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EXAMINING THE MODERATING INFLUENCE OF MOTHERHOOD STATUS ON THE DETERMINANTS OF EXERCISE MOTIVATION AND BEHAVIOR IN PREGNANCY

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ABSTRACT

Significant life events such as pregnancy and motherhood may place women of the childbearing age at elevated risk for low levels of exercise behavior, and in turn, may negatively impact the long-term health of both mother and child. Little is known, however, about how to positively influence exercise motivation and behavior of pregnant women with and without other children. Thus, the purpose of this dissertation was to: (1) examine how changes in exercise attitude, subjective norm, perceived behavioral control, intention, and behavior from the first to second and the second to third pregnancy trimesters varied by motherhood status; and understand the impact of selected external factors on the TPB variables and exercise behavior across motherhood status groups; and (2) prospectively examine the moderating influence of motherhood status on the associations between: a) intention and perceived behavioral control (PBC) for predicting exercise behavior, and b) attitude, subjective norm, and PBC for predicting intention from the first to the second and the second to the third pregnancy trimester. Pregnant women (N = 166; M age = 30 years; 47% with no children; 53% with one or more children) were recruited in the first pregnancy trimester. Participants completed self-reported measures of exercise attitude, subjective norm, PBC, intention, and behavior mailed to them at 12-, 22-, and 32-weeks gestation. On the 12-week survey, participants were also asked to report demographic information (e.g., age, race, and motherhood status [i.e., pregnant women with vs. pregnant women without children]), depressive symptoms, pre-pregnancy body mass index, and pre-pregnancy exercise behavior. The study findings for the first purpose indicated that there were no motherhood status differences in the changes in attitude, subjective norm, perceived behavioral control,

intention, or exercise behavior from the first to the second or the second to the third trimesters. However, for all participants, attitude, subjective norm, and PBC increased from the first to the second trimester, while all constructs significantly decreased from the second to the third trimester. With respect to the second study purpose, motherhood status moderated the PBC-intention and PBC-behavior associations such that first trimester PBC influenced second trimester exercise behavior and intention and third trimester intention to a greater extent for pregnant women with children compared to those women without children. Also, second trimester intention emerged as the sole predictor of third trimester exercise behavior. This dissertation is the first to examine how the motivational determinants of exercise behavior vary among pregnant women with and without children using the TPB as a theoretical framework. The study findings illustrate the significant impact of PBC on women's exercise behavior and intention, particularly for women with children. Future studies can use these findings to inform the design and implementation of pregnancy-related exercise interventions so that researchers and clinicians can more effectively promote exercise behavior during this transitional, yet defining, time point in women's lives.

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CHAPTER 1

Introduction

It is well known that regular exercise is associated with improvements in physical and psychosocial health outcomes such as a reduced risk of cardiovascular disease, diabetes, obesity, cancer, depression, and anxiety (United States Department of Health and Human Services [USDHHS], 2000; 2008). However, most women are not participating in enough exercise to achieve these health benefits. In particular, significant life events such as pregnancy and motherhood may place women of childbearing age at an elevated risk for low levels of exercise behavior. This is problematic because low levels of exercise during pregnancy may have a negative impact on both mother's and child's short- and long-term health. Thus, evidence-based intervention and prevention strategies are needed during this important period in women's lives to promote exercise motivation and behavior to improve both maternal and infant health.

Pregnancy is associated with physical (e.g., nausea and vomiting in early pregnancy, weight gain as pregnancy progresses) and psychological (e.g., anxiety and depression) symptoms; many of which contribute to the decline in exercise behavior during this transitional time of life (Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Dennis, Ross, & Grigoriadis, 2007; Gadsby, Barnie-Adshead, & Jagger, 1993). Becoming a mother is also a major life event that prompts considerable changes in women's daily lives. There is evidence to suggest that among non-pregnant mothers, having young children at home facilitates a general decline in exercise behavior for most women; and that motherhood itself is the main reason for this decline in daily exercise rather than the age or relative number of children (Bellows-Riecken & Rhodes, 2008; Verhoef & Love, 1994). However, little is known about how exercise motivation and behavior vary by motherhood status during pregnancy. There is little to no published research examining

the psychosocial predictors of exercise motivation and behavior among pregnant mothers with children compared to those without children (Hinton & Olson, 2001). Therefore, the first step is to understand whether having any children (versus no children) while pregnant has an impact on these psychosocial predictors of exercise motivation and behavior. These findings will help to inform researchers if future studies are needed to examine how the motivational determinants of exercise behavior may vary among pregnant women by the relative number of children (versus motherhood itself). Finally, before effective interventions to increase women's exercise behavior during pregnancy can be developed, research with a strong theoretical framework is needed to examine the underlying mechanisms that influence exercise motivation and behaviors of pregnant women both with and without other children. This research is important to better understand how the type and strength of motivational determinants for influencing exercise behavior during pregnancy varies by motherhood status.

The Theory of Planned Behavior (TPB; Ajzen, 1991) has guided much of the exercise behavior research among a variety of populations; however, few published studies have examined women's exercise motivation and behavior during pregnancy. Moreover, no located published studies have examined how these psychosocial determinants of pregnant women's exercise motivation and behavior may differ for women with and without children. The TPB is a belief-based, social cognitive theory used to understand the psychological determinants of motivation and behavior. The TPB is a good theory to use among pregnant women because it captures the important determinants of motivation and behavior such as women's attitude (i.e., personal evaluation of the behavior), subjective norm (i.e., feelings about important others' evaluation of exercise), perceived behavioral control (i.e., feelings of control over performing a behavior), and intention (i.e., motivation); all of which may be influenced by the rapid

psychological and physical changes associated with pregnancy (Hausenblas, Symons Downs, Giacobbi, Tuccitto, & Cook, 2008). In short, the TPB may be a useful framework for developing interventions that can impact women's exercise behavior across each pregnancy trimester and into postpartum.

The objective of this introduction is to lay the groundwork for understanding: (a) why it is important for pregnant women with and without children to engage in exercise behavior; (b) how exercise motivation and behavior during pregnancy may be influenced by motherhood; and (c) why the TPB (Ajzen, 1991) is an appropriate theoretical framework for understanding and explaining how exercise motivation and behavior may vary by motherhood status. The first purpose of this introduction is to examine the empirical evidence on the public health implications of exercising in pregnancy including the benefits of exercising during pregnancy, exercise recommendations, and the prevalence of pregnant women meeting the exercise recommendations. The second purpose is to review the empirical evidence on the TPB (Ajzen, 1991), pregnancy and motherhood status, and exercise motivation and behavior. The third purpose is to provide a brief overview of the research proposed for this dissertation.

Public Health Implications of Exercising in Pregnancy

The vicious cycle of pregnancy, inactivity, high gestational weight gain, and obesity often persists in subsequent pregnancies and has life-long consequences (Hauger, Gibbons, Vik, & Belizan, 2008; Pettit & Jovanovic, 2007). Moreover, while not all women exceed the recommended guidelines for weight gain, almost half of all women (i.e., 40% of normal weight and 60% of overweight) gain more weight than is recommended during pregnancy (Institute of Medicine [IOM], 2009), and many women are not able to return to their pre-pregnancy weight during postpartum (Chu, Callaghan, Bish, & D'Angelo, 2009; Deierlein, Siega-Riz, & Herring,

2008; Mamun, Kinarivala, O'Callaghan, Williams, & Najman, 2010). Moreover, a greater proportion of women with children, compared to women in their first pregnancy, enter pregnancy already overweight and thus have a greater risk of gaining too much weight during pregnancy (Olson & Strawderman, 2003). Excessive weight gain often leads to complications and places both the mother and her baby at an increased risk for chronic diseases including long-term obesity, diabetes mellitus, and cardiovascular disease, as well as a reduced quality of life (IOM, 2009).

Recently, pregnancy-related exercise has been acknowledged as important for the health of the mother and baby (USDHHS, 2008). Specifically, the current guidelines suggest that healthy pregnant women without medical or obstetrical complications should participate in at least 150 minutes of moderate-intensity aerobic activity per week (American College of Obstetricians and Gynecology [ACOG], 2002; USDHHS, 2008). These guidelines are now consistent with the exercise recommendations for non-pregnant populations and reflect the findings from the numerous experimental, epidemiological, and meta-analytic reviews documenting that moderate-intensity exercise (e.g., brisk walking) offers physical benefits to women without compromising fetal growth and development or negatively affecting the processes of pregnancy, labor, or delivery (ACOG, 2002; American College of Sports Medicine [ACSM], 2000; Beckman & Beckman, 1990; Clapp, 2000; Lokey, Tran, Wells, Myers, & Tran, 1991; USDHHS, 2000; 2008).

It is important to note that the recommendations for women's exercise during pregnancy have not always been in line with those of the general population. In fact, the exercise guidelines for pregnant women have changed markedly over the past 60 years. In the 1950s, recommendations limited pregnant women's exercise to walking no more than one mile/day, followed by the

introduction of conservative guidelines in 1985 proposing that pregnant women should not perform intense activity continuously for more than 15 minutes on 3 days/week and to limit heart rate to 140 beats/min (ACOG, 1985). In 1994, only previously-active women were encouraged to maintain mild-to-moderate intensity exercise during pregnancy. However, due to an increased number of studies in the 1990s and early 2000s documenting the protective effects of exercise during pregnancy and illustrating that exercise does not compromise pregnancy and delivery outcomes (Clapp, 2000; Lokey et al., 1991), the ACOG guidelines were revised again in 2002 and have remained relatively consistent with the recommendations as they stand today. A consensual understanding among researchers, clinicians, and pregnant women of the benefits of meeting these exercise recommendations is important to promote the optimal dosage of exercise during this transitional time in women's lives to in turn promote long-term health for both the mother and child.

