

Antecedents of Regular Exercise among Women Who Do and Do Not Achieve Weight Loss Over Six Months

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ANTECEDENTS OF REGULAR EXERCISE AMONG WOMEN WITH OBESITY WHO DO
AND DO NOT ACHIEVE WEIGHT LOSS OVER SIX MONTHS

By

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ABSTRACT
ANTECEDENTS OF REGULAR EXERCISE AMONG WOMEN WITH OBESITY WHO DO
AND DO NOT ACHIEVE WEIGHT LOSS OVER SIX MONTHS

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Marquette University, 2014

In the United States, 35.5% of adult women are classified as obese, defined as a body mass index (BMI) of $\geq 30 \text{ kg/m}^2$. The health risks associated with obesity can be mitigated through losing even 5-10% of initial body weight. Evidence shows that reductions in caloric intake alone without increases in caloric expenditure leads to a decline in resting metabolic rate, thereby impeding attainment or maintenance of weight loss.

The purpose of this cross-sectional, mixed-methods study was to explore the antecedents of regular exercise among women with obesity who did and did not achieve weight loss over six months. The antecedents studied (behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intentions) were based on the Theory of Planned Behavior (TPB) (Ajzen, 2006).

Forty-two women were recruited from a clinic in the Midwest. Twenty-six women did not achieve at least a 5% weight loss over six months, while 16 women did. Quantitatively, the antecedents were measured using the Physical Activity Survey for Adults at Risk for Diabetes (Blue, 2004). Additionally, a subgroup of women participated in one of two focus groups, based on their achievement of weight loss, to explore antecedents of their intention to exercise. No statistically significant findings were noted to discriminate TPB antecedents between the two groups when bivariate comparisons were conducted. However, four themes emerged from analysis of the focus group data using the qualitative descriptive approach: *exercise is good for me, but I don't like it; friends make it happen; more time does not equal more exercise; and control is key*. Overall, the focus group data yielded differences in how the two groups discussed the antecedents of attitude and perceived behavioral control. Similarly, multiple regression analysis noted that attitude and perceived behavioral control were the only independent predictors of intention to exercise ($F(2,39) = 33.426, p < .0005$) and explained 63.2% of the variance of intention to exercise. Results from the study indicate that targeted interventions to increase women's perception of behavioral control and attitudes toward exercise may facilitate their intention to exercise, and thereby their actual exercise behavior.

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Heather Vartanian, MSN, RN, ANP-BC

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CHAPTER ONE

Introduction

Median weight gain in U.S. adults is 1.8 pounds per year, which equates to approximately 20 pounds every 10 years (Hill, Wyatt, Reed, & Peters, 2003). Although many individuals attempt to lose weight each year, inherent challenges are manifested in the continued high prevalence of obesity in the United States (Flegal, Carroll, Ogden, & Curtin, 2010). The current study strives to provide insights into the challenges of obese women who are attempting to lose weight, and how health care providers can best support them in their efforts. In this chapter, the scope and significance of the problem of obesity is described. Following this description, a discussion about behaviors that contribute to achieving weight loss, as well as the challenges to maintaining these behaviors are presented. These sections will be followed by a brief review of recent literature that introduces the rationale for the study. Lastly, a description of the purpose of the study and the study research questions is presented.

Scope and Significance

In the United States, 35.5% of adult women are classified as obese, defined as a body mass index (BMI) of $\geq 30 \text{ kg/m}^2$ (Flegal et al., 2010). Obesity is associated with premature death and an increased rate of chronic illness, and it is linked to increased incidence of hyperlipidemia, heart disease, high blood pressure, insulin resistance, diabetes, and certain cancers (Centers for Disease Control and Prevention, 2012a; Sturm, 2007; Visscher & Seidell, 2001). Evidence shows that even a modest weight loss of 5 to 10% of initial body weight among individuals with obesity can produce health benefits,

such as improvements in blood pressure, cholesterol, and blood glucose (Blackburn, 1995; National Heart, Lung, and Blood Institute, 1998). Health care-related treatment of obesity and related conditions is estimated to cost \$147 billion dollars per year (Finkelstein, Trogdon, Gochen, & Dietz, 2009). This figure translates into individuals with obesity incurring \$1,429 more in health care costs per year than someone of normal weight. In a reversal of a 200-year trend where each generation lived longer than the last, some models indicate that life expectancy in the United States will decline within the next few decades as a consequence of rising obesity prevalence (Olshansky et al., 2005).

Sustainable lifestyle modifications, such as participating in regular exercise and reduced caloric intake, promote weight loss and weight maintenance and may mitigate the associated morbidity, chronic illnesses, and costs of care for patients with obesity (Kumanyika & Brownson, 2010). Despite the benefits of regular exercise, only 42.6% of women reported levels of activity sufficient to meet the 2008 Physical Activity Guidelines for Americans, defined as 150 minutes of moderate-intensity physical activity per week, or 75 minutes of vigorous-intensity activity per week (Centers for Disease Control, 2012b; U.S. Department of Health and Human Services, 2008). Vigorous or moderate physical activity, often termed regular exercise, has been shown to lower the all-cause mortality rate in women (Gregg et al., 2003; Rockhill et al., 2001). Therefore, further research is needed to increase understanding of approaches that will close the gap between what is known about the benefits of regular exercise and increasing the number of women initiating and maintaining regular exercise.

Background

Weight loss is the result of an individual creating a negative energy balance, whereby more calories are consistently expended than consumed (Kumanyika & Brownson, 2010). In order to achieve a negative energy balance, individuals need to reduce their energy intake, as well as increase their energy expenditure through regular physical activity (Kumanyika & Brownson, 2010). In this study, reduced energy intake is defined as decreasing consumption of calories from baseline (American Dietetic Association, 2009). Physical activity is defined as activities that require skeletal muscle use resulting in body movements that consume calories (Caspersen, Powell, & Christenson, 1985). Regular physical activity that is planned, structured, and repetitive and has an objective of improvement or maintenance of health can be termed “exercise” (Caspersen et al., 1985). Although regular physical activity and regular exercise are at times used synonymously, for the purposes of this study, regular exercise is defined as all physical activities that are planned, structured, and repetitive and have the objective of improvement or maintenance of health. Similarly, when reviewing previous studies or national guidelines, physical activity that is of moderate or vigorous intensity and sustained for a period of time will be deemed regular exercise. For example, physical activity guidelines that are deemed exercise in this study include:

- Moderate-intensity activity for a minimum of 30 minutes 5 days per week, or vigorous activity for a minimum of 20 minutes 3 days per week (Haskel et al., 2007);
- 150 minutes of moderate-intensity physical activity per week, or 75 minutes of vigorous-intensity activity per week (U.S. Department of Health and Human Services, 2008)

Maintaining regular exercise and reduced energy intake is defined according to the Trans-Theoretical Model's definition of maintenance, which is to perform the behavior consistently for at least six months (Prochaska & Velicer, 1997). Maintaining regular exercise and reduced energy intake can create a negative energy balance of 300 to 1000 kilocalories per day (National Heart, Lung, and Blood Institute, 1998). Over a six month period, consistently reaching this level of negative energy balance can result in a 5-10% weight loss, dependent on the individual's baseline weight and degree of negative caloric balance per day (National Heart, Lung, and Blood Institute, 1998).

Without consistently participating in the behaviors of regular exercise and reduced caloric intake, an individual is unlikely to be successful at losing weight and then maintaining the weight loss (Kumanyika & Brownson, 2010). Although both behaviors contribute to weight loss, the focus of this study was on beliefs about and participation in regular exercise. Studies have shown that in meeting the negative energy balance needed to lose weight, resting metabolic rate (the energy expended by the active cell mass to maintain normal body function at rest) declines due to food restriction and loss of lean body mass (Wang et al., 2008; Wadden, Foster, Letizia, & Mullen, 1990). The decrease in resting metabolic rate created by the weight loss makes obtaining a negative energy balance more difficult, thereby predisposing individuals to regain weight previously lost (Stiegler & Cunliffe, 2006). However, through regular exercise, resting metabolic rate can be maintained during weight loss by maintaining the fat-free mass, consisting of highly metabolically active muscles (Tsai, Sandretto, & Chung, 2003; Van Dale, Saris, & Ten Hoor, 1990).

The importance of participating in regular exercise during weight loss was highlighted in a number of studies. For example, subjects who engage in regular exercise during, and following, weight loss exhibited a normal resting metabolic rate relative to their body mass (Van Dale et al., 1990). In comparison, those who did not exercise had a lower-than-predicted resting metabolic rate relative to their body mass (Van Dale et al., 1990). Furthermore, correlational studies showed that regular exercise is essential to maintaining weight loss (Jakicic, Marcus, Lang, & Janney, 2008; Jeffery, Wing, Sherwood, & Tate, 2003; Sternfeld et al., 2004; Wang et al., 2008). These findings demonstrate the physiological importance of regular exercise as a necessary component of a weight reduction and weight maintenance program. In order to be successful at maintaining weight loss, individuals must first be successful at maintaining regular exercise. Unfortunately, more than 50% of people who start a regular exercise program drop out within three to six months of starting the program (Annesi & Unruh, 2007; Dolansky, Stepanczuk, Charvat, & Moore, 2010). A goal of the current study is to provide insight into the challenges women have when trying to maintain regular exercise in order to facilitate weight loss.

The current study explored the antecedents of regular exercise among women with obesity who do and do not achieve weight loss over six months. The study focused on women, as further information is needed to understand why women are less likely to engage in regular exercise than men (42.6% vs. 52.1%), and why a majority of the women do not participate in regular exercise in general (Centers for Disease Control and Prevention, 2012b). Both quantitative and qualitative methods were used to gain a deeper understanding of the influences of exercising regularly. Gaining a better

understanding of why women with obesity do or do not participate in regular exercise may direct future interventions designed to promote and maintain weight loss among women.

Behavior change theories and models can direct researchers toward understanding how and why individuals maintain regular exercise, thus contributing to weight loss and maintenance of weight loss. A theoretical framework frequently used to explain health behavior change is Ajzen's Theory of Planned Behavior, which was the framework guiding this study (TPB) (Ajzen, 1991; Azjen, 2006). According to the TPB, the intention to perform a behavior is the best predictor that a desired behavior will actually occur (Fishbein & Azjen, 2010). Behavioral intentions are derived from attitudes (an individual's positive or negative feelings towards a behavior), subjective norms (which are perceived social pressures to engage or not engage in a behavior), and perceived behavioral control (an individuals' perceptions of the how capable they are of performing a behavior, the extent they have the resources they need, and whether they can overcome encountered obstacles) (Fishbein & Ajzen, 2010). The model further delineates that attitudes, subjective norms, and perceived behavioral control are influenced by an individual's beliefs. Attitudes are based on behavioral beliefs, which are a person's beliefs regarding the positive or negative outcomes of a behavior. Likewise, subjective norms are based on normative beliefs, which are beliefs about how others view the behavior and the individual's willingness to comply with other people's expectations. Perceived behavioral control is based on control beliefs, which are personal and environmental factors that help or impede attempts to carry out a behavior Overall, the

model depicts a linear process where changes in beliefs affect intentions, which in turn influence an individual's behavior.

Results from meta-analyses support the hypothesized relationships between the concepts of the TPB related to initiating regular physical activity (Hagger, Chatzisarantis, & Biddle, 2002; Symons Downs & Hausenblas, 2005). However, only one published study could be located that tested the TPB concepts in relation to maintaining regular exercise (Armitage, 2005). The study, which defined regular exercise as weekly participation in a gym membership, followed 94 newly enrolled members (53 women and 41 men) over a 3 month time period (Armitage, 2005). Findings from the study showed that attitude, subjective norm, and perceived behavioral control accounted for 49% of the variance in behavioral intention. Subjective norm and perceived behavior control were significant independent predictors of intention ($\beta = .12$ and $.19$, respectively, $\alpha = .05$). Armitage also found that behavioral intention and perceived behavioral control predicted 22% of the variance in actual exercise, with the multiple regression results noting that perceived behavioral control was a significant independent predictor ($\beta = .38$, $\alpha = .05$). Overall, Armitage concluded partial support for the TPB relationships when looking at predicting gym use over 12 weeks, particularly for the ability of perceived behavioral control to predict intention as well as behavior.

Although components of the TPB were able to predict maintenance of regular exercise, the author noted that a relatively low number of participants maintained regular physical programs over the 12 weeks (29% of the sample). Insights were gained into which TPB constructs explained the most variance in initiating and maintaining gym attendance, but what remains unknown from this study is why a majority of individuals

were not successful at maintaining their exercise program. In addition, because women are less likely to participate in regular exercise than men, further study is needed to explain their unique beliefs and behaviors related to regular exercise (Centers for Disease Control and Prevention, 2012b). As a step to fill the void, this study used the TPB as a framework to better understand the antecedents of maintaining regular exercise in a sample of women with obesity. Results from the current study may contribute toward development of targeted interventions to facilitate regular exercise as a means to losing weight and maintaining weight lost.

Purpose

The purpose of this study was to explore the antecedents of regular exercise (behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intentions) among women with obesity achieved at least a 5% loss of body weight over six months from women with obesity who did not achieve at least a 5% loss of body weight over six months.

Hypothesis and Research Questions

In order to address the purpose of the study, the following hypothesis and research questions were addressed:

- 1.) Hypothesis 1: Women who are able to lose at least 5% of their body weight during a six month time frame will report higher levels of regular exercise than those who are not able to lose at least 5% of their body weight during this time.

- 2.) Research Question 2: Are there significant differences in behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control of intentions to engage in regular exercise among women with obesity who have and have not achieved at least a 5% weight loss over six months?
- 3.) Research Question 3: How much variance in intention to exercise can be predicted from the TPB antecedents of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control for women with obesity who have and have not achieved at least a 5% weight loss over six months?
- 4.) Research Question 4: In a population of women with obesity who either have or have not lost achieved at least a 5% weigh loss over six months, what influences participation in regular exercise?

The current study addressed this hypothesis and research questions through a cross-sectional, mixed-methods design. Quantitatively, the constructs of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intentions were measured using the Physical Activity Survey for Adults at Risk for Diabetes (Blue, 2004). Regular physical activity was measured using the Kaiser Physical Activity Survey Sports and Exercise subsection (Sternfeld, Ainsworth, & Quesenberry, 1999). In addition to the quantitative measures, two focus groups were conducted. The first focus group consisted of women who achieved at least a 5% weight loss, and the second consisted of women who did not achieve at least a 5% weight loss. The content of the qualitative data obtained in the

focus groups was analyzed using the process of qualitative descriptive content analysis (Sandelowski, 2000, Sandelowski, 2010). Validity and reliability of the quantitative instruments, the process for conducting the focus groups, and details regarding data analysis is presented in Chapter Three. The next chapter, Chapter Two, further describes the conceptual framework and philosophical foundation for the study, presents a more in-depth review of the literature, and delineates the assumptions of the study.

Chapter One Summary

This chapter included an overview of the scope and significance of the health condition of obesity. The cornerstone of treating obesity is creating a sustained negative energy balance that results in weight loss. Although regular exercise and decreased caloric intake both contribute to creating the negative energy balance necessary for weight loss, the focus of the study was regular exercise. Previous studies have shown that regular exercise can maintain the resting metabolic rate, which is prone to decrease during weight loss due to decreased caloric intake and a loss of fat-free mass (Wang et al., 2008; Wadden et al., 1990). Maintaining regular exercise maintains the resting metabolic rate, which then facilitates weight loss maintenance (Jakicic et al., 2008; Jeffery et al., 2003; Sternfeld et al., 2004; Wang et al., 2008). Despite the benefits, maintaining regular exercise has proven to be a challenging behavior. The Theory of Planned Behavior is a commonly used theory to help exercise behavior, and includes the antecedents of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norm, perceived behavioral control, and behavioral intentions (Fishbein & Ajzen, 2010). There is support for the relationships in the TPB related to initiating exercise, but what remains to be explored is why a majority of individuals are not successful at maintaining

regular exercise. In addition, because women are less likely to participate in regular exercise than men, further study is needed to explain their unique beliefs and behaviors related to regular exercise (Centers for Disease Control and Prevention, 2012b). As a step to fill the void, this study used the TPB as a framework to better understand the antecedents of maintaining regular exercise in a sample of women with obesity striving to achieve weight loss over a six month timeframe.

CHAPTER TWO

Introduction

In this chapter, the conceptual framework used to guide the study, the Theory of Planned Behavior (TPB), will be described in depth. Definitions of the constructs in the TPB will be provided, followed by a discussion of the philosophical underpinnings of the study. Next, the role regular exercise plays in weight loss and weight maintenance is described, along with a review of the relationship between resting metabolic rate, weight loss, and regular exercise. Challenges to participation in regular exercise, as well as possible solutions based on results from recent studies, are discussed. Next, a critical review of the literature focusing on regular exercise and the TPB, as well as qualitative literature on regular exercise, will be provided. The chapter will conclude with a review of the study hypothesis and research questions, as well as presentation of the assumptions of the study.

Conceptual Framework

As introduced in Chapter 1, the study was guided by the Theory of Planned Behavior (TPB) (Figure 1). According to the TPB, the intention to perform a behavior is the best predictor that a desired behavior will actually occur (Fishbein & Ajzen, 2010). Behavioral intentions are derived from attitudes, subjective norms, and perceived behavioral control (Fisbein & Ajzen, 2010). This theory further delineates that attitudes, subjective norms, and perceived behavioral control are influenced by individuals' beliefs, specifically behavioral, normative, and control beliefs, respectively. Beliefs are influenced by an individual's background factors, including an individual's personality,

values, past behavior, education, age, culture, and knowledge. Based on this theory, participation in regular exercise (the behavior) is best predicted by intentions to engage in regular exercise. Intentions are determined by attitudes, perceived behavioral control, and subjective norms, which in turn are determined by beliefs. Overall, the theory depicts a linear process where changes in beliefs affect intentions, which in turn influence behavior.

