the use of both the IBM and models similar to the IBM, such as the Theory of Planned Behavior (TPB). Lastly, a summary of the salience of using the IBM to determine the gender differences in aerobic and muscle strengthening behavior will be discussed.

Review of Physical Activity (Aerobic and Muscle strengthening)

Physical activity is any type of activity that puts a body in motion and there are two major components of physical activity: aerobic and muscle strengthening (CDC, 2016b). Aerobic physical activity refers to endurance type exercises and is commonly called cardiorespiratory or cardio exercise, which improves cardiorespiratory functioning and therefore cardiovascular health (CDC, 2016b). Muscle strengthening physical activity refers to muscle strengthening or resistance exercises (both are more common terms for muscle strengthening physical activity), which improves muscle mass and bone mineral density amongst other health outcomes (CDC, 2016b). As

previously mentioned, the combination of aerobic and muscle strengthening physical activity brings about many improvements in health outcomes and quality of life.

While research documenting the distribution and determinants of aerobic and muscle strengthening physical activity is relatively new, much research has been done since the mid 21st century concerning physical inactivity amongst Americans, which has sparked concern from the U.S. Department of Health and Human Services (HHS, 2008). The HHS, in a joint effort with the USDA, set Dietary Guidelines for Americans in 1995 which included brief guidance for physical activity, specifically participating in about 30 minutes of physical activity daily to expend energy and maintain a healthy weight (HHS, 1995). Although previous dietary guidelines by the HHS and USDA mentioned exercise as a way to lose weight, the 1995 guidelines were the first physical activity recommendations set by the government (HHS, 1995). Since then, as more scientific research on the importance of different types of physical activity developed, the HHS set new standards for physical activity in America. This was done through a team known as the *Physical Activity Guidelines Advisory Committee* arranged by the HHS secretary Mike Leavitt in 2007. After a year of research and consulting, the 2008 Physical Activity Guidelines for Americans were developed with specific guidelines for aerobic and muscle strengthening physical activity.

The CDC has collected data on the nation's health for many years using systems such as the Behavioral Risk Factor Surveillance System (BRFSS), which is currently the world leader in conducting the most health survey interviews, the National Health and Nutrition Examination Survey (NHANES), and the National Health Interview Survey (NHIS) (CDC, 2016c, CDC, 2016d, and CDC, 2014). Although the latter two

have been in existence longer and each has its own set of questions regarding physical activity, all physical activity survey questions for the three health data collection systems are from the CDC's current recommendations for physical activity (the 2008 Physical Activity Guidelines for Americans). In 2011, the results for physical activity prevalence found using BRFSS and NHIS were similar for meeting both aerobic and muscle strengthening physical activity recommendations, which was 20.6% of the population (sample sizes were over 450,000 for BRFSS and 231,376 for NHIS) (CDC, 2013). However, aerobic and muscle strengthening results were not as close when comparing results individually: according to the BRFSS, 51.6% of adults meet aerobic physical activity recommendations while according to the NHIS, 48.4% meet recommendations. For muscle strengthening physical activity, according to the BRFSS, 29.3% of adults meet recommendations while according to the NHIS, 24.1% meet recommendations (CDC, 2013). The differences in these data are most likely due to the way the surveys are conducted and the different questions used to collect data (MMWR, 2013). Even though there are some differences in the data collected from the two surveys, results show that there is a disparity between the amount of people meeting aerobic exercise recommendations and the amount of people meeting muscle strengthening exercise recommendations. Unfortunately, the data for the differences between aerobic and muscle strengthening physical activity cannot be compared to prior BRFSS or other CDC survey data because official federal guidelines for physical activity did not exist before 2008 (HHS, 2008).

The differences between males and females for meeting aerobic and muscle strengthening physical activity requirements were also reported in the 2011 BRFSS.

Currently, 23.4% [95% Confidence Interval (CI) of 23.0-23.8] of adult males meet both aerobic and muscle strengthening physical activity recommendations compared to only 17.9% (95% CI of 17.6-18.2) of adult females (CDC, 2013). For meeting muscle strengthening physical activity recommendations, 34.4% of adult males meet recommendations 95% CI of 34.0-34.9) and 24.5% of adult females meet recommendations (95% CI of 24.1-24.8). Differences for aerobic physical activity recommendations were only slightly different, with 53.1% (95% CI of 52.6-53.5) of men and 50.2% (95% CI of 49.8-50.6) of women meeting recommendations. When stratified by age (18-24 years, 25-24 years, 35-44 years, 45-54 years, 55-64 years, and 65 years and older) the largest disparities for aerobic, muscle strengthening, and both types of physical activity combined occurring between the 18-24-year-old groups and the 25-34-year-old group. For the 18-24-year-old group 30.7% (95% CI of 29.7-31.9) met both aerobic and muscle strengthening physical activity requirements while only 23.0% (95% CI of 22.3-23.7) of 25-34 year olds met the recommendations. For muscle strengthening physical activity, 44.1% (95% CI of 42.9-45.2) of 18-24 year olds met recommendations while 34.6% (95% CI of 33.7-35.4) of 25-34 year olds met recommendations. Finally, for aerobic physical activity 56.8% (95% CI of 55.7-58.0) of 18-24 year olds met recommendations while and 49.8% (95% CI of 49.0-50.7) of 25-34 year olds met recommendations.

Review of the Integrative Behavior Model

The IBM represents a combination of social and behavioral theories that have been demonstrated as important over time (Fishbein & Ajzen, 2010). The IBM takes into account internal aspects of behavior, that if understood, could be targeted to change behaviors in individuals that could lead to improved health outcomes over time. Those internal aspects include one's intentions which are influenced by one's attitudes, perceived norms, and perceived behavioral control (PBC) (Fishbein & Ajzen, 2010). Constructs that directly influence each of the determinants of intentions include: Experiential attitudes and instrumental attitudes (for attitudes), injunctive norms and descriptive norms (for perceived norms), and capacity and autonomy (for PBC) (Fishbein & Ajzen, 2010). Constructs that directly influence each of the determinants of these antecedents are: Behavioral beliefs and outcome expectations (for attitudes), injunctive normative beliefs and motivation to comply (for injunctive norms), descriptive normative beliefs and identification with referent (for descriptive norms), and control beliefs and perceived power (for PBC) (Fishbein & Ajzen, 2010). The IBM also takes into account external aspects of behavior as well, including one's skills to perform a behavior and whether or not the environment enables one to perform the behavior (Fishbein & Ajzen, 2010).

Literature Search

A literature search was done using the following databases: Academic Search Elite, CINAHL, ERIC, Health Source Nursing Academic Edition, Medline, Sport Discus, and Communication Source. Key words used in the search were: Theory of Reasoned Action/Theory of Planned Behavior, Integrative Behavior Model, physical

activity/exercise, aerobic, muscle strengthening, gender differences, and college students. Different tenses, synonyms and combinations of these key words were used and a thorough history of the literature search can be found below in tables 2.1 and 2.2. Other articles were found by searching Icek Ajzen's personally constructed bibliography of studies utilizing the Theory of Planned Behavior (http://people.umass.edu/aizen/tpbrefs.html), using Icek Ajzen and Martin Fishbeins' book "Predicting and Changing Behavior" and through Google Scholar.

Table 2.1: Search Report

Search Engine	Search (S) terms	Retrieved: (numbers within brackets used in combined searches)	# Met inclusion criteria
Academic Search Elite	S1 – TRA or TPB or TRA/TPB	(593)	
Academic Search Elite	S2 – IBM	4	1
Academic Search Elite	S3 – physical activity or exercise	(51,761)	
Academic Search Elite	S4 – aerobic or cardio or cardiorespiratory	(11,055)	
Academic Search Elite	S5 – muscle strengthening or strength or resistance	(133,139)	
Academic Search Elite	S6 – gender differences or sex differences	(11,278)	
Academic Search Elite	S7 – college students or undergraduate	(15,566)	
Academic Search Elite	S8 – S1 or S2 and (S3 or S4 or S5) and S6	2	2
Academic Search Elite	S9 – S1 or S2 and (S3 or S4 or S5) and S7	3	2
Academic Search Elite	S10 – S8 and S7	2	1
Academic Search Elite	S11 – (S3 or S4 or S5) and S7	(271)	
Academic Search Elite	S12 – S11 and S6	4	1
Totals		15	4
CINAHL	S1 – TRA or TPB or TRA/TPB	(396)	
CINAHL	S2 – IBM	3	1
CINAHL	S3 – physical activity or exercise	(45,251)	
CINAHL	S4 – aerobic or cardio or cardiorespiratory	(4,453)	
CINAHL	S5 – muscle strengthening or strength or resistance	(26,277)	
CINAHL	S6 – gender differences or sex differences	(4,885)	
CINAHL	S7 – college students or undergraduate	(6,981)	
CINAHL	S8 – S1 or S2 and S3 or S4 or S5 and S6	2	1
CINAHL	S9 – S1 or S2 and S3 or S4 or S5 and S7	2	1
CINAHL	S10 – S8 and S7	1	1
CINAHL	S11 – S3 or S4 or S5 and S7	(166)	
CINAHL	S12 – S11 and S6	26	
Totals		33	3
ERIC	S1 – TRA or TPB or TRA/TPB	(130)	
ERIC	S2 – IBM	5	1
ERIC	S3 – physical activity or exercise	(4,928)	
ERIC	S4 – aerobic or cardio or cardiorespiratory	(211)	
ERIC	S5 – muscle strengthening or strength or resistance	(3,058)	
ERIC	S6 – gender differences or sex differences	(3,311)	
ERIC	S7 – college students or undergraduate	(15,760)	
ERIC	S8 – S1 or S2 and S3 or S4 or S5 and S6	6	3
ERIC	S9 – S1 or S2 and S3 or S4 or S5 and S7	11	4
ERIC	S10 – S8 and S7	2	1
ERIC	S11 – S3 or S4 or S5 and S7	185	6
ERIC	S12 – S11 and S6	151	3
Totals		360	10

Manual searches:			
Boolean Search:	S8 – S1 or S2 and S3 or S4 or S5 and S6	14	1
Health Source Nursing	S9 – S1 or S2 and S3 or S4 or S5 and S7	103	7
Academic Edition,	S10 – S8 and S7	2	1
Medline, Sports	Totals	119	10
Discuss, and			
Communication			
Source			
Icek Ajzen	S3 – physical activity or exercise	97	6
	S4 – aerobic or cardio or cardiorespiratory	4	0
	S5 – muscle strengthening or strength or resistance	14	0
Miscellaneous	Ackerman, Brianna. (2015).		
	McEachan, R.R.C. et al. (2011).		
	Buckworth, Janet & Nigg, Claudio. (2004).		

Table 2.2: Exact Key Searches

Search #	Search Word Combinations
S1	"theory of reasoned action" OR "theory of planned behavior" OR "theory of reasoned action/theory of planned behavior"
S2	"integrated behavior model" OR "integrated behavioral model" OR "integrative behavior model" OR "integrative behavioral model"
S3	“physical activity” OR exercise
S4	aerobic OR cardio OR cardiorespiratory
S5	muscle strengthening OR strength OR resistance
S6	"gender differences" OR "gender difference" OR "sex differences" OR "sex difference”
S7	“college students” OR undergraduate
S8	("theory of reasoned action" OR "theory of planned behavior" OR "theory of reasoned action/theory of planned behavior" OR "integrated behavior model" OR "integrated behavioral model" OR "integrative behavior model" OR "integrative behavioral model") AND (“physical activity” OR exercise OR aerobic OR cardio OR cardiorespiratory OR muscle strengthening OR strength OR resistance) AND ("gender differences" OR "gender difference" OR "sex differences" OR "sex difference”)
S9	("theory of reasoned action" OR "theory of planned behavior" OR "theory of reasoned action/theory of planned behavior" OR "integrated behavior model" OR "integrated behavioral model" OR "integrative behavior model" OR "integrative behavioral model") AND (“physical activity” OR exercise OR aerobic OR cardio OR cardiorespiratory OR muscle strengthening OR strength OR resistance) AND (“college students” OR undergraduate)
S10	("theory of reasoned action" OR "theory of planned behavior" OR "theory of reasoned action/theory of planned behavior" OR "integrated behavior model" OR "integrated behavioral model" OR "integrative behavior model" OR "integrative behavioral model") AND (“physical activity” OR exercise OR aerobic OR cardio OR cardiorespiratory OR muscle strengthening OR strength OR resistance) AND ("gender differences" OR "gender difference" OR "sex differences" OR "sex difference”) AND (“college students” OR undergraduate)
S11	(“physical activity” OR exercise OR aerobic OR cardio OR cardiorespiratory OR muscle strengthening OR strength OR resistance) AND (“college students” OR undergraduate)
S12	(“physical activity” OR exercise OR aerobic OR cardio OR cardiorespiratory OR muscle strengthening OR strength OR resistance) AND (“college students” OR undergraduate) AND ("gender differences" OR "gender difference" OR "sex differences" OR "sex difference”)

Literature Review of Integrative Behavior Model and Physical Activity

Two articles were found that utilized the IBM, as it relates to physical activity. The first was a cross-sectional study that examined gender differences in leisure time physical activity (LTPA), which consisted of aerobic physical activity only, and gender differences in correlations between measures of the Theory of Planned Behavior (TPB) and the IBM with LTPA (Beville, et al. 2014). LTPA was defined as how frequently in the last week one participates in "mild, moderate, and strenuous exercise" in their free time for more than 15 minutes at a time. The study's sample consisted of 621 students (of which 421 were female) from 15 randomly chosen undergraduate classes at a Southeastern university. Students were asked to complete a voluntary survey measuring past LTPA, sports participation, Body Mass Index (BMI), demographic information, and the TPB and IBM constructs: intention, attitudes, subjective (injunctive) norm, descriptive norm, PBC (autonomy), and self-efficacy (capacity) towards engaging in "regular LTPA (either 30 minutes of moderate-intensity LTPA on at least 5 days per week or 20 minutes of vigorous LTPA on at least 3 days per week)" (Beville, et al. 2014). Bivariate analyses revealed that gender was significantly related with all constructs except descriptive norms ($F = 0.902$, $p = 0.343$), PBC ($F = 3.705$, $p = 0.055$), and age ($F = 2.622$, $p = 0.106$) (Beville, et al. 2014). Multivariate analyses showed that males (mean = 57.26 minutes +/- 25.92 minutes) participated in significantly more LPTA than females (mean = 49.05 minutes +/- 24.54 minutes) ($F = 14.627$, $p < 0.001$) (Beville, et al. 2014). Males also scored significantly higher than females on all TPB and IBM constructs, except for subjective norms ($F = 10.679$, $p = 0.001$), which were significantly lower for males (mean = 5.58 +/- 1.00) compared to females (mean = 5.89

+/- 1.13) (Beville, et al. 2014). Afterwards Pearson's correlation coefficients for TPB/IBM constructs and LTPA for each gender showed the constructs significantly correlated with participation in LTPA for males were intentions, attitude, PBC, descriptive norm, and self-efficacy (all r values between 0.185 and 0.459, $p < 0.01$) (Beville, et al. 2014), while for females, all constructs (intentions, attitudes, subjective norms, PBC, descriptive norms, and self-efficacy) were significantly correlated with participation in LTPA (all r values between 0.152 and 0.622, $p < 0.01$) (Beville, et al. 2014). For intentions, all constructs (attitude, subjective norms, PBC, descriptive norms, and self-efficacy) were significantly correlated for males (all r-values between 0.198 and 0.699), self-efficacy being the strongest of the correlations ($r = 6.99$) (Beville, et al. 2014). For females, all constructs were also significantly correlated with intentions (all r-values between 0.307 and 0.664), with again, self-efficacy having the strongest strength of association ($r = 0.664$, $p < 0.01$) (Beville, et al. 2014). Finally, multivariate analyses showed that subjective norms (females only), attitude, PBC, self-efficacy, intention, BMI, year in school, Greek affiliation, and sports participation explained 20.2% of the variance of LTPA for males ($F = 6.038$, $p < 0.001$) and 42.5% of the variance for females (Beville, et al. 2014).

There were a few notable limitations to the first study. First, while the authors mentioned measuring injunctive and descriptive norms (for perceived norms) and autonomy (labeled as PBC) and capacity (labeled as self-efficacy) (for PBC), they did not mention measuring experiential and instrumental attitudes (for attitudes). Second, as specified by Fishbein and Ajzen (2010), to understand how the TPB/IBM influences behavior, determinants of behavior must be examined by intentions and PBC, and

determinants of intentions must be examined by attitudes, perceived norms and PBC. Beville, et al. (2014) however only examined the determinants of behavior, with all of the model's constructs, and also included extra demographic variables. Finally, the authors did not examine determinants of attitudes (via behavioral beliefs and outcome expectations), injunctive norms (via injunctive normative beliefs and motivation to comply), descriptive norms (via descriptive normative beliefs and identification with referent), and PBC (via control beliefs and perceived power).

The next study was a follow-up to the previous study, examining only the female participants, except authors included strength training exercises in addition to moderate to vigorous physical activity (Patterson, Meyer, & Beville, 2015). Most females (n=421) did not meet the strength training recommendations of two days per week (66.3% did not meet recommendations; (mean = 1.17 days +/- 1.55) (Patterson, Meyer, & Beville, 2015). Bivariate analyses showed that there was a significant positive relationship between all the IBM constructs except injunctive norms (subjective norms) and meeting strength training recommendations ($p < 0.01$) (Patterson, Meyer, & Beville, 2015). A Pearson's correlation test also revealed the IBM constructs that had the strongest association with meeting strength training recommendations was self-efficacy ($r = 0.411$, $p < 0.01$), intentions ($r = 0.402$, $p < 0.01$), and MVPA ($r = 0.480$, $p < 0.01$) (Patterson, Meyer, & Beville, 2015). Lastly, a logistic analysis revealed the most significant predictors of female college students meeting the strength training recommendations was self-efficacy ($ß = 0.077$, $p = 0.004$), intentions ($ß = 0.402$, $p = 0.015$), and MVPA ($ß = 0.258$, $p = 0.000$) (Patterson, Meyer, & Beville, 2015).

A limitation to both studies was that neither mentioned the behavior under investigation. For example, Fishbein and Ajzen (2010) note that behaviors should always be defined using TACT (target, action, context, and time sensitive). It was unclear from both studies if the evaluated IBM constructs (i.e. intentions/attitudes) could be attributed towards physical activity in general, consisting of MVPA and muscle strengthening activity, or one or the other. Another limitation to both studies is that the muscle strengthening and aerobic physical activity recommendations have changed, and therefore newer studies are needed to reflect this change. Both studies only measured direct measures of the IBM constructs and their relationship to the behaviors, but neither study measured the difference in types of attitudes. Also, neither study included indirect measures of the IBM. In general, there are a lack of studies specifically using the IBM with these exercise behaviors, which leaves a gap in the current literature for this study to fill.

Literature Review of the Theory of Planned Behavior and Other Theory Based Models with Physical Activity

All of the studies in this literature review evaluated theory-based predictors of physical activity, other behaviors, or a combination of both. The most common way to measure behaviors and theoretical relationships with them is by self-report (i.e. administering surveys/questionnaires), hence all of these studies used surveys/questionnaires in their measurement design. The TPB was most commonly used amongst the articles found and is the theory that most resembles the IBM, therefore the first section will review the studies that used the TPB. The next section

will review articles that used some other type of similar theory, construct, or behavior to predict physical activity behaviors.