For example, current evidence has demonstrated the role of exercise behavior for preventing the onset of pregnancy-related diseases often associated with obesity and high gestational weight gain. In one of the first prospective studies examining preconception predictors of gestational weight gain, Weisman, Hillemeier, Symons Downs, and Dyer (2010) found that women who exercised at least 30 minutes on most days of the week during the preconception period were more likely to have pregnancy weight gain within the IOM (2009) guidelines compared to women who were not meeting the exercise recommendations prior to pregnancy (ACOG, 2002). Furthermore, Dempsey, Butler, and Williams (2005) found that women who are physically active during pregnancy have a 50% reduced risk for gestational diabetes and 40% reduced risk for preeclampsia, compared to their non-active counterparts. In addition, maintaining exercise behaviors over the course of pregnancy assists with the necessary pregnancy-related increases in

respiratory volume, cardiac output, and blood volume (Brown, 2002; Lokey et al., 1991). Other physical benefits that may be considered protective include but are not limited to shorter labor and delivery, lower rate of cesarean section delivery, less postpartum weight retention, and decreased risk for the onset of obesity and diabetes later in life (Catalano, 2010; Clapp & Little, 1995; Damm, Breitowicz, & Hegaard, 2007; Dye, Knox, Artal, Aubry, & Wojtowycz, 1997; Lokey et al., 1991; Periera et al., 2007; Polley, Wing, & Sims, 2002). Finally, there are psychological benefits for women who exercise during pregnancy including decreased stress, depressive symptoms, anxiety, and insomnia (Abraham, Taylor, & Conti, 1991; Kjos & Buchanan, 1999; Poudevigne & O'Connor, 2006; Symons Downs, DiNallo, & Kirner, 2008), improved mood, self-efficacy, and body image (Da Costa, Rippen, Dritsa, & Ring, 2003; Marquez-Sterling, Perry, Kaplan, Halberstein, & Signorile, 2000; Symons Downs et al., 2008), and a better overall quality of life (Boscaglia, Skouteris, & Wertheim, 2003).

In addition, it is important to mention that current research suggests no adverse effects (e.g., early pregnancy loss, late pregnancy complications, abnormal fetal growth) of regular maternal exercise on infant outcomes (Davies et al., 2003). Several studies have demonstrated that women who are active during pregnancy have infants with fewer neonatal complications, fewer signs of fetal distress, and lower fetal heart rate indicating an improved cardiovascular system (Beckman & Beckman, 1990; Ben-Haroush, Yogev, & Hod, 2004; May, Gustafson, Popescu, Popescu, & Drake, 2008). Moreover, in Project Viva, the association between gestational weight gain and child adiposity was examined and the researchers found that higher gestational weight gain, regardless of mothers' BMI, was significantly associated with greater child adiposity (i.e., higher child BMI, and greater risk of overweight) at age three (Oken, Taveras, Kleinman, Rich-Edwards, & Gillman, 2007). Because there is a hypothesized link regarding maternal exercise

for controlling gestational weight gain, it is possible that exercising during pregnancy could slow gestational weight gain and thus indirectly serve as a protective factor against excessive child adiposity.

Despite these well-defined guidelines and suggested health benefits of pregnancy-related exercise for both mothers and their infants, existing epidemiological evidence suggests that only about 15% of women are meeting the national recommendations for exercising in pregnancy (Evenson & Wen, 2010) and women with children are even less active compared to women in their first pregnancy (Gaston & Cramp, 2011). While research is scant regarding the trimester-specific changes in exercise behavior and the impact of motherhood status on exercise behavior during pregnancy, there is evidence that exercise behavior decreases from early to late pregnancy (Evenson, Savitz, Huston, 2004; Evenson & Wen, 2010; Hausenblas & Symons Downs, 2005); and that previously-active women may become sedentary during pregnancy (Borodulin, Evenson, & Herring, 2009; Melzer, Schutz, Boulvain, & Kayser, 2010). This is problematic because the global epidemic of sedentary behavior coupled with obesity-related pathology is related to the development of certain disorders such as hypertension, gestational diabetes, preeclampsia, and the future development of maternal and child diabetes (Wolfe & Weissgerber, 2003).

Prior to 2004, there was paucity of available epidemiological data on the actual prevalence of women meeting the exercise recommendations during pregnancy. One of the main issues was that the early major epidemiological studies (i.e., Behavior Risk Factor Surveillance System [BRFSS]) with an assessment of exercise behavior did not differentiate between pregnant and non-pregnant women, nor did these studies report other identifying factors such as number of children. Thus, prevalence rates of exercise behavior were unclear. The first large-scale

epidemiological study assessing and reporting women's exercise behavior in pregnancy was conducted by Evenson and colleagues (2004) who analyzed BRFSS data and found that only 16% of pregnant women were meeting the exercise guidelines during their leisure time, 49% were insufficiently active, and 35% participated in no leisure-time exercise. Furthermore, they reported parity and demographic factors including age, marital status, occupation, employment, education, and family income. Findings from their study indicated that more education and younger age (i.e., < 35 years compared to 35-44 years and older) were significantly associated with meeting the exercise recommendations.

More recently pregnant women have self-reported trimester-specific declines in the time spent in exercise as pregnancy progresses toward delivery (Borodulin, Evenson, Wen, Herring, & Benson, 2008; Haakstad, Voldner, Henriksen, & Bo, 2009; Hausenblas & Symons Downs, 2004; Symons Downs & Hausenblas, 2003; 2007). For example, Borodulin and colleagues (2008) examined the self-reported exercise behaviors of 1,482 women in their second and third pregnancy trimesters and found that only 13% of women met the exercise guidelines in the second trimester, and 11% met the guidelines in the third trimester (ACOG, 2002; ACSM, 2000).

Researchers have also documented that even active women decrease their exercise behavior across the duration of pregnancy (Borodulin et al., 2009; Clarke, Gross, & Psychol, 2004; Cramp & Bray, 2009; Haakstad et al., 2009; Melzer et al., 2010). Cramp and Bray (2009) found that self-reported leisure-time exercise behavior decreased by 15% from 59 MET hr/month (i.e., metabolic equivalent [1 MET = 3.5 ml/kg/min] of activity [e.g., tennis = 8.0 METs] x number of hours performed/month) in the first trimester to 50 MET hr/month in the second pregnancy trimester, and by 23% from 50 MET hr/month in the second trimester to 39 MET hr/month in the third trimester (Ainsworth, 2002). Another study by Borodulin and colleagues (2009) revealed

that self-reported activities described as “fairly light” (e.g., easy walking) to “somewhat hard” (e.g., fast walking) significantly declined from 25 MET hr/week in the second trimester to 19 MET hr/week in the third pregnancy trimester. However, while women returned to their early pregnancy exercise routines at three months postpartum, most of the exercises were performed at lower intensities compared with early pregnancy, which may not be intense enough to obtain health benefits or promote weight management.

Identifying specific strategies to increase exercise behavior prior to pregnancy and the early prenatal period is essential because it appears to set the stage for a healthy pregnancy and may also facilitate exercise behavior in late pregnancy. For researchers, practitioners, and intervention specialists, understanding the most salient factors driving the exercise motivation and behaviors of pregnant women with and without other children is important to promote women meeting the exercise recommendations through interventions so that they can achieve the protective health benefits. For health care providers, this information can be helpful in providing pregnant and postpartum women with tailored information on the benefits of meeting the exercise recommendations during and after pregnancy.

Furthermore, the literature examining exercise behavior among pregnant women with and without children is scant. However, both motherhood and pregnancy appear to be time points in women’s lives when higher intensity activities are replaced by lower intensity activities and the time spent in exercise behavior decreases (Bellows-Riecken & Rhodes, 2008; Borodulin et al., 2009; Poudevigne & O’Connor, 2006). Because of the unique physical and psychological challenges associated with motherhood and pregnancy, and the influence of these changes on women’s exercise behavior, research with a strong conceptual framework is warranted to identify how motherhood may influence the determinants of pregnant women’s exercise

behavior as pregnancy progresses toward delivery.

Empirical Evidence Examining the Theory of Planned Behavior, Pregnancy and Motherhood Status, and Exercise Motivation and Behavior

A comprehensive theory is needed to understand the multidimensional determinants of exercise motivation and behavior among pregnant women with and without children to more effectively assist with the development of specific intervention components designed to promote exercise during pregnancy. While several theories and models (e.g., Self-Determination Theory, Protection-Motivation Theory, Biopsychosocial Model, Transtheoretical Model) have been used to explain exercise behavior among a variety of populations, the Theory of Planned Behavior (TPB; Ajzen, 1991) is one of the most well-supported theoretical frameworks guiding the exercise studies (Biddle & Nigg, 2000).

The TPB is an extension of both Ajzen and Fishbein's Theory of Reasoned Action (1980) and Bandura's Social Cognitive Theory (1977). The Theory of Reasoned Action (1980) is grounded in several theories of attitude (e.g., Learning Theory, Expectancy-Value Models, and Attribution Theory) positing that behavior is voluntary and one's intention or motivation to perform that behavior is based on the evaluation of that behavior as well as the perception of important others' opinions about that behavior. However, because many behaviors (e.g., exercise) are not completely voluntary, perceived behavioral control was added to the Theory of Reasoned Action to form the TPB. The addition of perceived behavioral control to the TPB takes into consideration those behaviors that require skills or opportunities, and involve conscious decision-making. Thus, assessing an individual's perceived behavioral control helps to more accurately predict intention because it accounts for non-volitional behaviors such as exercise. That is, identifying the extent to which a behavior is under an individual's perceived control appears to

strengthen the underlying tenet of the TBP.