The antecedents in the TPB are classified as either direct or indirect influences of behavior, based on their linear relationship to intentions and behavior. The direct influences represent the step just prior to intentions and behavior, and therefore provide direct insights into predicting intentions and behavior. The direct influences are attitudes, subjective norms, and perceived behavioral control. Indirect influences of intention and behavior refer to an individual's behavioral, normative, and control beliefs, which contribute to the direct influences of attitudes, subjective norms, and perceived behavioral control, respectively. Measuring the indirect and direct influences, or antecedents, to behavior provides an understanding of behavior change. Using a theory, such as the TPB, allows for strategic collection and analysis of data, and provides an organized structure to present conclusions and discuss implications for future study. The following sections describe the antecedents of exercise, starting with the indirect and direct influences of behavior, and ending with behavioral intentions.

Behavioral Beliefs and Attitudes

Behavioral beliefs are individuals' expectations of positive or negative outcomes if the behavior is performed (Fishbein & Ajzen, 2010). In turn, the outcome individuals expect (behavioral beliefs) determines their attitude towards the behavior. Therefore,

attitude is defined as positive or negative feelings towards a behavior. In general, if an individual believes the behavior will result in more positive than negative outcomes, the attitude toward the behavior will be more favorable. Attitudes toward a behavior are formed automatically and inevitably as new beliefs are formed about the behavior (Fishbein & Ajzen, 2010). Beliefs stem from different experiences with the behavior either directly, indirectly through others, or through inferences. For example, a woman hears that a family member sustained an injury while exercising, and now she believes she will get hurt exercising (behavioral belief) and has a negative feeling towards exercise (attitude).

Normative Beliefs and Subjective Norms

Normative beliefs are comprised of both injunctive and descriptive beliefs, which then influence subjective norms (Fishbein & Ajzen, 2010). Injunctive beliefs refer to beliefs that important individuals or groups would approve or disapprove of the individual performing the behavior. Descriptive beliefs refer to the belief that an important person or group does or does not perform a certain behavior. For example, an individual may believe her family wants her to stay healthy by engaging in regular physical activity (injunctive belief), but she does not believe that anyone in her family actually partakes in physical activity themselves (descriptive belief). These beliefs determine an individual's subjective norms, which are perceived social pressures to engage or not engage in a behavior. In other words, subjective norms refer to what is permissible or acceptable behavior in a society or group (Fishbein & Ajzen, 2010).

Control Beliefs and Perceived Behavioral Control

Control beliefs are thoughts about personal and environmental factors that help or impede attempts to carry out a behavior (Fishbein & Ajzen, 2010). Control beliefs are based on how much control individuals feel they have, and how large of an impact their control will actually have over the behavior. Control beliefs influence perceived behavioral control. Perceived behavioral control refers to an individuals' perceptions of the how capable they are of performing a behavior, extent they have the resources they need, and whether they can overcome encountered obstacles (Fishbein & Ajzen, 2010). If control beliefs identify more facilitating than inhibiting factors, an individual has higher perceived behavioral control. For example, a woman feels she does not have control over when she can exercise because she is required to care for her children after work. She perceives she cannot control her behavior due to external factors inhibiting her ability to exercise. Another woman drops her children off at the babysitting service at a local health club while she works out after work. She likely has a higher perception of her ability to control her exercise behavior. In addition, once this woman is successful at performing the behavior, her success can increase her perception of being able to control the behavior in the future.

Behavioral Intentions

Behavioral intentions are indications of individuals' likeliness to perform a behavior (Fishbein & Ajzen, 2010). According to Fishbein and Ajzen, the stronger the intention, the more likely the behavior will be carried out. In the latest versions of this theory, Fishbein and Ajzen (2010) recognize that in addition to intending to perform a behavior, an individual must possess the ability to carry out the behavior and must work within environmental constraints (actual control). Individuals' actual control over

performance of the behavior can moderate the effect between intention and behavior (Figure 1). Fishbein and Ajzen recognized that measures of actual control are often not available, and therefore suggested that perceived behavior control can be used as a proxy. Fishbein and Ajzen also pointed out that behavioral intentions, plans, willingness, or expectations should be viewed as measures of the same underlying concept of intention.

Philosophical Underpinnings of the Study

Examining the philosophical underpinnings of a study can provide insights into the rationale for the study design, methods, and assumptions. Accordingly, this section will present the history and background of post-positivism, the scientific philosophy that undergirds this study. Examples are provided to demonstrate how this study aligns with the post-positivist paradigm. From a historical perspective, post-positivism gained popularity after positivism began to be discredited following the end of WWII. During this time, many researchers began to see that the relationship between scientific theories and evidence was more complex than many in the scientific community had originally thought (Phillips, 1990). In the past, research was generally based on the positivistic philosophy, believing that reality was driven by laws of nature and verified by our senses. Positivistic philosophy also guided researchers to exclude their values from the outcome, and stated hypotheses were subject to empirical tests under carefully controlled conditions (Guba, 1990). However, some researchers began to appreciate the limitations of positivism, such as the inability to verify certain scientific phenomena (i.e., subatomic particles, pain perceptions, and health behavior) with senses alone, and they begin to search for other philosophies of science that would resolve these concerns (Phillips, 1990).

In response to the identified shortcoming of positivism, scientific philosophers Karl Popper and Thomas Kuhn lead the post-positivist movement. Popper and Kuhn purported that objectivity continue to underpin inquiry, but they also recognized the importance of values and subjectivity in science as well (Phillips, 1990). Well-defined concepts and variables, controlled conditions, and empirical testing continue to be emphasized (Lincoln & Guba, 1994). However, post-positivism views events as a product of many factors coming together under prescribed circumstances (Clark, Lissel, & Davis, 2008). Researchers ascribing to the post-positivist philosophy believe that reality and universal truth exist, but one cannot be certain that truth has been uncovered (Guba, 1990). Therefore, if objectivity can never be entirely attained, it is suggested that researchers rely on many different sources of data, referred to as elaborated triangulation, to make it less likely that distorted interpretations will be made (Kimchi, Polivika, & Stevenson, 1991). In addition to quantitative methods, post-positivism encourages qualitative methods, grounded theory, and reintroduces discovery into the inquiry process. Research using post-positivism includes hypotheses, distinct methodologies, and specific strategies for analyzing data.

In this study, the post-positivist philosophy can be seen in various components of the study design. For example, the Theory of Planned Behavior has underpinnings in the post-positivist philosophy. Clark and colleagues (2008) noted that in post-positivism, events are a product of many factors coming together in certain circumstances. Similarly, in the TPB, behavior is a product of various antecedents coming together to influence behavior. In addition, a mixed-methods approach was used for data collection. Following the concept of elaborated triangulation, quantitative surveys and qualitative

focus group data were used to better capture the truth and to avoid distorted interpretations. As is delineated by post-positivism, a hypothesis and research questions for the study have been presented prior to initiating the study. A well-defined methodology is presented (Chapter Three), as well as a plan for analyzing the data. However, the investigator allowed for discovery in the data collection and analysis process. This quest for discovery was especially true in data analysis of the qualitative focus group data, during which themes were allowed. Furthermore, modified objectivity was followed in the study, meaning that the investigator stayed as neutral as possible and disclose assumptions for the study prior to its commencement.

Review of Relevant Literature

Regular Exercise for Weight Loss and Weight Maintenance

Although previous studies have shown that there is a low probability of achieving weight loss through exercise alone, numerous studies have provided support for the proposition that regular exercise, along with reduced caloric intake, facilitates a greater amount of weight loss than through reduced caloric intake alone (Diabetes Prevention Program Research Group, 2002; Jeffery & Wing, 2001; Okura, Nakata, & Tanaka, 2003; Tsai et al., 2003). For example, of the more than 3000 subjects in the National Weight Control Registry, most subjects reported engaging in regular exercise as a strategy to help them lose weight (Wing & Phelan, 2005). Possibly of even greater significance, evidence shows that an increased level of regular exercise during weight loss mitigates weight regain in women (Wang et al., 2008). Wang and colleagues (2008) studied 34 overweight and obese women during a 12-week weight loss intervention consisting of a

reduced calorie diet with or without treadmill walking. Women then were followed for 12 additional months, with study results showing that the amount of weight regained after 6 and 12 months was inversely related to lower levels of physical activity energy expenditure during initial 12-week weight loss period. Study investigators concluded that a high level of daily physical activity during weight loss is important to mitigate weight regain after weight loss.

Similar to the findings by Wang and colleagues, regular exercise also has been shown to diminish the effects of menopause and age on weight gain in women (Sternfeld et al., 2004). As a part of the Study of Women's Health Across the Nation (SWAN), Sternfeld and colleagues followed women transitioning to menopause. During three years of follow-up, mean weight increased by 2.1 kg (SD = 4.8) in the 3,064 racially and ethnically diverse women, although findings showed that regular exercise attenuated weight gain during this time. Specifically, a one-unit increase (on a scale of 1-5) in reported level of regular exercise was longitudinally related to a decrease of 0.32 kilograms in weight. The authors suggested that although midlife women tend to experience weight gain over time, maintaining or increasing regular exercise can prevent this weight gain.

Supporting the role regular exercise plays in maintaining weight loss, correlational studies have shown a strong association between regular exercise and maintaining weight loss (Jakicic et al., 2008; Jeffery et al., 2003). Data from the National Weight Loss Registry indicated that a high level of daily exercise (about one hour per day) was necessary to prevent weight regain (Wing & Phelan, 2005). Although these individuals used a variety of methods to lose weight, more than 90% reported exercise as

crucial to maintaining their weight loss. Similar findings were observed by Schoeller, Shay, and Kushner (1997), who studied 32 previously overweight and obese women who had reached their target weight loss (mean loss = 23 kg, SD = 9 kg) within the past three months. After a one-year follow-up period, women who remained highly active (measured by the total energy expenditure in relation to the resting metabolic rate) gained 2.5 kg, moderately active women gained 9.9 kg, and sedentary women gained 7.0 kg. Retrospective analysis of weight gain pointed to an average need for 80 minutes per day of moderate activity or 35 minutes per day of vigorous activity (defined as regular exercise in the current study) as the threshold to maintain weight loss. Due to the evidence that regular exercise is necessary to both lose weight and maintain weight loss, it is hypothesized for the current study that woman who lost at least 5% of their body weight during the six month time frame will have participated in higher levels of regular exercise compared to those women who were not successful at losing at least 5% of their body weight.

Resting Metabolic Rate, Weight Loss, and Regular Exercise

As explained in Chapter One, the focus of this study is on regular exercise rather than decreased caloric intake, with the rationale for this based on the relationship between weight loss, resting metabolic rate, and regular exercise. Daily energy expenditure consists of energy consumed by the resting metabolic rate, thermic effect of feeding (the energy needed to digest food), and physical activity (consisting of regular daily activities completed at home and work, that may include regular exercise) (Donahoo, Levine, & Melanson, 2004). Resting metabolic rate is the energy expended by the active cell mass to maintain normal body function at rest. It is the largest component of daily energy

expenditure, comprising 60-70% of total expenditure (Stiegler & Cunliffe, 2006). In order to lose weight, a negative energy balance needs to be achieved through sufficient energy expenditure and reduced caloric intake (Kumanyika & Brownson, 2010). However, in meeting this negative energy balance to lose weight, studies have shown that resting metabolic rate declines due to food restriction and loss of lean body mass (Wang et al., 2008; Wadden et al., 1990). In other words, creating a negative energy balance through reduced caloric intake alone also can decrease the resting metabolic rate (Calles-Escandon, 2001; Doucet, 2001). The decrease in resting metabolic rate created by weight loss then makes obtaining a negative energy balance more difficult, thereby predisposing individuals to regain the weight they lost (Stiegler & Cunliffe, 2006).

In order to maintain resting metabolic rate during weight loss, studies suggest maintaining the fat-free mass (which consists of highly metabolically active muscles) through participation in regular exercise (Tsai et al., 2003; Van Dale et al., 1990). For example, subjects who engaged in regular exercise during and following weight loss had a normal resting metabolic rate relative to their body mass, while those who did not exercise had a lower-than-predicted resting metabolic rate relative to their body mass (Van Dale et al., 1990). These findings demonstrate the physiological importance of regular exercise as a necessary component of a weight reduction program. Although there is evidence to show that weight loss induced by dietary restriction is accompanied by a decline in resting metabolic rate, studies show that resting metabolic rate is preserved or increased when moderate dietary restriction is combined with regular exercise (Stiegler & Cunliffe, 2006; Nieman, Haigh, De Guia, & Register, 1988; Belko, Van Loan, Barbier, & Mayclin, 1987).

Challenges to Engaging in Regular Exercise

In both research and practice settings, women cite various challenges to engaging in recommended amounts of regular exercise (Wing & Gorin, 2003). These challenges can be described in terms of antecedents of behavior in the TPB, including perceived behavioral control (lack of time or no access to exercise equipment), attitude towards the behavior (negative feelings towards physical activity), and subjective norm (lack of support from family and friends) (Wing & Gorin, 2003). Researchers have attempted to address some of these challenges, specifically pertaining to perceived behavioral control. For example, to address concerns related to the lack of time to exercise, studies have shown that completing the recommended amounts of exercise in 10 minute increments can have similar effectiveness as completing all the activity at one time period (U.S. Department of Health and Human Services, 2008). Likewise, to address concerns of not having access to a gym or health club, a recent Cochrane review concluded that home based programs appear to be superior to programs at an exercise center in terms of adherence to regular exercise, especially related to long-term adherence (Ashworth, Chad, Harrison, Reeder, & Marshall, 2009).

To address other challenges to engaging in regular exercise, brisk walking, which does not require special equipment or a gym membership, has been found to be the most commonly cited type regular exercise by individuals who successfully lose weight and maintain their weight loss (Church, 2008). This finding can be used to help women who contend that they do not like sweating or participating in vigorous exercise (like jogging). Instead, moderate activity is sufficient for weight loss as long as the activity is maintained for a long enough session. According to Schoeller, Shay, and Kushner (1997),

80 minutes of moderate intensity activity per day is needed to maintain weight loss, compared to only 35 minutes of vigorous intensity activity per day. Although evidence is available to answer some of the challenges women cite against engaging in regular exercise, the continued wide-scale lack of participating in regular exercise warrants further exploration with respect to rationale for why women struggle with maintaining this behavior.

Review of Studies Relating TPB and Exercise

Due to the depth and breadth of studies focused on the TPB relationships related to exercise or physical activity, this section will first focus on meta-analyses that summarized findings and implications of multiple studies. After review of the meta-analyses, a more focused review will be conducted on studies that use the TPB related to exercise in women. At the end of this section, a summary of findings from these significant studies will be discussed, demonstrating the need for the current study.

The earliest meta-analysis focusing on exercise and the TPB was conducted by Hausenblas and colleagues. This meta-analysis included 31 studies published between 1975 and 1997 that focused on physical activity or exercise, and the Theory of Reasoned Action (TRA) (the precursor to the TPB) or Theory of Planned Behavior (Hausenblas, Carron, & Mack, 1997). Inclusion of the 31 studies yielded 162 effect sizes based on $N=10,621$ participants. Using Cohen's guidelines (1988), the authors reported a large effect size between attitude and intention ($r = .52$). There was a moderate effect size for the relationships between intention and exercise behavior ($r = .47$), attitude and exercise behavior ($r = .39$), perceived behavioral control and intention ($r = .43$), and perceived behavioral control and exercise behavior ($r = .45$). A small effect was seen for the

relationship between subjective norm and intention ($r = .27$). The review did not support a relationship between subjective norm and exercise behavior ($r = .09$). Since most of the relationships in the model showed a moderate to large effect, and the authors concluded there was strong support for the validity of the TRA and TPB related to exercise. The review contributes to validity the TPB by reporting the strengths of the associations, but critics expressed their concerns that the review did not have sufficient sample size to comment on the predictive validity of the theory constructs, and called for further studies to be undertaken (Hagger et al., 2002).

To address the limitations of the review by Hausenblas and colleagues, Hagger, Chatzisarantis, and Biddle (2002) conducted a review to examine the predictive and construct validity of the TRA and TPB in physical activity and exercise research. Unlike the review by Hausenblas and colleagues, this review included studies that defined physical activity as either leisure-time physical activity, sports training, or exercise. A total of 79 data sets from 72 studies of the TRA and TPB related to physical activity in various populations published between 1975 and 2001 met inclusion criteria for the review. To analyze the studies, corrected correlations, multiple regression, and path analysis were used to determine the unique relationships between the variables with the effect of mediator variables identified and removed. Similar to reports by Hausenblas and colleagues, the authors reported mostly large to moderate effect sizes for the TPB variables and physical activity. The findings included large effect sizes between intention and behavior ($r = .51$), attitude and intention ($r = .60$), and perceived behavioral control and intention ($r = .57$). Moderate effect sizes were reported for subjective norm and intention ($r = .32$), attitude and behavior ($r = .35$), and perceived behavioral control

and behavior ($r = .39$). A small effect was seen for the relationship between subjective norm and behavior ($r = .17$). The path analysis showed attitude ($\beta = .40, p = .01$), subjective norm ($\beta = .05, p = .01$), and perceived behavior control ($\beta = .33, p = .01$) significantly contributed to accounting for 44.5 % of the variance in intention. Overall, attitude was the strongest independent predictor of intention. TPB variables of attitude, subjective norm, perceived behavioral control, and intention accounted for 27.41% of the variance in behavior, and perceived behavior control was a significant independent predictor ($\beta = .15, p = .01$). The authors concluded support for the TPB relationships of attitude, subjective norm, perceived behavioral control, intention, and behavior related to regular exercise. Specifically, attitude and perceived behavioral control were the best predictors of intention, and intention was the best predictor of actual behavior.