Part of the inclusion criteria for the articles used in this literature review were that they had to be published no earlier than 2005, however, due to the lack of research using the TPB to predict both aerobic and muscle strengthening physical activity, this article by Bryan and Rocheleau (2002) was included in the review. In this study, a pre and post-test questionnaire was given to 210 students in a psychology course from the University of Connecticut (Bryan & Rocheleau, 2002). Aerobic physical activity was defined as "any activity that uses large muscle groups, is done for at least 20 minutes, and is done at a level that causes your breathing to be heavy and your heart to beat faster," and muscle strengthening physical activity was defined as "any activity involving resistance that is done for at least 20 minutes in which moderate to heavy weight is lifted" (Bryan & Rocheleau, 2002). The pre-test measured aerobic and muscle strengthening physical activity in the past 3 months and past week, perceived health, extroversion, and the four TPB constructs: attitudes, perceived norms, PBC, and intentions (Bryan & Rocheleau, 2002). Three months later, the post-test, questionnaire evaluated participation in aerobic and muscle strengthening exercise in the past 3 months (Bryan & Rocheleau, 2002). Correlations for all of the constructs, including extroversion and perceived health, revealed they were all significantly related with aerobic physical activity behavior, with the highest as intentions ($r = 0.42$, $p < 0.001$) (Bryan & Rocheleau, 2002). Similarly, all constructs were significantly correlated with aerobic physical activity intentions, with the highest being PBC ($r = 0.64$, $p < 0.001$) (Bryan & Rocheleau, 2002). For muscle strengthening physical activity, all constructs

were significantly correlated with the behavior, with the strongest being PBC ($r = 0.61$, $p < 0.001$) and intentions ($r = 0.59$, $p < 0.001$) (Bryan & Rocheleau, 2002). All constructs were also significantly correlated with muscle strengthening physical activity intentions with the strongest being PBC ($r = 0.79$, $p < 0.001$) (Bryan & Rocheleau, 2002). Next, confirmatory factor index was used to create a model of the predictive ability of attitudes, norms, extroversion, perceived health, and PBC on intentions, which found 47% of variance accounted for aerobic physical activity intentions and 67% of variance accounted for muscle strengthening physical activity intentions. Next a model of the predictive ability of PBC and intentions on behavior was done, which showed 19% of variance accounted for aerobic physical activity and 40% of variance accounted for muscle strengthening physical activity (Bryan & Rocheleau, 2002).

In Bryan and Rocheleau's (2002) study, the muscle strengthening behavior was defined as minutes per day (not days per week as recommended). This is likely the case because recommendations for muscle strengthening physical activity had not been released yet during the time of their study. Unlike Bryan and Rocheleau's (2002) study, this study used the scientifically based muscle strengthening physical activity recommendations set by the CDC. Also, like Bryan and Rocheleau's (2002) study, in this study, logistic regression was used to observe the percent of variance accounted for when using intentions, PBC, skills, and environmental constraints to predict behavior. Lastly, Bryan and Rocheleau's study included measures not used in the IBM or TPB, whereas this study only focused on measuring the IBM constructs as they were intended to be measured.

In the next study researchers used the TPB to predict the physical activity engagement of participants across a 3-month period (Armitage, 2005). Participants (n=94) between the ages of 16 and 65, who were members of a new gym were given a questionnaire at the beginning and end of the study with a 3-month interim (Armitage, 2005). The TPB constructs measured in the questionnaires were attitudes, subjective norms (injunctive norms in IBM), PBC, and intentions (Armitage, 2005). In addition to self-report, which was measured by asking participants at the end of the study "how often one engaged in physical activity over the past 3 months", physical activity performance was monitored by how many times the participant checked in to the gym and was labeled "actual physical activity" (Armitage, 2005). Zero-order correlations were run with both self-reported and actual physical activity behavior with all of the measures and attitudes ($r = 0.36$; $r = 0.39$, $p < 0.01$), PBC ($r = 0.51$; $r = 0.40$, $p < 0.01$), and intentions ($r = 0.42$; $r = 0.51$, $p < 0.01$) were significantly related, however, subjective norms ($r = 0.14$ $r = 0.02$, $p < 0.01$) was not. Afterwards, multiple regression analyses determined that the TPB constructs predicted 49% of the variance of intentions, and intentions and PBC predicted 22% of the actual behavior monitored at check-in to the gym (Armitage, 2005).

The previous study had a number of limitations. First, it was not apparent that TACT (target, action, context, and time) was used when determining the behavior for this study. Although, the TPB constructs predicted a significant amount of intentions and behavior, the only behaviors they were predicting was one's self-report and actual report of how many times they attended the gym over a 3-month period. The type of physical activity done by participants at the gym was not evaluated, therefore nothing

can be concluded about the model in its ability to predict engagement in physical activities. In this study, the type of physical activity will be clearly defined for participants using TACT as described by Fishbein and Ajzen (2010), and based upon current government physical activity recommendations.

Next, in two studies by Blanchard, et al. (2007; 2008) researchers focused on using the TPB to explore ethnic differences in physical activity participation among college students, specifically between Caucasians and African Americans (Blanchard, et al. 2007 & Blanchard, et al. 2008). Each of the studies measured attitudes (both experiential and instrumental), subjective norms, PBC, and intentions to evaluate their relationship between aerobic physical activity (Blanchard, et al. 2007 & Blanchard, et al. 2008). In Blanchard, et al. (2007) researchers also evaluated behavioral beliefs, injunctive normative beliefs, and control beliefs (each are indirect measures of attitudes, perceived norms, and PBC), which was novel as many studies in this review did not (Blanchard, et al. 2007). However, the value-laden constructs outcome evaluations, motivation to comply, and power of control factors that usually accompany these belief questions were not measured in this study. Blanchard, et al. (2007) also measured different types of recommended aerobic physical activity (getting at least 30 minutes of moderate intensity exercise at least 5 days a week or getting at least 20 minutes of vigorous intensity exercise at least 3 days a week), whereas in Blanchard, et al. (2008) researchers only reported whether students were meeting moderate intensity physical activity requirements or not (Blanchard, et al. 2007 & Blanchard, et al. 2008).

In the first study (Blanchard, et al., 2007) 170 African American participants (57.1% of which were female) and 180 Caucasian participants (66.1% of which were

male) (Blanchard, et al. 2007) were recruited from 2 universities in Georgia. Hierarchical latent variable regression was done with BMI and the TPB constructs (not the beliefs-based indirect measures) on intentions and then BMI, intentions, and PBC on physical activity (Blanchard, et al. 2007). Altogether, BMI and the TPB constructs accounted for 46% of the variance of intentions for Caucasians and 49% of the variance of intentions for African Americans with the most significant contributors being subjective norm, affective (experiential) attitude, and PBC for both (Blanchard, et al. 2007). Concurrently, BMI, intentions, and PBC accounted for 23% of the variance of physical activity among white students and 18% of the variance of physical activity for black students, with only intentions as the significant predictor for both (Blanchard, et al. 2007). Each of the items evaluated beliefs (behavioral, normative, and control) were then correlated with its respective direct measure, intentions, and physical activity for each ethnicity and another latent variable regression analysis was done (Blanchard, et al. 2007). Results showed that while some significant ethnic differences emerged, overall, the indirect measures of the TPB were associated with the direct measures of the TPB constructs mostly equal between groups (Blanchard, et al. 2007). The key aspects of this regression analysis are that all questions were significantly related to their respective belief constructs for whites and only 3 of the 25 were not for African Americans, all control beliefs questions, the same 4 normative beliefs questions, and few of the behavioral beliefs questions were related to intention for both ethnicities. Lastly, the control belief questions had more significant relationships with physical activity than the behavioral and normative beliefs combined for both ethnicities (Blanchard, et al. 2007).

Observing indirect measures of intentions strengthen the Blanchard, et al. (2007) study, however, only 3 of the 8 different indirect measures were evaluated (behavioral beliefs, injunctive normative beliefs, and control belief strength), but this current study included the impact of all of the indirect and direct measures on intention. Lastly, the previous study included BMI in the TPB model to account for variance in intentions and behavior which is not normally done. Therefore, in this current study, the variance for each physical activity behavior (aerobic and muscle strengthening) and gender using only the IBM constructs was accounted for, and then the gender differences were compared afterwards.

In the second study by Blanchard, et al (2008) 238 African American college students and 197 Caucasian college students from the same universities in Georgia were recruited, and again the African American population was mostly female (66.4%) while the Caucasian population was mostly male (64%) (Blanchard, et al. 2008). According to zero-order correlations, all TPB constructs (affective attitude, instrumental attitude, subjective norms, and PBC) in the study were significantly related to intention for both races (all r values between 0.24 and 0.69, $p < 0.01$), and intention (r for African Americans = 0.25, r for Caucasians = 0.47) and PBC (r for African Americans = 0.32, r for Caucasians = 0.39) were significantly related to physical activity for both races (Blanchard, et al. 2008). According to Blanchard, et al (2008), the ANOVA's revealed that Caucasians (mean = 5.67 times per week +/-3.61) participated in significantly more physical activity than African Americans (mean = 4.28 times per week +/-3.61) (Blanchard, et al. 2008). However, correlation tests do not compare mean differences and therefore cannot show significant differences between items. All of the core TPB

constructs were significantly correlated with intentions ($r = 0.24$-0.69, $p < 0.01$) but not all with physical activity (Blanchard, et al. 2008). Hierarchical regression analyses using year in school, attitudes (instrumental and experiential), subjective norm and PBC predicted intentions, and results found that a significant amount of the variance was explained for whites (65%) and blacks (49%), with attitudes and PBC being the strongest significant predictors in whites and experiential attitudes and PBC being the most significant predictor in blacks (Blanchard, et al. 2008). Another hierarchical regression analysis was done using year in school, PBC, and intentions to predict physical activity participation and results found that a significant amount of the variance was explained for whites (22%) and blacks (10%), with intention ($ß = 0.33$, $p < 0.001$) being the only significant predictor for whites and PBC ($ß = 0.23$, $p < 0.001$) the only significant predictor for blacks (Blanchard, et al. 2008). Next, a linear regression analysis was reported to observe any possible regulating effects of gender on the TPB constructs, the ability of gender to predict intention or physical activity, and any interactions between gender and ethnicity (Blanchard, et al. 2008). According to the authors, the results revealed that gender did not have significant impact for physical activity (Blanchard, et al. 2008).

In the next study, researchers used the TPB to predict physical activity participation in college freshmen (n=212) by evaluating them twice: once at the beginning of the semester and again after eight weeks (Wing Kwan, et al. 2009). In this study, physical activity was defined as participating in 30 or more minutes of moderate to vigorous physical activity for 4 or more days a week (Wing Kwan, et al. 2009). The study used past behavior and the TPB constructs (intention, attitude, subjective norms,

and PBC) to predict physical activity participation (Wing Kwan, et al. 2009). Pearson correlations found that the correlates with the strongest association with physical activity behavior was past physical activity ($r = 0.39$), subjective norms ($r = 0.25$), and PBC ($r = 0.20$) ($p < 0.01$) (Wing Kwan, et al. 2009). TPB constructs and past behavior were all significantly correlated with intentions (range of 'r-values' = 0.32 - 0.54, $p < 0.01$) (Wing Kwan, et al. 2009). Using past behavior and physical activity engagement after the 8-week interim between pre and post-test, a repeated measures ANOVA revealed a significant decrease in physical activity ($F = 16.04$, $p < 0.01$) (Wing Kwan, et al. 2009). A hierarchical linear multiple regression analysis showed that 37.1% of the amount of variance in intentions could be explained by the core TPB constructs (attitudes, subjective norms, and PBC) (Wing Kwan, et al. 2009). When past behavior was added to the model, it increased to 38.6% (+1.5%). A logistic regression analysis also evaluated determinants of physical activity, and neither intentions or PBC were significant, but past behavior was significant (Wing Kwan, et al. 2009).

In this study the authors did not use all of the TPB constructs, excluding experiential and instrumental attitudes, descriptive norms, and capacity/self-efficacy. Also, neither intentions nor PBC accounted for the variance of behavior, which is not consistent with previous literature (Wing Kwan, et al. 2009). All of the other studies in this review have shown that either intentions or PBC (and many times both) significantly account for the variance in behavior. For this study, the IBM was used in its entirety, sought to support previous research that has shown PBC and intentions to significantly account for the variance in behavior.

In the final article found for this review, researchers examined race and gender differences in physical activity using the Social Cognitive Theory (SCT) (Nehl, et al. 2012). The SCT has some similar constructs to the IBM including self-efficacy (capacity), social modeling (which is similar to identification with referents), social support (which is similar to injunctive normative beliefs), attitudes, and facilitation or in this study "perceived campus recreational facilities" (which is the opposite of environmental constraints, and similar to PBC) (Nehl, et al. 2012). The other SCT constructs used in this study were self-regulation and three types of mood (vigor, anxiety, and depression) (Nehl, et al. 2012). The study was done in two southern universities and included 449 students who were given surveys measuring demographics and the SCT constructs in regards to physical activity behavior (Nehl, et al. 2012). The physical activity behavior measured was aerobic physical activity and was reported as the number of days a week, in the past month, one participated in moderate and/or vigorous physical activity for at least 15 minutes (Nehl, et al. 2012). After two months the students were given the surveys again, and this time asked to self-report actual physical activity behaviors done in the last two months (Nehl, et al. 2012). Pearson's (r) correlations revealed that all of the constructs except for mood-anxiety and mood-depression were correlated to physical activity (Nehl, et al. 2012). The gender and ethnic differences within the sample were relatively distributed evenly (52.2% male, 47.8% female, 51.4% Caucasian, and 48.6% African American) (Nehl, et al. 2012). Regression models were done to observe the relationships of the SCT constructs with physical activity by ethnicity and then by gender (Nehl, et al. 2012). The regression analysis by ethnicity accounted for 20% of the variance of physical activity,

with self-regulation goal setting (ß = 0.17) and self-efficacy (ß = 0.24) being the only significant predictors of physical activity (Nehl, et al. 2012). The regression analysis by gender accounted for 21% of the variance of physical activity, with race (ß = -0.13), self-regulation goal setting (ß = 0.15) and self-efficacy (ß = 0.29) being the only significant predictors of physical activity (Nehl, et al. 2012). This revealed no significant differences by gender or ethnicity for the predictability of the SCT constructs on physical activity.

Summary

Many studies have been done measuring many aspects of the IBM model without using the model in its entirety. Some studies have used the TPB model, which is closely related to the IBM, yet many studies also do not measure some of the constructs or sub-constructs. This study will utilize the IBM in its entirety with both direct and indirect measures as recommended by Fishbein and Ajzen (2010). Also, although most studies show that in general intention is significantly related to behavior, many aspects of intentions (attitudes, perceived norms, and PBC) don't always have the same significance in predicting intentions across the studies. This is partially expected since demographics can impact results but it is also because not all constructs are measured across studies, little research has been done using the IBM, and the physical activity behavior is defined differently in almost every study. This study uses the physical activity recommendations set by government entities for both types of physical activity. This review has also shown that across studies differences exist between males and females with regards to physical activity, specifically aerobic and muscle strengthening elements of exercise, therefore this study will explore potential gender-

theory-based determinants of physical activity, to explain why this disparity exists. Finally, few studies have observed muscle strengthening physical activity, which is likely the case since government recommendations were not established until 2008. The lack of research on muscle strengthening physical activity studied leaves a large gap in the literature that this study will help fill.

If gender differences for predicting intentions and aerobic and muscle strengthening physical activity behaviors exists, interventions can be designed to effectively target male and female college students. These interventions could then shape the health of America's young adults and in time improve the chronic health of all Americans as these adults carry healthy physical activity practices with them into old age.

Chapter 3: Methods

Introduction

The purpose of this study was to explore differences in aerobic and muscle strengthening behaviors between male and female college students using the Integrative Behavior Model (IBM). As illustrated in Chapter 2, oftentimes research regarding any type of exercise is grouped into "physical activity" behavior, which is consists of many types of behaviors. In this study college students' aerobic and muscle strengthening physical activity behaviors were evaluated, because they have separate government recommendations, and carry different health benefits. Previous research has also shown that there are differences between males and females for meeting physical activity requirements in general, as well as aerobic and muscle strengthening requirements (Beville, et al. 2014, Bryan and Rocheleau, 2002, Nehl, et al. 2012, and Hutchins, et al. 2010). Also, since the IBM has not been well utilized, and when it is utilized it is not fully operationalized, it will provide the theoretical basis for this study. This chapter addresses the sample, instrumentation/measurement protocols, the research design, and the data collection procedures.

Sample

This study used a cross-sectional design to test research hypotheses. The inclusion criteria for the sample consisted of male and female undergraduate college students between the ages of 18 and 24, enrolled in at least one credit hour at the University of Oklahoma. Students could not have any mental or physical disability, or other condition, that would prevent them from meeting the weekly muscle strengthening and aerobic exercise recommendations. The sample consisted of a convenience sample

recruited via an email, which contained a link to the study survey on the University of Oklahoma Qualtrics website. Recruiting students in this way helped to recruit a diverse sample (Nehl, et al. 2012 and Ackerman, 2015). Participation in this study was voluntary. Since this was a correlational study with a heterogeneous sample that involved survey based data collection, it required a larger sample size. None of the studies reviewed in Chapter 2 reported an a priori sample size calculation (Beville, et al. 2014, Bryan & Rocheleau, 2002, Blanchard, et al. 2007, Blanchard, et al. 2008, Patterson, et al. 2015, Wing Kwan, et al. 2009, Nehl, et al. 2012, and Armitage, 2005), therefore, determining a sample size for this study was done in a number of ways. First, a recent meta-analysis evaluating the utility of the IBM with physical activity was reviewed. In the meta-analysis, the expected effect sizes between constructs were as followed: intentions with (attitudes at $\rho = 0.60$, subjective norms at $\rho = 0.38$, and PBC at $\rho = 0.55$) and intentions with behavior ($\rho = 0.48$) and PBC with behavior ($\rho = 0.34$) (McEachen, et al. 2011). Since the smallest effect size was 0.34 (ρ), this current study used a medium effect size (0.15 – 0.34) in a G*power equation to statistically determine the minimum sample size needed. G*power is a software program often used to determine sample sizes for research (G*POWER 3.1). The inputs for the G*Power calculation were as follows: the statistical test was a linear multiple regression – fixed model, R^2 deviation from zero, the test family was an F test with 6 predictors, the power analysis was an a priori with an alpha of 0.05 and a power of 80%. The determined sample size using G*power was 98, but since gender differences are being considered, it was determined that a minimum sample size of 196 was needed, with at least 98 participants for each gender. In addition, according to Tabachnick and Fidell (2007), a

sample size of no less than 300 is ideal for a factor analysis. Therefore, since the most conservative estimate was at least 300, the minimum sample size for this study is 300, with at least 98 men and 98 women.

Instrumentation/Measurement Protocols

A survey instrument developed by the lead author and Dr. Paul Branscum, was used in this study that measured all of the constructs of the IBM, including: attitudes (including both experiential and instrumental attitudes), perceived norms (including injunctive and descriptive norms), and perceived behavioral control (PBC) (including capacity and autonomy). In addition, value-expectancy measures of each construct was evaluated; behavioral beliefs and outcome expectations were evaluated for attitudes; injunctive normative beliefs and motivation to comply were evaluated for injunctive norms; descriptive normative beliefs and identification with referents were evaluated for descriptive norms; and control beliefs and perceived power were evaluated for PBC. Finally, both behaviors were evaluated (aerobic and muscle strengthening), and determinants of both behaviors were evaluated, including intentions, environmental constraints, and skills. This survey can be found in Appendix B. There were no surveys or questionnaires used in previous research that evaluated all of the constructs (both direct and indirect) of the IBM for muscle strengthening and aerobic exercise, therefore the survey was developed based off of the procedures outlined by Fishbein and Ajzen (2010). All questions in the survey [except the demographic questions and behavior (aerobic and muscle strengthening physical activity)] used a 7-point sematic differential scale.

First, all constructs were constitutively defined and then operationally defined. Then, survey items were generated from all operational definitions. To generate belief and value based items (indirect IBM measurements), an elicitation of beliefs was accomplished using the questionnaires in appendices C and D. The questionnaires were developed using the methods explained by Ajzen and Fishbein (2010). One example from the cardio questionnaire is, "What do you believe are the TOP advantages and disadvantages of participating in the recommended amount of cardio exercise each week?" The cardio questionnaires were completed by 44 male and 54 female undergraduate students from the University of Oklahoma in different physical activity classes. The same males and females completed the muscle strengthening questionnaire, except for one female who decided not to participate in the muscle strengthening questionnaire. Any responses that were mentioned by at least 20% of the students were included in the survey to elicit beliefs. For example, a common response to the example question above was that participating in the recommended amount of cardio helps one to be fit, so the statement "Getting the recommended amount of moderate or vigorous cardio exercise every week will improve my fitness" was scaled on a 7-point Likert scale (using unlikely to likely) in the survey. All of the indirect beliefs questions in the questionnaire were developed by this elicitation.

After the survey was developed, it was inspected for face and content validity by a panel of 6 experts (two experts of the IBM, two experts on the college population and physical activity, and two experts in survey development) in a 2-round review (Sharma and Petosa, 2014). The instrument was also pilot tested with 27 undergraduate students from the University of Oklahoma who also provided feedback of the survey's clarity to

help with readability and to determine how long the survey was. The pilot test revealed that the survey took an average of 15.57 (+/- 4.5) minutes to complete.