The TPB framework encompasses one's intention or motivation to perform a behavior based on one's own evaluation of the behavior (i.e., attitude), one's perceptions of important others' beliefs about the behavior (i.e., subjective norm), as well as one's perceptions of one's own ability to perform the given behavior (i.e., perceived behavioral control). Moreover, because of the evidence supporting the utility of the TPB for examining the psychological determinants of motivation and behavior among a wide variety of populations, many researchers have applied this theory to understand and explain exercise behavior (Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997; Symons Downs & Hausenblas, 2004a; 2005a; 2005b).

Motivational Determinants of the Theory of Planned Behavior. The TPB is based on a social cognitive framework positing that a person's intention or motivation to perform a behavior is the central determinant of her behavior and is influenced by the three primary motivational determinants (Ajzen, 1988; 1991). For example, if a woman intends to exercise three days per week in her third pregnancy trimester, there is an increased chance that she actually will perform the behavior, compared with a woman who does not intend to exercise. In turn, intention is determined by attitude, subjective norm, and perceived behavioral control. Attitude is the positive or negative evaluation of performing a behavior. Some women have a positive attitude toward exercising during pregnancy because they feel that it reduces symptoms of stress. Subjective norm is the perceived social pressure that individuals feel to perform or not to perform a behavior. For example, feeling supported by a physician to exercise during pregnancy may impact how a woman perceives exercise during this time. Perceived behavioral control is the perceived ease or difficulty of performing the behavior, and it may have direct and indirect effects on behavior. A woman may perceive that her financial situation does not provide her

with the opportunity to exercise. In summary, the main proposition of the TPB is that people will intend to perform a behavior when they evaluate it positively (attitude), believe that important others think they should perform it (subjective norm), and perceive it to be under their volitional control (perceived behavioral control; Ajzen, 1991; see Figure 1.1).

In addition, there are three types of beliefs indirectly influencing the motivational determinants of attitude, subjective norm, and perceived behavioral control. The TPB identifies the salient behavioral, normative, and control beliefs of a specific population, as well as essential information about the cognitive foundation of people's behavior (Ajzen & Fishbein, 1980, p. 53), as core underlying factors of the motivational determinants of a behavior such as exercise. First, behavioral beliefs are determined by a woman's perceived positive and negative consequences of a behavior (e.g., exercise improves overall mood), forming her attitude toward the behavior. Next, normative beliefs represent a woman's perception that important others think she should engage in a behavior (e.g., my husband is supportive of me exercising during pregnancy), providing the structure for subjective norm. Lastly, control beliefs are developed from a woman's perception that she has the resources to engage in a particular behavior (e.g., exercising in pregnancy is difficult due to having no energy), forming her perceived behavioral control (Ajzen, 1991). While the beliefs are important such that they represent the underlying determinants of the main constructs to predict and explain exercise intention and behavior, a direct measure of these higher-order constructs (i.e., attitude, subjective norm, and perceived behavioral control) are commonly used and recognized as sufficient (Ajzen, 1991). Thus, the focus of this dissertation study will be on the TPB higher-order constructs for predicting pregnant women's exercise intention and behavior.

Support for the Theory of Planned Behavior: Exercise Motivation and Behavior. The findings from statistical reviews of the TPB and exercise literature (Hagger et al., 2002; Hausenblas et al., 1997; Symons Downs & Hausenblas, 2004a; 2005a; 2005b) support the validity of using this theory as a framework for explaining exercise beliefs, attitude, subjective norm, perceived behavioral control, intention, and exercise behavior. In the most recent TPB meta-analysis of 111 TPB studies with 788 effect sizes (*ES*), Symons Downs and Hausenblas (2005b) reported that attitude, subjective norm, and perceived behavioral control explained 40-60% of the variance in intention, and perceived behavioral control and intention explained 20-40% of the variance in exercise behavior (Culos-Reed, Gyurcsik, & Brawley, 2001; Godin, 1993; Hagger, et al., 2002). In addition, the *ES* (i.e., small *ES* = 0.2; medium *ES* = 0.5; large *ES* = 0.8) for the following associations were found to be large: intention and exercise behavior (*ES* = 1.01), attitude and intention (*ES* = 1.07), and perceived behavioral control and intention (*ES* = 0.90). The effect sizes for the associations between subjective norm and intention (*ES* = 0.59), and perceived behavioral control and exercise behavior (*ES* = 0.51) were moderate. This meta-analysis also highlighted the significant moderators of the associations between intention and behavior, including the time interval between measuring intention and behavior (e.g., ≤ 1 week, > 1 week and ≤ 1 month, > 1 month and ≤ 1 year, > 1 year), scale correspondence (i.e., equivalence in the measures for the target, action, context, and time), participant age (years), operationalization of the main TPB constructs (e.g., affective vs. instrumental attitude), and publication status (e.g., published vs. unpublished studies). Specifically, significantly larger intention-behavior associations were found for: (1) assessments at the shorter time intervals compared to the longer time intervals, (2) studies with scale correspondence versus those without scale correspondence, (3) studies with adult participants compared to child participants, and (4)

unpublished studies versus published studies. They also observed a significantly larger intention-behavior association when intention was measured using "plan/goal" items compared to "intend" items.

Also, Symons Downs and Hausenblas (2005b) emphasized the importance of examining other potential moderators of the TPB constructs for explaining exercise behavior to better understand the contributions of these psychological determinants for promoting women's exercise behavior. Following this meta-analysis and in an effort to explain why the theorized associations between intention and behavior do not always occur, Amireault, Godin, Vohl, and Perusse (2008) examined possible moderators (e.g., socio-demographic, biological, and psychosocial variables) of TPB intention-behavior and perceived behavioral control-behavior relationships for leisure-time exercise behavior. They found that age and annual income moderated the intention-behavior and perceived behavioral control-behavior relationships among non-pregnant populations. That is, there was a significantly stronger intention-behavior association for the older participants (i.e., ≥ 50 years) compared to the younger participants (i.e., < 25 years), and for the participants with a higher (i.e., ≥ Canadian [CAN] $40,000/year) versus lower (i.e., < CAN $20,000/year) annual income. Also, a stronger PBC-behavior association was observed among the younger participants (i.e., < 25 years) compared to the middle age participants (i.e., 25-49 years), and among the participants with a middle (i.e., CAN $20,000–39,999/year) and higher (i.e., ≥ CAN $40,000/year) annual income compared to those with a lower (i.e., < CAN $20,000/year) annual income. Thus, there is some evidence that factors external to the TPB constructs are important for understanding exercise motivation and behavior.

However, research examining how the TPB determinants of exercise intention and behavior may vary by motherhood status is scant. For example, motherhood status (i.e., pregnant women

with vs. without children) was not examined as a moderator in the meta-analysis by Symons Downs and Hausenblas (2005b) due to insufficient data. Nevertheless, motherhood (sometimes referred to as parental status) is a factor in the non-pregnant literature that has been shown to influence parents' time and priorities for daily activities (Bellows-Riecken & Rhodes, 2008; Verhoef & Love, 1994). The responsibilities associated with having young children at home may therefore impact pregnant women's attitude, subjective norm, and perceived behavioral control for explaining exercise intention and behavior. That is, the determinants of motivation to participate in a preventive health behavior like exercise are likely to vary among pregnant women with and without children because mothers have to balance multiple roles associated with parenting, while experiencing the physical and psychological challenges of pregnancy.

Support for the Theory of Planned Behavior: Exercise Motivation and Behavior in Pregnancy. The TPB has been used to predict exercise intention and behavior in the first, second, and third pregnancy trimesters (Hausenblas & Symons Downs, 2004; Symons Downs & Hausenblas, 2003; 2007). Hausenblas and Symons Downs (2004) found that in the first pregnancy trimester, intention and perceived behavioral control explained 25% of the variance in exercise behavior, and that perceived behavioral control was the strongest predictor of behavior (β = .35). In addition, attitude (β = .57) and subjective norm (β = .28) were significant predictors of exercise intention, explaining 68% of the variance in intention. In the second pregnancy trimester, Symons Downs and Hausenblas (2003) found that exercise intention and perceived behavioral control accounted for 47% of the variance in exercise behavior, with intention (β = .39) emerging as the stronger predictor. In addition, attitude (β = .29), subjective norm (β = .13), and perceived behavioral control (β = .28) accounted for 33% of the variance in exercise intention, and attitude was the strongest predictor of exercise intention. Finally, Symons Downs

and Hausenblas (2007) found that in the third pregnancy trimester intention (β = .39) was again the strongest predictor of exercise behavior, explaining 24% of the variance; however, now subjective norm (β = .51) explained the greatest proportion of the variance in exercise intention (31%), followed by attitude (β = .13), and perceived behavioral control (β = .07). These studies highlight the influence of women's subjective norm on exercise intention, particularly in early and late pregnancy. Moreover, as pregnancy progressed toward delivery women's exercise behavior was most strongly influenced by their exercise intention (Symons Downs & Hausenblas, 2007). In sum, these findings demonstrate that the TPB is a useful framework for explaining the trimester-specific contributions of attitude, subjective norm, and perceived behavioral control for explaining intention; and intention and perceived behavioral control for explaining exercise behavior in pregnancy.