To confirm the findings by Hagger and colleagues using a larger number of studies, Symons Downs and Hausenblas (2005) more recently reviewed 111 TRA/TPB studies related to leisure-time physical activity in various populations. The 111 studies included in the review, which were published between 1975 and 2004, were based on 35,752 participants and yielded 215 effect sizes. The studies were analyzed with correlation for effect size and hierarchical regression. Similar to the previous two meta-analyses, moderate to large effect sizes were found for the majority of TPB variables when testing the relationships related to exercise (0.20, 0.50, and 0.80 represent small, medium, and large effects). Large effect sizes were found between attitude and intention ($ES = 1.07, p \leq .05$), intention and behavior ($ES = 1.01, p \leq .05$), and perceived behavioral control and intention ($ES = .90, p \leq .05$), while moderate effect sizes were found between subjective norm and intention ($ES = .59, p \leq .05$) and perceived

behavioral control and behavior ($ES = .51, p \leq .05$). Data was not reported on the effect sizes for attitude and behavior or subjective norm and behavior. Results of the hierarchical regression showed intention and perceived behavioral control accounted for 21.0% of the variance in behavior, with intention being a significant predictor of physical activity behavior ($\beta = .42, p < 0.001$). Furthermore, a combination of attitude, perceived behavioral control, and subjective norm accounted for 30.4% of the variance in intention. Attitude ($\beta = .34, p = <0.001$) and perceived behavioral control ($\beta = .27, p = .0002$) were significant independent predictors of physical activity, but subjective norm was not ($\beta = .13, p = .014$). Based on these results, the authors concluded the predictive and construct validity of the TRA/TPB for explaining leisure time physical activity (i.e. regular exercise) intention and behavior was supported. Like the previous meta-analyses, intention was found to be the strongest determinant of behavior, and attitude most strongly influenced intention.

Overall, findings from the three meta-analyses supported the predictive and construct validity for the TPB in the context of regular exercise. These previous analyses indicate that attitude, subjective norm, and perceived behavior control predict intention, with attitude being the strongest predictor. Furthermore, intention is the strongest predictor of actual regular exercise behavior. When relating the findings to women with obesity, caution may be needed. The wide variety of populations included in the meta-analyses may not have generalizability to regular exercise behavior of women with obesity. The meta-analyses also include the varying definitions of physical activity, rather than just a focus on regular exercise, which is the interest of this study.

To address issues of generalizability of the meta-analyses to the population in the current study, studies were specifically targeted that used the TPB related to regular exercise in women. Five studies could be located specifically related to women, with these studies focusing on either a population of pregnant (Godin, Vezina, & Leclerc, 1989; Symons Downs & Hausenblas, 2003), postpartum (Hales et al., 2010), postmenopausal (Vallance et al., 2011), or overweight women (Ellis Gardner and Hausenblas, 2005). Because pregnant and postpartum women are excluded from the current study, this review of the literature focused on the remaining two studies conducted with postmenopausal and overweight women. The authors of the first study investigated the utility of the TPB in understanding regular exercise behavior and intentions in postmenopausal women (Hales et al., 2010). Women were characterized as engaging in regular exercise if they participated in at least 30 minutes of moderate intensity physical activity 5 times per week, or 30 minutes of vigorous activity 3 times per week. Hierarchical multiple regression was used, and to the antecedents of attitude, subjective norm, and perceived behavioral control explained 44% of the variance in exercise intention ($R^2 = .44$, $F = 37$, $df = 6,284$), with attitude being the strongest predictor. Intention explained 23% of the variance in exercise behavior ($R^2 = .23$, $F = 86.68$, $df = 1,294$). Women meeting regular exercise guidelines reported higher scores for the antecedents of attitude, subjective norm, perceived behavioral control, and intention than women who did not meet the guidelines for regular exercise. Overall, the authors concluded the TPB has validity in predicting regular exercise intentions and behavior in post-menopausal women.

Although there is support for use of the TPB in the context of regular exercise in postmenopausal women, findings were mixed when using the theory to predict intention and regular exercise in overweight women (Ellis Gardner and Hausenblas, 2005). Ellis Gardner and Hausenblas prospectively examined the ability of the TPB constructs (behavioral beliefs, normative beliefs, control beliefs, attitude, subjective norm, and perceived behavioral control) to predict intention and regular exercise behavior (defined as participating in a structured 4 week exercise program) of 117 overweight women aged 18-62. Results of the study only partially supported the relationships proposed by the TPB. Attitude, subjective norm, and perceived behavioral control explained 47% of the variance in exercise intention, with perceived behavioral control being an independent predictor ($\beta = .69, p < .001$). However, a combination of all of the constructs of the TPB were only able to predict 6% of the variance in regular exercise behavior, which did not reach significance ($R^2 = .06, p = .74$). The authors suggested that the TPB relationships may have not been supported in the study due to participants' lack of familiarity with the exercise program, leaving participants unable to estimate their perceptions of control. They also suggested that four weeks may not be enough time for some women to stabilize their exercise behaviors, and that attending a structured exercise program may yield different results than participating in a home-based exercise program.

Due to the discrepancies reported in the literature regarding the utility of the TPB applied to regular exercise in women, as well as the limited research available, further study is required. The meta-analyses support the validity of the TPB related to beginning an exercise program, but does not detail the applicability of the TPB specifically related to women with obesity. In addition, the two previously conducted studies that closely

relate to the population of this study showed mixed results, with one supporting the ability of the TPB to predict intention and behavior (Vallance et al., 2011), and the other only supporting the ability of the TPB to predict intention (Ellis Gardner & Hausenblas, 2005). Due to the small sample sizes of these studies and lack of studies relating the TPB to regular exercise among women with obesity, additional research is needed to examine the utility of the TPB to identify antecedents to intention to exercise and regular exercise in this population.

The TPB and Maintaining Regular Exercise

Few studies are available that investigated the TPB specifically related to maintenance of regular exercise, rather than just initiation of regular exercise. Recently, more consideration has been given to the idea that initiation and maintenance of behavior are two related, but distinct phenomena (Nilsen, Haverkos, Nebeling, & Vogel, 2010). Therefore, studies are needed that focus on the TPB relationships related to maintaining regular exercise, rather than mere initiation of exercise. Although no studies were found that focused on the TPB relationships specifically related to maintaining regular exercise in women, one study was located that investigated the applicability of TPB relationships in a 12-week gym membership program in a mixed group of men and women (53 women and 41 men) (Armitage, 2005). In this study, the author tested the ability of the TPB to predict participation in a 12-week exercise program. Throughout the 12 weeks, physical activity was measured by membership card swipes at the gym (scored as *1 = did not attend this week, 2 = did attend this week*) for participants who were all newly beginning a gym membership. Self-reported behavior was measured at the end of 12-weeks by asking participants how often they participated in regular exercise in the last three months

(never-frequently). Results of the study showed that attitude, subjective norm, and perceived behavioral control accounted for 49% of the variance in intention to exercise measured at the beginning of the study. Perceived behavioral control and intention explained 22% of the variance in actual exercise behavior during the 12 weeks. Overall, the author concluded the findings supported relationships in the TPB to predict behavior across a 3-month time period, with subjective norm and perceived behavioral control independently contributing to predicting intention, and perceived behavioral control independently able to predict behavior. These findings vary from the previously described meta-analyses related to the TPB and exercise initiation, where attitude was the best predictor of intention, and intention was the best predictor of behavior.

The findings presented by Armitage indicate which antecedents most strongly predict maintaining physical activity, although several limitations were noted that exemplify gaps in the literature requiring further research. First, due to challenges presented when analyzing the data, Armitage did not measure the frequency, duration, or intensity of physical activity over the 12 week time frame. Since national guidelines recognize the need for many individuals to incorporate 60 minutes of moderate intensity physical activity to lose weight, and possibly even 90 minutes to maintain weight, knowing the pattern of the participants' physical activity over the 12 week time frame would be useful (American College of Sports Medicine, 2009; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2005). In addition, only 29.35% of the sample attended the gym at least once a week over the 12 week timeframe. Although insights were provided into which TPB constructs explained the most variance

for those who maintained gym attendance, what remains unknown is why a majority of individuals were not successful.

To summarize, conclusions from various meta-analyses on physical activity or exercise in various populations supported the hypothesized TPB relationships (Hagger et al., 2002; Hausenblas et al., 1997; Symons Downs & Hausenblas, 2005). However, there are mixed results from studies that investigated the TPB relationships related to regular exercise in women, and only one study could be located that investigated the applicability of TPB relationships to maintaining regular exercise (Armitage, 2005; Ellis Gardner & Hausenblas, 2005; Vallance et al., 2011). Due to the mixed results and gaps in the literature, further investigation is needed to examine the utility of the TPB to identify antecedents to regular exercise in women with obesity striving to lose weight over a six month timeframe. Exploring antecedents of regular exercise will lay the groundwork for future intervention studies with women with obesity striving to lose weight and maintain weight loss.

Regular Exercise and Weight Loss in Qualitative Research

Qualitative research has been previously conducted related to weight loss or regular exercise in women (Ali, Baynouna, & Bensen, 2010; Kirchhoff, Elliott, Schlichting, & Chin, 2008; Krans & Chung, 2011; Vallance et al. 2011; Wysoker, 2002). However, no study could be located that used qualitative methods to describe regular exercise in women in the process of losing weight. Three studies were located that published findings related to components of weight loss or regular exercise that have applicability to the study population. When reviewing available qualitative research on weight loss or regular exercise in women, studies focusing on a population excluded in

this study (i.e., pregnant women) or diet (i.e., focus on reduced calorie intake) were not included in the review.

In the first study, Wysoker (2002) developed a conceptual model of weight loss and weight regain after interviewing middle-aged women. The model had four phases. Phase one is considered the “Seeking weight loss” stage, which is driven by desperation. The second phase, “Weight loss,” consists of feelings of comfort from deciding to do something about the desperation, and feelings of pain from the hard weight loss process. In the third phase, “Pain,” the comfort diminishes, pain takes over and desperation to lose is no longer paramount, leading to weight regain. During “Regain,” the last phase in the model, there is perceived loss of control and the long history of losing weight and gaining the weight back is perpetuated. The author encouraged providers to use the model as a framework for treatment when working with women who are trying to lose weight. However, unlike the TPB that works to explain and predict behavior, this model focused on describing the process and outcome of weight loss and weight regain without incorporating information about contributing behaviors.

In the second study, beliefs about regular exercise in 297 postmenopausal women were described, including elicitation of advantages and disadvantages, as well as facilitating and inhibiting factors, of participating in regular exercise (Vallance et al., 2011). The most commonly perceived advantages of regular exercise were that it led to weight loss and improved physical and mental well-being, overall health, fitness level, energy, and sleep. The most commonly perceived disadvantages of regular exercise were that it was too time consuming, exacerbated musculoskeletal problems, was not

enjoyable, caused fatigue, and cost too much. Facilitating factors for regular exercise included having a companion to be active with, planned and scheduled exercise, more access to exercise opportunities, and a better climate. In contrast, perceived barriers were weather, not enough time, current musculoskeletal problems, and lack of motivation to be active. Like Vallance and colleagues, the current study elicited women's beliefs regarding the facilitators and barriers to regular exercise, but specifically focused on a population of women with obesity. Exploring the beliefs of women with obesity who are actively trying to lose may uncover additional facilitators and barriers to regular exercise specific to this population.

In the last study, Kirchhoff and colleagues (2008) examined the benefits from, and barriers to, regular exercise in a group of 19 African American women using semi-structured qualitative interviews. Of the 19 women, ten were classified as "maintainers" based on attaining the Center for Disease Control's recommended level of physical activity for at least 6 months, and 9 were classified as "relapsers" (had exercised in the past but did not maintain recommended levels). Both groups reported similar benefits from (i.e., weight loss, improved well-being, health benefits) and barriers to (i.e., work commitments, poor weather, family-related constraints) regular exercise. Maintainers reported strategies used to sustain regular exercise including wanting to act as a role model, seeking out social support, and setting goals. The format used by Kirchhoff and colleagues was similar to the current study, as two groups of women were used to elicit benefits and barriers to regular exercise. However, this current study compared perceptions of women with obesity who actually achieved at least a 5% weight loss over

six months and those who did not, which allowed for analysis of how each of the groups discussed the TPB antecedents.

Review and Summary of Hypotheses and Research Questions

The purpose of this study was to explore the antecedents of regular exercise (behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intentions) among women with obesity who achieved at least a 5% loss of body weight over six months from women with obesity who did not achieve at least a 5% loss of body weight over six months. To address the purpose of the study, one hypothesis and two research questions were explored.

- 1.) Hypothesis 1: Women who are able to lose at least 5% of their body weight during a six month time frame will report higher levels of regular exercise than those who are not able to lose at least 5% of their body weight during this time.
- 2.) Research Question 1: Are there significant differences in behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control of behavioral intentions to engage in regular exercise among women with obesity who have and have not achieved at least a 5% weight loss over six months?
- 3.) Research Question 2: How much variance in intention to exercise can be predicted from the TPB antecedents of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control for women with obesity who have and have not achieved at least a 5% weight loss over six months?

- 4.) Research Question 3: In a population of women with obesity who either have or have not achieved at least a 5% weight loss over six months, what influences participation in regular exercise?

Assumptions of the Study

The assumptions of the study are based upon use of the TPB as the conceptual framework (#1-3; Fishbein & Azjen, 2010), the review of the literature (#4) and those established from working with human subjects (#5-8).

- 1.) Perceived behavioral control, attitudes, and subjective norm predict intention to perform a behavior.
- 2.) Actual behavior is predicted by behavioral intentions.
- 3.) Perceived behavioral control, attitudes, and subjective norm are predicted by beliefs, namely control beliefs, behavioral beliefs, and normative beliefs, respectively.
- 4.) Women with obesity who have achieved at least a 5% weight loss over six months will have exercised more than women who did not achieved at least a 5% weight loss over six months.
- 5.) Women's responses in the focus groups will be honest.
- 6.) Women will be able to reflect on their experiences with exercise over the past six months and accurately communicate these experiences with the investigator.
- 7.) Women recruited for the study actually wanted to lose weight.
- 8.) If women change their behavior, they will be able to lose weight.

Chapter Two summary

In this chapter, an overview of the Theory of Planned Behavior was provided, along with a discussion about the way in which post-positivism provides the philosophical underpinnings of the study. Regular exercise has been shown to play an integral role in losing weight and maintaining the loss (Jakicic et al., 2008, Wing & Phelan, 2005) and can offset the decrease in resting metabolic rate seen with reduced caloric intake alone (Tsai et al., 2003; Van Dale et al., 1990). Meta-analyses demonstrated support for the TPB relationships related to initiating regular exercise, specifically focusing on attitude and perceived behavioral control as the strongest predictors of intention, and intention as the strongest predictors of regular exercise behavior (Hagger et al., 2002; Hausenblas et al., 1997; Symons Downs & Hausenblas, 2005). However, there are mixed results from studies that investigate the TPB relationships related to regular exercise in women, and limited studies investigating the applicability of TPB relationships to maintaining regular exercise. Due to the mixed results and gaps in the literature, further investigation is warranted pertaining to the TPB relationships related to regular exercise in women with obesity. Supplementing quantitative findings with qualitative data related to women with obesity's behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norm, perceived behavioral control, and behavior intentions related to regular exercise provides more accurate insights into how to best support women with obesity striving to lose weight.

CHAPTER THREE

Introduction

In this chapter, the study design and sample is provided. An in-depth discussion of the study variables is undertaken, focusing on description of instruments that were used for data collection. Then, a detailed account of the methods for conducting the study, as well as discussion about data analysis is included. Throughout each of these sections, rationale about the decisions for the study design, sample, instruments, and data collection methods is explicated. Additionally, steps taken to ensure methodological rigor, both quantitatively and qualitatively, is discussed. The end of the chapter consists of identification of limitations of the study, as well as provisions for ensuring human subject protections.

Design

A cross-sectional, mixed methods design was used to explore the antecedents of regular exercise (behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intentions) among women with obesity achieved at least a 5% loss of body weight over six months from women with obesity who did not achieve at least a 5% loss of body weight over six months. This design allowed for use of quantitative analysis using comparative and predictive testing, as well as qualitative analysis to deepen understanding of the salient antecedents of regular exercise in the population. This exploratory approach was appropriate for the study because a limited number of studies have been conducted related the TPB antecedents to a population of women with obesity striving to achieve weight loss.

Reflecting on the mixed-methods approach, quantitative research is a means for testing objective theories and examining the relationship among variables (Creswell, 2009). These variables are usually measured with instruments and analyzed with statistical procedures. In contrast, qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2009). The researcher collects narrative and subjective information that is rich, in-depth, and based on firsthand knowledge of the phenomena, but requires some degree of researcher interpretation of the data in order to find meaning (Polit & Beck, 2008; Creswell, 2009). In this way, the current study used quantitative methods to analyze the TPB in the context of women with obesity and their beliefs, attitude, subjective norm, perceived behavioral control, and intention related to regular exercise, combined with qualitative methods to provide a richer understanding of the antecedents. According to Creswell and Plano Clark (2011), a mixed method approach is more than collecting and analyzing both quantitative and qualitative data. Rather, it uses both methods in tandem which strengthens the study due to symbiotic interaction from the two sources of data. A mixed methods approach is suitable for the study because both quantitative and qualitative data are necessary to answer the proposed research questions, following the idea that the research questions should direct the methods of the study (Hulley, Cummings, Browner, Grady, & Newman, 2007).