After data collection, psychometric properties of the instrument were assessed to evaluate its validity and reliability. Specifically, to evaluate stability (test-retest reliability) the survey was given to a small cohort of students (n=73) twice, with 2 weeks apart. Scales were then correlated from time point 1 to time point 2, and a Pearson's correlational coefficient analysis of 0.70 was used to determine acceptable stability. Next, internal consistency reliability was measured using Crobach's Alpha, and scores ≥ 0.70 were deemed acceptable. In order to test construct validity, a maximum likelihood confirmatory factor analysis was conducted to determine if the indicator variables load correctly on the variables they are supposed to predict (Sharma & Petosa, 2014).

In order to measure physical activity, a modified version of the BRFSS questionnaire was used. One of the modifications made was that instead of asking the BRFSS aerobic question "how many times per week or per month did you take part in this (cardio) activity," we asked "how many times per week did you take part in this (cardio) activity" (CDC, 2011). This modification was made so that the student responses would be uniform in regards to measuring days per week only and not days per week and month. Also, this would keep students from mistakenly giving a number of days per week when they actually meant days per month or vice versa. The other modification made was for the muscle strengthening physical activity measurement, which for the BRFSS questionnaire was "during the past month, how many times per week or per month did you do physical activities to strengthen your muscles?" and for

our questionnaire was “During the past month, how many days per week did you do exercise to strengthen the following muscle groups” and a list of all the major muscle groups specified in the 2008 Physical Activity Guidelines (arms, back, hips, shoulders, chest, abdomen, and legs) along with a corresponding “days per week” answer space was given (CDC, 2011). The “per month” was removed from the questionnaire for the same reasons mentioned for the aerobic physical activity question. The “for all major muscle groups” with corresponding “days per week” spaces were added because the current 2008 Physical Activity Guidelines specifies the importance of strengthening all the major muscle groups, but the current BRFSS muscle strengthening physical activity question does not measure that with the lack of muscle group specificity in the question (CDC, 2011). This limitation was specified in the “Data Users Guide to the BRFSS Physical Activity Questions” (CDC, 2011).

In this study, cardio exercise referred to aerobic physical activity and muscle strengthening exercise refers to muscle strengthening physical activity. According to the IBM “Behavior” refers to an observable event, that contains a *Target, Action, Context, and Time.* In this study, there were two behaviors under investigation. The first was “Meeting the government recommended amount of cardio exercise every week” and the second was “Meeting the government recommended amount of muscle strengthening exercise every week”. These behaviors had a Target (aerobic and muscle strengthening exercise), Action (engaging in the recommended amounts of aerobic and muscle strengthening exercise weekly), Context (college students) and Time-frame (every week). Both behaviors were operationalized in this study as individual responses to seven items for aerobic (cardio) exercise behavior and one item for muscle

strengthening (muscle strengthening) exercise behavior. For aerobic exercise behavior, items referred to whether the individual participated in aerobic exercise, the type of aerobic exercise they engaged in most (moderate/vigorous), how often they engaged in that aerobic exercise (in days per week), and how long they performed that type of aerobic exercise (in minutes per day). The questions were then repeated for the next type of aerobic exercise (if applicable). To evaluate muscle strengthening exercise, items referred to how often the individual did exercises to strengthen each muscle group (arms, back, hips, shoulders, chest, abdomen, and legs) in days per week. The population being targeted was undergraduate students between the ages of 18 and 24 enrolled in at least one hour at the University of Oklahoma.

According to the IBM "Intentions" refers to an individual's readiness to engage in a particular behavior, so a readiness to meet the recommended amount of aerobic physical activity and a readiness to meet the recommended amount of muscle strengthening physical activity. In this study, this construct was operationalized as individual responses to items referring to "I intend", "I plan", and "I will" directed towards the behavior. This construct was measured by 3 items for aerobic physical activity and for muscle strengthening physical activity with a possible range of -9 to +9 for each behavior. This range indicated that those that scored -9 have low intentions, and those that scored 9 have high intentions.

According to the IBM "Attitudes towards a behavior" (or simply Attitudes) refers to the overall feeling of favorableness or un-favorableness towards a behavior. In this study, this construct was operationalized using direct and indirect measures. For each behavior, four items measured attitudes, with two items evaluating instrumental

attitudes, for example, “Getting the recommended amount of muscle strengthening exercise every week is: non-beneficial - beneficial), and two items evaluating experiential attitudes, for example, “Getting the recommended amount of muscle strengthening exercise every week is: unpleasant – pleasant.” The possible range for this scale was between -12 to +12 for each behavior. This range indicates that those that scored -12 have unfavorable attitudes, and those that scored 12 have favorable attitudes.

To evaluate the indirect measures of attitudes, behavioral beliefs, for example, “Getting the recommended amount of muscle strengthening exercise every week will make me healthy: slightly likely – extremely likely,” with a corresponding outcome evaluation, for example, “For me to be healthy is: slightly desirable – extremely desirable,” for each belief was evaluated. Then, the both measured were multiplied. Each behavioral belief item was scored from 1-7 and each outcome evaluation was scored from -3 to +3, with a possible range of -21 to +21 for each pair.

According to the IBM “Perceived Norms” refers to one’s perception of social pressure to engage in a certain behavior. In this study, this construct was operationalized using direct and indirect measures. For each behavior, four items measured perceived norms, with two items evaluating injunctive norms, for example, “Most people who are important to me think I should get the recommended amount of muscle strengthening exercise every week: strongly disagree – strongly agree,” and two items evaluating descriptive norms, for example, “Most people who are important to me get the recommended amount of muscle strengthening exercise every week: strongly disagree – strongly agree.” The possible range for this scale was between -12 to +12 for each behavior. This range indicates that those that scored -12 have negative perceived

norms, and those that scored 12 have positive perceived norms.

To evaluate the indirect measures of perceived norms, both types of norms (injunctive and descriptive) were evaluated separately. First, injunctive normative beliefs were evaluated, for example, "My parents think that I should get the recommended amount of muscle strengthening exercise every week: strongly disagree – strongly agree," and each item had a corresponding item evaluating motivation to comply, for example, "For matters related to health, I want to do what my parents think I should do: strongly disagree – strongly agree." Second, descriptive normative beliefs were evaluated, for example, "Most athletes get the recommended amount of muscle strengthening exercise every week: strongly disagree – strongly agree," and each item had a corresponding item evaluating identification with referent, for example, "For matters related to health, I am similar to most athletes: strongly disagree – strongly agree." Then, the both measured were multiplied. Each normative belief item was scored from 1-7 and each type of evaluation was scored from -3 to +3, with a possible range of -21 to +21 for each pair.

According to the IBM, "Perceived Behavioral Control" refers to one's belief in his or her ability to perform a certain behavior and his or her control over the behavior. For each behavior, four items measured PBC, with two items measuring capacity, for example, "I believe I have the ability to get the recommended amount of muscle strengthening exercise every week: strong disagree – strongly agree," and two items measuring autonomy, for example, "It is mostly up to me whether or not I get the recommended amount of muscle strengthening exercise every week: strong disagree – strongly agree." The possible range for this scale was between -12 to +12 for each

behavior. This range indicates that those that scored -12 have low PBC, and those that scored 12 have high PBC.

To evaluate the indirect measures of PBC, power of control factors were evaluated, for example, "Having access to a place to do muscle strengthening will enable me to get the recommended amount of muscle strengthening exercise every week: strongly disagree – strongly agree," with a corresponding item evaluating control beliefs, for example, "I will have access to a place to do muscle strengthening in the next week: extremely unlikely – extremely likely." Then, the both measured were multiplied. Each control belief item was scored from 1-7 and each perceived power was scored from -3 to +3, with a possible range of -21 to +21 for each pair.

In the IBM "Skills" refers to the knowledge and abilities one possesses to perform a behavior. In this study, this construct was operationalized as "I have the skills needed to" directed towards the behavior. This construct was measured by one item for each behavior, and the construct had a possible range of 1-7 for each behavior. This range indicated that those that scored 1 have low skills, and those that scored 7 have high skills.

In the IBM "Environment" refers to the barriers that conflict with the ability to perform a behavior. In this study, this construct was operationalized as "there are environmental constraints that keep me from" directed towards the behavior. This construct was measured by one item for each behavior, with a possible range of 1-7 for each behavior. This range indicated that those that scored 1 have low environmental constraints, and those that scored 7 have high environmental constraints.

Research Design

This study is considered a cross-sectional study since it measures physical activity behavior from the participants at a single point in time. There were demographic questions at the end of the survey that were used to compare IBM constructs and behavioral responses between males and females to determine whether the research null hypotheses will be rejected, or whether we will fail to reject the null hypotheses. Most threats to internal validity were minimized naturally since there is no experimental treatment involved in this study. Also, since the survey was distributed online there was no participant-researcher interaction effects. The main internal validity issue is social desirability since this was a self-report survey about behaviors most people know they should do. The only strategy to counteract this threat to validity was to explain to the subjects the importance of honest responses and ensure that those responses are anonymous.

Data Collection Procedures

Data collection began on October 26th, 2016 and continued through the end of January 24th, 2017. After receiving approval from the Institutional Review Board, the surveys were sent to all University of Oklahoma students via email and the students who had access to their email had the voluntary option to participate. The email contained the purpose of the study, the informed consent, address the risks and benefits associated with the study, ensured participants that all gathered information would be kept anonymous, and had a link to the survey. As an incentive, at the end of the survey there was an option for the participants to provide their email address to be entered into a drawing for 1 of 10 gift cards ($10 each).

Data Management and Analysis

All survey data was received from Qualtrics and then stored on the private University of Oklahoma Health and Exercise Science Department's computers in Dr. Branscum's lab. Only approved researchers from this lab had access to the survey data. SPSS 21 was used for all data analyses.

A Pearson's correlation coefficient test was conducted first to examine the linear correlations of all of the core constructs of the IBM (experiential attitude, instrumental attitude, injunctive norm, descriptive norm, capacity, and autonomy, intentions, skills, and environment), along with aerobic exercise (minutes per day) and muscle strengthening exercise (days per week).

Gender differences for IBM constructs and physical activity behaviors.

Next, frequencies and chi-square analyses were used to determine if differences in demographics exist between males and females. Chi-alpha analyses were run to determine if there were any significant differences between men and women for meeting cardio recommendations, muscle-strengthening recommendations, and both recommendations. Independent t-tests were run on every construct for each gender and behavior to detect any significant differences between genders for each behavior (aerobic and muscle strengthening).

Determinants of Attitudes, Perceived Norms, and Perceived Behavioral Control for Physical Activity Behaviors

To evaluate the determinants of attitudes, perceived norms, and PBC for each behavior, a Pearson's correlation coefficient test was done to determine the strength of association between the indirect paired measures (belief x evaluation) on the summative

scores for each antecedent. Listed in the table below are the indirect constructs with their corresponding direct constructs:

Table 3.1: Determinants of Attitudes, Perceived Norms and Perceived Behavioral Control

Indirect Constructs	Direct Constructs		
Behavioral Beliefs X Outcome Expectations	Attitudes	Experiential Attitudes	Instrumental Attitudes
Injunctive Normative Beliefs X Motivation to Comply	Perceived Norms	Injunctive Norms	
Descriptive Normative Beliefs X Identification with Referents	Perceived Norms	Descriptive Norms	
Control Beliefs X Perceived Power	Perceived Behavioral Control	Capacity	Autonomy

Determinants of Intentions for Physical Activity Behaviors

Multiple linear regressions were run to determine the ability of two IBM models (one used attitudes, perceived norms and PBC, and the expanded model used instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity, and autonomy) to predict intentions for each behavior. Multiple regression analyses have assumptions associated with them, which are outliers, ratio of subjects to independent variables, normality, homoscedasticity, and multicollinearity (Vincent and Weir, 2012). There were no outliers in this study that needed to be regressed to the standard deviation. The ratio of subjects to independent variables should be a minimum of 5 to 1, which we accounted for by collecting a minimum of 300 subjects. By observing the curve of the data, we were able to address any skewness and/or kurtosis in the curve that would affect normality of the data distribution. Homoscedasticity was determined looking at the variance in residuals using a scatter plot and line of best fit in

SPSS. Multicollinearity was tested for using a variance inflation factor (VIF) in SPSS to make sure that the independent variables were not too inter-correlated. The VIF could not exceed a value of 10 if the independent variable was to remain.

Determinants of Physical Activity Behaviors

Finally, four logistic regression analyses were conducted (two for men and two for women) to determine the predictability of intentions, PBC, environmental constraints, and skills on both behaviors (muscle strengthening and aerobic). Logistic regression is used because the behaviors are dichotomous (meeting and not meeting aerobic and muscle strengthening recommendations). Past behavior is used in this study rather than future behavior because past behavior, especially in regards to exercise, has been shown to predict future behavior consistently (Fishbein & Ajzen, 2010). Also, measuring past behavior can be measured with a cross-sectional study, which requires less time and poses less of a threat to validity than a prospective study does, which is beneficial when time is limited.

Chapter 4: Data Analysis

Introduction

In 2013, only about half (50.2%) of the adults in the US met the aerobic/cardio recommendations set by the USDA for minimal health benefits and barely over a quarter (30%) met the muscle strengthening recommendations (CDC, 2016b). As for those meeting both the cardio and muscle strengthening recommendations, the percentage was less than 20% of the population (CDC, 2016b). Within this population significant differences have been reported between males and females for those meeting and not meeting these types physical activity recommendations. The purpose of this study was to observe these differences among a college population, and to detect any differences among intentions predicting behaviors and other IBM constructs between males and females for these two types of physical activity. Cardio and physical activity in general have been studied often in the literature, however the methods of measuring cardio are not consistent and muscle strengthening has had minimal attention. Also, although the Theory of Planned Behavior has been used extensively, its most updated version, the Integrative Behavior Model (IBM), has not been used as much in research with physical activity, especially muscle strengthening.

Due to the lack of use of the IBM with physical activity (especially when comparing two types) and the lack of consistency in measuring cardio and muscle strengthening physical activity, a survey tool was developed for the study to test the hypotheses. Stability of the survey was measured using test-retest reliability with 73 students and a Pearson's correlational coefficient analysis of 0.70 was used to determine acceptable stability.

Next, internal consistency reliability was measured using Crobach's Alpha, and scores ≥0.70 were deemed acceptable. Construct validity was tested with a maximum likelihood confirmatory factor analysis to determine if the indicator variables loaded correctly on the predicted variables. A Pearson's correlation coefficient test was conducted to examine the linear correlations of all of the core constructs of the IBM along with the behaviors cardio exercise and muscle strengthening exercise. Next, frequencies and chi-square analyses were used to determine if differences in demographics exist between males and females. Chi-square analyses were also run to determine if there were any significant differences between men and women for meeting cardio recommendations, muscle-strengthening recommendations, and both recommendations. Independent samples t-tests were run on every construct for each behavior to detect any significant differences between genders for each behavior (cardio and muscle strengthening). Multiple linear regressions were run to determine the ability of attitudes, perceived norms and PBC to predict intentions for each behavior. The assumptions associated with multiple regression analyses that were addressed during analysis were outliers, multicollinearity, normality, and homoscedasticity. No outliers were detected during analysis and therefore none had to be replaced. By observing the curve of the data, we were able to address any skewness and/or kurtosis in the curve that would affect normality of the data distribution. Homoscedasticity was determined looking at the variance in residuals using a scatter plot to make sure there was no clustering of data points, which there was not. Multicollinearity was tested for using a variance inflation factor (VIF) in SPSS to make sure that the independent variables were not too intercorrelated (VIF>10). To evaluate the determinants of attitudes,

perceived norms, and PBC for each behavior, a Pearson's correlation coefficient test was done to determine the strength of association between the indirect paired measures (belief x evaluation) on the summative scores for each antecedent. Finally, four logistic regression analyses were conducted (two for men and two for women) to determine the predictability of intentions, PBC, environmental constraints, and skills on both behaviors (muscle strengthening and aerobic).

Results of Data Analysis

Missing data

Cardio-exercise

The missing data was examined for this section and no variable had more than 7 missing data cases (n=392 which is 1.7%), except for injunctive normative beliefs, which was intentional because we gave people an option to put N/A, when the referent was not applicable to the individual. Therefore, the following normative belief and motivation to comply items had missing data cases: parents (15 missing cases), friends (17 missing cases), significant other (187 missing cases), and coach/trainer (292 missing cases). Since the amount of missing data was minimal no mean replacement was needed.

Muscle strengthening

The missing data was examined for this section and no variable had more than 5 missing data cases (n=392 which is 1.3%), except for injunctive normative beliefs, which was intentional because we gave people an option to put N/A, when the referent was not applicable to the individual. the following normative belief and motivation to comply items had missing data cases: parents (15 missing cases), friends (17 missing

cases, significant other (187 missing cases), coach/trainer (292 missing cases). Since the amount of missing data was minimal no mean replacement was needed.

Reliability and Validity measures for Survey

Most of the Pearson's r correlational coefficients did not reach ≥0.70 between the pre and post-tests when testing test-retest reliability, which can be seen in Tables 4.1 and 4.2 below. This means the participants were not consistent with their responses between pre and post-test. Those variables that did reach ≥0.70 were intentions and capacity for the cardio section of the survey and intentions and injunctive norms for the muscle strengthening survey. The Cronbach's Alpha scores were nearly all above 0.70, with the only exceptions being descriptive norms and autonomy in the cardio section, and autonomy in the muscle strengthening section. Therefore, the internal consistency was mostly good, meaning most of the variables were related to each other and measuring the same construct. The construct validity was evaluated in Tables 4.3 and 4.4 which shows that intentions and its three sub constructs (attitudes, perceived norms, and PBC) each had an eigenvalue ≥1 and the factor loadings range from 0.313 to 0.996. All of the factor loadings were acceptable and showed that the variables in each scale had a significant effect on the subsequent variable with the eigenvalue ≥1 for that scale.

Table 4.1 Cardio - Direct measures test-retest reliability and internal consistency reliability

Construct	Time 1 x Time 2 Pearson r	Cronbach's Alpha
Intentions	0.74	0.95
Attitudes	0.12	0.83
Instrumental Attitudes	0.21	0.84
Experiential Attitudes	0.08	0.92
Perceived Norms	0.63	0.75
Descriptive Norms	0.61	0.68
Injunctive Norms	0.49	0.71
Perceived Behavioral Control	0.53	0.78
Capacity	0.72	0.83
Autonomy	0.20	0.68

Table 4.2 Muscle Strengthening - Direct measures test-retest reliability and internal consistency reliability

Construct	Time 1 x Time 2 Pearson r	Cronbach's Alpha
Intentions	0.75	0.97
Attitudes	0.58	0.87
Instrumental Attitudes	0.56	0.87
Experiential Attitudes	0.48	0.95
Perceived Norms	0.69	0.81
Descriptive Norms	0.60	0.78
Injunctive Norms	0.71	0.73
Perceived Behavioral Control	0.53	0.75
Capacity	0.39	0.83
Autonomy	0.48	0.56

Table 4.3 Cardio - Direct measures summary of factor analysis for establishing construct validity

Variable	Eigenvalue	Factor Loadings
Intentions	***2.747***	
I intend to do the behavior		0.939
I plan to do the behavior		0.971
I will do the behavior		0.894
Attitudes	***2.665***	
Instrumental:		
Doing the behavior is		
Non-Beneficial/Beneficial		0.452
Unimportant/Important		0.538
Experiential:		
Doing the behavior is		
Frustrating/Enjoyable		0.929
Unpleasant/Pleasant		0.919
Perceived Norms	***2.314***	
Injunctive Norms:		
Most people who are important to me think I should get…		0.789
Most people whom I respect and admire would support me getting…		0.628
Descriptive Norms:		
Most people who are important to me get…		0.696
Most people who are similar to me get…		0.533
…the recommended amount of moderate or vigorous cardio exercise every week.		
Perceived Behavioral Control	***2.429***	
Capacity:		
I believe I have the ability to get…		0.867
I am certain that I can get…		0.830
Autonomy:		
It is mostly up to me whether or not I get…		0.537
Getting...is beyond my control.		0.469
…the recommended amount of moderate or vigorous cardio exercise every week.		