Motherhood Status and Exercise Behavior. A thorough examination of the impact of motherhood on exercise behavior is important to better understand how this life event may provide context to the TPB psychological constructs for explaining pregnant women's exercise intention and behavior. While it is common for researchers to present parity as a descriptive variable of the study population, no located studies have examined the moderating influence of motherhood status on the TPB motivational determinants for predicting exercise behavior.

Becoming a parent is a life event that affects the health behaviors of both mothers and fathers. Having dependent children has been associated with an increased risk of low levels of exercise behavior (Grace, Williams, Stewart, & Franche, 2006; Scharff, Homan, Kreuter, & Brennan, 1999; Woodward, Green & Hebron, 1999). In addition, prior research has documented a decrease in the actual number of physical activities that parents are involved in during the childbearing years (Nielson, Wraae, Brizen, Hermann, Anderson, et al., 2006). Bellows-Riecken

and Rhodes (2008) reviewed the literature on exercise and parenthood. They found that 82% (13/17) of the studies identified a negative relationship between parenthood and time spent in exercise, with non-parents reporting higher levels of exercise compared to parents. Also, they observed that while both mothers and fathers were at an increased risk for inactivity, mothers were at a particularly high risk. These findings are consistent with some other recent studies. For example, Nomaguchi and Bianchi (2004) performed a large scale, cross-sectional epidemiological study on 13,496 adults, ages 18-64 years (66% women; 50% parents) to examine if being a spouse, parent, or full-time employee was associated with less time in exercise behavior. After controlling for work and family roles, they observed the amount of time that mothers and fathers spent exercising and found: (1) both mothers and fathers with children less than five years of age exercised less than those parents with older children or no children; (2) caring for young children was associated with less leisure-time activities, especially for mothers compared to fathers; (3) work (e.g., employment status) and family (e.g., childcare and home chore responsibilities) obligations reduced time spent in leisure-time exercise activities for both parents; and (4) compared to fathers who reported exercising 172 minutes/week, mothers reported 43 minutes less time/week exercising. These findings suggest that the transition to parenthood may be moderated by gender such that mothers experience a greater decline in exercise-related activities (e.g., running, biking, and sports) compared to fathers. That is, mothers spend more of their time in household and childcare activities than in exercise-related activities, whereas fathers appear to spend more time in exercise-related activities than in household and childcare activities.

Furthermore, Brown and Trost (2003) examined whether key life events (i.e., marriage, birth of a child, divorce/separation, becoming a single parent, beginning/resuming work, education,

and changing work patterns) experienced by young women in early adulthood were associated with increasing levels of physical inactivity. They found that several life events influenced women's physical activity. Among these findings was that women with children were more likely to be inactive (i.e., < 150 min of moderate-intensity activity) than women without children (≥ 150 min of moderate-intensity activity). The authors suggested that strategies such as family-friendly policies in homes, workplaces, and communities to promote the maintenance of activity during such key life-stage transitions are needed. Verhoef, Love, and Rose (1992) also found that while most women perceived similar benefits of exercising, women with children perceived more barriers to exercise (e.g., lack of time and social support, fatigue, childcare, and obligations to other roles) and were significantly less active than women without children. For example, compared to 40% of women without children, approximately 75% of women with children experienced these barriers to exercising. Moreover, their findings illustrated that among women who reported any exercise participation, women with children exercised less than women without children. The implications of these findings call for the development of specific strategies to motivate women who participate in no exercise behavior as well as to increase the frequency and intensity of exercise for women who participate in some exercise, particularly among women with children.

Likewise, Sternfeld, Ainsworth, and Queensbury (1999) identified that women with children (102 min of moderate-vigorous activity/week) exercised significantly less than women without children (420 min of moderate-vigorous activity/week). However, women with children were 10 times more likely to engage in household-related activities than women without children. Evidence from these studies illustrate that for women with children, leisure-time activities may be replaced by household activities, likely due to a change in their roles during the transition to

motherhood. This transition is an important time that may increase women's risk for reduced leisure-time exercise behaviors, which in turn, may promote greater involvement in low-active and sedentary activities (Scharff et al., 1999).

Several studies examining the effects of motherhood on health-related behaviors further illustrate this issue. For example, Grace and colleagues (2006) examined the health-promoting behaviors (e.g., eating a balanced diet, participation in exercise, stress management activities) of 243 women in pregnancy and postpartum. They found that: (1) pregnant women without children engaged in significantly greater exercise (118 min/week) compared to those with children (96 min/week); and (2) women who engaged in more exercise during pregnancy also engaged in more exercise in postpartum compared to women reporting "never" participating in exercise activities in postpartum. In sum, these findings illustrate a trend toward low levels of exercise behaviors among new mothers. Importantly, low exercise behaviors in each pregnancy make it even more difficult for women to maintain a consistent and recommended amount of exercise throughout the childbearing years.

In short, researchers have demonstrated that parents are less active than non-parents and they display significant declines in exercise behavior throughout parenthood (Bellows-Riecken & Rhodes, 2008). Only one unpublished pilot study to date has examined the moderating influence of motherhood status on pregnant women's exercise motivation and behavior using the TPB framework (Symons Downs, DiNallo, & Kirner, 2007). While they found that perceived behavioral control (β = .14) and intention (β = .62) explained 56% of the variance in exercise behavior, no moderating effect was observed for motherhood status. However, attitude (β = .28), subjective norm (β = .24), and perceived behavioral control (β = .43) explained 67% of the variance in exercise intention and the interaction between perceived behavioral control and

motherhood status accounted for an additional 3% of the variance in intention. Specifically, attitude was the strongest determinant of intention for women without children and perceived behavioral control was the strongest determinant of intention for women with children. The authors suggested that when designing an intervention to promote exercise behavior during the second pregnancy trimester researchers should promote a positive attitude toward exercise for women without other children, whereas the focus for women with children should be on increasing their perceived control for exercise. The information collected from this pilot study is important because it was the first to examine how the TPB motivational determinants of pregnancy exercise behavior varied by motherhood status. However, more research is needed to extend the findings of this study. First, the effect of motherhood status (i.e., women with children versus without children) on the motivational determinants of pregnancy-related exercise behavior should be examined longitudinally across the trimesters to better understand the most salient factors influencing pregnant women's exercise behavior as pregnancy progresses toward delivery. The next step in future research is to examine how exercise behavior during pregnancy may be impacted by the number of children that women have: more variability in exercise behavior may be observed among pregnant women with more children.

Moreover, it is likely that for pregnant women who already have children, the number and relative influence of barriers to regular exercise is increased (Urizar, Hurtz, Albright, Ahn, Atienza, et al., 2005; Verhoef & Love, 1994). While there is no published data examining exercise among pregnant women with and without children, there is research to suggest that barriers to exercise behavior are particularly challenging for mothers of young children, and that the perception of these barriers is negatively associated with involvement and time spent in exercise-related activities (Bellows-Riecken & Rhodes, 2008; Urizar et al., 2005). For example,

Cody and Lee (1999) found that key barriers to exercise for women with children under the age of five included a lack of childcare and the dependence on one's husband or partner to provide child supervision. Moreover, existing research has identified the most salient exercise barriers among parents as a lack of time and social support, fatigue, childcare, and obligations to other roles (Fahrenwalkd & Noble-Walker, 2003; Fahrenwald & Shangreauz, 2006; Verhoef & Love, 1994). Specifically, Verhoef and Love (1994) examined perceived barriers and benefits to exercise participation in 1,113 urban women, ages 20 to 49 years, and found time constraints to be the most salient barrier to exercise such that increased motherhood responsibilities predicted greater inactivity. However, women who reported more "free-time", social support, and availability of childcare also reported more time spent exercising. While all women experience barriers to exercise, existing evidence suggests that women with children perceive these barriers to a greater extent than women without children (Urizar et al., 2005).

As previously mentioned, findings from existing research suggest that the link between motherhood status and subjective norm (i.e., the amount of perceived support from important others) is important for understanding women's motivation to exercise. It is important to note that exercise behavior among pregnant women may also be indirectly influenced by external factors which may vary by motherhood status (Fleten, Stigum, Magnus, & Nystad, 2010; Karivinen, Courneya, Campbell, Pearcey, Dundas, et al., 2007; Symons Downs et al., 2008). For example, pregnant women with other children may be less likely to be employed full-time compared to pregnant women without children (Hoffman & Youngblade, 1999). Thus, research is needed to explore how these specified factors may influence the TPB constructs for predicting pregnancy-related exercise behavior.