Sample and Setting

A convenience sample of women was recruited from a clinic in the Midwest that focuses on preventing the onset or sequelae of cardiovascular disease and diabetes, also known as cardiometabolic risk. A convenience sample is suitable for the exploratory

approach of this study. This type of sampling provides cost and logistic advantages that allowed the study to be completed in a timely manner using the resources available to the primary investigator (PI) (Hulley et al., 2007). As described in Chapter 1, the focus of the study was on women because they are less likely to engage in regular exercise than men (Centers for Disease Control and Prevention, 2012b; U.S. Department of Health and Human Services, 2008). Women were invited to participate if they spoke English, and were over 21 and under 70 years of age. Justification of this age range was based upon differences in women's metabolism and body fat percentages changes that occur as women age, which can affect their ability to lose and maintain weight loss (Daniels, 2011; Baker & Heitkemper, 2011). Women were eligible to participate if they had a BMI ≥ 30 kg/m² six months ago, and they were followed in the clinic for at least 6 months. Women were excluded from the study if they were pregnant or had been pregnant in the past year, or if they had medical reasons to restrict their exercise behavior. Women were also excluded from the study if they had any type of bariatric surgery in the past two years because any weight loss may be attributed to the procedure rather than regular exercise or reduced caloric intake.

Women who were eligible and volunteered to participate were recruited into two groups based upon a review of their medical record over the previous 6 months. Women who lost at least 5% of their body weight and maintained this loss during the six month time frame were invited to participate in Group 1. Women who had not achieved or maintained at least a 5% decrease of their body weight during the six month time frame were invited to participate in Group 2. The initial goal was to recruit thirty-five women into each group, for a total sample size of $n = 70$. Recruiting this number of patients

would allow for a detection of a moderate effect size of 0.60, based on a power of 0.80 when using comparative analysis. A moderate effect size was chosen due to results from previously conducted meta-analyses (reviewed in Chapter 2) indicating a large to moderate effect between most of the TPB relationships (Hagger et al., 2002; Hausenblas et al., 1997; Symons Downs & Hausenblas, 2005). To be conservative, a moderate effect size was chosen to help determine the sample size. The proposed sample size also allowed for predictive analysis with 10 cases per variable (antecedent) in the TPB model.

Study variables and instruments

The primary variables studied included the TPB antecedents of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norm, perceived behavioral control, and behavior intentions related to regular exercise, as well as women's actual exercise behaviors. Quantitatively, the TPB antecedents were measured with the Physical Activity Survey for Adults at Risk for Diabetes (PASARD) (Blue, 2004). The instrument contains 84 items. Although the instrument uses the term physical activity, based on the definition of physical activity used in the survey instructions (moderate or vigorous activities that one would do for at least 30 minutes each time on most, if not all, days of the week), it fits the this study's definition of regular exercise and was thus deemed appropriate for use. In addition, obesity is a risk factor for diabetes, therefore extending validity of the survey to the population in this study (Centers for Disease Control and Prevention, 2012a; Sturm, 2007; Visscher & Seidell, 2001).

Of the 84 survey items in the PASARD, 64 of the items were taken from the Physical Activity Belief Scales (PABS). The PABS has three subscales based on TPB antecedents: behavioral beliefs, normative beliefs, and control beliefs. The PABS were

developed and validated with a population of individuals at risk for diabetes (Blue, Marrero, & Black, 2008). Reliability testing of the PABS revealed that Cronbach's alpha coefficients for all the belief scales exceeded .70 (behavioral beliefs Time 1 $\alpha = .93$, Time 2 $\alpha = .92$; normative beliefs Time 1 $\alpha = .87$, Time 2 $\alpha = .91$, control beliefs Time 1 $\alpha = .89$, Time 2 $\alpha = .90$) and test-retest reliabilities for the behavioral belief ($r = .91$), normative belief ($r = .79$), and control belief ($r = .85$) were all significant (Blue et al., 2008).

Looking at each of the three subscales in the PABS, the behavioral belief subscale has 16 outcome expectancy (oe) items and 16 outcome evaluation (e) items. The outcome expectancy items measure the strength of belief about whether good and bad things would happen if an individual gets regular physical activity, and the outcome evaluation items measure the degree to which the person judges the outcome to be good or bad. Negative items (items n, o, and p for questions 1 and 2) are reverse scored, with higher scores indicating more positive beliefs. The normative belief subscale has 6 normative belief (nb) items and 6 corresponding motivation to comply (mc) items. The normative belief items measure the strength of belief that another person would influence the participant to get regular physical activity, and the motivation to comply items measure the degree to which the participant would comply with the wishes of other people. The control belief subscale has 12 control beliefs (cb) items and 12 control power (p) items. The control belief items measure the strength of belief that a factor would facilitate or inhibit getting regular physical activity, and the power items measure the degree of ease or difficulty of being physically active if the condition presents.

Each of the subscales of the PABS is measured with Likert-type scale responses, with values ranging from one to five. An example of the Likert-type scaling can be seen with the outcome expectancy items that measure the strength of belief from 1 (*very unlikely*) to 5 (*very likely*) that relate to whether good or bad things will happen if the person gets moderate or vigorous activity for at least 30 minutes on most days of the week. To score the belief scales, each belief item is multiplied by its corresponding item, and the products are summed for behavioral beliefs ($\sum oe * e$), normative beliefs ($\sum nb * mc$), and control beliefs ($\sum cb * p$), respectively. A higher score signifies individuals have beliefs that are more likely to increase intention to exercise. An example of how to score the belief items is provided below.

The PASARD contain 10 items to directly measure the TPB constructs of attitude, subjective norm, and perceived behavioral control. Like the belief scales, each of these items is scaled on a 1 to 5 Likert-type scale, with 6 items representing attitude (Cronbach's $\alpha = .85-.89$), 3 items representing subjective norm (Cronbach's $\alpha = .84-.83$), and 1 item representing perceived behavioral control (Blue et al., 2008). As delineated by the TPB, the indirect measures of intention measured in the PABS subscales (behavioral beliefs, normative beliefs, and control beliefs) should be correlated with these 10 items representing the direct measures of attitude, subjective norm, and perceived behavior control, respectively (Fishbein & Ajzen, 2010). Previous testing of the PABS subscales and 10 items representing the direct measures showed positive moderate correlations between each of the belief measures and its respective direct measure (behavioral beliefs and attitude, $r = .39, p < .05$; normative beliefs and subjective norm, $r = .34, p < .05$; and control beliefs and perceived behavior control, $r = .52, p < .05$) (Blue et

al., 2008). Construct validity of the PABS and 10 direct measure items also was supported by confirmatory factor analysis and structural equation modeling (Blue et al., 2008).

In addition to the items previously described that were reported in Blue, Marrero, and Black's (2008) report of development and psychometric testing of the Physical Activity Belief Scale, there are six other items included in the PASARD that are not reported in the article. The six other items address the TPB constructs of subjective norm, perceived behavioral control, and intention. One additional item to measure subjective norm (Question 8), and two additional items to measure perceived behavioral control (Question 12 and 14) also are included. Three items pertaining to behavioral intention (Questions 15-17) are included on the PASARD that use three different stems ("I tend," "I will try," and "I plan") to provide information about anticipated involvement in moderate or vigorous physical activity for at least 30 minutes on most days of the week over the next two months. Although efforts were made to contact the author of the PASARD to get further information on the reliability and validity of these six questions, the author did not respond to requests. Despite this limitation, the questions do have face and content validity because they meet recommendations by Fishbein and Ajzen on how to develop and format survey questions to measure these TPB constructs (2010).

Scoring items from the PASARD that measure attitude, subjective norm, perceived behavior control, and intentions requires a different process than the scoring procedure used for the belief items. As mentioned previously, to score the belief scales, each belief item is multiplied by its corresponding item, and the products are summed for behavioral beliefs ($\sum \text{outcome expectancy}(\text{oe}) * \text{outcome evaluation}(\text{e})$); normative beliefs

$(\sum \text{normative belief}(\text{nb}) * \text{motivation to comply}(\text{m}); \text{ and control beliefs } (\sum \text{control beliefs}(\text{cb}) * \text{control power}(\text{p}), \text{ respectively. For example, for behavioral beliefs, the score from item 1a which ranges from 1 to 5 ("Moderate or vigorous physical activity improves my physical health"}) is multiplied with the score from item 2a which ranges from 1 to 5 ("Improving my physical health is"). The product (1a*2a) is added to the products of 1b*2b, 1c*2c... 1p*2p, to produce a total score for behavioral beliefs. However, to measure the antecedents of attitude, subjective norm, perceived behavior control, and intention, responses from items representing these antecedents are averaged, producing a score from 1-5 (Francis et al., 2004). Scores closer to five represent a higher likelihood that individuals are going to have the intention to perform the behavior, therefore representing the likelihood of actually completing that behavior, in this case regular exercise.$

Regular exercise was measured with the Kaiser Physical Activity Survey Sports and Exercise subsection (Sternfeld et al., 1999). This subsection contains a total of 15 questions; 9 of the questions are Likert-type questions ranging from 1 to 5, 3 questions are yes/no format, and 3 questions are fill in the blank. The Sports and Exercise subsection has established test-retest reliability (Intraclass Correlations for 1-month = 0.84, $p < .0001$) and validity with activity records ($r = .73$, $p < .01$), accelerometer recordings measured in accumulated daily MET intensities per minute per activity ($r = .57$, $p < .01$), and maximal oxygen consumption (VO_2 peak) ($r = .76$, $p < .01$) among women (Ainsworth, Sternfeld, Richardson, & Jackson, 2000).

Scoring responses from the 15 questions that comprise the Sports and Exercise subsection produces a value for the Sports and Exercise Index, which range from 1 to 5

(Sternfeld et al., 1999). Values closer to 5 indicate the subject participates in a greater amount or higher intensity of exercise. To score the instrument, values of the first three questions are added to the simple sport score and averaged ($(\sum \text{questions 1, 2, 3, and the simple sports score})/4$). The simple sports score is calculated by multiplying the intensity by proportion by time for each specific sport or exercise listed in questions 5, 9, and 13, and then summing these values for each activity. The simple sport score will take on a value of 1, 2, 3, 4, or 5 corresponding to summary scores of 0, 0.01- <4 , 4- <8 , 8- <12 , and >12 . For example, a woman participated in one type of exercise or sport over the past 6 months that was 4-6 METs (value of 1.26 per scoring directions). She has done the activity for 3-4 out of the last 6 months (value of 3.5), and greater than 2 but less than 3 hours per week (value of 0.42). Multiplying the intensity by proportion by time ($1.25*3.5*0.42$) gives a value of 1.85, which takes on a simple sport score of 2.

Completion of the Kaiser Physical Activity Survey Sports and Exercise subsection required a listing of specific sports and exercises relevant to the study (i.e., brisk walking will be included, but not native New Zealander physical activities). Participants reviewed the list and identified whether they have participated in any of the activities, or similar activities, within the past six months (Questions 5, 9 and 13). Subsequent questions eliciting further detail about the amount of time spent participating in these activities followed. The list of activities was generated from the *2011 Compendium of Physical Activities*, which is a list of activities and associated metabolic equivalents (METs) (Ainsworth et al., 2011).

The Compendium was designed to standardize the assignment of MET intensities in physical activity and exercise questionnaires. Per the author's definition, a MET is the

ratio of the work metabolic rate to the resting metabolic rate (Ainsworth et al., 2011). One MET equals 1 kcal/kg/hour, and is approximately equivalent to the energy cost of sitting quietly. The Compendium was developed with support from the National Heart, Lung, and Blood Institute, and is cited in the 2008 United States Physical Activity Guidelines (U.S. Department of Health and Human Services, 2008). Sixty-eight percent of the codes have measured MET values from established laboratory or field experiments that measured the oxygen costs of specific activities, and the remaining MET values are estimated values based on similar activities. The latest version of the Compendium (2011) has 821 activity codes that apply to occupational, leisure, home, volunteer, religious, sports, and exercise activities. However, as guided by the developers of the Compendium, the principal investigator (PI) selected sports and exercise activities that applied to the study population. Therefore, 270 activities pertaining to sports and exercise were included on the list for women to select from to complete the Kaiser Physical Activity Survey Sports and Exercise subsection.

In addition to the quantitative instruments, two focus groups (the first with women who did not achieve at least a 5% weight loss over six months, and second with women who did) were convened to identify what influences women's participation in regular exercise. The investigator asked the group to talk about general beliefs about regular exercise, facilitators and barriers to participation, and self-reflection on their exercise intention and behavior. A semi-structured interview questions was developed and used to guide the groups (Appendix A).

Procedure

Prior to study commencement, approval was received from the Marquette Institutional Review Board. Subjects were recruited from a clinic located in the Midwest that focuses on preventing the onset or sequelae of cardiovascular disease and diabetes, also known as cardiometabolic risk. The PI reviewed the medical record of women seen in the clinic for their six-month follow-up visit to screen each patient for inclusion and exclusion criteria. If a woman qualified for the study, the PI approached her after the health care team was finished with her visit to determine if she was interested in hearing about the study opportunity. If the woman agreed to participate, informed consent and quantitative data collection was completed at that time. Women completed the instruments in a private, confidential room in the clinic. On average, it took woman 20-30 minutes to complete the instruments, and each woman was able to read and complete the instruments on their own without the PI needing to read the questions to her. Alternatively, some women completed the informed consent and then requested to complete the study instruments and mail them back to the investigator. All study instruments completed at home were mailed back to the PI, or given to the PI at the subsequent follow-up visit. In addition to the PASARD and Kaiser Physical Activity Survey Sports and Exercise subsection, women completed a demographic form (Appendix B). Collecting demographic information allowed the PI to determine if significant differences exist between the two groups of women. In addition to the quantitative instruments, information also was collected from the medical record, including the patient's age, height, baseline weight, weight at the end of the six month time frame (Appendix C). The quantitative data collection tools were converted to Teleforms prior to the study commencing for ease of data entry.

As part of the quantitative data collection process, participants were given a separate questionnaire asking them to indicate their interest in taking part in a focus group. If they were interested in participating, they provided information to be contacted at a later date. In order to ensure confidentiality of participants and avoid undue bias of the PI when analyzing data, this document was kept separate from other quantitative documents and only used to contact women when establishing the focus group meeting times. After the study was completed, the contact information was shredded and disposed of in confidential disposal bins. Rather than waiting until the end of the study to randomly select interested women to participate in the focus groups, the focus groups were conducted as soon as six women per group self-identified as willing to participate. This form of convenience sampling was used because waiting to conduct the groups until after quantitative data collection was completed would have meant additional time for beliefs and behaviors to possibly change, confounding the ability to use the qualitative information to enhance understanding of the quantitative results.

Each of the two focus groups lasted 60-70 minutes, and the investigator utilized a semi-structured topical interview guide to guide the group discussion (Appendix A). Using a semi-structured interview guide allows researchers to make good use of a one-time interview to ensure all the information of interest is obtained (Cohen & Crabtree, 2006). At the same time, a semi-structured interview guide provides subjects the flexibility to express their views in their own terms, and provides researchers the freedom to further explore or clarify a topic (Cohen & Crabtree, 2006). To contribute to the content validity of the interview guide, the questions on the guide were reviewed by the nurse practitioner currently working at the cardiometabolic clinic, as well as another

investigator highly experienced in qualitative methods. Changes were made to the guide based on these expert recommendations. Focus groups took place in a private conference room in the clinic. The women who participated in the group completed a second informed consent specific to the focus group. Prior to the group interview commencing, the importance of maintaining confidentiality of what each of the other group members shared during the interview was stressed. To further protect the women, they chose a pseudonym for use during the interview and data analysis process.

Although efforts were made to help the women feel comfortable interacting with the group, participants were told they should only share what they feel comfortable sharing.

The focus groups were recorded with a digital audio recorder and downloaded to the investigator's password protected computer. The recordings were transcribed verbatim by a transcriptionist that has completed a NIH training course on protecting human research participants. Interviews and transcriptions were reviewed by the PI to ensure transcribing accuracy. The interviews were only listened to in a private room on low volume with the door closed. In addition to recording the interviews, the PI kept a log of field notes that were written after each focus group, which allowed the investigator to capture relevant observations made during the focus group (Appendix D).

A master list was kept in a locked file cabinet separate from the rest of the data which used participants' names and study identification numbers to indicate whether they participated in one of the two focus groups. Keeping the master list allowed for analysis of the demographic data provided when filling out the survey forms to better understand the background of the women participating in the focus groups. The master list was shredded and disposed of in confidential disposal bin at the end of the study.

Prior to collection of any quantitative or qualitative data, study information was reviewed and questions answered before obtaining written consent from all participants. Participants were provided with a copy of the consent form, including the investigator's contact information. The PI informed participants they had three days to withdraw themselves from the study after completing the quantitative instruments. After this time, the questionnaires were scanned into the computer, and the de-identified nature of the data did not allow for removal of the data. Because participants in the focus groups had pseudo names, they were informed they could choose to withdraw up to three days after the focus group discussion, and their data would be removed after the transcript transcription is concluded. No participant requested to be removed from the study after consenting to participate. Women were provided a \$5 gift card to a local health and pharmacy store after completing the quantitative instruments as a token of appreciation for their participation. Women could have chosen to not complete the questionnaire and still receive the gift card at any time, after informed consent had been provided. Women who participated in the focus groups received a \$10 gift card to a local health and pharmacy store as a token of appreciation for their participation. Once again, women were informed they could leave the focus group prior to completion and obtain the gift card on a table by the door.