Note: Maximum likelihood estimation used for all subscales
Behavior: Meeting the recommended amount of cardio exercise each week

Table 4.4 Muscle Strengthening –
Direct measures summary of factor analysis for establishing construct validity

Variable	Eigenvalue	Factor Loadings
Intentions	***2.824***	
I intend to do the behavior		0.936
I plan to do the behavior		0.996
I will do the behavior		0.993
Attitudes	***2.874***	
Instrumental:		
Doing the behavior is		
Non-Beneficial/Beneficial		0.490
Unimportant/Important		0.635
Experiential:		
Doing the behavior is		
Frustrating/Enjoyable		0.960
Unpleasant/Pleasant		0.940
Perceived Norms	***2.543***	
Injunctive Norms:		
Most people who are important to me think I should get…		0.784
Most people whom I respect and admire would support me getting…		0.582
Descriptive Norms:		
Most people who are important to me get…		0.775
Most people who are similar to me get…		0.721
…the recommended amount of muscle strengthening exercise every week.		
Perceived Behavioral Control	***2.390***	
Capacity:		
I believe I have the ability to get…		0.933
I am certain that I can get…		0.781
Autonomy:		
It is mostly up to me whether or not I get…		0.639
Getting...is beyond my control.		0.313
…the recommended amount of muscle strengthening exercise every week.		

Note: Maximum likelihood estimation used for all subscales
Behavior: Meeting the recommended amount of muscle strengthening exercise each week.

Correlations of IBM constructs between genders for each physical activity behavior

Table 4.5 shows that for women most of the IBM constructs for cardio significantly correlated with each other, however that was not the case for men. All of the constructs were significantly correlated with intentions ($p \leq 0.05$) except for environment for men ($r=-0.122$). Environment only correlated with PBC, capacity, and autonomy for men ($p \leq 0.001$), however for women that also included skills ($p \leq 0.001$). Besides intentions, autonomy only correlated with PBC and capacity for men ($p \leq 0.001$). Instrumental attitudes only correlated significantly with all norms, all attitudes, intentions, and skills for men ($p \leq 0.05$). Perceived norms and descriptive norms had no significant correlations with PBC, autonomy, or environment for men. Injunctive norms only correlated significantly with all norms, all attitudes, and intentions for men ($p \leq 0.001$). For women, the only constructs besides environment that did not correlate with the others was autonomy with descriptive norms.

For muscle strengthening in Table 4.6, there were more significant correlations between all the IBM constructs for both genders compared to the cardio table. For men, autonomy and environment only significantly correlated with each other, capacity, autonomy, skills and intentions (autonomy only) ($p \leq 0.05$).

Table 4.5 Cardio – Pearson's correlation coefficient analyses of the Integrative Behavioral Model constructs

Females (n=272)	1. Int	2. Att	3. IA	4. EA	5. PN	6. IN	7. DN	8. PBC	9. Cap	10. Aut	11. Skills	12. Env
1. Int	-	0.395***	0.195***	0.466***	0.516***	0.410***	0.475***	0.582***	0.698***	0.271***	0.533***	-0.129*
2. Att	0.477***	-	0.839***	0.868***	0.348***	0.303***	0.300***	0.256***	0.277***	0.154*	0.353***	-0.003
3. IA	0.299***	0.850***	-	0.458***	0.171**	0.176**	0.126*	0.174**	0.163**	0.133*	0.171**	0.005
4. EA	0.518***	0.910***	0.555***	-	0.413***	0.334***	0.375***	0.260***	0.303***	0.130*	0.419***	-0.009
5. PN	0.469***	0.457***	0.378***	0.425***	-	0.828***	0.897***	0.328***	0.394***	0.153*	0.395***	-0.032
6. IN	0.344***	0.371***	0.415***	0.259***	0.866***	-	0.491***	0.299***	0.303***	0.203***	0.432***	-0.100
7. DN	0.472***	0.427***	0.252**	0.476***	0.883***	0.529***	-	0.273***	0.371***	0.077	0.271***	0.029
8. PBC	0.483***	0.212*	0.116	0.244**	0.135	0.087	0.148	-	0.876***	0.835***	0.512***	-0.359***
9. Cap	0.572***	0.192*	0.076	0.244**	0.214*	0.134	0.237**	0.916***	-	0.465***	0.560***	-0.247***
10. Aut	0.214*	0.177	0.138	0.170	-0.016	-0.006	-0.022	0.822***	0.525***	-	0.300***	-0.377***
11. Skills	0.491***	0.281**	0.198*	0.288***	0.195*	0.131	0.208*	0.680***	0.697***	0.454***	-	-0.217***
12. ENV	-0.122	0.037	-0.033	-0.056	0.055	-0.006	0.099	-0.432***	-0.299***	-0.494***	-0.141	-
Males (n=120)	1. Int	2. Att	3. IA	4. EA	5. PN	6. IN	7. DN	8. PBC	9. Cap	10. Aut	11. Skills	12. Env

Notes: ***p≤0.001, **p≤0.01, *p≤0.05.

Beh (Behavior); Int (Intentions); Att (Attitudes); IA (Instrumental Attitudes); EA (Experiential Attitudes); PN (Perceived Norms); IN (Injunctive Norms); DN (Descriptive Norms); PBC (Perceived Behavioral Control); Cap (Capacity); Aut (Autonomy); Skills; ENV (Environment)

Table 4.6 Muscle Strengthening – Pearson's correlation coefficient analyses of the Integrative Behavioral Model constructs

Females (n=272)	1. Int	2. Att	3. IA	4. EA	5. PN	6. IN	7. DN	8. PBC	9. Cap	10. Aut	11. Skills	12. Env
1. Int	-	0.547***	0.346***	0.589***	0.562***	0.480***	0.514***	0.600***	0.697***	0.272***	0.627***	-0.156**
2. Att	0.668***	-	0.850***	0.886***	0.470***	0.449***	0.388***	0.394***	0.423***	0.222***	0.449***	-0.082
3. IA	0.591***	0.897***	-	0.509***	0.371***	0.382***	0.280***	0.266***	0.268***	0.174**	0.271***	-0.088
4. EA	0.636***	0.943***	0.698***	-	0.442***	0.397***	0.388***	0.409***	0.456***	0.210***	0.495***	-0.056
5. PN	0.526***	0.522***	0.499***	0.469***	-	0.873***	0.898***	0.358***	0.447***	0.123*	0.360***	-0.083
6. IN	0.414***	0.475***	0.508***	0.386***	0.886***	-	0.569***	0.368***	0.423***	0.173**	0.360***	-0.133*
7. DN	0.522***	0.458***	0.386***	0.450***	0.898***	0.592***	-	0.271***	0.371***	0.051	0.281***	-0.019
8. PBC	0.508***	0.373***	0.328***	0.357***	0.260**	0.245**	0.220*	-	0.886***	0.806***	0.609***	-0.435***
9. Cap	0.609***	0.491***	0.438***	0.465***	0.396***	0.345***	0.361***	0.911***	-	0.439***	0.630***	-0.252***
10. Aut	0.217*	0.098	0.077	0.100	-0.005	0.033	-0.040	0.822***	0.513***	-	0.375***	-0.520***
11. Skills	0.571***	0.431***	0.400***	0.397***	0.390***	0.355***	0.341***	0.712***	0.722***	0.483***	-	-0.229***
12. Env	-0.086	0.093	0.101	0.074	0.079	0.019	0.120	-0.365***	-0.206*	-0.475***	-0.276**	-
Males (n=120)	1. Int	2. Att	3. IA	4. EA	5. PN	6. IN	7. DN	8. PBC	9. Cap	10. Aut	11. Skills	12. Env

Notes: ***p≤0.001, **p≤0.01, *p≤0.05.

Beh (Behavior); Int (Intentions); Att (Attitudes); IA (Instrumental Attitudes); EA (Experiential Attitudes); PN (Perceived Norms); IN (Injunctive Norms); DN (Descriptive Norms); PBC (Perceived Behavioral Control); Cap (Capacity); Aut (Autonomy); Skills; ENV (Environment)

Summary of demographics

Table 4.7 shows the demographic frequencies and chi-square analysis of the study population. Over 80% of the population for men, women, and both were Caucasian, with every other race each making up less than 10% of the population for each gender. There was a significant difference between genders for year in school ($p=0.009$), however, the average age for males was 20.14 years and for females 19.82 and this difference was not significant ($p=0.098$). Only 8 participants were student athletes (only 1 male), 21% of the total study population participated in club/inter-mural sports, the male student athlete was the only participant that participated in both, and almost 80% of the total study population did not participate in either. There was a significant difference between genders for being an athlete or not ($p=0.007$) but when athletes and club/intermural sports participants were removed from the later logistic regression analyses there was not a significant difference between keeping them and not keeping them, so athletes remained in the later analyses.

Table 4.7 A summary of demographics (Categorical)

	Males (n=120)	Females (n=272)	Total (N=392)	Chi-Square (χ^2)	p-value
Race/Ethnicity					
	Caucasian – 98(82%)	Caucasian – 229(84%)	Caucasian – 327(83%)	6.750	0.345
	African American – 3(3%)	African American – 6(2%)	African American – 9(2%)		
	Hispanic – 6(5%)	Hispanic – 3(1%)	Hispanic – 9(2%)		
	Asian - 7(6%)	Asian – 13(5%)	Asian – 20(5%)		
	Native American - 2(2%)	Native American – 7(3%)	Native American 9(2%)		
	Pacific Islander - 0	Pacific Islander – 1(<1%)	Pacific Islander – 1(<1%)		
	Multi-racial – 4(3%)	Multi-racial – 12(4%)	Multi-racial – 16(4%)		
Year in school				13.532	0.009
	Freshman – 38(32%)	Freshman – 94(35%)	Freshman – 132(34%)		
	Sophomore – 22(18%)	Sophomore – 68(25%)	Sophomore – 90(23%)		
	Junior – 26(22%)	Junior – 49(18%)	Junior – 75(19%)		
	Senior – 26(22%)	Senior – 27(10%)	Senior – 53(14%)		
	Graduate Student – 8(7%)	Graduate Student – 34(13%)	Graduate Student – 42(11%)		
Athlete/Non-Athlete				12.092	0.007
	Student Athlete - 0	Student Athlete – 7(3%)	Student Athlete – 7(2%)		
	Club/inter-mural	Club/inter-mural	Club/inter-mural		
	Sports participant – 35(29%)	Sports participant -47(17%)	Sports participant – 82(21%)		
	Both – 1(1%)	Both – 0	Both – 1(<1%)		
	Neither – 84(70%)	Neither – 218(80%)	Neither – 302(77%)		

Chi-Square and t-tests measuring gender differences among IBM constructs and behaviors

As seen in Table 4.8, all p-values for the chi-square analysis were insignificant and therefore did not detect any significant differences between genders for any of the physical activity behaviors (meeting cardio recommendations, meeting muscle strengthening recommendations, and meeting both recommendations). This means we failed to reject the null for hypotheses 1-3 and there are no significant differences between genders for meeting any of the physical activity recommendations.

The independent t-tests in Tables 4.9 and 4.10 revealed that there were no significant differences between males and females for most of the direct IBM constructs. The only exceptions were perceived norms and injunctive norms for cardio and PBC and capacity for muscle strengthening ($p<0.05$). Therefore, the null hypotheses 4-5 were accepted since there were no significant differences between genders for intentions, skills, and environmental constraints towards meeting the recommend amount of each physical activity (cardio and muscle strengthening). We failed to reject the null for hypotheses 6-7 since only some and not all of the constructs describing intentions were significantly different between genders for meeting the recommended amount of each physical activity (cardio and muscle strengthening).

Table 4.8 Chi-square analysis of differences between males and females meeting the recommended amount of cardio exercise, muscle strengthening exercise, and both types of exercise

	Males (n=120)	Females (n=272)	Total (n=392)	Chi-square Statistic (χ^2)	p-value
Cardio Recommendations					
Meeting	71(59%)	149(55%)	220(56%)	0.652	0.420
Not meeting	49(41%)	123(45%)	172(44%)		
Muscle Strengthening Recommendations					
Meeting	34(28%)	65(24%)	99(25%)	0.868	0.351
Not meeting	86(72%)	207(76%)	293(75%)		
Cardio and Muscle Strengthening Recommendations					
Meeting	23(19%)	45(17%)	68(17%)	0.399	0.527
Not meeting	97(81%)	227(83%)	324(83%)		

Table 4.9 Cardio - Mean and Standard Deviations for IBM constructs

Theoretical Construct	Possible/Observed Min-Max	Males M(SD)	Females M(SD)	p-value
Intentions	-3 to +3	0.88(1.9)	1.09(1.7)	0.296
Attitudes	-3 to +3	1.44(1.3)	1.43(1.4)	0.924
Instrumental	-3 to +3	2.14(1.3)	2.12(1.5)	0.905
Experiential	-3 to +3	0.75(1.7)	0.74(1.7)	0.960
Perceived Norms	-3 to +3	0.58(1.2)	0.84(1.1)	0.036*
Injunctive Norms	-3 to +3	1.39(1.3)	1.67(1.1)	0.031*
Descriptive Norms	-3 to +3	-0.23(1.4)	0.02(1.4)	0.122
Perceived Behavioral Control	-3 to +3	1.96(1.0)	1.78(1.1)	0.133
Capacity	-3 to +3	1.78(1.4)	1.63(1.4)	0.336
Autonomy	-3 to +3	2.13(0.98)	1.92(1.2)	0.091
Skills/Abilities	1 to 7	6.21(1.3)	6.14(1.2)	0.624
Environment	1 to 7	2.41(1.7)	2.66(1.7)	0.176

Table 4.10 Muscle Strengthening - Mean and Standard Deviations for IBM constructs

Theoretical Construct	Possible/Observed Min-Max	Males M(SD)	Females M(SD)	p-value
Intentions	-3 to +3	0.73(2.1)	0.48(1.9)	0.252
Attitudes	-3 to +3	1.45(1.5)	1.2(1.5)	0.136
Instrumental	-3 to +3	1.93(1.4)	1.79(1.57)	0.426
Experiential	-3 to +3	0.98(1.9)	0.63(1.8)	0.078
Perceived Norms	-3 to +3	0.35(1.2)	0.33(1.3)	0.914
Injunctive Norms	-3 to +3	1.03(1.4)	1.11(1.4)	0.622
Descriptive Norms	-3 to +3	-0.34(1.4)	-0.44(1.5)	0.525
Perceived Behavioral Control	-3 to +3	1.87(1.1)	1.60(1.2)	0.032*
Capacity	-3 to +3	1.75(1.5)	1.42(1.5)	0.046*
Autonomy	-3 to +3	1.98(1.1)	1.78(1.2)	0.100
Skills/Abilities	-3 to +3	5.87(1.5)	5.65(1.5)	0.189
Environment	-3 to +3	2.68(1.9)	2.59(1.7)	0.632

Model 1: Cardio - Predicting intentions with attitudes, perceived norms, and perceived behavioral control.

According to the IBM, intentions are predicted by attitudes, perceived norms, and PBC. Using multiple regression models, the three constructs predicted 43.6% of the variance of intentions for men and 47.7% of the variance for women. All 3 variables were significant in the model (Table 4.11). According to the standardized beta-coefficients, PBC (0.388 men and 0.435 for women) was the most influential variable, followed by perceived norms (0.298 for men and 0.312 for women) and attitudes (0.258 for men and 0.175 for women).

Model 2: Cardio - Predicting intentions with instrumental attitudes, experiential attitudes, descriptive norms, injunctive norms, capacity, and autonomy.

The same regression model was used again, except the constructs of attitudes were split between instrumental and experiential attitudes, perceived norms were split into injunctive and descriptive norms, and PBC was split into capacity and autonomy (Table 4.11). Experiential attitudes, descriptive norms and capacity predicted 50.4% of the variance of intentions in men, which is 6.8% higher than the original model. Instrumental attitudes, injunctive norms and autonomy were not significant and therefore removed from the model. Experiential attitudes, descriptive norms, injunctive norms and capacity predicted 58.6% of the variance of intentions in women, which is 10.9% higher than the original model. Instrumental attitudes and autonomy were not significant and therefore removed from the model. According to the standardized beta-coefficients, capacity was the most influential (0.445 for men and 0.550 for women),

followed by experiential attitudes (0.303 for men and 0.212 for women), descriptive norms (0.222 for men and 0.141 for women), and injunctive norms (0.103 for women).

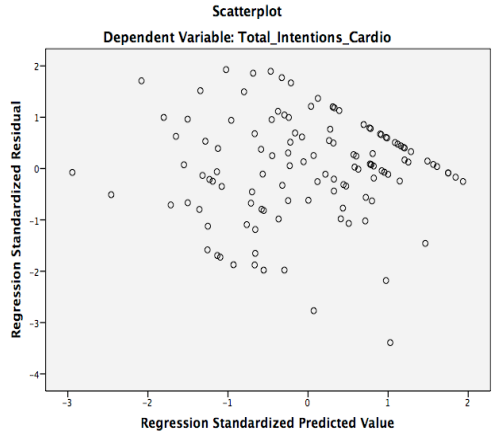
Table 4.11 Cardio - Parameter estimates and model prediction for males (n=120) and females (n=272)

	Adjusted R^2	Standardized coefficients β	t	*P*	Variance Inflation Factor
Model 1 (males): Predicting INT	0.436 (total)				
Attitudes		0.258	3.28	0.001	1.30
PBC		0.388	5.50	0.001	1.05
Perceived Norms		0.298	3.85	0.001	1.27
Model 1 (females): Predicting INT	0.477 (total)				
Attitudes		0.175	3.68	0.001	1.17
PBC		0.435	9.23	0.001	1.15
Perceived Norms		0.312	6.43	0.001	1.22
Model 2 (males): Predicting INT	0.504 (total)				
Experiential Attitudes		0.303	4.08	0.001	1.33
Descriptive Norms		0.222	2.99	0.003	1.32
Capacity		0.445	6.62	0.001	1.09
Model 2 (females): Predicting INT	0.586 (total)				
Experiential Attitudes		0.212	4.88	0.001	1.24
Injunctive Norms		0.103	2.23	0.026	1.39
Descriptive Norms		0.141	2.97	0.003	1.49
Capacity		0.550	12.75	0.001	1.22

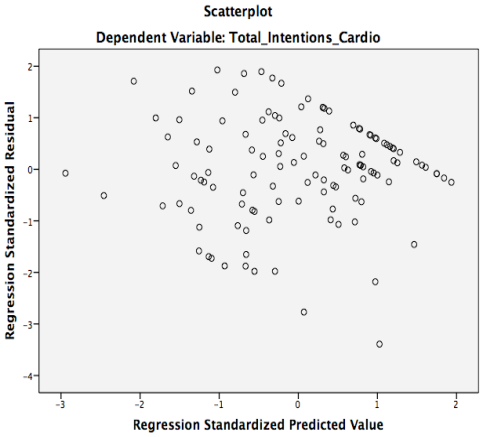
Note: INT (intentions); PBC (perceived behavioral control)
*Model 2 (descriptive norms not significant for males, and instrumental attitudes, autonomy not significant for either ($p<0.05$)
*None of the variance inflation factors exceeded a value of 10, so there were no issues with multi-collinearity

Figure 4.1 Homoscedasticity – Cardio

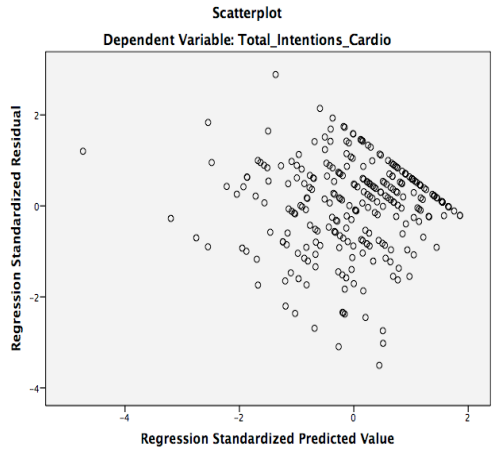
Males - Scatter Plot of the Regression Standardized Residuals for intentions predicted by perceived behavioral control, attitudes, and perceived norms



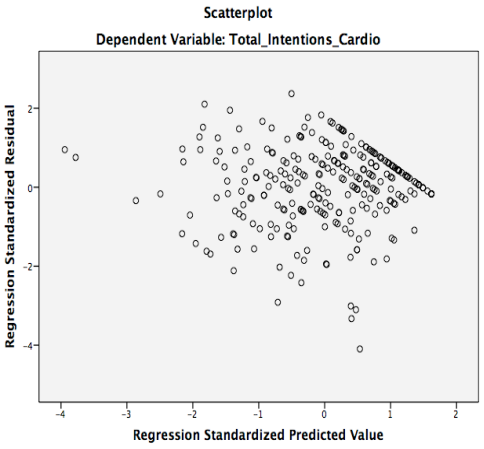
Males- Scatter Plot of the Regression Standardized Residuals for intentions predicted by injunctive norms, descriptive norms, instrumental attitudes, and experiential attitudes, capacity, and autonomy



Females - Scatter Plot of the Regression Standardized Residuals for intentions predicted by perceived behavioral control, attitudes, and perceived norms



Females- Scatter Plot of the Regression Standardized Residuals for intentions predicted by injunctive norms, descriptive norms, instrumental attitudes, and experiential attitudes, capacity, and autonomy



Model 1: Muscle Strengthening - Predicting intentions with attitudes, perceived norms, and perceived behavioral control.