Influences of Exercise Behavior

Socio-Demographic variables. Variables external to the TPB are expected to influence exercise behavior and intention indirectly through attitude, subjective norm, and perceived behavioral control (Ajzen, 1991; Jones, Guill, Keir, Carter, Friedman, et al., 2007; Figure 1.2). However, the TPB does not rule out other factors (e.g., socio-demographic, psychosocial factors, life events, personality) that may influence behavior, but assumes these to be more distal (e.g., externally related to a particular behavior) than the proximal (e.g., factors directly linked to a given behavior) determinants specified by the theory (Ayers, Baum, & McManus, 2007). Thus, it has been suggested to use the TPB as a model for explaining the impact of the psychological determinants of a given behavior and to also consider external or distal factors that are hypothesized to potentially influence the components of the theory (Sutton, 2004). For example, demographic factors such as occupation status, marital status, race/ethnicity, education, and family income have all been studied in the context of exercise behavior (Weinberg & Gould, 2003). Specifically, people with higher occupation status, more education, and higher incomes are more likely to participate and adhere to exercise compared to their unemployed, less educated, lower-income counterparts. The U.S. Centers for Disease Control and Prevention (1993) reported that 65% of individuals who earn less than $15,000/year are inactive compared to 48% of those people who earn more than $50,000/year. In addition, 72% of people with less than a high school education are sedentary compared to 50% of those with a college education. Finally, compared to Caucasians, non-Caucasian populations are less likely to participate in exercise behavior (Eyler, Baker, Cromer, King, Brownson, et al., 1998; Taylor, Baranowski, & Young, 1998). Thus, it is logical that these factors may also influence women's psychosocial

predictors of exercise intention and behavior and should therefore be considered when examining women's exercise motivation and behavior during pregnancy.

Pre-pregnancy Weight Status. Furthermore, there is some evidence that pre-pregnancy health factors may influence pregnancy-related health behaviors and outcomes. First, weight status has been shown to influence exercise behavior in non-pregnant populations (Godin, Belanger-Gravel, & Nolin, 2008); however, the association between pre-pregnancy weight status and pregnancy-related exercise behavior has not been well-studied. Existing study findings suggest an increased risk in negative health outcomes (e.g., gestational diabetes, preeclampsia, and postpartum weight retention leading to obesity) for women who enter pregnancy already overweight or obese (Chasan-Taber, Schmidt, Pekow, Sternfeld, Solomon, et al., 2008; Dempsey, Sorensen, Williams, & Lee, 2004; Kim, Brawarsky, Jackson, Fuentes-Afflick, & Haas, 2005; Rudra, Williams, Lee, Miller, & Sorensen, 2005). Also, recent evidence from the National Health and Nutrition Examination Survey (NHANES) estimated that 64% of women between the ages of 20 and 39 years are overweight (body mass index [BMI] > 25 kg/m^2), and 34% of those women are obese (BMI > 30 kg/m^2; Flegal, Carroll, Ogden, & Curtin, 2010). While the research examining the effects of pre-pregnancy weight status is scant, findings from a recent study performed by Weisman and colleagues (2010) suggest that being overweight prior to becoming pregnant increases the odds of excessive pregnancy weight gain by nearly three-fold based on the recently updated guidelines from the IOM (2009). Less is known, however, about the impact of pre-pregnancy weight status on women's pregnancy-related exercise behavior.

Pre-pregnancy Exercise Behavior. In addition, the evidence regarding exercise behavior performed in the year before pregnancy is equivocal. There is some research to suggest that pre-pregnancy exercise may have a positive influence on pregnancy outcomes (Chasan-Taber,

Schmidt, Pekow, 2007; Dempsey, Sorensen, & Williams, 2004; Weisman et al., 2010). That is, women who are active prior to pregnancy may have better pregnancy (e.g., increased mobility and energy; Haas, Jackson, Fuentes-Afflick, Stewart, Dean, et al., 2005) and postpartum health (e.g., depression; Abraham, Taylor, & Conti, 2001). Moreover, Ajzen (1991) suggested that past experiences are an important influence on present cognitions. In support, researchers have found that past exercise behavior influences present attitude, subjective norm, perceived behavior control, and intention (Hagger, Chatzisarantis, & Biddle, 2002; Rhodes, Macdonald, & McKay, 2006). However, Hausenblas, Symons Downs, Giacobbi, Tuccitto, and Cook (2008) found evidence to the contrary. They prospectively examined pregnant women's first and second trimester exercise intention and behavior and the potential moderating effect of past exercise behavior using the TPB and found that pre-pregnancy exercise behavior did not significantly account for subsequent longitudinal changes. They suggested that the lack of association may be due to the rapid physical changes that occur during pregnancy, and that while pre-pregnancy exercise is recommended for positive pregnancy health outcomes, it likely has little influence on pregnancy exercise behavior. Further research, however, is needed to confirm or refute these findings.

Depressive Symptoms. Finally, the impact of lifestyle (e.g., perceived lack of time, changes in daily routines) and physical changes (e.g., fatigue, weight gain, discomfort) in pregnancy may be perceived as challenges, which in turn, may be associated with poor psychological well-being (Poudevigne & O'Connor, 2006; Symons Downs et al., 2008). For example, symptoms of depression may be important to consider when identifying the salient determinants of women's pregnancy-related exercise behavior. The prevalence of prenatal depression is approximately 11% with rates varying across the pregnancy trimesters (Bennett, Einarson, Taddo, Koren, &

Einarson, 2004; Dennis, Ross, & Grigoriadis, 2007). Moreover, the frequency and severity of depressive symptoms in future pregnancies may also be elevated among women who have experienced prenatal depression (American Psychological Association [APA], 2000), thus potentially placing women who have had children at increased risk for depressive symptoms. That is, between 9 and 16% of women suffer from postpartum depression (O'Hara, & Swain, 1996) and this rate increases to almost 41% for women who experienced depression in a prior pregnancy (APA, 2007). Thus, early pregnancy is an important time to identify symptoms of depression and to understand how it may influence important health behaviors like exercise. The available research among pregnant populations demonstrates that physical inactivity is associated with a worse mood (Poudevigne & O'Connor, 2006) and that depressive symptoms in early pregnancy may predict depressive symptoms in later pregnancy (Symons Downs et al., 2008). More specifically, recent study findings from a sample of 230 middle class pregnant women provide preliminary support for the collective influences of psychosocial variables such as depressive symptoms, body image satisfaction, and exercise behavior for explaining depressive symptoms across pregnancy and postpartum (Symons Downs et al., 2008). These study findings demonstrate that pre-pregnancy exercise behavior may offer protective effects against the onset of depressive symptoms in early pregnancy. Alternatively, the motivational determinants of exercise behavior may be negatively impacted among women who experience depressive symptoms in early pregnancy. However, a better understanding of the relationship between depression and the TPB variables as they predict exercise during pregnancy can help to inform intervention design and thus potentially improve both maternal and infant health (Chasan-Taber et al., 2007; Dempsey et al., 2004; Kim et al., 2005; Rudra et al., 2005). As women enter into pregnancy many factors can influence their motivation to be active during this transitional period

of time. Therefore, it is important to understand how factors external to the TPB may impact the higher-order constructs for predicting the exercise intention and behavior of pregnant women with and without children, and thus their long-term health by reducing the risk of diseases such as gestational diabetes, preeclampsia, and postpartum obesity.

Summary of the Evidence Supporting Dissertation Research

There is strong evidence to demonstrate significant associations among the TPB motivational determinants of exercise behavior both in pregnant and non-pregnant populations (Hagger et al., 2002; Hausenblas et al., 1997; Hausenblas & Symons Downs, 2004; Symons Downs & Hausenblas, 2003; 2005a; 2005b; 2007). There is also plausible evidence that motherhood status may influence the TPB psychosocial constructs for explaining women's exercise intention and behavior during pregnancy (Bellows-Riecken & Rhodes, 2008; Grace et al., 2006; Symons Downs et al., 2007). This dissertation will extend the current body of literature by further examining how the psychological determinants of exercise intention and behavior vary by motherhood status (i.e., pregnant women with vs. without children) using the TPB theoretical framework. Specifically, this study will examine the impact of attitude, subjective norm, and perceived behavioral control for predicting exercise intention; and intention and perceived behavioral control for predicting exercise behavior from the first to the second and the second to the third pregnancy trimesters for women with and without children. Because pregnancy is a time when significant changes occur quickly as pregnancy progresses toward delivery, it is important to understand how the most salient predictors of exercise motivation and behavior may differ by motherhood status. The use of a strong conceptual framework such as the TPB (Ajzen, 1991) can provide an understanding of how exercise intention and behavior may vary by motherhood status from the first to the second and the second to the third pregnancy trimesters to

better understand the social roles and significance of motherhood as a life event for influencing exercise behavior during pregnancy. In addition, this study will provide a more complete picture of some of the factors external to the TPB (i.e., demographic, psychological, and physical) that may impact pregnant women's lives during this transitional period and it will provide a good opportunity to identify the most important psychological variables to target in interventions designed to increase women's exercise motivation and behavior throughout pregnancy.

CHAPTER 2

Existing research supports that most pregnant women are not active enough to obtain the health benefits of exercise (Evenson et al., 2004; Symons Downs et al., 2008). While limited, there is some evidence to suggest that a significant life event such as becoming a mother may negatively impact pregnant women's exercise behavior (Bellows-Riecken & Rhodes, 2008; Nomaguchi & Bianchi, 2004; Symons Downs et al., 2007). That is, although it is likely that having other children to care for during pregnancy would further attenuate women's exercise motivation and behavior, theoretically-driven research supporting this assumption is scant, and no published studies to date have addressed how motherhood status may moderate the determinants of pregnant women's exercise intention and behavior from the first to the second and the second to the third pregnancy trimesters. The Theory of Planned Behavior (TPB; Ajzen, 1991) is a well-supported theory for predicting and understanding exercise behavior, and it has been used with pregnant women (Hausenblas & Symons Downs, 2004; Symons Downs & Hausenblas, 2003; 2007). However, understanding the motivational determinants of exercise in pregnancy across the trimesters is needed to guide exercise intervention design to promote meeting the current recommendations among pregnant women, particularly in late pregnancy when exercise behavior tends to decline the most (Haakstad et al., 2009).