Ensuring Rigor in Qualitative Methods

Several strategies were used to ensure rigor during qualitative data collection and analysis in order to develop trustworthiness of the data. Prior to the start of the study, the PI identified assumptions or biases that may affect the study outcome, which are listed in Chapter Two. Another method that was used to establish credibility of the data is to

establish member checks. In a member check, the PI seeks feedback from participants to determine if the PI's interpretations of the data represent the participant's reality (Carlson, 2010). The PI conducted *in situ* member checking, presenting a summary of information discussed at the end of the focus group (Polit & Beck, 2008). Presenting the information to the participants in real time confirmed the PI was on track with initial data analysis process (Polit & Beck, 2008). The data were reviewed by rater, who independently developed codes and themes from each of the focus groups. The primary investigator and second rater discussed the coding decisions and themes until agreement was reached. A third author who has expertise in qualitative research also reviewed the transcripts to determine congruency with what participants expressed and themes presented. Throughout the data analysis process, the PI kept a log of decisions made and the rationale for these decisions in order to create an audit trail that was later reviewed by the additional raters (Wolf, 2012). At various points of the study, the PI also participated in peer debriefing with a member of the dissertation committee who is an expert in qualitative research. The purpose of the debriefing was to summarize the data that has been collected, strategies used to analyze the data, and initial categories that have been developed subsequent to the data analysis (Polit & Beck, 2008). The debriefing helped identify issues such as evidence of researcher bias, errors of interpretation, and incomplete analysis of the data.

Data analysis

Prior to analysis, data was cleaned and discrepancies or missing data was verified against the raw data. No participant had over 10% missing data; if data were missing, the mean value for the question for the group was imputed to allow for a complete set of

participant data to be used. One outlier was detected using boxplots based on the interquartile range, although the data point was not removed as it was felt the value was attributed to normal variation within the population. The Shapiro-Wilk test and Q-Q plots noted violations in the assumptions of normality. Therefore, the nonparametric Mann-Whitney U test was used to determine if there were significant differences between the two groups of women. Demographic data was analyzed with chi-square test for categorical data (e.g., race/ethnicity, income, education), and the Mann-Whitney U test for continuous data (e.g., age, weight, BMI), which allowed for detection of significant differences between the two groups that could affect the results of the study. A significance level of $p < .05$ was used in all analyses.

After initial data screening was completed, the research hypothesis and research questions were addressed using the data analysis approaches listed below.

- 1.) Hypothesis 1: Women who are able to lose at least 5% of their body weight during a six month time frame will report higher levels of exercise than those who are not able to lose at least 5% of their body weight during this time.

Analysis procedure used: The study hypothesis was addressed through use of the Mann-Whitney U test to compare the levels of regular exercise between the two groups. The independent variable, regular exercise, was measured with the Kaiser Physical Activity Sports and Exercise subsection (Sternfeld, Ainsworth, & Quesenberry, 1999). The dependent variable, weight loss of at least 5% over the past six months, was determined by data collected during a view of the medical record.

- 2.) Research Question 1: Are there significant differences in behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control of intentions to engage in regular exercise among women with obesity who have and have not achieved at least a 5% weight loss over six months?

Analysis procedure used: The first research questions was analyzed using Mann-Whitney U tests to determine significance differences between the independent variables of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control based on the dependent variable of intention to exercise. The variables were measured using the Physical Activity Survey for Adults at Risk for Diabetes (Blue, 2004).

- 3.) Research Question 2: How much variance in intention to exercise can be predicted from the TPB antecedents of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control for women with obesity who have and have not achieved at least a 5% weight loss over six months?

Analysis procedure used: The second research question was analyzed using multiple linear regression using the “Enter” approach. The independent variables of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control, as well as the dependent variable of intention to exercise, were measured using the Physical Activity Survey for Adults at Risk for Diabetes (Blue,

2004). Output from the analysis was reviewed for violations of assumptions of multicollinearity, normality, linearity, and outliers.

- 4.) Research Question 3: In a population of women with obesity who either have or have not lost achieved at least a 5% weigh loss over six months, what influences participation in regular exercise?

Analysis procedure used: To address research question three, the content of the qualitative interviews was analyzed using the process of qualitative descriptive content analysis (Sandelowski, 2000). In qualitative descriptive content analysis, a comprehensive summary of events is presented in everyday language. The researcher avoids asserting significant interpretation of the data, as is done in other qualitative methods such as grounded theory or phenomenology (Sandelowksi, 2010; Sandelowski, 2000). Qualitative descriptive content analysis is data-derived, meaning that codes are applied to the data to assist with analysis.

To assist with this analysis process, data were entered into the NVivoTM software analysis program (Version 10.0; QRS International, Burlington, MA). A template based on the TPB antecedents was used to begin the coding process. Once the data were categorized, they were reviewed and analyzed to determine themes from both of the groups. Themes were generated based on how the two groups discussed the antecedents, or influences, of their exercise. The data were independently reviewed by a second rater, who used the same starting template to categorize the data, review and analyze the data, and determine themes from both groups. The primary investigator and second rater discussed the coding decisions and themes until agreement was reached. A third author

who has expertise in qualitative research also reviewed the transcripts to determine congruency with what participants expressed and themes presented.

Data management

Throughout the study, various steps were taken to protect the confidentiality of participant data. Data was kept in a locked storage cabinet in the office of the principal investigator, and computers containing electronic files were password protected and maintained in locked offices. Information from the quantitative instruments and the demographic form were scanned into SPSS using a password protected computer, and the paper copies will be shredded and placed in confidential disposal bins after a period of five years. The consent forms also will be shredded and placed in confidential disposal bins after a period of five years. Recorded focus group interviews were uploaded to the computer and deleted from the digital recorder within 24 hours of completing the interview. Electronic recordings will be kept on a password protected computer and deleted after five years, but the transcribed interviews will be kept indefinitely.

The master list that contains participants' names and study identification numbers to tie the demographic data for quantitative and qualitative data analysis was shredded and disposed of in confidential disposal bins at the end of the study. Contact information provided by women interested in participating in the focus groups was kept in a locked file cabinet and shredded and placed in confidential disposal bins at the end of the study. When data were being transported between the clinic and the investigator's office, a locked messenger bag was used. Participants were assigned study identification numbers to identify quantitative instruments and avoid the need for personal information on the

instruments and demographic form. For the focus group interviews, participants chose a pseudonym for the interview and analysis process, and participants were asked to refrain from identifying themselves. Any identifying information collected on the transcripts was deleted. Lastly, the PI meet with her advisor and committee members to ensure proper procedure was maintained throughout the study to maintain confidentiality of patient data.

Limitations

Although efforts have been made to ensure methodological rigor and promote internal and external validity of the study, several study limitations remain. Several potential limitations may be attributable to the sampling procedure. Although the study sample included women with obesity from 21 to 70 years old, the results may not generalizable to men, or women older or younger than the target population or non-obese individuals. In addition, women are only being recruited from only one clinic, and their experiences may not be generalizable to other clinic populations. However, recruiting from one clinic controls any confounding variables that may affect the outcome of the study attributable to studying multiple clinical sites, thereby increasing the internal validity of the findings. Using a convenience sample without randomizing participants is another limitation of the study, but ensures the study could be completed in a timely mannerly using the resources available.

Another limitation to the study is based on the population that was recruited for each group in the study. For the group of women that lost at least 5% of their body weight over six month, women were not be differentiated based on when they lost the weight. Women may have lost the weight in the first month and have maintained the

weight over the last five months, slowly lost the weight over each month, lost the weight in the final month, or lost and gained weight over the months. Although these women may have different beliefs and behaviors regarding regular exercise, for the purposes of this study, they were all be considered part of the group that lost 5% of their initial body weight. Analyzing the relationship between when women lose weight and their beliefs about exercise may be warranted in the future.

Other limitations to the study are evident with data collection and data analysis. The Kaiser Physical Activity Survey has been widely used in the literature and has established reliability and validity in women (Ainsworth et al., 2000). On the other hand, the Physical Activity Survey for Adults at Risk for Diabetes has reported validity and reliability on most of the items, but previous validity and reliability of some of items is lacking (Blue et al., 2008). Although the instrument has not been widely used, it does have face and content validity because the questions are formatted based on the recommendations of Fishbein and Ajzen (2010), the developers of the TPB. There is also a potential limitation when completing the qualitative data analysis because it is possible that another investigator may analyze the data differently and conclude different findings. To address this possibility, an audit trail was created in an effort to make the data analysis more transparent and contribute to rigor in data analysis and validity of findings. Additionally, two other raters reviewed the transcripts and discussed the data and identified themes until agreement was reached.

The Hawthorne effect represents another potential limitation. Participants' may have responded in a manner they thought was socially acceptable to the investigator, or responded differently because they know they are participating in a study investigating

regular exercise (Gardner & Campagna, 2011). To minimize the Hawthorne effect the investigator informed the sample that she is interested in their real life experiences, to attain a true picture of what influences their exercise. Along these lines, the PI is a non-obese woman, and participants may have felt uncomfortable sharing their experiences with someone who has not lived the experience of being a woman with obesity. To address this, the PI worked to convey a sense of openness, respect, and compassion when working with the participants. In order to demonstrate experience in working with women with obesity, the PI introduced herself as a nurse who has previously worked with women in the cardiometabolic clinic. Other limitations related to sample size and study results are reported in the manuscripts listed under Chapters 4 and 5.

Human Subjects Use

In order to ensure the study is meeting all ethical and professional standards for the safety of subjects, approval from the Institutional Review Board at Marquette University was attained prior to beginning to the study (Appendix E). The cardiometabolic clinic does not have its own IRB, but accepts IRB approval from the Marquette University. Risks to participants are minimal. Past research notes challenges women face related to their weight, such as previous failures during the process of weight loss and living in a society that can have a negative bias towards obesity. It is possible that in discussing their weight or exercise, unpleasant emotions were invoked based on previous negative experiences (Annesi & Unruh, 2007; Polivy & Herman, 2002; Puhl & Heuer, 2009). To minimize distress, participants were told they could drop out of the study at any time, were free to answer questions as they desire, and may choose not to answer questions.

In order to avoid coercion, the women recruited from the clinic were assured that their decision to participate or not participate in the study did not affect the care they received at the clinic. The women were informed that there were no direct health benefits to them for participating in the study, although some women may have found benefit in reflecting or talking about their experiences. All women were informed of the details of the study and signed a consent form before beginning the data collection (Appendix F). If applicable, women participating in the focus groups signed a second consent form prior to the start of the discussion, which included provision for allowing tape recording of the group discussion (Appendix G). Confidentiality of the data was maintained by the researcher, and the participants in the focus groups were instructed to maintain confidentiality of the experiences shared during the group discussion.

Chapter Three Summary

In this chapter, the details about the design, sample, study variables, and procedure for data collection and data analysis were provided. A cross-sectional, mixed-methods design was used to explore antecedents of regular exercise in achieved at least a 5% weight loss over six months, and those who did not achieved at least a 5% weight loss over six months. The antecedents were drawn from the Theory of Planned Behavior, which were measured with the Physical Activity Survey for Adults at Risk for Diabetes (Blue, 2004). To measure actual behavior, regular exercise was measured with Kaiser Physical Activity Survey Sports and Exercise subsection (Sternfeld, Ainsworth, & Quesenberry, 1999). In addition to the quantitative instruments, two focus groups were conducted consisting dichotomized by women did or did not achieve at least a 5% weight over six months, in order to explore influences on their regular exercise. The statistical

software analysis program, SPSS, was used to provide descriptive data, bivariate comparisons, and regression analysis to answer the quantitative research questions, and NVivo™ was used to organize the qualitative data for the process of qualitative descriptive content analysis. The chapter concluded with discussion of limitations of the study, as well as provisions for human subject use.

CHAPTERS FOUR & FIVE

Manuscript 1: “A Comparison of Antecedents of Regular Exercise among Women with Obesity Who Do and Do Not Achieve Weight Loss Over Six Months” (Appendix H)

Manuscript 2: “Antecedents of Intention to Exercise among Women with Obesity Who Do and Do Not Achieve Weight Loss Over a Six–Month Period” (Appendix I)

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Appendix A: Focus Group Semi-Structured Interview Guide

The purpose of the guide is to assist the primary investigator to facilitate the focus groups in an organized manner to elicit desired information, but still provides the respondents flexibility and creativity when sharing their experiences.

Primary investigator (PI): Hello and welcome. I appreciate you taking the time to attend the focus group today. The purpose of this meeting is to learn more about women and exercise. Please remember that anything said during this group meeting must remain confidential, meaning that it is not shared with anyone once we leave the room. You are welcome to share as much or as little as you would like to, and are free to leave the meeting at any time. As you were informed of previously, the meeting will audio recorded to help me review the meeting later on. Today I am going to ask you some questions about exercise. Before we begin, are there any questions thus far about anything? (Pause)

PI: Ok, well let's get started. You all have a name tent with the pretend name you chose on both sides. Please take a moment to review your pretend name. Please identify yourself by your pretend name before commenting when in group discussion to help me make sense of the conversation when I am listening to the tape again. To begin, I'd like everyone to go around and introduce themselves by their pretend name, and say a bit about why they were willing to come today.

(Questions to be asked. Clarification questions may be added).

Tell me about your thoughts about exercise. In other words, when you hear the word exercise, what does it mean to you?

For the rest of our conversation, I'd like you to think of exercise as planned, structured activities that you do to maintain or improve your health. Sometimes this is defined as moderate or vigorous-intensity activity for a minimum of 30 minutes five days per week, or vigorous activity for a minimum of 20 minutes three days per week (Definition is written down on a poster board and displayed for the group at this time. It will be kept visible throughout the remainder of the discussion).

Imagine you are giving advice to a friend about exercising in the way I just defined. What would you say to convince them to exercise?

For those of you that do exercise, what makes you do it? What are your personal reasons for exercising? Are your personal reasons the same reasons you would have told your friend?

What things help you exercise?

What things make it hard to exercise?

Tell me about which people in your life help you to exercise. How do they help you?

Tell me about which people in your life make it hard to exercise. How do they make it hard to exercise?

Tell me about how much control you have over how much exercise you get.

Tell me about any strategies you use to keep yourself on track with your exercise.

Tell me about any changes to your exercise strategies over time.

What concerns do you have, if any, about maintaining your exercise in the future?

Appendix B: Demographic Questionnaire

1. What is your race/ethnicity?
 - American Indian or Alaska Native
 - Asian
 - Black or African American
 - Hispanic or Latino
 - Native Hawaiian or other Pacific Islander
 - White
 - Mixed
 - Other (please specify)

2. What is your highest level of education?
 - Some high school
 - High school diploma or GED
 - Associate's degree, technical degree, or some college credits
 - Bachelor's degree
 - Master's degree
 - Doctorate degree or post-Master's degree
 - Other (please specify)

3. How many children do you have?

4. What is your relationship status?
 - Single
 - In a relationship, living in separate households
 - Married, or living with a partner in the same household
 - Divorced or widowed

5. How many hours per week do you spend at work or school?
 - 0-9 hours/week
 - 10-19 hours/week
 - 20-29 hours/week
 - 30-39 hours/week
 - 40-49 hours/week
 - 50-59 hours/week
 - 60 or more hours/week

6. What is your estimated yearly household income?

- Below \$20,000
 - \$20,000-\$39,999
 - \$40,000-\$59,999
 - \$60,000-\$79,999
 - \$80,000-\$99,999
 - Above \$100,000
7. How many people live in your household?
8. Please indicate what medical conditions you currently have or have previously been treated for (circle all that apply).
- Heart disease
 - Diabetes
 - Stroke
 - High blood pressure
 - Kidney disease
 - Peripheral vascular disease
 - COPD
 - Asthma
 - Arthritis
 - Cancer (please write in type)
 - Other (please specify)
9. Do you currently smoke?
- Yes
 - No
10. Do you currently have health insurance?
- Yes
 - No

Appendix C: Chart Data Collection Tool

1. Today's date: _____
2. Beginning date of six month attempted weight loss period: _____
3. Participant age: _____
4. Participant height: _____
5. Weight six months ago: _____ BMI: _____
6. Current weight: _____ BMI: _____

Appendix D: Field Notes Template

1. Describe the setting. This may include pencil drawings of space and furniture arrangements.
2. Describe the activities that took place in the setting. Reproduce the sequence of actions and behaviors, paying particular attention to what may not have been audio recorded.
3. Describe any informal interactions or unplanned activities.
4. Describe any nonverbal communication that was observed during the focus groups.
5. Describe anything that the PI observed that did not happen.
6. Describe any impact the PI might have had on the situation.

Appendix E: IRB Approval Letter

March 5, 2013

Ms. Heather Vartanian
Nursing

Dear Ms. Vartanian:

Your protocol number HR-2552, titled, "*A comparison of antecedents of regular exercise among obese women who do and do not achieve weight loss during six months*" was expedited on March 5, 2013, by a member of the Marquette University Institutional Review Board. This approval is contingent upon an approved Authorization Agreement between the Marquette University IRB and Columbia St.-Mary's IRB.

Your IRB approved informed consent forms are enclosed with this letter. Use the stamped copies of these forms when recruiting research participants. Each research participant should receive a copy of the stamped consent form for their records. Participants must also sign a HIPAA Authorization form releasing medical records for research purposes. Your IRB approved stamped recruitment flyer is also attached; use stamped copies for recruitment purposes.

Subjects who go through the consent process are considered enrolled participants and are counted toward the total number of subjects, even if they have no further participation in the study. Please keep this in mind when conducting your research. This study is currently approved for 90 subjects (70 for the survey and 20 for the focus group).

If you need to increase the number of subjects, add research personnel, or make any other changes to your protocol you must submit an IRB Protocol Amendment Form, which can be found on the Office of Research Compliance web site: <http://www.marquette.edu/researchcompliance/research/irbforms.shtml>. All changes must be reviewed and approved by the IRB before being initiated, except when necessary to eliminate apparent immediate hazards to the human subjects. Any public advertising of this project requires prior IRB approval. If there are any adverse events, please notify the Marquette University IRB immediately.