The same regression models were run for the muscle strengthening activity for both men and women. In Table 4.12, all three of the core IBM constructs predicted 57.4% of the variance of intentions for men and 53.8% for women. All three variables were significant in the regression model but their influences varied by gender. According to the standardized beta-coefficients, for men, attitudes (0.447) was the most influential variable, followed by PBC (0.285) and perceived norms (0.219). For women, the most influential variable was PBC (0.393), followed by perceived norms (0.304), and attitudes (0.249).

Model 2: Muscle Strengthening - Predicting intentions with instrumental attitudes, experiential attitudes, descriptive norms, injunctive norms, capacity, and autonomy.

The same regression model was used again, except the constructs of attitudes were split between instrumental and experiential attitudes, perceived norms were split into injunctive and descriptive norms, and PBC was split into capacity and autonomy (Table 4.12). Instrumental attitudes, experiential attitudes, descriptive norms and capacity predicted 57.1% of the variance of intentions in men, which is 0.3% lower than the original model. Injunctive norms and autonomy were not significant and therefore removed from the model. Experiential attitudes, descriptive norms, and capacity predicted 61.5% of the variance of intentions in women, which is 7.7% higher than the original model. Instrumental attitudes, injunctive norms, and autonomy were not significant and therefore removed from the model. According to the standardized beta-

coefficients, capacity was the most influential (0.331 for men and 0.485 for women), followed by experiential attitudes (0.256 for men and 0.281 for women), descriptive norms (0.217 for men and 0.225 for women), and instrumental attitudes (0.183 for men).

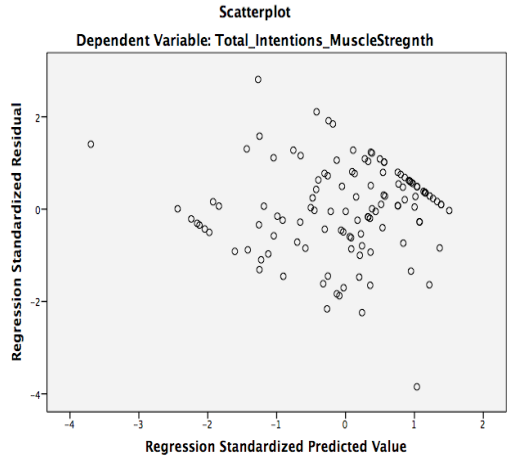
Table 4.12 Muscle Strengthening - Parameter estimates and model prediction for males (n=120) and females (n=272)

	Adjusted R^2	Standardized coefficients β	t	*P*	Variance Inflation Factor
Model 1 (males): Predicting INT	0.574 (total)				
Attitudes		0.447	5.92	0.001	1.50
PBC		0.285	4.27	0.001	1.17
Perceived Norms		0.219	3.01	0.003	1.38
Model 1 (females): Predicting INT	0.538 (total)				
Attitudes		0.249	5.12	0.001	1.39
PBC		0.393	8.53	0.001	1.24
Perceived Norms		0.304	6.35	0.001	1.35
Model 2 (males): Predicting INT	0.571 (total)				
Instrumental Attitudes		0.183	2.15	0.034	2.03
Experiential Attitudes		0.256	2.88	0.005	2.19
Descriptive Norms		0.217	3.16	0.002	1.31
Capacity		0.331	4.74	0.001	1.36
Model 2 (females): Predicting INT	0.615 (total)				
Experiential Attitudes		0.281	6.39	0.001	1.36
Descriptive Norms		0.225	5.35	0.001	1.25
Capacity		0.485	11.12	0.001	1.34

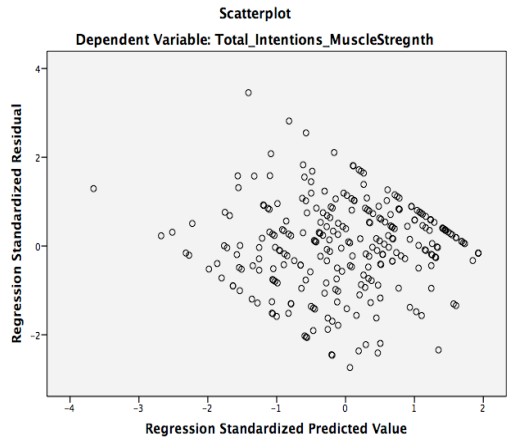
Note: INT (intentions); PBC (perceived behavioral control)
*Model 2 (instrumental attitudes not significant for females, and injunctive norms and autonomy not significant for either ($p<0.05$)
*None of the variance inflation factors exceeded a value of 10, so there were no issues with multi-collinearity

Figure 4.2 Homoscedasticity – Muscle strengthening

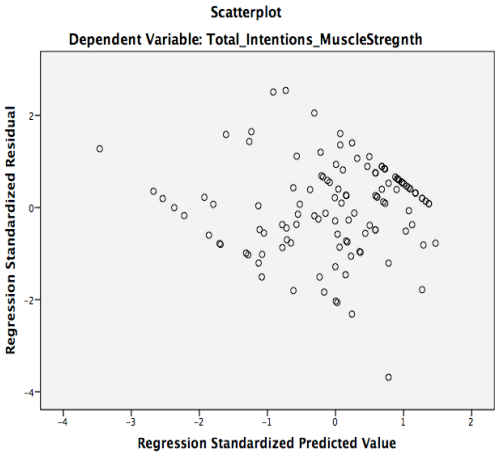
Males - Scatter Plot of the Regression Standardized Residuals for intentions predicted by perceived behavioral control, attitudes, and perceived norms



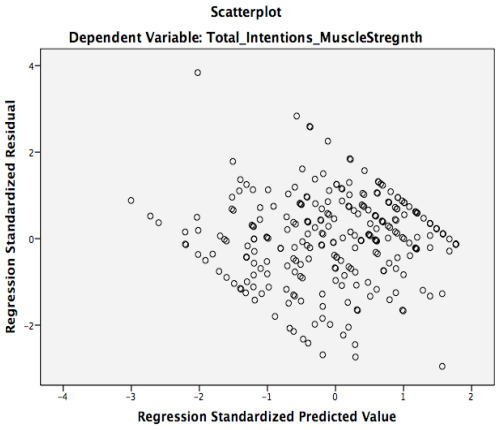
Females - Scatter Plot of the Regression Standardized Residuals for intentions predicted by perceived behavioral control, attitudes, and perceived norms



Males- Scatter Plot of the Regression Standardized Residuals for intentions predicted by injunctive norms, descriptive norms, instrumental attitudes, and experiential attitudes, capacity, and autonomy



Females- Scatter Plot of the Regression Standardized Residuals for intentions predicted by injunctive norms, descriptive norms, instrumental attitudes, and experiential attitudes, capacity, and autonomy



Determinants of Attitudes, Perceived Norms, and Perceived Behavioral Control

Attitudes: Belief Strength, Outcome Evaluation, Belief-Evaluation Product, and Correlations of Belief-Evaluation Product with Direct Attitude Measure.

Seven items evaluated behavioral beliefs and seven items evaluated the corresponding outcome evaluations. As previously discussed, each behavioral belief was multiplied by an outcome evaluation, and then correlated to total attitudes (TA), total instrumental attitudes (TIA), and total experiential attitudes (TEA).

For meeting the cardio recommendations, participants' beliefs about having a healthy heart, healthy weight, improved fitness, and health ($p \leq 0.001$ for men $p \leq 0.01$ for women) were the only items that had significant correlations with total attitudes, total instrumental attitudes, and total experiential attitudes. Being injured, having joint pain, and missing out on other important activities resulted in insignificant correlations. (Table 4.13).

For meeting the muscle strengthening recommendations, participants' beliefs about being healthy, strong, attractive, having a better mood, and being sore all had varied levels of significance ($p \leq 0.001$ and 0.05) with total attitudes, total instrumental attitudes (except for being sore for women), and total experiential attitudes for men and women. The other beliefs, being injured and missing out on other important activities, were significant with total experiential attitudes only ($p \leq 0.01$) for women and insignificant with total attitudes, total instrumental attitudes, and total experiential attitudes for men. (Table 4.14).

Table 4.13 Cardio - Indirect Attitudes: Behavioral Belief, Outcome Evaluation, Belief-Evaluation Product, and Correlations of Belief-Evaluation Product with Direct Attitude Measure

Behavioral Belief	Belief Strength (bb_i)		Outcome Evaluation (oe_i)		bb_i x oe_i		Correlation bb_ioe_i with		
	M	SD	M	SD	M	SD	TA	TIA	TEA
Getting the recommended amount of moderate to vigorous cardio exercise will make me/cause me…									
Males (n=120)									
…have a healthy heart	6.38	0.85	2.46	0.93	15.98	6.43	0.321***	0.326***	0.249**
…have a healthy weight	5.98	1.07	2.43	1.03	14.76	6.75	0.419***	0.294***	0.429***
…improve my fitness	6.53	0.74	2.28	1.30	15.14	8.61	0.417***	0.373***	0.364***
…healthy	6.08	1.02	2.45	0.94	15.07	6.47	0.375***	0.320***	0.340***
…to be injured	3.08	1.38	-1.45	2.00	-4.28	7.09	0.079	0.102	0.045*
…joint pain	3.30	1.37	-1.12	1.95	-3.97	6.96	-0.001	0.013	-0.012
…miss out on other important activities	3.08	1.50	-0.74	1.88	-2.97	6.41	0.133	0.167	0.079
Females (n=272)									
…have a healthy heart	6.55	0.70	2.61	0.75	17.19	5.44	0.261***	0.212***	0.233***
…have a healthy weight	6.17	1.04	2.62	0.89	16.37	6.14	0.256***	0.161**	0.270***
…improve my fitness	6.61	0.74	2.45	0.93	16.27	6.70	0.301***	0.161**	0.345***
…healthy	6.17	1.03	2.60	0.76	16.18	5.72	0.330***	0.232***	0.327***
…to be injured	3.18	1.37	-1.65	1.96	-5.49	6.99	-0.022	-0.095	0.051
…joint pain	3.58	1.58	-1.45	1.93	-5.43	7.71	-0.007	-0.080	0.062
…miss out on other important activities	3.22	1.62	-0.90	1.82	-3.73	6.77	0.041	-0.044	0.108

Note. Belief strength can range from 1 to 7 and outcome evaluation can range from -3 to 3, and bb x oe can range from -21 to 21. TA means total attitudes, TIA means total instrumental attitudes, and TEA means total experiential attitudes.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Table 4.14 Muscle Strengthening - Indirect Attitudes: Behavioral Belief, Outcome Evaluation, Belief-Evaluation Product, and Correlations of Belief-Evaluation Product with Direct Attitude Measure

Behavioral Belief	Belief Strength (bb_i)		Outcome Evaluation (oe_i)		bb_i x oe_i		Correlation $bb_i oe_i$ with		
	M	SD	M	SD	M	SD	TA	TIA	TEA
Getting the recommended amount of muscle strengthening exercise will make me/cause me…									
Males (n=120)									
…healthy	5.79	1.24	2.45	0.94	14.52	6.49	0.373***	0.421***	0.286***
…strong	6.43	0.90	1.81	1.46	12.36	9.44	0.636***	0.643***	0.545***
…attractive	5.80	1.34	1.80	1.52	11.41	9.14	0.363***	0.499***	0.209*
…have a better mood	5.65	1.57	2.07	1.25	12.72	7.54	0.552***	0.532***	0.492***
…to be injured	3.48	1.44	-1.45	2.00	-5.38	7.65	0.040	0.045	0.031
…to be sore	5.48	1.43	0.77	1.82	4.02	10.42	0.219*	0.207*	0.199*
…miss out on other important activities	3.51	1.79	-0.74	1.88	-3.25	7.50	0.158	0.116	0.169
Females (n=272)									
…healthy	6.01	1.08	2.60	0.76	15.86	5.72	0.361***	0.264***	0.358***
…strong	6.50	0.78	1.97	1.26	13.19	8.42	0.440***	0.304***	0.452***
…attractive	5.59	1.44	2.11	1.25	12.97	7.54	0.236***	0.138*	0.264***
…have a better mood	5.98	1.27	2.48	0.79	15.38	6.20	0.393***	0.224***	0.445***
…to be injured	3.27	1.55	-1.65	1.96	-5.76	6.93	0.070	-0.052	0.161**
…to be sore	5.72	1.33	0.81	1.78	4.44	10.71	0.236***	0.084	0.311***
…miss out on other important activities	3.62	1.69	-0.90	1.82	-4.18	7.24	0.103	0.006	0.164**

Note. Belief strength can range from 1 to 7 and outcome evaluation can range from -3 to 3, and bb x oe can range from -21 to 21. TA means total attitudes, TIA means total instrumental attitudes, and TEA means total experiential attitudes.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Injunctive Norms: Injunctive Normative Beliefs, Motivation to Comply, Belief-Comply Product, and Correlations of Belief-Comply Product with Direct Injunctive Measure.

Four items evaluated injunctive normative beliefs and another four items evaluated motivation to comply. Once multiplying the corresponding items to one another, that value was then correlated to total perceived norms (TPN) and total injunctive norms (TIN).

For meeting cardio recommendations, all four items, parents, friends, significant other, coach/personal trainer, were significantly correlated to total perceived norms and total direct measures of injunctive norms for women ($p \leq 0.001$). However, for men, coach/personal trainer did not significantly correlate but the other beliefs did ($p \leq 0.05$). The correlations can be found below in Table 4.15.

For meeting muscle strengthening recommendations, all four items were again significantly correlated to total perceived norms and total direct measures of injunctive norms for women ($p \leq 0.01$). However, for men, coach/personal trainer did not correlate with either, and friends was only significantly correlated with total direct measures of injunctive norms ($p \leq 0.01$). The correlations can be found below in Table 4.16.

Table 4.15 Cardio - Injunctive Norms: Injunctive Normative Beliefs, Motivation to Comply, Belief-Comply Product, and Correlations of Belief-Comply Product with Direct Injunctive Measure

Normative Belief		Injunctive Normative Beliefs (inb_i)		Motivation to Comply (mtc_i)		inb_i x mtc_i		Correlation inb_imtc_i	
	n	M	SD	M	SD	M	SD	TPN	TIN
Males									
Parents	111	5.06	1.61	0.11	1.88	1.85	9.87	0.310***	0.393***
Friends	111	4.77	1.53	-0.03	1.78	1.43	8.55	0.230*	0.346***
Significant other	57	4.72	1.57	0.38	2.07	3.94	9.37	0.464***	0.521***
Coach/Personal trainer	30	5.43	1.80	0.47	2.06	5.62	9.57	0.228	0.304
Females									
Parents	266	5.48	1.44	0.73	1.80	5.33	9.99	0.370***	0.440***
Friends	264	4.62	1.55	0.03	1.74	1.42	8.72	0.291***	0.342***
Significant other	148	5.36	1.61	1.10	1.85	7.52	9.88	0.278***	0.394***
Coach/Personal trainer	70	6.01	1.53	1.51	1.74	10.99	9.25	0.397***	0.503***

Note. Injunctive normative beliefs can range from 1 to 7 and motivation to comply can range from -3 to 3, and inb x mtc can range from -21 to 21. TPN means total perceived norms and TIN means total injunctive norms.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Table 4.16 Muscle Strengthening - Injunctive Norms: Injunctive Normative Beliefs, Motivation to Comply, Belief-Comply Product, and Correlations of Belief-Comply Product with Direct Injunctive Measure

Normative Belief		Injunctive Normative Beliefs (inb_i)		Motivation to Comply (mtc_i)		inb_i x mtc_i		Correlation inb_imtc_i	
	n	M	SD	M	SD	M	SD	TPN	TIN
Males									
Parents	111	4.61	1.83	0.11	1.88	1.63	8.66	0.260**	0.359***
Friends	111	4.86	1.55	-0.03	1.78	0.82	8.13	0.183	0.286**
Significant other	57	4.96	1.59	0.38	2.07	4.82	8.77	0.403**	0.423**
Coach/Personal trainer	30	5.69	1.51	0.47	2.06	7.04	8.73	0.129	0.337
Females									
Parents	266	4.69	1.76	0.73	1.80	4.92	8.88	0.303***	0.348***
Friends	264	4.24	1.61	0.03	1.74	1.62	7.88	0.205***	0.256***
Significant other	148	5.02	1.74	1.10	1.85	7.24	9.53	0.264***	0.323***
Coach/Personal trainer	70	5.90	1.61	1.51	1.74	11.39	9.32	0.339**	0.350**

Note. Injunctive normative beliefs can range from 1 to 7 and motivation to comply can range from -3 to 3, and inb x mtc can range from -21 to 21. TPN means total perceived norms and TIN means total injunctive norms.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Descriptive Norms: Descriptive Normative Beliefs, Identification with Referents, Belief-Referents Product, and Correlations of Belief-Referents Product with Direct Descriptive Measure.

Seven items evaluated descriptive normative beliefs and another seven items evaluated identification with referents. Once multiplying the corresponding items to one another, that value was then correlated to total perceived norms (TPN) and direct measures of total descriptive norms (TDN).

For meeting cardio recommendations, Table 4.17 depicts the following items as being significantly correlated to total perceived norms and total descriptive norms for men; athletes, fit people, and healthy people at $p \leq 0.001$ with a positive correlation and elderly people at $p \leq 0.05$ with a negative correlation. Men also have a significant negative correlation with the belief overweight/obese people and total descriptive norms ($p \leq 0.05$). Athletes, fit people, and healthy people were also significantly and positively correlated with total perceived norms and total descriptive norms for women ($p \leq 0.001$). Overweight/obese people had a negative significant correlation with total perceived norms and total descriptive norms ($p \leq 0.01$), and young adults had a positive significant correlation with total perceived norms for women ($p \leq 0.05$).

For meeting muscle strengthening recommendations, Table 4.18 depicts athletes, body builders, and men as being significantly correlated to total perceived norms and total descriptive norms for men and women ($p \leq 0.05$). Men also had a negative significant correlation for elderly people with total descriptive norms ($p \leq 0.05$), and women had a positive significant correlation for young adults with total perceived norms and total descriptive norms ($p \leq 0.05$).