Thus, the objective of this study was to prospectively examine the moderating influence of motherhood status on the associations among attitude, subjective norm, and perceived behavioral control for explaining pregnant women's exercise intention and behavior from the first to the second trimester and the second to the third trimester using the theoretical framework of the TPB (Ajzen, 1991). The **first purpose** was to: (a) examine how changes in attitude, subjective norm, perceived behavioral control, intention, and exercise behavior from the first to second and the

second to third pregnancy trimesters vary by motherhood status; and (b) understand the influence of motherhood status on these constructs after controlling for the impact of socio-demographic factors (i.e., participant age, occupation status), pre-pregnancy weight status, and depressive symptoms. Based on existing research (Brown & Trost, 2003; Hausenblas & Symons Downs, 2004; Hausenblas et al., 2008; Nomaguchi & Bianchi, 2004; Symons Downs & Hausenblas, 2003; 2007; Symons Downs et al., 2007; Verhoef et al., 1992), the first hypothesis was that pregnant women without children would report significantly more minutes of exercise behavior and higher attitude, subjective norm, perceived behavioral control, and intention from the first to the second trimester and the second to the third trimesters compared to pregnant women with children. The second hypothesis was that for both pregnant women with and without children, an increase in the TPB constructs would be observed from the first to the second trimester, while a decrease would be observed in the TPB constructs from the second to the third trimester. The **second purpose** was to prospectively examine the moderating influence of motherhood status on the associations between: (1) first trimester intention and perceived behavioral control for predicting second trimester exercise behavior, (2) second trimester intention and perceived behavioral control for predicting third trimester exercise behavior, (3) first trimester attitude, subjective norm, and perceived behavioral control for predicting second trimester intention, and (4) second trimester attitude, subjective norm, and perceived behavioral control for predicting third trimester intention, while controlling for targeted socio-demographic factors (i.e., participant age, occupation status), pre-pregnancy weight status, and depressive symptoms. Based on findings from Hausenblas and Symons Downs (2004), Symons Downs et al. (2007), and Symons Downs and Hausenblas (2003, 2007), the first hypothesis was that after accounting for the selected socio-demographic variables, pre-pregnancy weight status, and depressive

symptoms, motherhood status would moderate: (1a) the associations between perceived behavioral control and exercise intention for predicting exercise behavior from the first to the second trimester and the second to the third trimester; and (1b) the associations between attitude, subjective norm, and perceived behavioral control for predicting exercise intention from the first to the second trimester and the second to the third trimester. Based on evidence examining the TPB in pregnant women (Symons Downs et al., 2008; Symons Downs & Hausenblas, 2003; 2007), the second hypothesis was that after accounting for the influence of the selected socio-demographic variables, pre-pregnancy weight status, and depressive symptoms, intention would be the strongest predictor of exercise behavior and attitude would be the strongest predictor of exercise intention in the second and third trimesters among both pregnant women with and without children.

Method

Participants

Participants were 166 pregnant women (*M* age = 30.1 years, *SD* = 4.0, range = 18-43 years). The sample was largely homogenous as most of the women were Caucasian (92%), married (85%), completed college, graduate, or professional school (89%), and had a family income of $40,000 or higher per year (73%). Approximately half (47%) of the women were pregnant with no other children and 53% were pregnant and had one or more children (25% had one child, 16% had two children, 8% had three children, and 4% had more than three children). On average, women's pre-pregnancy BMI was in the normal-weight category (*M* = 24.2, *SD* = 5.2 $kg \cdot m^{-2}$) and the range was from normal (18.7 $kg \cdot m^{-2}$) to overweight/obese (52.2 $kg \cdot m^{-2}$; IOM, 2009). In general, this sample of women is representative of the local community population: the majority of women residing in and around State College, Pennsylvania are Caucasian (85%), college-

educated (73%), of middle income or higher (70%), and overweight/obese (60%; Pennsylvania Department of Health, 2000; 2005).

Measures

Motherhood Status. Motherhood status was determined by asking women at study entry (i.e., first pregnancy trimester) to complete a self-reported item inquiring about how many children they had living at home (i.e., no children, 1 child, 2 children, 3 children, > 3 children). This method has been previously used to identify motherhood status among pregnant and non-pregnant women (Bell & Lee, 2005; King, 1999; Nomaguchi & Milkie, 2003; Nomaguchi & Bianchi, 2004; Symons Downs et al., 2007; Verhoef et al., 1992). For the purposes of this study, motherhood status was coded as 0 = pregnant women without children, and 1 = pregnant women with children as done by prior researchers (Bell & Lee, 1995; Symons Downs et al., 2007),

Theory of Planned Behavior Constructs. The TPB constructs were examined based on the following four elements: target, action, context, and time (Ajzen, 1991, 2002; Courneya, Friedenreich, Arthur, & Bobick, 1999). Ajzen (2002) suggests that defining these elements of a behavior define that behavior at the theoretical level; however, the explanation can be somewhat arbitrary and should be interpreted by the researcher. For example, for the purposes of this dissertation study exercise behavior was defined in terms of its target (pregnant women with and without children), action (exercise behavior), and time (specific trimester). Finally, the context was generalized as women's free-living environment in which exercise behavior may have taken place (e.g., at home, outside, and at the gym). Correspondence was obtained based on time elements between exercise behavior and intention. All questions were asked in the approximate middle of the first, second, and third pregnancy trimesters to allow women to have enough time to experience each pregnancy trimester and more accurately self-report their exercise behavior.

Participants were provided the following statement before completing any of the TPB questions: "Regular exercise behavior = participating in 30 min of accumulated moderate exercise on most, if not all days of the week. This exercise can be performed at one time (e.g. 30 minutes of continuous walking or jogging) or accumulated throughout the day (e.g. walking 10 min in the morning and 20 min in the evening)." This statement was provided to participants in order to facilitate a standardized understanding of regular exercise behavior. In addition, this definition of exercise behavior was based on the ACSM (2000) guidelines for meeting exercise recommendations. Item constructs were elicited from an extensive examination by Symons Downs and Hausenblas (2005a) who examined salient exercise beliefs relating to the TPB.

Attitude. Attitude was assessed with the following seven semantic differential pairs commonly used in the exercise literature: 1) useless-useful, 2) bad-good, 3) boring-interesting, 4) unpleasant-pleasant, 5) foolish-wise, 6) harmful-beneficial, and 7) unenjoyable-enjoyable (Azjen, 1991; 2002; Symons Downs & Hausenblas, 2003; 2005a). Participants were given the statement, "For me, exercising during my (1^{st}, 2^{nd}, or 3^{rd}) trimester of pregnancy will be…" and were asked to complete the statement by rating each pair using a 7-point Likert scale ranging from 1 (useless, bad, boring, unpleasant, foolish, harmful, unenjoyable) to 7 (useful, good, interesting, pleasant, wise, beneficial, enjoyable), respectively. Consistent with prior research (Symons Downs & Hausenblas, 2003; 2005a), the internal consistency scores for the seven attitude items for the first, second, and third trimesters were good-to-excellent ($\alpha = 0.90$, $\alpha = 0.89$, and $\alpha = 0.93$, respectively).

Subjective Norm. Subjective norm was assessed with the following three items: 1) "Most people who are important to me think that I should exercise regularly in my (1^{st}, 2^{nd}, or 3^{rd}) trimester," 2) "Most people who are important to me want me to exercise regularly in my (1^{st},

2nd, or 3rd) trimester," and 3) "Most people who are important to me approve of me exercising regularly in my (1st, 2nd, or 3rd) trimester" (Symons Downs & Hausenblas, 2005a). Participants responded to these three questions with a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree) for the first two items, and 1 (disagree) to 7 (agree) for the third item (Ajzen, 1991; 2002; Symons Downs & Hausenblas, 2003; 2005a). Internal consistency scores for the three items for the first, second, and third trimesters were excellent ($\alpha = 0.94$, $\alpha = 0.95$, and $\alpha = 0.97$, respectively)

***Perceived Behavioral Control*.** Perceived behavioral control was assessed with the following three items: 1) "How much control do you have over exercising at least 3 days per week in your (1st, 2nd, or 3rd) trimester?," ranging from 1 (very little control) to 7 (complete control); 2) "For me to exercise at least 3 days per week in my (1st, 2nd, or 3rd) trimester will be…," ranging from 1 (extremely difficult) to 7 (extremely easy); and 3) "If I wanted to, I could easily exercise regularly in my (1st, 2nd, or 3rd) trimester," ranging from 1 (strongly disagree) to 7 (strongly agree; Courneya et al., 1999; Symons Downs & Hausenblas, 2003; 2005a). Similar to previous research (Symons Downs & Hausenblas, 2003; 2005a), the internal consistency scores for the three perceived behavioral control items in the current study were good-to-excellent in the first ($\alpha = 0.89$), second ($\alpha = 0.91$), and third ($\alpha = 0.90$) pregnancy trimesters.

***Intention*.** Intention to exercise during each pregnancy trimester was assessed with the following three items: 1) "I intend to exercise regularly in my (1st, 2nd, or 3rd) trimester," ranging from 1 (strongly disagree) to 7 (strongly agree); 2) "I intend to exercise at least 3 days per week in my (1st, 2nd, or 3rd) trimester," ranging from 1 (definitely not) to 7 (definitely); and 3) "I intend to exercise with the following regularity in my (1st, 2nd, or 3rd) trimester," ranging from 1 (not at

all) to 7 (very much). The internal consistency scores for intention in the current study were excellent in the first (α = 0.92), second (α = 0.91), and third (α = 0.92) pregnancy trimesters.