Your approval is valid until March 4, 2014. Prior to this date, you will be contacted regarding continuing IRB review.

An IRB Final Report Form must be submitted once this research project is complete. The form should be submitted in a timely fashion, and must be received no later than the protocol expiration date.

If you have any questions or concerns, please do not hesitate to contact me. Thank you for your time and cooperation.

Sincerely,
Amanda J. Ahmndt, RN, MS, MSN, CIM, CIP
IRB Manager

cc: Dr. Christopher Okunseri, IRB Chair
Dr. Robert Topp, Nursing
Ms. Sherri Lex, Graduate School

Appendix F: Consent for Written Surveys

MARQUETTE UNIVERSITY
AGREEMENT OF CONSENT FOR RESEARCH PARTICIPANTS – Written Surveys
A Comparison of Women's Exercise Beliefs and Behaviors
Heather Vartanian
Marquette University College of Nursing

You have been invited to participate in this research study. Before you agree to participate, it is important that you read and understand the following information. Participation is completely voluntary. Please ask questions about anything you do not understand before deciding whether or not to participate.

PURPOSE: The purpose of this research study is to get a better understanding of women's beliefs about exercise, and exercise practices. You would be one of 70 participants providing information for 3 paper and pencil based questionnaires. You may be asked to be one of approximately 20 participants in the focus group portion of the study, and would be asked to complete a separate consent form prior to participating in this group.

PROCEDURES: You are being asked to complete three questionnaires. The first questionnaire is a form asking information about you, the second questionnaire (Physical Activity Survey for Adults at Risk for Diabetes) is a survey asking about your exercise beliefs and attitudes, and the third questionnaire is a survey asking about your exercise participation in the past six months (Kaiser Physical Activity Survey Sports and Exercise subsection). There are no follow-up questionnaires. The questionnaires will be downloaded into the computer for analysis. Paper copies of questionnaires will be shredded after five years, and electronic files will be kept indefinitely and may be used in future research. For confidentiality purposes, your name will not be included with your responses.

DURATION: Your participation will consist of a one-time, 20-30 minute session to complete the three questionnaires.

RISKS: The risks associated with participation in this study are no more than participants would encounter in everyday life. You may feel uncomfortable answering the questions, but you are free to answer in your own way. If there is information that you would rather not share, you are free to keep that to yourself.

BENEFITS: There are no direct benefits associated with participation in this study. Some women may find benefit from reflecting on their experiences. Your participation

may help provide better understanding about factors that influence women's participation in regular exercise.

CONFIDENTIALITY: All information you reveal in this study will be kept confidential. All your data will be assigned an arbitrary code number rather than using your name or other information that could identify you as an individual. When the results of the study are published, you will not be identified by name. The data will be maintained in a locked file cabinet or in a password protected computer file in the principal investigator's (PI), Heather Vartanian, office. The data will be destroyed by shredding paper documents five years after the completion of the study. The data may be used by the PI in future research. Your research records may be inspected by the Marquette University Institutional Review Board or its designees, and (as allowable by law) state and federal agencies.

COMPENSATION: You will receive a \$5 Walgreen's gift card after filling out the questionnaires to compensate you for your time. You can choose to stop filling out the questionnaires and receive the gift card at any time.

VOLUNTARY NATURE OF PARTICIPATION: Participating in this study is completely voluntary and you may withdraw from the study and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled. If you chose to withdraw during, or up to three days after filling out the questionnaires, your information will be shredded. After this time, the questionnaires will have been scanned into the computer and the lack of identifying information will prevent yours from being deleted. Your decision to participate or not participate in the study will not affect the care you receive at the clinic.

CONTACT INFORMATION: If you have any questions about this research project, you can contact Heather Vartanian at heather.vartanian@mu.edu, or Bob Topp at robert.topp@mu.edu. If you have questions or concerns about your rights as a research participant, you can contact Marquette University's Office of Research Compliance at (414) 288-7570.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT.

Participant's Signature

Date

Participant's Name

Researcher's Signature

Date

Appendix G: Consent for Focus Groups

MARQUETTE UNIVERSITY
AGREEMENT OF CONSENT FOR RESEARCH PARTICIPANTS – Written Surveys
A Comparison of Women’s Exercise Beliefs and Behaviors
Heather Vartanian
Marquette University College of Nursing

You have been invited to participate in this research study. Before you agree to participate, it is important that you read and understand the following information. Participation is completely voluntary. Please ask questions about anything you do not understand before deciding whether or not to participate.

PURPOSE: The purpose of this research study is to get a better understanding of women’s beliefs about exercise, and exercise practices. You would be one of 70 participants providing information for 3 paper and pencil based questionnaires. You may be asked to be one of approximately 20 participants in the focus group portion of the study, and would be asked to complete a separate consent form prior to participating in this group.

PROCEDURES: You are being asked to complete three questionnaires. The first questionnaire is a form asking information about you, the second questionnaire (Physical Activity Survey for Adults at Risk for Diabetes) is a survey asking about your exercise beliefs and attitudes, and the third questionnaire is a survey asking about your exercise participation in the past six months (Kaiser Physical Activity Survey Sports and Exercise subsection). There are no follow-up questionnaires. The questionnaires will be downloaded into the computer for analysis. Paper copies of questionnaires will be shredded after five years, and electronic files will be kept indefinitely and may be used in future research. For confidentiality purposes, your name will not be included with your responses.

DURATION: Your participation will consist of a one-time, 20-30 minute session to complete the three questionnaires.

RISKS: The risks associated with participation in this study are no more than participants would encounter in everyday life. You may feel uncomfortable answering the questions, but you are free to answer in your own way. If there is information that you would rather not share, you are free to keep that to yourself.

BENEFITS: There are no direct benefits associated with participation in this study. Some women may find benefit from reflecting on their experiences. Your participation

may help provide better understanding about factors that influence women's participation in regular exercise.

CONFIDENTIALITY: All information you reveal in this study will be kept confidential. All your data will be assigned an arbitrary code number rather than using your name or other information that could identify you as an individual. When the results of the study are published, you will not be identified by name. The data will be maintained in a locked file cabinet or in a password protected computer file in the principal investigator's (PI), Heather Vartanian, office. The data will be destroyed by shredding paper documents five years after the completion of the study. The data may be used by the PI in future research. Your research records may be inspected by the Marquette University Institutional Review Board or its designees, and (as allowable by law) state and federal agencies.

COMPENSATION: You will receive a \$5 Walgreen's gift card after filling out the questionnaires to compensate you for your time. You can choose to stop filling out the questionnaires and receive the gift card at any time.

VOLUNTARY NATURE OF PARTICIPATION: Participating in this study is completely voluntary and you may withdraw from the study and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled. If you chose to withdraw during, or up to three days after filling out the questionnaires, your information will be shredded. After this time, the questionnaires will have been scanned into the computer and the lack of identifying information will prevent yours from being deleted. Your decision to participate or not participate in the study will not affect the care you receive at the clinic.

CONTACT INFORMATION: If you have any questions about this research project, you can contact Heather Vartanian at heather.vartanian@mu.edu, or Bob Topp at robert.topp@mu.edu. If you have questions or concerns about your rights as a research participant, you can contact Marquette University's Office of Research Compliance at (414) 288-7570.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT.

Participant's Signature

Date

Participant's Name

Researcher's Signature

Date

Appendix H: Manuscript I (*In Review*)

Title: Predictors of Intention to Exercise in Middle-Aged Women with Obesity

Authors: Heather K. Vartanian, PhD(c), RN; Jill Winters Berg, PhD, FAHA; Robert Topp, PhD, RN

Authors' Affiliations: PhD candidate, College of Nursing, Marquette University, Milwaukee, Wisconsin & Associate Dean of Practice, Columbia College of Nursing, Glendale, Wisconsin (Vartanian); President & Dean, Columbia College of Nursing, Glendale, Wisconsin (Dr. Winters Berg); Associate Dean for Research, College of Nursing, Marquette University, Milwaukee, Wisconsin (Dr. Topp).

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Conflicts of Interest: Vartanian: None; Winters Berg: None; Topp: None

Predictors of Intention to Exercise in Middle-Aged Women with Obesity

Abstract

In the United States, 35.5% of adult women are classified as obese, defined as a body mass index of ≥ 30 kg/m². Evidence supports the importance of participating in exercise during weight loss in order to mitigate regaining lost weight, and intention to exercise is the primary predictor of this behavior. The purpose of this study was to determine if variance in intention to exercise could be predicted by salient variables in the Theory of Planned Behavior (TPB) in middle-aged women with obesity, striving to lose weight. Forty-two women who were attempting to lose weight over the previous six months were recruited. Twenty-six women were unable to lose at least 5% of their body weight from baseline, while 16 women were successful at attaining at least 5% weight loss. The TPB variables were measured using the Physical Activity Survey for Adults at Risk for Diabetes (Blue, 2004). The five variables that initially correlated ($r > .35$, $p \leq .05$) with intention (normative beliefs, control beliefs, perceived behavioral control, attitude, and subjective norm) were entered into a regression model to predict intention to exercise. The resulting model contained two variables (perceived behavioral control and attitude) ($F_{(2,39)} = 33.426$, $p < .0005$), explaining 63.2% of the variance of intention to exercise. Results from this study support the TPB framework and suggest that targeted interventions to increase women's perception of behavioral control and attitudes toward exercise may facilitate their intention to exercise.

Introduction

Median weight gain in U.S. adults is 1.8 pounds per year, which equates to approximately 20 pounds every 10 years (Hill, Wyatt, Reed, & Peters, 2003). Although many individuals attempt to lose weight, inherent challenges to addressing this problem are evident by the continued high prevalence of obesity in the United States (US) (Flegal, Carroll, Ogden, & Curtin, 2010). Approximately 35.5% of adult women in the US are classified as obese, defined as a body mass index (BMI) of ≥ 30 kg/m² (Flegal et al., 2010). Obesity is associated with premature death and an increased rate of chronic illness, and it is linked with increased incidence of hyperlipidemia, heart disease, high blood pressure, insulin resistance, diabetes, and certain cancers (Centers for Disease Control and Prevention, 2012; Sturm, 2007; Visscher & Seidell, 2001). Evidence shows that among individuals with obesity, even a modest weight loss of 5 to 10% of initial body weight can produce health benefits, such as improvements in blood pressure, cholesterol, and blood glucose (Blackburn, 1995; National Heart, Lung, and Blood Institute, 1998). Health care-related treatment of obesity and related conditions is estimated to cost \$147 billion dollars per year (Finkelstein, Trogon, Gochen, & Dietz, 2009). This figure translates to individuals with obesity incurring \$1,429 more in health care costs per year than someone of normal weight.

Sustainable lifestyle modifications, such as participating in regular exercise and reduced caloric intake, promote weight loss and weight maintenance and may diminish the associated morbidity, chronic illnesses, and costs of care for patients with obesity (Kumanyika & Brownson, 2010). Previous studies demonstrate a low probability of

achieving weight loss through regular exercise alone, without a decrease in caloric intake. However, evidence supports the importance of participating in regular exercise during weight loss in order to mitigate regaining lost weight (Wang et al., 2008; Wing and Phelan, 2005). It is important to note that at least 80% of women are unsuccessful at prevention of regaining weight previously lost (Wing and Phelan, 2005), contributing to a potential cycle of weight loss, weight regain, and discouragement from further weight loss attempts. In an effort to prevent regaining previously lost weight, Wang and colleagues showed that an increased level of regular exercise during weight loss was a promising strategy in women who are overweight and obese after a 12-week weight loss intervention (Wang et al., 2008).

This study was guided by the Theory of Planned Behavior (TPB) (Ajzen, 1991, 2006). The TPB hypothesizes that intention to perform a behavior is the best predictor that a desired behavior will actually occur (Fishbein & Ajzen, 2010). Behavioral intentions are influenced from attitudes, subjective norms, and perceived behavioral control, which in turn are derived from an individual's beliefs (behavioral beliefs, normative beliefs, and control beliefs, respectively). Overall, the model depicts a linear process, whereby changes in beliefs influence attitudes, subjective norms, or perceived behavioral control. These factors impact intention, which in turn influence an individual's actual behavior.

Results from meta-analyses support the hypothesized relationships between the concepts of the TPB related to exercise intention and exercise behavior (Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997; Symons Downs & Hausenblas, 2005). In the most recent and comprehensive review, intention was the

strongest predictor of exercise behavior, and attitude was the strongest predictor of exercise intention (Symons Downs & Hausenblas, 2005). When the TPB was used to specifically address women, attitude was the strongest predictor of exercise intention in a population of post-menopausal women (Vallance, Murray, Johnson, & Elavsky, 2011), while perceived behavioral control was the strongest predictor of exercise intention in a population of overweight women (Ellis Gardner & Hausenblas, 2005). It remains unclear which variables best predictor intention to exercise in women, specifically middle-aged women with obesity who are striving to lose weight. Determining the best predictors of intention to exercise may provide guidance for future interventions directed at increasing intention to exercise and actual exercise behavior in this vulnerable population.

Therefore, the purpose of this study was to determine how much variance in intention to exercise could be predicted from the TPB antecedents of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control for middle-aged women with obesity who have and have not attained at least a 5% weight loss over six months.

Methods

A convenience sample of women was recruited from a primary care clinic in the Midwest that focuses on preventing the onset or sequelae of cardiovascular disease and diabetes. Women were invited to participate if they spoke English, and were between the ages of 21-70 years of age. All women recruited for the study had an initial BMI >30 kg/m², and all had attempted to lose weight over a 6-month timeframe. Women were excluded from the study if they were pregnant or had been pregnant in the past year, if they had a medical reason to restrict regular exercise, or if they had a bariatric procedure

within the past two years. Data were collected using a one-time paper-based survey, after completing a follow-up office visit in the clinic. After an initial review of the medical record to determine eligibility, the principal investigator approached potential participants in the clinic, explained the purpose of the study, and determined interest in participation. Involvement was voluntary, and potential participants were informed that their decision to participate would not affect care delivery at the clinic. Informed consent process, approved by the Institutional Review Board, was completed with all participants at the time of study enrollment, prior to data collection. The survey took approximately 15-20 minutes to complete, and all participants were able to complete the survey independently. Women were recruited to one of two subgroups, based upon whether or not they lost at least 5% of their initial body weight during the previous six months (Not Attained = did not lose at least 5%, Attained = lost at least 5%).

TPB antecedents of maintaining regular exercise, including behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intentions were measured using the Physical Activity Survey for Adults at Risk for Diabetes (PASARD) (Blue, 2004). The 84-item, paper-based instrument, was developed based on recommendations by Fishbein and Ajzen (2010). Of the 84 survey items in the PASARD, 66 of the items were extracted from the Physical Activity Belief Scales (PABS). The PABS has three subscales, based on the TPB antecedents of behavioral beliefs, normative beliefs, and control beliefs, which are known as the indirect influences of intention. The PASARD survey also contains 10 items, representing the direct influences of intention, including the TPB constructs of attitude, subjective norm, and perceived behavioral control. These 76 items demonstrated

acceptable psychometric properties in an earlier study (Blue, Marrero, & Black, 2008). In addition to the items previously reported by Blue, Marrero, and Black (2008), six other items were included in the PASARD, including one additional item to measure subjective norm, two additional items to measure perceived behavioral control, and three items pertaining to behavioral intention. Although validity and reliability data had not been previously reported, these questions had face and content validity and met the recommendations by Fishbein and Ajzen (2010) on how to develop and format survey questions to measure the TPB constructs. For all items on the PASARD, a higher score in each of the items signified individuals had beliefs that were more likely to increase intention to exercise.

Data were analyzed using the Statistical Package for Social Sciences (SPSS 21.0; IBM Corp., 2012, Armonk, NY). Each of the completed surveys had less than 10% missing data. If data were missing, the mean value for the question for the group was imputed to allow for participant data to be used. Descriptive statistics were conducted on demographic data for the sample (Table 1). To address the purpose of the study, multiple regression analysis using the “Enter” approach was used to determine the degree of variance in intention to exercise that could be predicted by salient variables in the TPB.

Results

Of the 42 women who consented to participate, 26 (61.9%) women did not attain at least a 5% weight loss (Not Attained), while 16 (38.1%) women did attain at least a 5% weight loss during the six months prior to data collection (Attained). The average age of women in the study was 57.17 (SD = 8.62). The average baseline weight was 219.98 pounds (SD = 35.15), and the average weight at the end of the six month timeframe was

213.71 pounds (SD = 39.59). Most women were Caucasian (83.3%), held an Associate's degree or higher (88%), and were married (52.4%).

In order to determine which variables to enter into the regression model, correlations were calculated between intention and each of the six variables that serve as antecedents to intention in the TBP: behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control. There was a large, positive correlation between intention and control beliefs ($r = .65, p < .0005$), intention and perceived behavioral control ($r = .61, p < .0005$), intention and attitude ($r = .61, p < .0005$), and intention and normative beliefs ($r = .59, p < .0005$). There was a medium correlation between intention and subjective norm ($r = .35, p = .025$), and a small correlation between intention and behavioral beliefs that was not statistically significant ($r = .15, p = .34$). The five statistically significant variables with large or medium correlations with intention were entered into a regression model to predict intention.

Model 1 ($F_{(5,41)} = 14.65, p < .0005$) explained 67.1% of the variance of exercise intention to exercise (Table 2). Only two variables identified within this model were independently significant. Perceived behavior control made the largest unique contribution to the variance in exercise intention ($beta = .44, p = .001$), while attitude also made a significant unique contribution ($beta = .35, p = .001$). A second model was created that included only these two variables. The second model ($F_{(2,39)} = 33.426, p < .0005$) explained 63.2% of the variance in intention to exercise. In this model, perceived behavioral control and attitude independently explained 26% and 25.4% of the variance in intention to exercise, respectively.