Table 4.17 Cardio - Descriptive Norms: Descriptive Normative Beliefs, Identification with Referents, Belief-Referents Product, and Correlations of Belief-Referents Product with Direct Descriptive Measure

Normative Belief	Descriptive Normative Beliefs (dnb_i)		Identification with Referents (iwr_i)		dnb_i x iwr_i		Correlation $dnb_i iwr_i$	
	M	SD	M	SD	M	SD	TPN	TDN
Males (n=120)								
Athletes	6.61	0.70	-0.14	2.00	-1.03	13.30	0.405***	0.483***
Fit people	5.93	1.07	0.63	2.01	3.88	12.18	0.422***	0.475***
Healthy people	5.32	1.23	0.92	1.64	5.49	9.13	0.307***	0.373***
Young adults	3.26	1.16	0.35	1.48	1.34	5.23	-0.016	-0.007
Elderly people	2.53	0.99	-2.32	0.95	-5.61	3.14	-0.207*	-0.238**
Overweight/obese people	1.71	0.94	-2.10	1.58	-3.33	3.33	-0.127	-0.222*
Busy people	2.89	1.05	-0.35	1.66	-0.38	4.79	-0.001	-0.045
Females (n=272)								
Athletes	6.69	0.66	-0.73	1.19	-4.68	12.84	0.333***	0.409***
Fit people	6.23	0.86	0.25	1.88	1.84	12.10	0.344***	0.385***
Healthy people	5.61	1.05	0.85	1.64	4.72	9.72	0.323***	0.317***
Young adults	3.34	1.30	0.65	1.64	2.68	6.31	0.135*	0.087
Elderly people	2.51	1.19	-2.04	1.34	-4.72	4.14	-0.110	-0.096
Overweight/obese people	1.93	1.15	-2.02	1.39	-3.39	3.69	-0.165**	-0.168**
Busy people	2.82	1.26	0.54	1.71	1.95	5.38	-0.016	-0.053

Note. Descriptive normative beliefs can range from 1 to 7 and identification with referents can range from -3 to 3, and dnb x iwr can range from -21 to 21. TPN means total perceived norms and TDN means total descriptive norms.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Table 4.18 Muscle Strengthening - Descriptive Norms: Descriptive Normative Beliefs, Identification with Referents, Belief-Referents Product, and Correlations of Belief-Referents Product with Direct Descriptive Measure

Normative Belief	Descriptive Normative Beliefs (dnb_i)		Identification with Referents (iwr_i)		dnb_i x iwr_i		Correlation $dnb_i iwr_i$	
	M	SD	M	SD	M	SD	TPN	TDN
Males (n=120)								
Athletes	6.42	0.87	-0.14	2.00	-1.11	13.01	0.381***	0.430***
Body builders	6.71	0.69	-1.10	1.86	-7.44	12.51	0.313***	0.395***
Men	3.90	1.34	0.30	1.49	2.11	6.38	0.264**	0.231*
Young adults	3.45	1.10	0.35	1.48	1.69	5.23	-0.027	-0.038
Elderly people	2.13	1.07	-2.32	0.95	-4.58	2.99	-0.177	-0.193*
Overweight/obese people	1.67	0.91	-2.10	1.58	-3.18	3.44	-0.099	-0.179
Busy people	2.70	1.03	-0.35	1.66	-0.35	4.42	0.046	-0.014
Females (n=272)								
Athletes	6.54	0.87	-0.73	1.19	-4.63	12.53	0.404***	0.444***
Body builders	6.70	0.92	-2.04	1.49	-13.54	10.50	0.341***	0.395***
Men	4.62	1.30	-1.51	1.63	-6.80	8.32	0.218***	0.200**
Young adults	3.42	1.08	0.65	1.64	2.47	5.91	0.164**	0.147*
Elderly people	2.00	1.04	-2.04	1.34	-3.59	3.40	-0.084	-0.058
Overweight/obese people	1.79	1.02	-2.02	1.39	-3.06	3.11	-0.097	-0.103
Busy people	2.79	1.08	0.54	1.71	2.01	5.02	0.005	0.008

Note. Descriptive normative beliefs can range from 1 to 7 and identification with referents can range from -3 to 3, and dnb x iwr can range from -21 to 21. TPN means total perceived norms and TDN means total descriptive norms.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Perceived Behavioral Control: Control Beliefs, Perceived Power, Belief-Power Product, and Correlations of Belief-Power Product with Direct PBC Measure.

Five items evaluated control beliefs and another five items evaluated perceived power. Once multiplying the corresponding items to one another, that value was then correlated to total PBC (TPBC) and direct measures of total capacity (CAP) and total autonomy (AUT).

For meeting cardio recommendations, the only item to have a significant correlation for men was "having other important activities to do" with total PBC, total capacity, and total autonomy ($p \leq 0.001$). For women, "having access to a place to do cardio," "having other important activities to do," and "having an illness" all had a significant correlation with total PBC, total capacity, and total autonomy ($p \leq 0.05$). "Having friends to exercise with" significantly correlated with total capacity ($p \leq 0.05$), and "having an injury" significantly correlated with total PBC and total autonomy ($p \leq 0.05$). (Table 4.19)

For meeting muscle strengthening recommendations, "having access to a place to do muscle strengthening," "having other important activities to do," and "having an injury" were significantly correlated with total PBC and total capacity for men ($p \leq 0.01$). "Having other important activities to do" also significantly correlated with total autonomy, and "having an injury" correlations were all negative. Women had positive significant correlations for "having access to a place to do muscle strengthening," "having friends to exercise with," "having other important activities to do," and "having an illness" with total PBC, total autonomy (except for "having an illness"), and total capacity ($p \leq 0.05$). (Table 4.20)

Table 4.19 Cardio - Perceived Behavioral Control: Control Beliefs, Perceived Power, Belief-Power Product, and Correlations of Belief-Power Product with Direct Perceived Behavioral Control Measure

Control Belief	**Control Beliefs** (cb_i)		**Perceived Power** (pp_i)		cb_ipp_i		**Correlation** cb_ipp_i **with**		
	M	**SD**	**M**	**SD**	**M**	**SD**	**TPBC**	**CAP**	**AUT**
Males (n=120)									
Having access to a place to do cardio.	6.44	1.34	1.28	1.83	8.68	12.14	0.063	0.0122	-0.039
Having friend(s) to exercise with.	4.37	2.24	0.69	2.00	4.46	9.12	-0.101	-0.102	-0.068
Having other important activities to do.	5.79	1.43	-1.07	1.77	-7.08	10.9	0.238***	0.329***	0.339***
Having an injury.	2.30	1.51	-2.07	1.21	-4.56	4.54	-0.020	-0.068	0.054
Having an illness.	2.17	1.18	-1.87	1.31	-4.10	3.81	0.055	0.018	0.091
Females (n=272)									
Having access to a place to do cardio.	6.64	0.95	1.94	1.45	13.34	9.65	0.206***	0.224***	0.122*
Having friend(s) to exercise with.	4.47	2.10	1.53	1.87	7.78	9.46	0.068	0.118*	-0.010
Having other important activities to do.	5.89	1.36	-1.61	1.49	-10.22	9.43	0.327***	0.355***	0.195***
Having an injury.	1.92	1.30	-2.13	1.31	-3.83	3.95	0.141*	0.103	0.140*
Having an illness.	2.15	1.41	-1.99	1.39	-4.34	4.71	0.187**	0.129*	0.196***

Note. Control beliefs can range from 1 to 7, perceived power can range from -3 to 3, and cb x pp can range from -21 to 21. TPBC means total perceived behavioral control.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Table 4.20 Muscle Strengthening - Perceived Behavioral Control: Control Beliefs, Perceived Power, Belief-Power Product, and Correlations of Belief-Power Product with Direct Perceived Behavioral Control Measure

Control Belief	**Control Beliefs** (cb_i)		**Perceived Power** (pp_i)		cb_ipp_i		**Correlation** cb_ipp_i **with**		
	M	**SD**	**M**	**SD**	**M**	**SD**	**TPBC**	**CAP**	**AUT**
Males (n=120)									
Having access to a place to do muscle strengthening.	6.28	1.40	1.89	1.76	12.50	11.40	0.322***	0.382***	0.142
Having friend(s) to exercise with.	4.37	2.24	0.88	1.92	5.36	8.91	0.099	0.082	0.092
Having other important activities to do.	5.79	1.43	-0.72	1.96	-4.98	11.86	0.322***	0.277**	0.286**
Having an injury.	2.30	1.51	-1.83	1.51	-3.85	4.65	-0.252**	-0.272**	-0.149
Having an illness.	2.17	1.18	-1.33	1.72	-3.05	4.10	-0.104	-0.083	-0.101
Females (n=272)									
Having access to a place to do muscle strengthening.	6.48	1.10	1.86	1.49	12.47	10.12	0.465***	0.456***	0.317***
Having friend(s) to exercise with.	4.47	2.10	1.43	1.81	7.43	8.98	0.221***	0.225***	0.141*
Having other important activities to do.	5.89	1.36	-0.97	1.69	-6.61	10.37	0.367***	0.373***	0.235***
Having an injury.	1.92	1.30	-1.83	1.59	-3.40	3.94	0.076	0.042	0.095
Having an illness.	2.15	1.41	-1.57	1.65	-3.59	4.80	0.128*	0.089	0.134*

Note. Control beliefs can range from 1 to 7, perceived power can range from -3 to 3, and cb x pp can range from -21 to 21. TPBC means total perceived behavioral control.
*Significant ***p≤0.001, **p≤0.01, *p≤0.05.

Logistic regression models predicting meeting physical activity recommendations

There are four models of logistic regression on Table 4.21, one for each gender and each physical activity recommendation (cardio and muscle strengthening). Logistic regression was used because of the dichotomous variables meeting and not meeting the recommended amount of physical activity (cardio and muscle strengthening) every week in the last month.

Model 1 evaluated men meeting the weekly cardio recommendations. The model successfully predicted 19.7% of the sample meeting and not meeting recommendations. Intentions was the only significant predictor for meeting the weekly cardio recommendations (B=-0.460, Wald=12.076, p=0.001).

Model 2 evaluated women meeting the weekly cardio recommendations. The model successfully predicted 13.6% of the sample meeting and not meeting recommendations. Intentions was the only significant predictor for meeting the weekly cardio recommendations (B=-0.361, Wald=12.215, p=0.001).

Model 3 evaluated men meeting the weekly muscle strengthening recommendations. The model successfully predicted 29% of the sample meeting and not meeting recommendations. Intentions was the only significant predictor for meeting the weekly muscle strengthening recommendations (B=-0.544, Wald=8.102, $p \leq 0.001$).

Model 4 evaluated women meeting the weekly cardio recommendations. The model successfully predicted 31.6% of the sample meeting and not meeting recommendations. Intentions was the only significant predictor for meeting the weekly muscle strengthening recommendations (B=-0.715, Wald=20.372, p=0.001).

Table 4.21 Models of Logistic Regression for meeting and not meeting physical activity recommendations with the Integrative Behavioral Model constructs

Type of PA (Gender)	Omnibus Model	-2 L-L	H-L Test	%	N-R^2	B	SE	Wald	Sig	Exp(B)	95% CI
Model 1											
Cardio (Male)	18.907	143.392	5.334	70.0	0.197						
Intentions						-0.460	0.132	12.076	0.001***	0.631	[0.487, 0.818]
PBC						0.089	0.311	0.082	0.775	1.093	[0.594, 2.010]
Skills						-0.048	0.223	0.046	0.831	0.953	[0.616, 1.477]
Environment						-0.094	0.146	0.415	0.520	0.911	[0.685, 1.211]
Constant						0.352	1.185	0.088			
Model 2											
Cardio (Female)	29.269	345.314	10.625	62.1	0.136						
Intentions						-0.361	0.103	12.215	0.001***	0.697	[0.570, 0.854]
PBC						-0.146	0.158	0.847	0.357	0.864	[0.634, 1.179]
Skills						0.016	0.137	0.013	0.909	1.016	[0.776, 1.329]
Environment						-0.018	0.084	0.045	0.832	0.982	[0.834, 1.158]
Constant						0.402	0.854	0.222			
Model 3											
MM (Male)	27.046	116.011	7.430	72.5	0.290						
Intentions						-0.544	0.191	8.102	0.004***	0.580	[0.399, 0.844]
PBC						-0.101	0.348	0.084	0.772	0.904	[0.457, 1.789]
Skills						-0.275	0.291	0.896	0.344	0.759	[0.429, 1.343]
Environment						-0.215	0.134	2.576	0.108	0.807	[0.621, 1.049]
Constant						4.129	1.739	5.635			
Model 4											
MM (Female)	64.405	234.736	4.170	79.4	0.316						
Intentions						-0.715	0.158	20.372	0.001***	0.489	[0.358, 0.667]
PBC						0.013	0.244	0.003	0.958	1.013	[0.628, 1.634]
Skills						-0.178	0.198	0.805	0.370	0.837	[0.568, 1.235]
Environment						-0.100	0.105	0.900	0.343	0.905	[0.736, 1.112]
Constant						3.277	1.160	7.978			

*-2 L-L = -2 Log Likelihood; H-L = Hosmar and Lemeshow; % = classification table of overall percent of dependent variables predicted by independent variables; N-R^2 = Nagelkerke's R^2; CI = confidence interval for Exp(B)

Summary

These results support that the instrument was internally consistent and valid, however results did not support the test-retest reliability of the survey. Contrary to what was expected, there were no significant differences between males and females with regards to meeting either of the physical activity requirements. There were also few significant differences between genders for the means of each of the variables (except for autonomy for cardio and muscle strengthening and descriptive norms for cardio). The regression models showed that the only significant predictor of meeting either weekly exercise requirements for both genders was intentions. The most influential predictors of intentions for meeting cardio requirements for men and women were PBC, perceived norms, and attitudes (in that order), but when using the sub-constructs in the model, capacity, experiential attitudes, and descriptive norms were the most influential for men, and capacity, experiential attitudes, descriptive norms, and injunctive norms were the most influential for women. The most influential predictors of intentions for meeting muscle strengthening requirements for men were attitudes, PBC, and perceived norms, and when using the sub-constructs in the model, capacity, experiential attitudes, descriptive norms, and instrumental attitudes become the most influential predictors. The most influential predictors of intentions for meeting muscle strengthening requirements for women were PBC, perceived norms, and attitudes, and when using the sub-constructs in the model, capacity, experiential attitudes, and descriptive norms became the most influential predictors. The determinants of attitudes, perceived norms, and PBC using indirect measures varied some between genders with some belief and value items being more important for one gender than the other.

Chapter 5: Discussion

Introduction

Research documenting social and behavioral determinants of physical activity has been ongoing for decades, but most research has focused on aerobic or cardio exercise and little involves muscle strengthening activities. The research on cardio has also not been consistent. For example, when measuring cardio activity some studies measure only minutes of cardio (Beville, et al. 2014), others measure how often one went to the gym (Armitage, 2005), and others measure whether individuals are meeting and not meeting recommendations (Blanchard, et al. 2007 & Blanchard, et al. 2008). The interpretations of each are also inconsistent across studies.

Gender differences in physical activity have also been evaluated in some studies but rarely while including cardio and muscle strengthening physical activity. Also, little research has been done using the Integrative Behavior Model (IBM). The purpose of this study was to explore the differences in aerobic and muscle strengthening behaviors between male and female college students using the IBM. Since an instrument measuring all aspects of the IBM for both cardio and muscle strengthening physical activity had not been developed yet, the authors of the current study created one, and an evaluation of its reliability and validity will be discussed in this section. This section will also discuss a new meta-analysis of the IBM, the outcome of the research hypotheses, limitations to the study, recommendations for future interventions and programs as well as future research, and the study conclusions.

Evaluation of Instrument Reliability and Validity

Since no instrument has fully used the IBM with both cardio and muscle strengthening exercise, a survey instrument had to be developed for this study. The survey questions for the IBM constructs were developed using the guidelines outlined by Martin Fisbein and Icek Ajzen (2010) and the behavior questions were developed using the 2008 BRFSS questionnaire and the Office of Disease Prevention and Health Promotion (ODPHP) (2016) recommendations for weekly exercise. Since this was a new survey instrument, its validity and reliability had to be tested. Face and content validity were confirmed by a panel of 6 experts (two experts of the IBM, two experts on the college population and physical activity, and two experts in survey development). After implementing the survey, the internal consistency was evaluated for each scale. The Cronbach's alpha coefficients supported the internal validity of the scales (all scales $\alpha>0.7$ except for autonomy for both the cardio and muscle strengthening portions of the survey and descriptive norms for the muscle strengthening portion only). Results from test-retest reliability were mostly poor however, as most scales contained a Pearson's (r) value of <0.7. As previously stated, the paper-pencil pre and post-tests were given two weeks apart from each other to a sample of 73 students. Two major events that occurred around this time could have impacted results. First, Thanksgiving fell within that two-week period between tests, which could have interrupted physical activity times, intentions, and attitudes. Second, the post-test was taken two weeks before finals week, which again could have changed students' physical activity times, intentions, and attitudes. The test-retest reliability of this survey should be re-examined

in future research, when participants are not likely to change physical activity patterns. If results remain consistent, the survey may need modification.

To evaluate construct validity, factor analysis using the maximum likelihood method was used, and showed that the indicator variables loaded correctly on the predicted variables. All factor loadings ranged from 0.313 to 0.996 (over half of those factor loadings being ≤0.7) and for each scale only one Eigenvalue (for the predicted variable) greater than 1 was produced, indicating a one-factor solution.

Review of Meta-Analysis

Between the time the literature review for this study was written and the data analysis ended, a new meta-analysis over the Reasoned Action Approach (RAA), another name for the IBM, was published that included articles not included in Chapter 2. Since the review of this relevant meta-analysis could not be covered in the original literature review, it will be reviewed here and then compared with the results of this current study.

The meta-analysis reviewed all articles that included physical activity behaviors and other behaviors using the Theory of Planned Behavior, RAA, or IBM (McEachan, et al. 2016). The studies had to include measures of all the direct constructs and at least one pair of sub-constructs for either attitude, perceived norms, or perceived behavioral control (PBC). Studies of all age groups were accepted and all studies had to be prospective. The behaviors were split into three groups; risk, protection/preventative, and other behaviors. Physical activity was one of the five protection/preventative behaviors and therefore the analyses of the protection behaviors is what will be discussed here. A total of 41 studies reviewed physical activity and of those only 9 used

the complete model of the IBM/RAA (not including indirect beliefs measurements, skills, or environment).

Researchers ran meta-analysis correlation estimates for intentions and behaviors with each of the IBM/RAA constructs (intentions, experiential attitudes instrumental attitudes, injunctive norms, descriptive norms, autonomy, and capacity) (McEachan, et al. 2016). As mentioned before in the literature review, the only constructs that should be correlated with behavior are intentions, PBC, skills, and environment. Running correlation tests between behaviors and all other constructs of the IBM is a common mistake seen here and in the previous studies mentioned in the literature review. Experiential attitude (r_+=0.546) and capacity (r_+=0.598) had the largest correlations with intentions compared to the other constructs with intentions, and intentions (r_+=0.481), experiential attitude (r_+=0.299), and capacity (r_+=0.388) had the largest correlations with behavior compared to the other constructs with behavior (McEachan, et al. 2016). Multiple regression analyses were also completed to evaluate which constructs, predicted intention and behavior best by explaining the most variance. The results concluded that experiential attitudes, instrumental attitudes, injunctive norms, descriptive norms, and capacity, on average, explain 58.7% of the variance when predicting intentions [R^2=0.587; F(6,3983)=942.4; p<0.001]. Also, intentions and capacity, on average, explain 30.9% of the variance in predicting behavior [R^2=0.309; F(3,3986)=595.1; p<0.001]. Autonomy was removed from both models because it was not significant when predicting intentions or behavior. Also, it seems each of the sub-construct pairs had a construct that was more prominent in its relationship with intentions than its cohort. For example, experiential attitude had a significantly greater

correlation with intentions than instrumental attitude, injunctive norms had a significantly greater correlation with intentions than descriptive norms, and capacity had a significantly greater correlation with intentions than autonomy.

Results of Hypotheses Tests

Gender differences (Hypotheses 1-7)

The first 3 hypotheses stated that men would meet the recommended amounts of cardio, muscle strengthening, and both types of physical activity significantly more than women would. However, Table 4.8 revealed that this was not the case in this study, as no significant differences between men and women for meeting any of the physical activity recommendations were detected. Most of the reviewed studies did not evaluate gender differences, but of those that did, three showed a significant difference between males and females participation in physical activity (Beville, et al. 2014; Bryan and Rocheleau, 2002; and Nehl, et al. 2012). However, one study by Blanchard, et al. (2008) did not show any gender differences in aerobic physical activity participation, muscle strengthening was not measured. Also, the 2011 BRFSS data reviewed to develop the physical activity questions for the survey of this current study, revealed some differences in meeting physical activity requirements [23.4% of males met muscle strengthening and cardio (95% CI 23.0-23.8) and 17.9% of females met muscle strengthening and cardio (95% CI 17.6-18.2) (n=453,721); 34.4% of males met muscle strengthening (95% CI 34.0-34.9) and 24.5% of females met muscle strengthening (95% CI 24.1-24.8) (n=469,312); and 53.1% of males met cardio (95% CI 52.6-53.5) and 50.2% of females met cardio (95% CI 49.8-50.6) (n=458,088)] (CDC, 2013). There was no report of actual t-tests run on the BRFSS data to show significant differences

between men and women, but observing the percentages and confidence intervals for meeting both recommendations and muscle strengthening recommendations, one could see potential for significant differences. There did not seem to be much of a difference between genders for meeting cardio recommendations.

Although the current study did not reveal any significant gender differences in meeting physical activity recommendations, it should be taken into consideration that each study measured physical activity differently (mainly observing minutes of physical activity rather than whether or not a person was meeting the recommendations) and only one study measured muscle strengthening. Also, it is important to note that our percentages for meeting the aerobic physical activity recommendations were similar to the BRFSS results, which is an indication that our physical activity data is likely accurate. However, the current study had lower percentages over all for meeting muscle strengthening and both physical activity recommendations compared to the BRFSS data, which is most likely because the muscle strengthening questions were more stringent in this study (how many days a week do you do muscle strengthening for each of these muscle groups; arms, legs, hips, abdomen, back, shoulders, and chest) compared to the BRFSS question (how many days a week do you do muscle strengthening) which is important because the recommendations state that one should do muscle strengthening for each of these muscle groups twice a week, not just do muscle strengthening twice a week. Table 5.1 compares the physical activity percentages of this study and the BRFSS study.