Exercise Behavior. Women's exercise behavior was assessed at four time points. First, women were asked to retrospectively report their pre-pregnancy exercise behavior at study entry by answering the following items: (1) "I exercised __ days a week in the year before pregnancy," with responses ranging from 0 to 7 days a week; and (2) "I exercised __ minutes per day in the year before pregnancy," with responses being open-ended. Women were also asked to report their exercise behavior in the first, second, and third pregnancy trimesters by answering the following items: (1) "Are you currently exercising?" (yes/no); (2) "How many days/week?" (0 1 2 3 4 5 6 7); and (3) "How many minutes/day?" (__ *minutes*). For the purposes of this dissertation, the term 'exercise' was used to refer to women's self-reported moderate-intensity exercise behavior in days and minutes recalled from the past week in their free-living during each pregnancy trimester. Exercise behavior was defined as engaging in 30 minutes of accumulated moderate (e.g., brisk walking) to strenuous (e.g., running) activity on most, if not all days of the week (ACSM, 2000).

Socio-Demographic Variables. A personal history questionnaire was designed for this study and inquired about participants' occupation, occupation status (i.e., full-time, part-time, homemaker, unemployed), marital status (i.e., married, single, divorced, other), race/ethnicity (i.e., Caucasian, African American, Indian, Asian, Other), highest level of education (i.e., < high school, high school, college, graduate/professional), family income (i.e., $10-20,000, $20-40,000, $40-100,000, > $100,000), and pre-pregnancy weight (pounds).

Pre-pregnancy Weight Status. Pre-pregnancy weight status was calculated from body mass index (BMI). Self-reported pre-pregnancy weight in pounds was converted to kilograms (kg),

and self-reported height in inches was transformed to meters squared (m^2; IOM, 2009). BMI was then calculated by dividing weight (kg) by height (m^2). Self-reported BMI has been found to be highly correlated (r = .80 to .96) with objectively-measured BMI among women of the childbearing age (Brunner Huber, 2007; Himes, Hannon, & Wall, 2005; Weisman et al., 2010). Next, women's pre-pregnancy weight status group was determined by using the IOM (2009) recommendations for pre-pregnancy BMI ($kg \cdot m^{-2}$) classifications such that underweight = BMI ≤ 18.5 $kg \cdot m^{-2}$, normal weight = BMI 18.6 $kg \cdot m^{-2}$ - 25.0 $kg \cdot m^{-2}$, overweight = BMI 25.1 $kg \cdot m^{-2}$ - 29.9, and obese = BMI ≥ 30.0 $kg \cdot m^{-2}$.

Depressive Symptoms. The Centers for Epidemiological Studies-Depression (CES-D) Scale (Radloff, 1977) was used to assess the degree of depressive feelings and behaviors experienced at approximately 8- to 12-weeks gestation (i.e., study entry). For the purposes of this study, only baseline depressive symptoms were assessed and considered as a covariate in the analyses. Participants responded to the CES-D using a 5-point Likert scale ranging from 0 (rarely) to 3 (most days). The range of scores is 0–60, with higher scores associated with moderate (>15) and severe (>22) depression (Eaton, Muntaner, Smith, & Tien, 2004). Previous research has established the CES-D internal consistency and test-retest reliability (Mercer & Fertich, 1988), and it is commonly used in pregnancy and postpartum (Li, 2008; Symons Downs et al., 2008). In addition, the CES-D has been shown to have good internal consistency in the first pregnancy trimester (α = 0.85; Symons Downs et al., 2008). In the current study, a total CES-D score was generated, and the internal consistency reliability alphas were found to be good (α = 0.80).

Design and Procedures

The University's Institutional Review Board approved this study and consent was obtained from a local obstetrics and gynecology office to recruit the participants from February, 2005 to

March, 2010. Pregnant women were recruited for this study as part of a larger longitudinal study examining women's pregnancy exercise beliefs and behaviors at each pregnancy trimester (PSU IRB # 23915). A prospective study design was used to conduct this research. The participants were followed from the first to the second and the second to the third pregnancy trimesters (two prospective prediction time periods), with assessments of the TPB constructs (i.e., attitude, subjective norm, perceived behavioral control, and intention) assessed in the first and second trimesters used to predict exercise behavior that was reported in the second and third trimesters, respectively.

At the first prenatal clinic visit (approximately 8-weeks gestation) pregnant women received an informational packet containing the clinic forms and an informational flyer about the study. If interested, women provided their contact information on the study flyer and returned it to a clinic nurse (N = 769). These study forms were collected on a weekly basis from the nurse by the author and/or a research assistant. Those interested in participating in the study were then sent a packet in the mail containing a cover letter explaining the study and the survey instruments, an informed consent, and the personal history questionnaire, along with a self-addressed stamped envelope. At the approximate midpoint of each pregnancy trimester (i.e., 12-, 20-, and 32-weeks gestation), women were sent a questionnaire packet in the mail with a self-addressed stamped envelope. Specifically, in the first trimester participants were asked to retrospectively self-report their pre-pregnancy weight and pre-pregnancy exercise behavior. In all three trimesters, participants were asked to self-report their exercise behavior and their TPB attitude, subjective norm, perceived behavioral control, and intention. To facilitate an acceptable response rate, personalized cover letters, business-reply envelopes, and multiple phone call reminders were used (Ransdell, 1996). In addition, participants were asked to return their survey

within one week, and the women whose surveys were not received were given a reminder phone call. If participants still did not send their survey back by the end of the second week, the research team sent the participant a second questionnaire packet. If an additional three weeks passed and a participant still did not return her survey, she was removed from the study (Ransdell, 1996).

Of the initial 769 women who completed a study interest form and returned it to a clinic nurse, 234 did not respond when contacted, leaving 535 (69.6%) women who received surveys in the first pregnancy trimester. Subsequent reasons for attrition included: "lost to follow-up" (n = 123), "miscarriage" (n = 25), "not interested" (n = 8), "withdrew consent" (n = 4), and "pregnancy complications" (n = 3). Thus, the response rate in the first trimester was 69.5% (372/535), 82.8% in the second trimester (308/372), and 79.2% in the third trimester (244/308). These response rates are adequate for mail surveys according to the American Association for Public Opinion Research (1997) minimum standards for publishing in key journals; and are consistent with response rates found in previous research with pregnant women (Hausenblas, & Symons Downs, 2004; Symons Downs & Hausenblas, 2003; 2007). Of the 244 women who had returned the first, second, and third trimester surveys, 41 women (16.8%) did not report motherhood status, 12 women (4.9%) did not complete at least one scale on the second trimester survey, and 21 women (8.6%) did not complete at least one scale on the third trimester survey. Thus, these women were excluded from the study. The sample with complete data for this study was 170 participants. The study analyses were conducted using SPSS data software (version 19.0). All statistical tests were conducted with alpha set at .05.

Preliminary Data Analyses

Theoretically and conceptually important variables based on the TPB, pregnancy, and exercise research were considered as covariates (Table 2.2). The variables that were considered important for the purposes of this dissertation study included participant age, occupation status, marital status, education status (i.e., highest level of education completed), race/ethnicity, family income, pre-pregnancy weight status (IOM BMI groups, 2009), pre-pregnancy exercise behavior (i.e., min of self-reported exercise in pre-pregnancy), and depressive symptoms at baseline (i.e., first trimester; Table 2.3). Variables were considered theoretically and conceptually important if there is existing evidence suggesting that the variable of interest may impact the outcome variable and potentially confound the study results. One-way analyses of variance (ANOVA; Table 2.1) and Chi-square analyses (Table 2.2) were conducted to test for differences in the aforementioned variables by motherhood status group (i.e., pregnant women with vs. without children). One-way ANOVAs were used to test for group differences among continuous variables (i.e., age, depressive symptoms, and pre-pregnancy exercise behavior) and Chi-square analyses were used to identify group differences among categorical variables (i.e., pre-pregnancy weight status, occupation status, marital status, race/ethnicity, education status, and family income). The following paragraphs explain the findings of the preliminary data analyses for each of the variables that were assessed.

Socio-Demographic Variables. The socio-demographic variables considered were participant age, occupation status, marital status, education status, race/ethnicity, and family income. Significant group differences by motherhood status were observed for participant age and occupation status. A one-way ANOVA revealed that women with children were significantly older (M = 31.2, SD = 3.6 years) compared to women without children (M = 28.8,

SD = 4.0 years; Table 2.1). In addition, a Chi-square analysis demonstrated significant group differences by motherhood status for occupation status (full-time, part-time, homemaker, self-employed, or unemployed; $\chi(3) = 38.66$, $p < .001$; see Table 2.2). Specifically, a greater proportion of women without children (82%) reported that they were employed full-time, followed by 10% part-time, 2% homemaker, and 5% unemployed, compared to women with children (45% full-time employment, followed by 17% part-time, 38% homemaker, and 0% unemployed). No significant motherhood status group differences (*p*'s > .05) were observed for marital status, education status, race/ethnicity, or family income (Table 2.3). Therefore, only participant age and occupation status were included as covariates in the final analyses.