Discussion

In this study, the TPB variables that predicted the greatest amount of variance in intention to exercise were perceived behavioral control (PBC) and attitude. Similar findings have been observed in related populations, with Vallance and colleagues (2011) reporting that attitude was the strongest predictor of intention to exercise in a population of postmenopausal women, and Ellis Gardner and Hausenblas (2005) reporting that perceived behavioral control was the strongest predictor of intention to exercise in a population of overweight women. These similar findings provide credence to the importance of addressing perceived behavioral control and attitude in order to influence intention to exercise among middle-aged women with obesity who are striving to lose weight. Focusing on exercise intention as a conduit to actual exercise behavior is supported by various meta-analyses, which noted exercise intention to be the strongest predictor of actual exercise (Symons, Downs, & Hausenblas, 2005; Hagger, Chatzisarantis, & Biddle, 2002). Exercise participation on a regular basis is a key behavior to creating the negative energy balance needed to lose weight and maintain weight loss (Kumanyika & Brownson, 2010; Wing & Phelan, 2005). Although the current study was limited by its relatively small sample size, it serves as an important step in demonstrating the applicability of the TPB among women with obesity striving to lose weight.

Results from this study suggest that targeted interventions to increase women's perception of behavioral control and attitudes toward exercise may facilitate intention to exercise. Health care providers working to empower women with obesity to exercise as part of a weight loss plan may benefit from focusing on women's perceived behavioral control and attitudes towards exercise. In other words, it may be beneficial to consider

interventions focusing on increasing perception of control over exercise behavior (e.g., women make a conscious decision to exercise as opposed to life situations or schedules dictating ability to exercise) and facilitating positive feelings towards exercise (e.g., exercise is satisfying, results in increased energy, and improves mood states). Additional studies are needed to determine if targeted interventions to address these areas actually increase women's intentions to exercise, and if the increase in exercise intention translates to actual exercise behavior.

Findings from the current study provoke questions to be addressed by future studies. Beyond initial weight loss, longitudinal studies are needed to determine the utility of the TPB for predicting long-term maintenance of exercise intention and behavior, an important factor to maintaining weight loss (Wang et al., 2008; Wing & Phelan, 2005). Currently, only one published study has examined the relationships between TPB concepts and maintaining regular exercise, with the author noting partial support for the TPB relationships (Armitage, 2005). Since current thinking in the field of behavior change recognizes initiation and maintenance of behavior as two related, but distinct, phenomena (Nilsen et al., 2010), further investigation is needed to determine if the TPB can be used to promote exercise maintenance. It remains unclear whether targeted interventions to increase women's perception of behavioral control and attitudes toward exercise may facilitate maintenance of long-term exercise intention.

Although efforts were made to ensure methodological rigor and promote validity of the study, several limitations were present. Women recruited for the study were from one clinic, and they were a relatively homogenous group. Therefore, experiences and beliefs expressed may not be generalizable to other populations of obese women. Among

the sample that lost 5% of their body weight during the previous six months (Attainers), no attempt was made to document exactly when or over what period of time during this six months the weight was lost. It is possible that women lost the weight in the first month and maintained their weight over the remaining five months, lost the weight slowly over the six months, lost the weight in the final month, or lost and gained weight over the six months. Clarification about patterns of weight loss and maintenance, as well as the relationship between these patterns and beliefs about exercise, are warranted. Lastly, the Hawthorne effect may have influenced the participants to respond in a manner that would be socially acceptable to the investigator. To minimize the Hawthorne effect, participants were advised about the importance of reporting actual beliefs about exercise in order to provide an accurate representation of their experiences.

The study findings support the applicability of the TPB for this sample of women with obesity striving to lose weight. Targeted interventions to increase women's perception of behavioral control and attitude toward exercise may facilitate intention to exercise. Additional studies are needed to determine if the TPB can be used to predict exercise intention, and actual exercise behavior, in other samples of middle-aged women with obesity.

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Table 1: Demographics of study sample

Variable	Categories	% of participants
Race	Caucasian	35 (83.3%)
	African American	7 (16.7%)
Education	Some high school	1 (2.4%)
	High school diploma or GED	2 (4.8%)
	Associate's degree	19 (45.2%)
	Bachelor's degree	9 (21.4%)
	Master's degree	8 (19%)
	Doctorate degree or post-Master's	1 (2.4%)
	Other	2 (4.8%)
Income	Below \$20,000	5 (12.5%)
	\$20,000-\$39,999	11 (27.5%)
	\$40,000-\$59,999	9 (22.5%)
	\$60,000-\$79,999	7 (17.5%)
	\$80,000-\$99,999	5 (12.5%)
	Above \$100,000	3 (7.5%)
Relationship Status	Single	11 (26.2%)
	In a relationship, living in separate households	0 (0%)
	Married or living with a partner in the same household	22 (52.4%)
	Widowed or Divorced	9 (21.4%)
Number of hours worked	0-9 hrs/week	18 (43.9%)
	10-19 hrs/week	2 (4.9%)
	20-29 hrs/week	1 (2.4%)
	30-39 hrs/week	4 (9.8%)
	40-49 hrs/week	13 (31.7%)
	50-59 hrs/week	2 (4.9%)
	60 or more hrs/week	1 (2.4%)

Table 2: Regression Models to Predict Intention to Exercise

Model Variables	Standardized Beta	<i>t</i>	<i>p</i>	Part Correlations	R	R squared	F	Sig.
<i>Model 1</i>					.819	.671	14.65	.00
Perceived Behavioral Control	.44	3.64	.001*	.349				
Control Beliefs	.16	.99	.38	.095				
Normative Beliefs	.22	1.68	.10	.161				
Attitude	.35	2.13	.04*	.204				
Subjective Norms	-.13	-1.15	.26	-.110				
<i>Model 2</i>					.795	.632	33.43	.00
Perceived Behavioral Control	.52	5.25	.00*	.510				
Attitude	.51	5.20	.00*	.504				

*Significant at the $\alpha = .05$ level

Appendix I: Manuscript II (*In Review*)

Title: Antecedents of Intention to Exercise among Women with Obesity Who Do and Do Not Achieve Weight Loss Over a Six–Month Period

Authors: Heather Vartanian, PhD(c), RN; Kristin Haglund, PhD, RN; Jill Winters Berg, PhD, RN, FAHA; Dana Rodriguez, PhD(c), RN; Robert Topp, PhD, RN

Conflicts of Interest: The authors have no conflicts of interest to declare.

Abstract

Based on the Theory of Planned Behavior, a mixed methods design was used to examine antecedents to exercise that discriminate between women with obesity who did and did not achieve at least 5% weight loss over six months. Forty-two women completed quantitative surveys, and a subset participated in focus groups to identify antecedents to their intention to exercise. Although the quantitative analysis revealed no statistically significant differences between the two groups, focus group data indicated differences in the antecedents of attitude and perceived behavioral control. Interventions to address these variables as a means to facilitate weight loss are suggested.

Key words: exercise, women, Theory of Planned Behavior, obesity, mixed methods

In the United States (US), approximately 36.1% of women are classified as obese, defined as a body mass index (BMI) of ≥ 30 kg/m² (Ogden, Carroll, Kit, & Flegal, 2013). Obesity is associated with premature death and is linked to increased incidence of hyperlipidemia, heart disease, high blood pressure, insulin resistance, diabetes, and certain cancers (Centers for Disease Control and Prevention, 2012; Sturm, 2007; Visscher & Seidell, 2001). Health care-related treatment of obesity and related conditions is estimated to cost \$147 billion dollars per year (Finkelstein, Trogon, Gochen, & Dietz, 2009). Beyond the financial impact, some models predict life expectancy will decline within the next few decades, as a consequence of the prevalence of obesity, reversing a 200-year trend in which each generation lived longer than the previous generation (Olshansky et al., 2005). However, evidence shows that even a modest weight loss of 5 to 10% of initial body weight among individuals with obesity can produce health benefits, such as improvements in blood pressure, cholesterol, and blood glucose (Blackburn, 1995; National Heart, Lung, and Blood Institute, 1998).

Despite these benefits, the continued high prevalence of obesity highlights the inherent challenges of weight loss. Weight loss occurs by creating a negative energy balance through a decreased caloric intake, an increased caloric expenditure, or a combination of these two strategies (Kumanyika & Brownson, 2010). Caloric energy expenditure through regular exercise plays a key role in creating the negative energy expenditure needed for weight loss, and it is even more important in mitigating weight regain after weight loss (Wang et al., 2008; Wing and Phelan, 2005). With 80% of women regaining weight previously lost, encouraging women to include exercise as a strategy for weight loss, and more importantly for maintaining weight lost, may allow

women to terminate the cycle of weight loss followed by weight regain (Wing and Phelan, 2005).

Health behavior models, such as the Theory of Planned Behavior (TPB), can guide health care practitioners to facilitate behavior change, such as initiating and maintaining regular exercise. According to the TPB, intention to perform a behavior directly influences an individual's actual performance of the behavior (Fishbein & Azjen, 2010). Behavioral beliefs, normative beliefs, and control beliefs influence a person's attitude towards a behavior, subjective norms, and perceived behavioral control, respectively, which in turn influence an individual's intention to perform a behavior. Overall, the model depicts a linear process whereby changes in beliefs influence attitudes, subjective norms, or perceived behavioral control, which affects intention, which in turn impacts an individual's actual behavior.

Results from meta-analyses support the hypothesized relationships between the concepts of the TPB related to exercise, including the proposition that exercise intention is the strongest influence of actual exercise behavior (Hausenblas, Carron, & Mack, 1997; Hagger, Chatzisarantis, & Biddle, 2002; Symons Downs & Hausenblas, 2005). Specifically addressing the TPB related to women and exercise, previous studies have sampled populations of pregnant (Hausenblas, Downs, Giacobbi, Tuccitto, & Cook, 2008; Downs & Hausenblas, 2007; Hausenblas & Downs, 2004; Downs & Hausenblas, 2003), postpartum (Hales, Evenson, Wen, & Wilcox, 2010), postmenopausal (Vallance, Murray, Johnson, & Elavsky, 2011), and overweight women (Ellis Gardner and Hausenblas, 2005). Specifically looking at a similar population of women included in this current study, investigators concluded intention to exercise was the strongest

predictor of exercise behavior in both postmenopausal and overweight women (Ellis Gardner & Hausenblas, 2005; Hales et al., 2010). Attitude was the strongest predictor of intention to exercise in postmenopausal women (Hales et al., 2010), whereas perceived behavioral control was the strongest predictor of intention to exercise in overweight women (Ellis Gardner & Hausenblas, 2005).

The current study was part of a larger study. Similar to findings from previously reported with postmenopausal and overweight women (Ellis Gardner & Hausenblas, 2005; Hales et al., 2010), in the larger study, attitude and perceived behavioral control were significant independent predictors of intention to exercise (Vartanian, Winters Berg, & Topp, in review). Attitude and perceived behavioral control explained 63.2% of the variance in intention to exercise in women with obesity ($F(2,39) = 33.426, p < .0005$). Additional information pertaining to the regression analysis is noted elsewhere and beyond the scope of this article (Vartanian, Winters Berg, & Topp, in review). Although attitude and perceived behavioral control have been noted to predict intention to exercise, further exploration of differences in the TPB variables between women who have and have not achieved weight loss might provide insight into how to best direct interventions to facilitate weight loss success in all women. Therefore, the purpose of this study was to compare the TPB antecedents of intention to exercise (behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, and perceived behavioral control) among women with obesity who did and did not achieve at least a 5% loss of body weight over six months.

Methods

In order to address the purpose of the study, a cross-sectional, comparative design was employed. The mixed methods design allowed for deeper understanding of the meaning of the quantitative findings through qualitative data gathered during two focus group encounters. Institutional review board approval was obtained for the study protocol prior to study commencement.

Participants

A convenience sample of women was recruited from a clinic in the Midwest that focuses on preventing the onset or sequelae of cardiovascular disease and diabetes. Women were invited to participate if they spoke English, and were between 21 and 70 years old. All women recruited for the study had an initial BMI $>30 \text{ kg/m}^2$, and had attempted to lose weight over the 6-month timeframe preceding invitation to the study. Women were excluded from the study if they were pregnant or had been pregnant in the past year, if they had a medical reason to restrict regular exercise, or if they had a bariatric procedure in the past two years.

Procedure

After initial review of the chart to determine eligibility, the principal investigator (PI) approached women at a follow-up clinic visit to explain the purpose of the study and determine interest in participation. Women were notified that their involvement was voluntary and their decision to participate would not affect their care at the clinic. Women who were eligible and volunteered to participate were recruited to one of two groups, based upon whether or not they lost at least 5% of their initial body weight during the previous six months (Group 1 = Non-Attainers; Group 2 = Attainers). Informed

consent was completed with participants at the time of enrollment, prior to data collection. Participants completed a one-time written survey that took approximately 15-20 minutes. After completing the survey, participants were given the option to provide contact information for participation in a future focus group.

Quantitatively, the constructs of behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intentions were measured using the Physical Activity Survey for Adults at Risk for Diabetes (Blue, 2004). The 84-item, paper-based instrument, was developed based on recommendations by Fishbein & Ajzen (2010), and previously demonstrated acceptable psychometric properties (Blue, Marrero, & Black, 2008). For all items on the PASARD, a higher score in each of the items signifies individuals have beliefs that are more likely to encourage or lead to exercise.

After completion of the quantitative survey, women who expressed interest in participating in the focus groups were contacted by the PI and scheduled for a group meeting. Two focus groups were held in a private conference room at the clinic. The first group was comprised of women who did not lose at least 5% of their body weight in the past six months (Non-Attainers), and the second focus group consisted of women who did lose at least 5% of their body weight in the past six months (Attainers). Dividing the women into two groups allowed for data to be analyzed for differences in the way in which women in the two groups discussed the TPB antecedents of intention to exercise. Participants completed a second informed consent prior to the group session. A semi-structured interview guide was created by the investigators to elicit responses regarding

antecedents of intention to exercise that incorporated the TPB principles. Example questions included, “What things help you

exercise?”; “What things make it hard to exercise?”; and “How much control do you have over your exercise?” Each focus group was audio recorded and lasted approximately 60 minutes. Women were instructed to maintain confidentiality of what other group members shared, and each woman chose a pseudonym to help protect her identity.

Analysis

Quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS 21.0; IBM Corp., 2012, Armonk, NY). Due to violations in normality assumptions, the Mann-Whitney U test and chi-square analysis were used to determine significant differences in demographic data and the TPB variables (behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, and intention) between the two groups of women. Each of the completed surveys had less than 10% missing data. If data were missing, the mean value for the question for the group was imputed to allow for participant data to be used (Pallant, 2010).

The qualitative data obtained in the focus groups were analyzed using the process of qualitative descriptive content analysis (Sandelowski, 2010; Sandelowski, 2000). In qualitative descriptive content analysis, a comprehensive summary of events is presented in everyday language. To assist with this analysis process, data were entered into the NVivoTM software analysis program (Version 10.0; QRS International, Burlington, MA). A template was used to begin the coding process. Initial codes corresponding to the TPB

antecedents were used, although additional coding was allowed for data not captured by the TPB antecedents. After initial coding by the PI, data were reviewed by another investigator, who independently coded the data using the established template. The PI and second rater discussed the coding decisions until agreement was achieved. The PI then developed themes based on the coded data. A third investigator who has expertise in qualitative research also reviewed the transcripts to determine congruency with what participants expressed and themes presented.

In addition to having multiple investigators review the transcripts and themes, other strategies were used to increase qualitative rigor. The current article attempts to provide a rich and detailed description of the study population and method employed to allow the reader to determine the transferability of the methods to another population. At the end of each focus group, member checking was completed to ensure the initial themes presented by the PI aligned with actual experiences of the participants, which contributed to the credibility of the findings. Credibility was also built through peer debriefing, as the PI worked with an expert in qualitative researcher to review the transcripts and discuss the coding methods. The PI also participated in reflexivity, by identifying biases related to the study at the onset, as well as seeking clarification of vague comments made during the focus groups. An audit trail of decisions made related to data analysis and coding was generated, contributing to the dependability of the findings. Attending to the transferability, transferability, and dependability of the study contributes to the conformability of the results (Thomas & Magilvy, 2011).

Results

Descriptive and quantitative findings

Forty-two women consented to and completed the quantitative surveys. Twenty-six (61.9%) women did not achieve at least a 5% weight loss from their initial body weight during the prior six months (Non-Attainers), while 16 (38.1%) women were able to achieve at least a 5% weight loss (Attainers) (Table 1). The only statistically significant difference noted between the two groups at baseline was race/ethnicity, with 26.9% (n = 7) of the Non-Attainers identifying themselves as African American and 73.1% (n = 19) identified as Caucasian, whereas all 100% (n = 16) of Attainers identified as Caucasian (Table 2). Of the 26 women in Non-Attainers group, 6 participated in the first focus group, and 3 out of 16 women in Attainers group participated in the second focus group. The average age of women who participated in the Non-Attainer focus group was 63.3 years old, and the average age for the Attainer focus group was 62.7 years old. All women in both focus groups identified themselves as Caucasian. Looking at the quantitative data provided by all 42 women in the study, there were no statistically significant differences in the TPB antecedents of exercise intention between the two groups (Table 3). However, analysis of qualitative findings facilitated identification of differences in how women in the two groups discussed the TPB antecedents of intention to exercise between the two groups.

Qualitative findings

Analysis and comparison of data from the two focus groups identified the following four themes related to the TPB variables: *Exercise is good for me, but I don't like it* (Theme 1: Behavioral beliefs and attitude), *Friends make it happen* (Theme 2:

Normative beliefs and subjective norms), *More time does not equal more exercise* (Theme 3: Control beliefs and perceived behavioral control), and *Control is key* (Theme 4: Control beliefs and perceived behavioral control). Pseudonyms have been used in the presentation of results to maintain anonymity of the participants.