Table 5.1 Comparisons of the percent of people that met the physical activity recommendations between the current study and the 2011 BRFSS study

	Met Cardio Recommendations		Met Muscle Strengthening Recommendations		Met both Cardio and Muscle Strengthening Recommendations	
Current study	56%	n=392	25%	n=392	17%	n=392
BRFSS 2011	51.6%	n=458,088	29.3%	n=469,312	20.6%	n=453,721

Hypotheses 4 and 5 stated that there would be significant differences between men and women in intentions, skills, and environmental constraints towards meeting each of the physical activity recommendations, since there were no differences as seen in Tables 4.9 and 4.10, we have failed to reject the null for hypotheses 4 and 5. None of the studies evaluating gender differences in physical activity measured environmental constraints or skills. Nehl, et al. (2012) also found no significant differences between genders for intentions. Conversely, Beville, et al. (2014) found that men scored significantly higher on intentions than women. Both of these studies measured only cardio based physical activity. The last two studies that looked at gender differences did not compare the mean differences between genders for each of the IBM theory items (Bryan and Rocheleau, 2002 and Blanchard, et al. 2008).

Hypotheses 6 and 7 stated that there would be significant differences between men and women in attitudes, perceived norms and PBC towards meeting each of the physical activity recommendations. Although there were some differences found for both types of physical activity between genders, not all of the constructs were significantly different, therefore the null for hypothesis 6 and 7 failed to be rejected. For cardio, females scored significantly higher on perceived and injunctive norms, and for muscle strengthening, males scored significantly higher on PBC and capacity. Beville, et al. (2014), found that men scored significantly higher on attitudes, descriptive norms,

PBC, and capacity than women did, which does not line up with the results found in this current study, since the Beville, et al. (2014) results only involve cardio behavior. They also found that men scored significantly lower on injunctive norms, which does match the results found in this current study. Nehl, et al. (2012) found that men scored significantly higher on capacity, which would be relevant to the current study had Nehl, et al not measured cardio only. Again, the studies by Bryan and Rocheleau (2002) and Blanchard, et al (2008) did not measure any differences with constructs between genders.

IBM constructs as predictors of physical activity behaviors and intentions (Hypotheses 8-11)

Hypotheses 8 and 9 stated that intentions, PBC, skills and environment would collectively have a significant relationship towards meeting each of the weekly recommendations for physical activity (cardio and muscle strengthening). The null hypotheses failed to be rejected based off the logistic regression analyses shown in Table 4.21 of the results section. However, although the constructs collectively predicted behavior, only intentions emerged significant for predicting meeting the weekly recommendations for either physical activity across genders. Intentions accounted for 19.7% of the variance in cardio physical activity for men and 13.6% for women. The significance of intentions went up for both genders when accounting for the variance in muscle strengthening physical activity with 29% of the variance accounted for with men and 31.6% for women. Any studies that used constructs other than intentions, PBC, skills, and environment to predict behavior (which is most of them) will still be mentioned but the other constructs will not be included since they are

not supposed to be used to predict behavior. The meta-analysis reviewed along with most of the other reviewed studies, found that intentions was a significant predictor of behavior (the meta-analysis reviewed multiple protective behaviors) (McEachan, et al. 2016; Beville, et al. 2014; Patterson, Meyer, & Beville, 2015; Bryan & Rocheleau, 2002; Armitage, 2005; Blanchard, et al. 2007; Blanchard, et al. 2008). Some studies found that PBC was also a significant predictor of physical activity behavior (Beville, et al. 2014; Bryan & Rocheleau, 2002; Armitage, 2005; Blanchard, et al. 2008). Two studies found that neither intentions nor PBC were significant predictors of physical activity behavior (Wing Kwan, et al. 2009 and Nehl, et al. 2012). It should be noted that the Nehl, et al. (2012) study evaluated multiple constructs to predict physical activity, including race, gender, and constructs from the social cognitive theory.

Hypotheses 10 and 11 stated that attitudes, perceived norms, and PBC will collectively have a significant relationship with intentions for meeting each of the weekly recommendations for physical activity (cardio and muscle strengthening). When not including the subcomponents of each of these constructs (instrumental and experiential attitudes, injunctive and descriptive norms, and capacity and autonomy), we reject the null because as seen in Tables 4.11 and 4.12, the multiple linear regressions show that each construct was significant in predicting intentions (range of variance accounted for being 43.6% to 57.4%). Any studies that used constructs other than attitudes, perceived norms, and PBC will still be mentioned but the other constructs will not be included since they are not supposed to be used to predict intentions according to the IBM. Any studies that used the subcomponents to predict intentions will be mentioned in the next paragraph. The only study that used all three

constructs, attitudes, perceived norms, and PBC, to predict intentions found them to all be significant (Bryan & Rocheleau, 2002). Multiple studies only found attitudes and PBC significantly predicted intentions. This may be due to how the norms construct was evaluated: typically, researchers only evaluated injunctive (subjective) norms, rather than perceived norms (Armitage, 2005; Blanchard, et al. 2007; Blanchard, et al. 2008; and Wing Kwan, et al. 2009).

When including the subcomponents of the constructs predicting intentions, only the following were significant in this current study: experiential attitudes, descriptive norms, and capacity when predicting intentions for cardio in males and for muscle strengthening in females; experiential attitudes, injunctive norms, descriptive norms, and capacity when predicting intentions for cardio in females; and instrumental attitudes, experiential attitudes, descriptive norms, and capacity when predicting intentions for muscle strengthening in males. In the McEachan, et al. (2016) meta-analysis, experiential attitudes, instrumental attitudes, injunctive norms, descriptive norms, and capacity were significant predictors of intentions. Multiple studies also found injunctive norms to be significant when predicting intentions for cardio (Armitage, 2005; Blanchard, et al. 2007; Blanchard, et al. 2008; and Wing Kwan, et al. 2009). The Blanchard, et al studies (2007 and 2008) also found experiential and instrumental attitudes to be significant predictors of cardio intentions. All of these studies support the current study results in some way except for the Blanchard, et al studies (2007 and 2008) with regards to instrumental attitudes. In the current study, instrumental attitudes were only significant for men's intentions for muscle strengthening, but the Blanchard studies only observed cardio physical activity

behaviors (Blanchard, et al. 2007 and Blanchard, et al. 2008). Injunctive norms and instrumental attitudes were only significant for predicting intentions once and on separate occasions, and autonomy was never significant when predicting intentions, which poses the question, are these constructs necessary when predicting intentions for physical activity behavior. Considering the results from this current study and past studies, there are arguable reasons to continue using injunctive norms and instrumental attitudes when predicting intentions towards doing physical activity. However, there is no evidence here to support the continual use of autonomy to predict intentions. Although autonomy was not observed in the original literature review, it was used in this study and in the meta-analysis and it was not significant in either of them (McEachan, et al. 2016).

Correlations between the IBM indirect constructs (belief-evaluation products) and their subsequent direct constructs and sub-constructs (Hypotheses 12-19)

Only one of the studies in the literature review used the indirect belief constructs of the IBM (behavioral beliefs, normative beliefs, and control beliefs), however, the study did not also use the indirect evaluation constructs, which limits the interpretation of the study because a belief-evaluation product was used in this current study (Blanchard, et al. 2007). Therefore, the Blanchard, et al. (2007) study results will not be compared to the current studies in this section. The meta-analysis reviewed earlier included some studies that looked at indirect constructs but the results of those were not reviewed in the final analysis. There are no reviewed studies that will be compared to this current study in the rest of this section.

Hypotheses 12 and 13 stated that the product of each behavioral belief and outcome evaluation would have a significant relationship with attitudes for each gender for meeting each of the physical activity recommendations (cardio and muscle strengthening). In this current study, the 'attitudes' that the product needed to have a significant correlation with were total attitudes (TA), total instrumental attitudes (TIA), and total experiential attitudes (TEA). Results in Table 4.13 and 4.14 show that these hypotheses cannot be accepted because not all belief-evaluation products were significant with total attitudes, total instrumental attitudes, or total experiential attitudes, so the null hypotheses were accepted. The significant belief-evaluation products were the same for males and females with regards to cardio but there were some variances in regards to muscle strengthening. The only insignificant items for the cardio section were the belief-evaluation products measuring the indirect experiential attitudes construct. A closer examination of Table 4.13 shows that the belief strengths and outcome evaluations for those survey items were very neutral (bb_i means=3.08 to 3.30 and oe_i means=-0.74 to -1.45) and therefore relatively unimportant to the participants. These items could be removed from the study without affecting the results of the total direct measurements of attitudes. There were some other insignificant items for men in the muscle strengthening portion of the survey ("to be injured" and "to miss out on other important activities"), but unless this survey was going to be given to men only these items should remain since they were significant for the females for TEA. Although, these items were not significant for females for TA they are still important because of their relationship with TEA because experiential attitudes was earlier

revealed to be a significant predictor of intentions for males and females for both cardio and muscle strengthening physical activity.

Hypotheses 14 and 15 stated that the product of each injunctive normative belief and motivation to comply will have a significant relationship with perceived norms for meeting the recommended amount of physical activity (cardio and muscle strengthening) for male and female college students. Although the product of each injunctive normative belief and motivation to comply did have a significant relationship with total perceived norms (TPN) and total injunctive norms (TIN) for meeting the recommended amount of physical activity (cardio and muscle strengthening) for women, it was not so for men, as seen in Tables 4.15 and 4.16. Therefore, the null hypotheses were accepted. All of these items had a "not applicable" response choice resulting in a drop of measurable responses to these items. Only 30 men for each physical activity section answered the injunctive normative belief item and subsequent motivation to comply item regarding one's coach or personal trainer. This number was not sufficient for revealing a significant correlation with TPN and TIN and therefore the items should not be removed from the survey unless future survey analyses showed that the items were insignificant with a larger male sample size and the survey was given to men only.

Hypotheses 16 and 17 stated that the product of each descriptive normative belief and identification with referent would have a significant relationship with perceived norms for meeting the recommended amount of physical activity (cardio and muscle strengthening) for male and female college students. The null hypotheses had to be accepted because not all of the belief-evaluation products were significantly

correlated to either total perceived norms (TPN) or total descriptive norms (TDN), as seen in Tables 4.17 and 4.18. Men and women had significant belief-evaluation products with TPN and TDN for athletes, fit people and healthy people in regards to meeting the cardio physical activity recommendations, and athletes, body builders, and men in regards to meeting the muscle strengthening physical activity recommendations. The significance of the belief-evaluation products with TPN and TDN here varied greatly across genders and types of physical activity for certain items (specifically with the items referring to descriptive normative beliefs and identification with young adults, elderly people, and overweight/obese people). The only referent that was consistently insignificant across gender and physical activity was 'busy people,' so the belief and evaluation items regarding that referent could be removed from the survey without affecting any other results, because although closer examination reveals a low expectation of 'busy people' meeting either type of physical activity recommendation (dnb_i mean=2.70 to 2.89), the participants identification with 'busy people' overall is neutral (iwr_i mean=-0.35 and 0.54).

Hypotheses 18 and 19 stated that the product of each control belief and perceived power would have a significant relationship with PBC for meeting the recommended amount of physical activity (cardio and muscle strengthening) for male and female college students. The null hypotheses had to be accepted because not all the belief-evaluation products were significantly correlated to either total PBC (TPBC), total capacity (CAP), or total autonomy (AUT), as seen in Tables 4.19 and 4.20. The significance of the belief-evaluations with TPBC, CAP, and AUT are quite scattered in these tables as well but there are some items that are consistently significant or

insignificant across gender for each physical activity. For the cardio exercise control beliefs and perceived power section, “having other important activities to do” is significant for both genders across TPBC, CAP, and AUT. There were two other sets of items that were significant for females across all three total direct PBC measurements, which were “having access to a place to do cardio” and “having an illness”. Most females did not perceive illness to be a problem in that following week (pp_i mean=-1.99) but they did perceive it to hinder them getting the recommended amount of cardio exercise if they were to get an illness (cb_i mean=2.15). The other items (“having friends to exercise with” and “having and injury”) still were significant for some total direct PBC measurements and therefore should not be removed from the survey. For the muscle strengthening exercise control beliefs and perceived power section, the items that were significant for both genders for TPBC and CAP (since autonomy was considered insignificant when predicting intentions AUT significance was ignored since these questions should be removed anyway) were “having access to a place to do muscle strengthening” and “having other important activities to do.” Here participants feel that having this access very much enables them to meet muscle strengthening recommendations and having other things to do can heavily impede their ability to meet muscle strengthening recommendations. The other significant factor for men (TPBC and CAP only) was “having an injury,” however a closer look revealed that the significance was because men thought that injury was neither an issue (cb_i mean=2.30) nor a likelihood (pp_i mean=-1.83) in the next week. Women, unlike men, had significant correlations with TPBC, CAP, and AUT ($p \leq .001$ for TPBC and CAP) for “having friend(s) to exercise with.” Their control beliefs about friends being enablers to meeting

muscle strengthening recommendations were not necessarily high (cb_i mean=4.47) but the likelihood that they would have friends in the next week to do muscle strengthening with them was (pp_i mean=1.43). Having an injury was of no significance to women but having an illness had a similar relationship for women as injury had for men. Unless the survey was specifically being given to one gender, none of these items should be removed because they are all significant with one gender or the other at some point.

Conclusions from the hypotheses

In conclusion, while contrary to what was expected, significant differences between men and women were not observed with regards to meeting the two types of physical activity recommendations (cardio and muscle strengthening). This could have been that the population of females that answered the survey were more physically active than the average female adult, which could be for numerous reasons not limited to a socio-economic status, age, and interest in physical activity research. Although there were no major differences between genders or physical activity types for predicting behavior (where only intentions were significant) or predicting intentions with the main direct constructs (where attitudes, PBC, and perceived norms were all significant), there were differences when it came to predicting intentions with the six direct sub-constructs (experiential attitudes, instrumental attitudes, injunctive norms, descriptive norms, capacity and autonomy). The first important find to mention when predicting intentions in this study is that autonomy was never significant. This justifies removing all direct measurements of autonomy from the survey. The other five constructs were important at one or multiple points across gender and physical activity in the survey and should therefore be kept. It is also important to note that instrumental

attitudes (one's beliefs about the importance of the effects of a behavior) were only significant for men and not women with regards to meeting the muscle strengthening exercise recommendations. Also, injunctive norms (one's beliefs about how others important to them feel about he or she doing the behavior and his or her motivation to comply) was only significant for women and not men in regards to meeting the cardio exercise recommendations. If the survey were only to be given to college women between the ages of 18 and 24, then instrumental attitudes items could be removed, and if it were only to be given to college men between the ages of 18 and 24, the injunctive norms items could be removed. Also, for both genders, injunctive norms could be taken from the muscle strengthening section of the survey and instrumental attitudes could be taken from the cardio exercise section of the survey, as long as the population was college adults between the ages of 18 and 24. The indirect constructs had varying significance across genders but the items that could be removed from the survey due to insignificance are: "to be injured," "joint pain," and "to miss out on other important activities" behavioral beliefs and outcome evaluation items from the cardio exercise section; "busy people" normative beliefs and identification with referent items from the cardio exercise and muscle strengthening section; and "overweight/obese people" normative beliefs and identification with referent items from the muscle strengthening section. Removing unnecessary/insignificant items from the survey will help reduce the length of this extensive survey which will improve the accuracy of this tool.

Limitations

The limitations stated in chapter one of this study were that the study population was a convenience sample from the University of Oklahoma and that participants were

both traditional and non-traditional. The first affected the generalizability of the study to where the results cannot be extended to other populations outside the University of Oklahoma or even outside the realm of college students between 18 and 24. The later was not addressed with a question in the survey instrument, but it should be considered that non-traditional students (students with jobs and/or children/dependents) could have more barriers than traditional students that would affect them meeting the recommended amounts of physical activity. Some may say another limitation here is that since this study was cross-sectional and not prospective this would limit its ability to truly measure behavior, but as stated in chapter three of this study, past behavior has time and time again shown to be a reliable and valid indicator of current behavior with regards to physical activity (Fishbein & Ajzen, 2010). Another limitation not mentioned earlier in the study was the length of the survey. Over 200 surveys were deleted because the participant did not complete at least 80% or 103 of the 128 questions on the survey. Also, it is possible that those who did complete the survey did not take as much time on and therefore did not respond as truthfully to the survey questions as they progressed through it.

Recommendations for Future Practice

If the sample in this study was a true representation of the students at the University of Oklahoma, then nearly half of students would not be meeting cardio exercise recommendations (44% not meeting), three quarters would not be meeting muscle strengthening recommendations (75% not meeting), and even more would not be meeting both of them (83% not meeting). Also, of the men that were meeting the muscle strengthening recommendations, 68% were also meeting the cardio exercise

recommendations. However, of the men that were meeting the cardio exercise recommendations, only 32% were also meeting the muscle strengthening recommendations. Likewise, of those women meeting the muscle strengthening recommendations, 69% were also meeting the cardio exercise recommendations, but of the women that were meeting the cardio exercise recommendations, only 30% were meeting the muscle strengthening recommendations as well. This reveals that those that meet the muscle strengthening recommendations are most likely also meeting the cardio exercise recommendations, however those that are meeting the cardio exercise recommendations are not also likely to be meeting the muscle strengthening exercise recommendations. The first chapter of this study discussed how detrimental meeting both the cardio and muscle strengthening physical activity recommendations is to one's health, and with so many not meeting these recommendations something needs to be done to improve these percentages, especially for muscle strengthening.

Universities provide unique opportunities to reach young adults and get them started on good exercise habits they can carry with them into life after college. Using IBM theory based interventions/programs can target an individual's intentions which have been shown in this study and others to be the most influential predictor of physical activity behavior. There were not many differences between genders when predicting intentions for meeting cardio exercise recommendations, so a gender based approach does not appear to be necessary here as PBC (capacity for the subcomponents) is the strongest predictor of intentions for both genders (Table 4.11). However, there are gender differences in the strength of significant predictors of intention with regards to meeting the muscle strengthening recommendations. Men's intentions are driven most

by their attitudes (experiential attitudes and instrumental attitudes combined for the subcomponents), whereas women's intentions are driven by their PBC (capacity for the subcomponents) (Table 4.12). Therefore, a gender-based approach might be advantageous when developing a program/intervention to increase muscle strengthening habits among college students. Now, all three constructs (attitudes, PBC, and perceived norms) were significant in predicting intentions so all should still be addressed in a program or intervention, but more attention should be given to certain constructs based on this study.

A way to approach instrumental attitudes is through education, helping people to understand why both types of physical activity are essential can shape their beliefs about the importance of those behaviors. Experiential attitudes take into account one's experience in doing the physical activity, so providing an environment that is encouraging and fun can improve one's experience and therefore their attitude towards the physical activity behavior. Important injunctive and descriptive norms of the target population need to be known in order to target them correctly. Since most of the indirect measurements of norms were neutral in this study less focus can be placed on them when dealing with the college population, and simple reinforcement strategies such as posters stating "the people that love you want you to get fit" or "the successful college students are the one's pumping iron for their brain" can be used to target perceived norms in general. When it comes to capacity and autonomy understanding what influences these the most for your population is important. It was previously stated that men had significantly higher scores for PBC and capacity for meeting muscle strengthening exercise, which, when referring back to the direct construct questions,

means men have more self-efficacy to do the physical activity. In order to counteract this effect, programs should be spent providing women with the skills needed to do muscle strengthening so that they may feel more confident in doing so. Also, the control beliefs section revealed that other important activities could significantly impede one's ability to do either physical activity and having access to a place to do muscle strengthening and cardio exercise could significantly enable one's ability to do either physical activity. To counteract the boundaries of limited time and access, a program could be developed to: Stress the importance of making physical activity a priority, educate about how physical activity can improve brain functioning to help one continue on with other important activities, and educate about physical activity exercises that could be done at home with little to no equipment in order for one to get the recommended amounts of both cardio and muscle strengthening physical activity.

Recommendations for Future Research

Although this study did add to the research using the IBM with cardio and muscle strengthening physical activity, there is still so little research with this theory with both physical activity behaviors. Also, the lack of consistency when measuring cardio physical activity needs to be a concern that drives future researchers to come to a conclusion on the best way to measure different types of physical activity. This current study was the first to measure how often participants did muscle strengthening for each muscle group outlined in the recommendations as well as how many days a week they did muscle strengthening in general. The results were a significant drop in the number of people that met the muscle strengthening recommendations when using the muscle group method rather than the days per week method that the BRFSS survey used for

muscle strengthening. Measuring how often one does muscle strengthening for each muscle group might end up being an underestimate of how many people meet the muscle strengthening recommendations, but only measuring how many days per week on does muscle strengthening is a gross overestimate.

Another recommendation when using this study's survey in future research would be to remove the items mentioned in the hypotheses review section that were insignificant, as long as the population was the same, or find new ways to measure them since there is always a possibility that they could be measured a better way that would make them significant. There were two insignificant constructs that should definitely be further explored rather than removed, and those are environmental constraints and skills. There was only one item for each of these constructs which complicated their ability to have significance. There is not much guidance or research with the IBM or TPB though that explains how to develop items for measuring environment and skills. More research studies need to explore this area to determine how to effectively measure these constructs.

It would also be interesting to duplicate this study with a sample of more varied ethnicities and races. The study population in this study was predominately Caucasian so no analyses were done concerning race/ethnicity, but other studies have reported significant differences between races/ethnicities when using the IBM, so it would be beneficial to explore this area for a better understanding of any differences that may exist (Blanchard, et al. 2007 and Blanchard, et al. 2008).

Conclusion

Many adults across the US are not meeting the cardio and muscle strengthening physical activity recommendations that provide the benefits needed to prevent numerous chronic diseases that lessen one's quality of life. Eliminating this issue requires one to understand why an individual chooses to engage or not engage in these beneficial physical activity behaviors. Using research based methods to understand one's intentions and what drives them will help health professionals to develop programs, interventions, and policies that could be significant in changing behavior. The IBM is one of the newest and most comprehensive theories available for understanding health behaviors and how to influence them. Continual research with this model in studies with different types of physical activity could direct the realm of health professionals to create the most effective solutions to physical activity behavior changes that would reshape the health of America.

In conclusion, this study found that there were no significant gender differences for meeting either physical activity recommendation, with 56% of college students meeting the cardio physical activity recommendations and only 25% meeting the muscle strengthening physical activity recommendations. The only significant gender differences that existed for the IBM constructs were that women scored higher than men on perceived norms and injunctive norms for meeting cardio physical activity, and men scored higher than women on PBC and capacity when meeting muscle strengthening physical activity. Intentions was the only significant determinant of physical activity across both types and genders. Experiential attitudes, descriptive norms, and capacity were the determinants of intentions that were significant for both types of physical

activity and gender. Autonomy was never a significant determinant of intentions. The determinants of attitudes and injunctive norms were similar across types of physical a gender, however more differences appeared when comparing determinants of descriptive norms and PBC across types of physical activity and gender. Based on the results found in this study and others, targeting one's intentions by focusing on the determinants of intentions outlined by the IBM could increase the low number of people participating in cardio and muscle strengthening physical activity. All of these results should be considered for future research and development of programs and policies regarding physical activity, especially muscle strengthening since it has only half the number of participants compared to cardio.

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Appendix A: Cardio and Muscle Strengthening Beliefs Survey

University of Oklahoma

Cardio and Muscle Strengthening Beliefs Survey

Participation in this survey is completely voluntary and anonymous. You may stop filling out the survey at any time. Please read the following questions carefully and answer each question with your honest opinion, to the best of your ability.

1. **During the past month, did you participate in any cardio exercise such as running, calisthenics, golf, gardening, or walking for exercise?** (Please circle one choice.)
   Yes No
2. **What type of cardio exercise did you spend the most time doing during the past month?**

   _____
3. **How many times per week did you take part in this activity?** (Please circle one choice.)
   1 2 3 4 5 6 7
4. **When you took part in this activity, for how many minutes did you usually keep at it?**

   _____minutes
5. **What other type of activity gave you the next most cardio exercise during the past month?**

   _____
6. **How many times per week did you take part in this activity?** (Please circle one choice.)
   1 2 3 4 5 6 7
7. **When you took part in this activity, for how many minutes did you usually keep at it?**

   _____minutes
8. **Overall, during the last week, on how many days did you do cardio exercise?**
   0 1 2 3 4 5 6 7
9. **On average, about how many *minutes per day* did you spend doing *MODERATE* cardio exercise?**
   (Exp: Walking briskly, water aerobics, and ballroom dancing)
   _____minutes per day
10. **On average, about how many *minutes per day* did you spend doing *VIGOROUS* cardio exercise?**
    (Exp: Running, swimming, and jogging)

_____minutes per day

The following questions are in regards to you meeting the recommended amount of cardiorespiratory exercise each week. *Recommendations* suggest that the average adult should participate in:

At least 2 hours and 30 minutes of moderate-intensity cardio exercise each week, which is the same as 30 minutes of moderate-intensity cardio exercise 5 times a week.

[For example: Walking briskly, water aerobics, calisthenics, golf, ballroom dancing, gardening, bicycling slower than 10 miles per hour, and tennis (doubles)]

OR

At least 1 hour and 15 minutes of vigorous-intensity cardio exercise each week, which is the same as 25 minutes of vigorous-intensity cardio exercise 3 times a week.

[For example: Race-walking, jogging, or running, swimming, tennis (singles), jumping rope, aerobic dancing, bicycling 10 mph or faster, and hiking uphill or with a heavy backpack.]

****You would also be meeting the recommendations if you did some combination of the two types of cardiorespiratory exercise.** [For example: Walking briskly for 1 hour and 15 minutes a week and running for 40 minutes a week, which is the same as walking for 45 minutes twice a week and running for 20 minutes twice a week.]****

The following questions are measured on scales of 1 to 7. Please circle ONE number on each scale from 1 to 7 that best matches your opinion. The numbers on the scale are as follows for many of the questions, *however*, please pay careful attention to each scale to understand how it is measured.

1	2	3	4	5	6	7
extremely	**quite**	**slightly**	**neither**	**slightly**	**quite**	**extremely**
			OR			
strongly	**somewhat**	**slightly**	**neither**	**slightly**	**somewhat**	**strongly**

Getting the recommended amount of moderate or vigorous cardio exercise every week will…

11. …make me have a healthy heart. Unlikely 1 2 3 4 5 6 7 Likely

12. …make me have a healthy weight. Unlikely 1 2 3 4 5 6 7 Likely
13. …improve my fitness. Unlikely 1 2 3 4 5 6 7 Likely
14. …make me healthy. Unlikely 1 2 3 4 5 6 7 Likely
15. …cause me to be injured. Unlikely 1 2 3 4 5 6 7 Likely
16. …cause me joint pain. Unlikely 1 2 3 4 5 6 7 Likely
17. …make me miss out on other important activities.

    Unlikely 1 2 3 4 5 6 7 Likely
18. For me to have a healthy heart is…

    Slightly Desirable 1 2 3 4 5 6 7 Extremely Desirable
19. For me to have a healthy weight is…

    Slightly Desirable 1 2 3 4 5 6 7 Extremely Desirable
20. For me to improve my fitness is…

    Slightly Desirable 1 2 3 4 5 6 7 Extremely Desirable
21. For me to be healthy is…

    Slightly Desirable 1 2 3 4 5 6 7 Extremely Desirable
22. My being injured is…

    Slightly Undesirable 1 2 3 4 5 6 7 Extremely Undesirable
23. My having joint pain is…

    Slightly Undesirable 1 2 3 4 5 6 7 Extremely Undesirable
24. My missing out on other important activities is…

    Slightly Undesirable 1 2 3 4 5 6 7 Extremely Undesirable

My _____ think(s) that I should get the recommended amount of moderate or vigorous cardio exercise every week.

25. …parents… Disagree 1 2 3 4 5 6 7 Agree N/A
26. …friends… Disagree 1 2 3 4 5 6 7 Agree N/A
27. …significant other… Disagree 1 2 3 4 5 6 7 Agree N/A
28. …coach/personal trainer… Disagree 1 2 3 4 5 6 7 Agree N/A

For matters related to health, I want to do what my _____ think(s) I should do.

29. …parents… Disagree 1 2 3 4 5 6 7 Agree N/A
30. …friends… Disagree 1 2 3 4 5 6 7 Agree N/A
31. …significant other… Disagree 1 2 3 4 5 6 7 Agree N/A
32. …coach/personal trainer… Disagree 1 2 3 4 5 6 7 Agree N/A

Most _____ get the recommended amount of moderate or vigorous cardio exercise every week.

33. …athletes… Disagree 1 2 3 4 5 6 7 Agree N/A

34. …fit people… Disagree 1 2 3 4 5 6 7 Agree N/A

35. …healthy people… Disagree 1 2 3 4 5 6 7 Agree N/A

36. …young adults… Disagree 1 2 3 4 5 6 7 Agree N/A

37. …elderly people… Disagree 1 2 3 4 5 6 7 Agree N/A

38. …overweight/obese people… Disagree 1 2 3 4 5 6 7 Agree N/A

39. …busy people… Disagree 1 2 3 4 5 6 7 Agree N/A

For matters related to health, I am similar to most…

40. …athletes. Disagree 1 2 3 4 5 6 7 Agree N/A

41. …fit people. Disagree 1 2 3 4 5 6 7 Agree N/A

42. …healthy people. Disagree 1 2 3 4 5 6 7 Agree N/A

43. …young adults. Disagree 1 2 3 4 5 6 7 Agree N/A

44. …elderly people. Disagree 1 2 3 4 5 6 7 Agree N/A

45. …overweight/obese people. Disagree 1 2 3 4 5 6 7 Agree N/A

46. …busy people. Disagree 1 2 3 4 5 6 7 Agree N/A

Having _____will *ENABLE* me to get the recommended amount of moderate or vigorous cardio exercise every week.

47. …access to a place to do cardio… Disagree 1 2 3 4 5 6 7 Agree

48. …friend(s) to exercise with… Disagree 1 2 3 4 5 6 7 Agree

Having _____will *PREVENT* me from getting the recommended amount of moderate or vigorous cardio exercise every week.

49. …other important activities to do… Disagree 1 2 3 4 5 6 7 Agree

50. …an injury… Disagree 1 2 3 4 5 6 7 Agree

51. …an illness… Disagree 1 2 3 4 5 6 7 Agree

I will have _____ in the next week.

52. …access to a place to do cardio… Unlikely 1 2 3 4 5 6 7 Likely

53. …friend(s) to exercise with… Unlikely 1 2 3 4 5 6 7 Likely

54. …other important activities to do… Unlikely 1 2 3 4 5 6 7 Likely

55. …an injury… Unlikely 1 2 3 4 5 6 7 Likely

56. …an illness… Unlikely 1 2 3 4 5 6 7 Likely

On the scales below, please indicate your feelings about the following statement. Circle the number between the adjectives that best represents your feelings

about each statement when the adjectives or phrases are added to the end of the statement. Numbers "1" and "7" indicate a very strong feeling. Numbers "3" and "5" indicate a fairly weak feeling. Number "4" indicates you are undecided or neutral. Getting the recommended amount of moderate or vigorous cardio exercise every week is:

57.	Non-Beneficial	1	2	3	4	5	6	7	Beneficial
58.	Unimportant	1	2	3	4	5	6	7	Important
59.	Frustrating	1	2	3	4	5	6	7	Enjoyable
60.	Unpleasant	1	2	3	4	5	6	7	Pleasant

61. **Most people who are important to me think I should get the recommended amount of moderate or vigorous cardio exercise every week.**

    Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

62. **Most people whom I respect and admire would support me getting the recommended amount of moderate or vigorous cardio exercise every week.**

    Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

63. **Most people who are important to me get the recommended amount of moderate or vigorous cardio exercise every week.**

    Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

64. **Most people similar to me get the recommended amount of moderate or vigorous cardio exercise every week.**

    Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

65. **I believe I have the ability to get the recommended amount of moderate or vigorous cardio exercise every week.**

    Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

66. **I am certain that I can get the recommended amount of moderate or vigorous cardio exercise every week.**

    Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

67. **It is mostly up to me whether or not I get the recommended amount of moderate or vigorous cardio exercise every week.**

    Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

68. **Getting the recommended amount of moderate or vigorous cardio exercise every week is beyond my control.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

69. **I intend to get the recommended amount of moderate or vigorous cardio exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

70. **I plan to get the recommended amount of moderate or vigorous cardio exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

71. **I will get the recommended amount of moderate or vigorous cardio exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

72. **I have the skills needed to get the recommended amount of moderate or vigorous cardio exercise every week.**

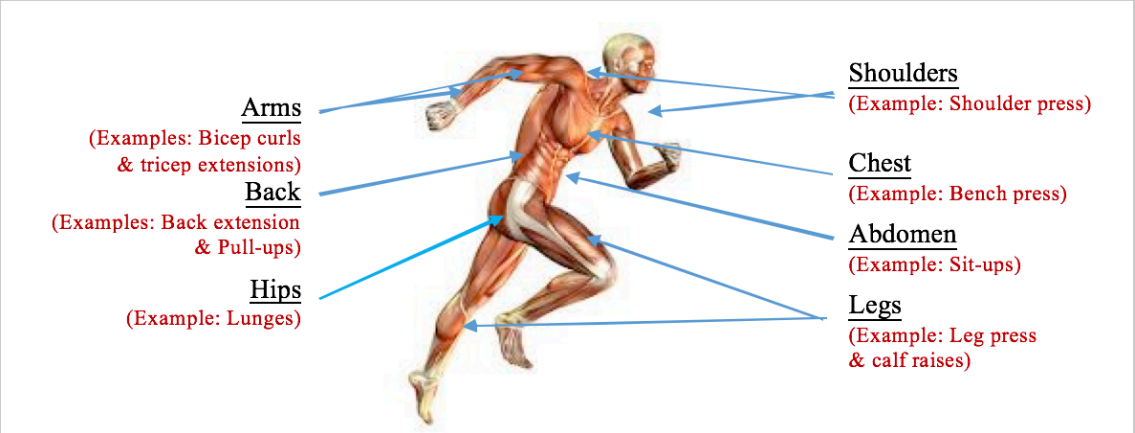
Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

73. **There are environmental barriers that keep me from getting the recommended amount of moderate or vigorous cardio exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

74. **During the past month, how many days per week did you do exercise to STRENGTHEN the following muscle groups?** [Do NOT count aerobic activities like walking, running, or bicycling. Only count activities using your own body weight like yoga, sit-ups or push-ups and those using weight machines, free weights, or elastic bands. KEEP IN MIND that many exercises include multiple muscle groups. For example, squats with a barbell target your hips and legs, but also include your shoulders and lower back as stabilizers. ALSO, this estimate is an average of how often you do muscle strengthening exercises per week, so if you only do muscle strengthening exercises once or twice per month please put 0 for each group.]

Arms	___ days per week	Chest	___ days per week
Back	___ days per week	Abdomen	___ days per week
Hips	___ days per week	Legs	___ days per week
Shoulders	___ days per week		



75. **During the past month, how many days per week in general did you do exercise to STRENGTHEN your muscles?**

_____days per week

Please read the following passage and answer the questions that follow.

The following questions are in regards to you meeting the recommended amount of **muscle strengthening exercise**. *Recommendations* suggest that the average adult should participate in muscle strengthening exercises for all major muscles groups including: the legs, hips, back, abdomen, chest, shoulders, and arms, **for at least 2 days a week**. [*Note: This can be spread out over the course of the week, so you don't have to exercise every muscle group in on the same day.]

The following questions are measured on scales of 1 to 7. Please circle ONE number on each scale from 1 to 7 that best matches your opinion. The numbers on the scale are as follows for many of the questions, *however*, please pay careful attention to each scale to understand how it is measured.

1	2	3	4	5	6	7
extremely	**quite**	**slightly**	**neither OR**	**slightly**	**quite**	**extremely**
strongly	**somewhat**	**slightly**	**neither**	**slightly**	**somewhat**	**strongly**

Getting the recommended amount of muscle strengthening exercise every week will…

76. …make me healthy. Unlikely 1 2 3 4 5 6 7 Likely
77. …make me strong. Unlikely 1 2 3 4 5 6 7 Likely
78. …make me attractive. Unlikely 1 2 3 4 5 6 7 Likely
79. …cause me to have a better mood. Unlikely 1 2 3 4 5 6 7 Likely
80. …cause me to be injured. Unlikely 1 2 3 4 5 6 7 Likely
81. …cause me to be sore. Unlikely 1 2 3 4 5 6 7 Likely
82. …make me miss out on other important activities. Unlikely 1 2 3 4 5 6 7 Likely
83. For me to be strong is…
    Slightly Desirable 1 2 3 4 5 6 7 Extremely Desirable
84. For me to be attractive is...
    Slightly Desirable 1 2 3 4 5 6 7 Extremely Desirable
85. For me to have a better mood is…

Slightly Desirable 1 2 3 4 5 6 7 Extremely Desirable

86. For me to be sore is…

Slightly Undesirable 1 2 3 4 5 6 7 Extremely Undesirable

My _____ think(s) that I should get the recommended amount of muscle strengthening exercise every week.

87. …parents… Disagree 1 2 3 4 5 6 7 Agree N/A

88. …friends… Disagree 1 2 3 4 5 6 7 Agree N/A

89. …significant other… Disagree 1 2 3 4 5 6 7 Agree N/A

90. …coach/personal trainer… Disagree 1 2 3 4 5 6 7 Agree N/A

Most _____ get the recommended amount of muscle strengthening exercise every week.

91. …athletes… Disagree 1 2 3 4 5 6 7 Agree N/A

92. …body builders… Disagree 1 2 3 4 5 6 7 Agree N/A

93. …men… Disagree 1 2 3 4 5 6 7 Agree N/A

94. …young adults… Disagree 1 2 3 4 5 6 7 Agree N/A

95. …elderly people… Disagree 1 2 3 4 5 6 7 Agree N/A

96. …overweight/obese people… Disagree 1 2 3 4 5 6 7 Agree N/A

97. …busy people… Disagree 1 2 3 4 5 6 7 Agree N/A

For matters related to health, I am similar to most…

98. …body builders. Disagree 1 2 3 4 5 6 7 Agree N/A

99. …men. Disagree 1 2 3 4 5 6 7 Agree N/A

Having _____will *ENABLE* me to get the recommended amount of muscle strengthening exercise every week.

100. …access to a place to do muscle strengthening… Disagree 1 2 3 4 5 6 7 Agree

101. …friend(s) to exercise with… Disagree 1 2 3 4 5 6 7 Agree

Having _____will PREVENT me from getting the recommended amount of muscle strengthening exercise every week.

102. …other important activities to do… Disagree 1 2 3 4 5 6 7 Agree

103. …an injury… Disagree 1 2 3 4 5 6 7 Agree

104. …an illness… Disagree 1 2 3 4 5 6 7 Agree

I will have _____ in the next week.

105. …access to a place to do muscle strengthening… Unlikely 1 2 3 4 5 6 7 Likely

On the scales below, please indicate your feelings about the following statement. Circle the number between the adjectives that best represents your feelings about each statement when the adjectives or phrases are added to the end of the statement. Numbers "1" and "7" indicate a very strong feeling. Numbers "3" and "5" indicate a fairly weak feeling. Number "4" indicates you are undecided or neutral. Getting the recommended amount of muscle strengthening exercise every week is:

106. Non-Beneficial 1 2 3 4 5 6 7 Beneficial

107. Unimportant 1 2 3 4 5 6 7 Important

108. Frustrating 1 2 3 4 5 6 7 Enjoyable

109. Unpleasant 1 2 3 4 5 6 7 Pleasant

110. **Most people who are important to me think I should get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

111. **Most people whom I respect and admire would support me getting the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

112. **Most people who are important to me get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

113. **Most people similar to me get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

114. **I believe I have the ability to get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

115. **I am certain that I can get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

116. **It is mostly up to me whether or not I get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

117. **Getting the recommended amount of muscle strengthening exercise every week is beyond my control.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

118. **I intend to get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

119. **I plan to get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

120. **I will get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

121. **I have the skills needed to get the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

122. **There are environmental barriers that keep me from getting the recommended amount of muscle strengthening exercise every week.**

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

Demographics: Answer these questions by filling the blank or circling the answer most applicable to you.

123. How old are you today? _____

124. What gender are you? Male Female Other

125. What race/ethnicity do you most identify with?

Caucasian African American Hispanic Asian Native American/ American Indian Pacific Islander Multi-racial

126. What year are you in school?

Freshman Sophomore Junior Senior Graduate Student

127. What is your major? _____

128. Are you a student athlete or do you participate in any club/intermural sports?

Student Athlete Club/inter-mural sports participant Neither Both

Thank you for participating!

Appendix B: Committee Members

Committee Members:

Paul Branscum, Ph.D., RD
Assistant Professor and Graduate Liason
Department of Health and Exercise Science
The University of Oklahoma

Daniel Larson, Ph.D.
Assistant Professor
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Sarah Maness, Ph.D.
Assistant Professor
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