Behavioral Beliefs and Attitude: *Exercise is good for me, but I don't like it*

According to the TPB, behavioral beliefs are an individual's expectations of positive or negative outcomes if the behavior is performed (Fishbein & Ajzen, 2010). The outcome an individual expects determines their attitude towards the behavior. Attitude is defined as positive or negative feelings towards a behavior (2010). Overall, women in the study had similar behavioral beliefs, as participants in both groups noted that exercise brings improved health (such as helping improve laboratory results, avoiding chronic illness, and increasing bone strength) and overall helps one feel better. For example, when asked about reasons to exercise, one woman commented that exercise brings "a good feeling and I do feel so much better after" (Bridget, Non-Attainer). Another noted exercise makes her feel better able to care for her family: "It made me feel a lot better that when we were done walking; I could go home and make supper and take care of my family" (Sarah, Non-Attainer). Many women from both groups commented on the health benefits from exercise, represented by comments such as, "I feel better longer after exercise because with arthritis, and all those old aches and pains, I feel better" (Nancy, Non-Attainer).

Although women in both groups presented overwhelmingly positive behavioral beliefs about exercise, attitudes toward exercise were less favorable in Non-Attainers

than Attainers. Most women in the Non-Attainer group noted how difficult exercise was, with one woman noting “I hate to exercise” (Marnie). Other women in the Non-Attainer group commented that exercise is “a negative word like it’s a job, like something I have to do, that's required” (Barb), while another noted, “I made up my mind when I retired that I wasn't going to do anything I didn't want to do, and exercise definitely was one of them” (Mary).

While the Attainers admitted they get tired of exercise, they nonetheless had more positive attitudes towards exercise than the Non-attainers. Among the Attainers, Alison commented, “Now I'm not scared of exercise. It's just that it really does tire me out a lot. I know it's not supposed to,” but followed up, with “So I’m excited about it (exercise).” Linda noted that she feels guilty when she does not exercise. She commented, “Guilt. That I'm not doing. I think it's really easy to make excuses.” Carol noted that having more stamina for participation in future physical activity, such as zip lining, is keeping her motivated to exercise currently: “It's keeping me excited and driven. There's something I'm trying to work for.”

Normative Beliefs and Subjective Norms: *Friends make it happen*

Normative beliefs are comprised of beliefs that important individuals or groups would approve or disapprove of an individual performing the behavior, as well as if the important person or group actually performs the behavior (Fishbein & Ajzen, 2010). These beliefs determine an individual’s subjective norms, which are perceived social pressures to engage or not engage in a behavior. Comments were similar in both groups related to normative beliefs and subjective norms. Although women in both groups noted

their family expected them to exercise and supported their efforts, most women stated that a friend was a stronger influence on their exercise behavior. Discussing the difference between family and friend support, Bridget (Non-attainer) explained,

Sometimes from family it's not - they're very supportive, I have two sisters that are supportive and my son and his significant other, but it's a little different having a friend being supportive than it is the family. Even though they're very positive - it doesn't always come across as being kind, as to more checking up on you. As much as you want their support and you know it's all for the good, maybe it's a sibling rivalry or something, but it (support from a family member) just kind of can be a little much.

Non-Attainers and Attainers noted the strong influence of having a friend or “buddy” that sets an expectation to exercise and motivates them to do so. Sarah, a Non-Attainer, said,

I have a friend who calls me lots and says ‘Let's go to the gym.’ And that helps me, if she will call me up and say let's meet. Otherwise sometimes I don't feel like doing it but I think if you have a friend or somebody that will do it with you it's a lot better than if you're just trying to get out yourself.

A woman in the Attainer group, Allison, said, “I think that the best advice is to have a buddy. That works for me, knowing that I have to answer to my friend and I can't let her down.”

Control Beliefs and Perceived Behavioral Control: *More time does not equal more exercise and Control is key*

Control beliefs are thoughts about personal and environmental factors that help or impede attempts to carry out a behavior (Fishbein & Ajzen, 2010). Control beliefs influence perceived behavioral control, which refers to an individual's perceptions of how capable they are of performing a behavior, the extent they have the resources they need, and whether they can overcome encountered obstacles (Fishbein & Ajzen, 2010). Attainers and Non-Attainers had similar environmental factors that influenced their control beliefs. Having a friend to exercise with was the most common facilitator to exercise. Beyond having a friend to exert social pressure to exercise as described in the previous section, participants from both groups explained that it was simply more enjoyable to exercise with a friend. One woman explained, "Since I belong to a gym and I have a friend that belongs, we can both go at the same time and we talk, the exercise goes faster" (Sarah, Non-Attainer).

Weather and change to daily routine were identified by participants in both groups as the most common inhibitors to exercise. One woman explained, "This winter's been really bad, and, there's no walking outside. That's for sure. I'm hesitant to join a fitness center just because of the money and I'm not sure how much I'll go" (Linda, Attainer). Another woman commented,

If I planned to exercise that day and I see that there's a lot of snow outside, I just won't go because number one, I'm afraid to drive, and number two, just being cold drives me nuts. So, I think "OK, I'll do it tomorrow (Sarah, Non-Attainer).

Both groups discussed the importance of having a routine to facilitate completion of exercise. Five out of the six Non-Attainers and two of three Attainers self-identified as being retired. Those retired agreed it was more challenging to exercise regularly after retirement because they no longer had a set routine. One woman explained, “I was exercising more when I was working than I am now. And I thought it would be the opposite. We do tend to get a little bit lazy in retirement” (Linda, Attainer). Another woman echoed these remarks:

In my working life I was able to exercise as part of my daily or my weekly routine and in my world that was the only way that it was somewhat easier. It was something that I just did. It's like, I go to work every day, I go to church on Sunday, I exercise on Mondays, Wednesdays and Fridays (Nancy, Non-Attainer).

Although both groups had similar control beliefs, examining how the groups discussed their perceived behavioral control over their exercise produced notable differences. When asked to describe how much control the women had over their exercise, Non-Attainers described how they have the potential ability to control the amount of exercise they do, but other factors have influenced their control up until this point. One woman in the Non-Attainer group said, “I think I haven't taken control of it. I'm a take-charge person so I should be able to take control of it, and I think it's just a mindset” (Marnie). Women in the Non-Attainer group also commented “I'm my own worst enemy” (Mary) and “If I can't convince myself, I don't know that I could convince anybody else” (Nancy).

In contrast, the Attainers were more confident about the control they had about over their exercise. This sentiment was exemplified by comments such as, “I have complete and total control” (Linda), “There is nothing keeping me from doing it” (Alison), and “Yup, I got the motivation” (Carol). Reflecting on her journey towards incorporating more exercise, Linda explained,

They have to be right there ready to do it. And then you (the health care provider) don't have to do anything. It all comes from inside of the person. And then if they're ready to do it, then they're ready to do it. You (the individual) could get the information about what's available to you, have a buddy system, do all this stuff, but if you're not really there for it (exercise), no amount of talking is gonna make you exercise.

Discussion

This study sought to compare the TBP antecedents of intention to exercise between women with obesity who did and did not achieve at least a 5% loss of body weight over period of six months. Quantitative data analysis did not yield significant differences related in TPB antecedents between the two groups. However, qualitative analysis of the focus groups data produced interesting findings to augment explanation of potential key differences between the women who were successful at achieving weight loss, and those who were not. Specifically, areas of discordance between Non-Attainers and Attainers were related to the TPB variables of attitude and perceived behavioral control. These findings parallel those noted in the regression analysis completed as part of the larger study undertaken with the complete study population, where attitude and

perceived behavioral control were the only significant independent predictors of intention to exercise amongst the TPB variables (Vartanian, Winters Berg, & Topp, in review).

Women in both focus groups had positive feelings about the outcome or benefits of exercise (behavioral beliefs), which according to the TPB, influence attitudes toward the behavior. Despite the similar behavioral beliefs, there were interesting differences in the two groups' attitude towards the behavior, captured by the theme of *Exercise is good for me, but I don't like it*. The Non-Attainers had a negative attitude towards exercise, with one participant simply noting "I hate to exercise." The Attainers, however, acknowledged that exercise was challenging and made them tired, but overall had a more favorable attitude toward it. When health care providers are working with women who are striving to lose weight, it may be helpful to alert women that even people who are successful at weight loss also think that exercise is challenging and tiresome. Rather than focusing on the challenges of exercise, women could be instructed to reframe their thoughts about exercise to create a more positive attitude toward it. Coaching women to complete positive daily self-talk about exercise, frequently reflecting on the benefits of exercise, and knowing that it is normal to not always like exercise may promote a more positive attitude towards exercise.

The other difference identified between the two groups is related to the TPB construct of perceived behavioral control, noted in the theme of *Control is key*. Non-Attainers placed a greater emphasis on external influences that served as barriers to controlling their exercise, such as a change in daily routine and the weather. On the other hand, Attainers discussed barriers that exist, but noted they still have control over their exercise, and they have the power to do what is necessary to overcome the barriers.

Those that were successful at losing weight also noted the importance of having the readiness to exercise. The importance of readiness and internal confidence to overcome barriers was noted in Fishbein and Ajzen's (2010) description of perceived behavioral control.

When working with women striving to lose weight, health care providers can tailor interventions to increase women's confidence to overcome barriers and promote readiness to participate in regular exercise. Rather than merely telling women about the importance of exercise, encouraging women to list barriers to exercise and strategies to address these barriers may facilitate increased perception of control. In addition, addressing how women can adapt if barriers change or additional barriers emerge may be a key element to successfully maintaining exercise behavior. Assessing and addressing the adaptive capacity of women to think critically about alternatives to unforeseen or anticipated changes may help women continue their regular exercise participation, and therefore be an important part to successful weight loss.

The two other themes identified, *Friends make it happen* and *More time does not mean more exercise*, did not vary between the two groups. However, these themes provide insights for health care providers when coaching women who are working to lose weight. Although the importance of having a friend to encourage exercise has been noted frequently in previous studies (Okun, Karoly, & Lutz, 2002; Wing & Gorin, 2003; Wing & Phelan, 2005), the idea of exercise behavior being affected by life transitions may warrant further investigation. In this study, many of the women who participated in the focus groups had approached the life transition period of retirement. These women noted the unexpected decrease in their exercise despite having more time to exercise.

Exploration of potential change to exercise behavior for women going through other life transitions (e.g., marriage, new baby, new job) may be warranted. It may be efficacious for health care providers to anticipate identifiable upcoming life transitions and help women ascertain strategies for overcoming new or additional barriers to exercise. Rather than assuming women will exercise more because they may have more time, providers working with women approaching retirement should facilitate identification of how women will continue, or begin, their exercise plan amidst changes to their typical daily routine.

Several limitations in the design of this study need to be acknowledged. A convenience sample was used, and the small sample size may not have allowed for statistically significant differences to be detected between the two groups of women related to quantitative measurement of the TPB variables. All women in the focus groups were Caucasian, and the average age for the women in the focus groups was 63.3 years old and 62.7 years old for the Non-Attainers and Attainers, respectively. Although efforts were taken to conduct the focus groups during a time that worked for the largest number of interested women, younger women who were potentially busier with work and family schedules may have not been interested in participating.

It is always possible that women in the focus groups may have been hesitant to share thoughts that would be viewed less positively. However, analysis of the data seemed to display representation of both positive and negative comments. The second focus group (Attainers) only had three women, which is a reflection of the challenges in recruiting women with obesity who have recently been successful with weight loss, since many women are not successful. However, the group seemed to share rich examples and

experiences, and thoughts expressed by the women overlapped in key areas. Although a deep explanation of their experiences was gathered, the number of participants in the focus groups was small, and the groups were homogenous. Therefore, their experiences may not be generalizable to all women with obesity who recently lost at least 5% of their initial body weight.

In conclusion, the current study explored differences in the TPB antecedents of intention to exercise between women with obesity who achieved or did not achieve at least a 5% weight loss over six months. Qualitative focus group data identified interesting differences between the two groups related to the TPB variables of attitude towards exercise and perceived behavioral control. Replication of the study with a larger and more diverse sample is warranted to determine if similar findings are presented. Similar findings would provide additional confidence to focus on interventions to address the interesting differences noted in this study. Interventions that actively solicit participation by women with obesity to address attitude and perceived behavioral control include coaching positive self-talk related to attitude towards exercise, encouraging women to frequently review the benefits of exercise, and having women address strategies to overcome and adapt to barriers to exercise. Continued research to address the challenges women with obesity face related to regular exercise and weight loss can help equip providers to best support this vulnerable population in the quest to reverse concerning life expectancy, physical, and psychological health trends.

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Table 1: Demographics of study sample

Variable	Categories	% of participants
Race	Caucasian	35 (83.3%)
	African American	7 (16.7%)
Education	Some high school	1 (2.4%)
	High school diploma or GED	2 (4.8%)
	Associate's degree	19 (45.2%)
	Bachelor's degree	9 (21.4%)
	Master's degree	8 (19%)
	Doctorate degree or post-Master's	1 (2.4%)
	Other	2 (4.8%)
Income	Below \$20,000	5 (12.5%)
	\$20,000-\$39,999	11 (27.5%)
	\$40,000-\$59,999	9 (22.5%)
	\$60,000-\$79,999	7 (17.5%)
	\$80,000-\$99,999	5 (12.5%)
	Above \$100,000	3 (7.5%)
Relationship Status	Single	11 (26.2%)
	In a relationship, living in separate households	0 (0%)
	Married or living with a partner in the same household	22 (52.4%)
	Widowed or Divorced	9 (21.4%)
Number of hours worked	0-9 hrs/week	18 (43.9%)
	10-19 hrs/week	2 (4.9%)
	20-29 hrs/week	1 (2.4%)
	30-39 hrs/week	4 (9.8%)
	40-49 hrs/week	13 (31.7%)
	50-59 hrs/week	2 (4.9%)
	60 or more hrs/week	1 (2.4%)

Table 2. Demographics of study sample

Variable	Non-attainers (n = 26)	Attainers (n = 16)	Total (n = 42)	χ^2	<i>p</i>
Race					
Caucasian	19 (73.1%)	16 (100%)	35 (83.3%)	5.169	.02
African American	7 (26.9%)	0 (0%)	7 (16.7%)		
Education					
Some high school or high school diploma	2 (7.7%)	1 (6.3%)	1 (7.1%)	7.40	.286
Associate's degree	13 (50%)	6 (37.5%)	19 (45.2%)		
Bachelor's degree	7 (26.9%)	2 (12.5%)	9 (21.4%)		
Master's degree or higher	4 (15.4%)	5 (31.3%)	9 (21.4%)		
Other	0 (0%)	2 (12.5%)	2 (4.8%)		
Income					
Below \$20,000	5 (20.8%)	0 (0%)	5 (12.5%)	7.33	.20
\$20,000-\$39,999	4 (16.7%)	7 (43.8%)	11 (27.5%)		
\$40,000-\$59,999	6 (25%)	3 (18.8%)	9 (22.5%)		
\$60,000-\$79,999	5 (20.8%)	2 (12.5%)	7 (17.5%)		
\$80,000-Above	4 (15.4%)	4 (25%)	8 (19%)		
Relationship status					
Single	9 (34.6%)	2 (12.5%)	11 (26.2%)	2.51	.29
Married or living with a partner in the same household	12 (46.2%)	10 (62.5%)	22 (52.4%)		
Widowed or Divorced	5 (19.2%)	4 (25%)	9 (21.4%)		
Number of children					
0	5 (19.2%)	4 (25%)	9 (21.4%)	3.05	.69
1	4 (15.4%)	3 (18.8%)	7 (16.7%)		
2	10 (38.5%)	6 (37.5%)	16 (38.1%)		
3 or more	7 (26.9%)	3 (18.8%)	10 (23.8%)		
Number of hours worked					
0-19 hrs/week	13 (50%)	7 (43.8%)	20 (47.6%)	4.15	.66
20-39 hrs/week	2 (7.7%)	3 (18.8%)	5 (11.9%)		
40-59 hrs/week	10 (38.5%)	5 (31.3%)	15 (35.7%)		
60 or more hrs/week	0 (0%)	1 (6.3%)	1 (2.4%)		

Table 3. Analysis of quantitative data

Variable	Group*	N	Mean \pm SD	Median	Mann Whitney -U	Z	p
Behavioral beliefs	Non-Attainers	26	249.13 \pm 62.92	271.50	180	-.726	.468
	Attainers	16	270.021 \pm 49.85	282.00			
Normative beliefs	Non-Attainers	26	101.54 \pm 27.88	109.72	192	-.415	.679
	Attainers	16	96.28 \pm 31.24	100.65			
Control beliefs	Non-Attainers	26	161.05 \pm 37.29	158.00	207.5	-.013	.990
	Attainers	16	157.03 \pm 51.87	162.61			
Attitude	Non-Attainers	26	4.36 \pm .26	4.50	200.5	-.196	.845
	Attainers	16	4.28 \pm .60	4.50			
Subjective norms	Non-Attainers	26	3.72 \pm .60	3.50	192	-.421	.673
	Attainers	16	3.80 \pm .83	3.63			
Perceived behavioral control	Non-Attainers	26	4.07 \pm .74	4.17	202.5	-.133	.885
	Attainers	16	4.15 \pm .64	4.33			
Intention	Non-Attainers	26	4.03 \pm .59	4.00	174	-.900	.368
	Attainers	16	3.67 \pm 1.06	4.00			

*Non-Attainers = women who have not lost at least 5% of their initial body weight in the past six months; Attainers = woman who have lost at least 5% of their initial body weight in the past six months