Pre-pregnancy Weight Status. Women's pre-pregnancy weight status group was determined by using the IOM (2009) recommendations for pre-pregnancy BMI ($kg \cdot m^{-2}$) classifications: (a) underweight (*n* = 4), normal weight (*n* = 120), overweight (*n* = 28), and obese (*n* = 18). Two preliminary steps were taken prior to deciding if pre-pregnancy weight status would be used as a covariate in the final analyses. First, due to insufficient data in the underweight group, these four cases were removed and not included in subsequent analyses; thus, reducing the final participant sample from 170 to 166 participants. Second, because the *N*'s in the overweight and obese BMI groups were lower than in the normal BMI group, preliminary analyses were performed to test if these two groups could be combined. No significant differences in age, occupation status, marital status, education status, race/ethnicity, or family income were noted between the overweight and obese BMI groups. Therefore, the overweight and obese groups were collapsed into one group, and pre-pregnancy weight status was categorized as 1 = normal weight (*n* = 120) and 2 = overweight (*n* = 46) for the remainder of the analyses. To determine if pre-pregnancy weight status would be used as a covariate in the final analyses, motherhood status group

differences were examined. A significant difference was observed in pre-pregnancy weight status, $\chi(1) = 4.92$, $p < .05$, (see Table 2.2) among women with and without children such that a greater proportion of women without children were in the overweight category prior to becoming pregnant compared to women with children. Thus, pre-pregnancy weight status was included in the final analyses as a covariate.

Pre-pregnancy Exercise Behavior. While pre-pregnancy exercise behavior is conceptually important, only 43 participants (26% of the total study sample) completed these questions. The reason for this was because questions about pre-pregnancy exercise behavior were added into the questionnaire later in the prospective study, and unfortunately there was insufficient data to include pre-pregnancy exercise behavior as a covariate in the study analyses.

Depressive Symptoms. A significant motherhood status group difference was found for depressive symptoms at baseline (Table 2.1). A one-way ANOVA revealed that women with children ($M = 19.6$, $SD = 6.6$) reported significantly more depressive symptoms in early pregnancy compared to women without children ($M = 18.1$, $SD = 6.8$; Table 2.1). Thus, a measure of depressive symptoms was included in the subsequent analyses as a covariate. In sum, after considering each empirically important variable, participant age, occupation status (full-time, part-time, homemaker, or unemployed), pre-pregnancy weight status (normal weight, overweight/obese), and depressive symptoms were selected to be entered as covariates in all subsequent analyses.

Data Analyses and Results

Study Sample Descriptives

Participant demographic variables by total sample and motherhood status group are displayed in Table 2.3. The means and standard deviations for the main study variables (i.e., attitude,

subjective norm, perceived behavioral control, intention, and exercise behavior) across the three trimesters for the total study sample as well as by motherhood status group are presented in Table 2.4. It is important to note that the trends for the means of all study variables at the mid-point of the first, second, and third trimesters are higher for pregnant women without children compared to those with children.

Purpose 1: Motherhood Status Group Differences from First to Second Trimester and Second to Third Trimester

To examine how the changes in TPB attitude, subjective norm, perceived behavioral control, and intention, and exercise behavior vary among women with and without children from the first to the second trimester and the second to the third trimester, adjusted (i.e., with covariates) and unadjusted (i.e., without covariates) repeated measures analyses were conducted. This purpose was examined using two sets of analyses. First, to examine the changes in TPB attitude, subjective norm, and perceived behavioral control by motherhood status from the first to the second and the second to the third pregnancy trimester, a 3 (time [i.e., trimester 1, trimester 2, and trimester 3]) x 2 (motherhood status group [i.e., women with vs. women without children]) repeated measures multivariate analysis of covariance (MANCOVA; controlling for participant age and occupation status) and a 3x2 multivariate analysis of variance (MANOVA; without covariates) were performed. A multivariate test evaluates whether the sample means on a set of variables vary across the levels of a factor. Second, to examine the impact of motherhood status on TPB intention and exercise behavior from the first to the second trimester and the second to the third trimester, individual 3 (time [i.e., trimester 1, trimester 2, and trimester 3]) x 2 (motherhood status group [i.e., women with vs. women without children]) repeated measures

analyses of variance, both adjusted (ANCOVA; with covariates) and unadjusted (ANOVA; without covariates), were performed.

Attitude, Subjective Norm, and Perceived Behavioral Control. Although TPB attitude, subjective norm, and perceived behavioral control are conceptually independent predictors of intention, empirically they are usually found to be inter-correlated because the same information can influence behavioral, normative, and/or control beliefs (i.e., the theoretical antecedents of attitude, subjective norm, and perceived behavioral control, respectively; Ajzen, 1991). Thus, a multivariate test, which is more powerful compared to a Univariate test, was used because it is able to account for the correlations among these variables (Huberty, Chou, & Benitez, 1994). In this sample, attitude, subjective norm, and perceived behavioral control were strongly correlated in the first (r = .48-.68, p's < .01), second (r = .58-.64, p's < .01), and third (r = .58-.71, p's < .01) trimesters (Table 2.5). Therefore, rather than conducting an individual repeated measures analysis of variance for each construct, TPB attitude, subjective norm, and perceived behavioral control were examined together using a multivariate approach.

To test the hypothesis that compared to pregnant women with children, pregnant women without children would report greater exercise attitude, subjective norm, and perceived behavioral control from the first to the second trimester and the second to the third trimester, a repeated measures MANCOVA was used adjusting for age, occupation status, pre-pregnancy weight status, and depressive symptoms. The multivariate tests revealed no significant effect for Time (p > .05) or a Time x Group interaction (p > .05) for TPB attitude, subjective norm, and perceived behavioral control (Table 2.5).

Next, an unadjusted repeated measures MANOVA, with partial eta squared (η^2_p; i.e., the ratio of sum of squares for an effect to the sum of squares between and sum of squares error [0.01 is a

small effect, 0.09 is a medium effect, and 0.25 is a large effect]) as an estimate of effect size, was used (Table 2.7). A statistically significant multivariate effect for Time, *Wilks' lambda* = .65, F (6, 159) = 14.05, $p < .001$, $\eta^2_p = .35$, was observed. However, no Time x Group interaction was found ($p > .05$). Univariate tests (sphericity assumed) indicated significant effects for Time for attitude, F (2) = 20.97, $p < .001$, $\eta^2_p = .11$, subjective norm, F (2) = 24.66, $p < .001$, $\eta^2_p = .13$), and perceived behavioral control, F (2) = 13.51, $p < .001$, $\eta^2_p = .08$.

To test the hypothesis that for both pregnant women with and without children, an increase in TPB attitude, subjective norm, and perceived behavioral control would be observed from the first to the second trimester, while a decrease would be observed in these TPB constructs from the second to the third trimester, Bonferroni post-hoc analyses were used to examine pairwise comparisons identifying where the significant changes occurred (Table 2.8), and Cohen's *d* (*d;* [M_2-M_1/*SD*]; i.e., 0.2 is a small effect, 0.5 is a medium effect, and 0.8 is a large effect) was reported indicating the magnitude of the difference. The results of the Bonferroni post-hoc analyses revealed that attitude was significantly lower ($p < .01$, $d = -.36$) in the first pregnancy trimester ($M = 38.6$, $SD = 8.6$) compared to the second pregnancy trimester ($M = 41.3$, $SD = 6.1$) and significantly higher ($p < .001$, $d = .58$) in the second pregnancy trimester ($M = 41.3$, $SD = 6.1$) compared to the third trimester ($M = 37.0$, $SD = 8.7$). Similarly, subjective norm was significantly lower ($p < .01$, $d = -.25$) in the first ($M = 16.5$, $SD = 4.4$) trimester compared to the second ($M = 17.5$, $SD = 3.6$) trimester, and significantly higher ($p < .001$, $d = .56$) in the second trimester ($M = 17.5$, $SD = 3.6$) compared to the third pregnancy trimester ($M = 15.1$, $SD = 4.9$). Third, perceived behavioral control was significantly lower ($p < .01$, $d = -.32$) in the first pregnancy trimester ($M = 13.3$, $SD = 5.1$) compared to the second pregnancy trimester ($M = 14.8$,

SD = 4.2), and significantly higher ($p < .001$, $d = .40$) in the second pregnancy trimester (*M* = 14.8, *SD* = 4.4) compared to the third trimester (*M* = 13.0, *SD* = 4.8; see Table 2.8).

Intention and Exercise Behavior. To test the hypothesis that pregnant women without children would report greater exercise intention and more minutes of exercise behavior from the first to the second trimester and the second to the third trimester compared to pregnant women with children, individual adjusted and unadjusted 3 (time [i.e., trimester 1, trimester 2, and trimester 3]) x 2 (motherhood status group [i.e., women with vs. women without children]) repeated measures analyses of variance (ANOVA) were conducted.

The individual repeated measures ANCOVAs, adjusting for participant age, occupation status, pre-pregnancy weight status, and depressive symptoms, revealed that for both intention and exercise behavior, no significant effects were observed for Time ($p > .05$) or Time x Group ($p > .05$; Table 2.10). Next, the individual repeated measures ANOVAs not adjusting for the covariates revealed that for TPB intention, a statistically significant repeated measures effect was observed for Time, *Wilks' lambda* = .75, F (2, 163) = 27.49, $p < .001$, $\eta^2_p = .25$, but not for Time X Group ($p > .05$; Table 2.10). A Univariate test (Huynh-Feldt adjustment to meet assumption of sphericity) indicated a significant effect for Time for intention, F (1.81) = 23.47, $p < .001$, $\eta^2_p = .13$. Similarly, for exercise behavior, a statistically significant repeated measures effect was observed for Time, *Wilks' lambda* = .73, F (2, 163) = 30.82, $p < .001$, $\eta^2_p = .27$, but not for Time X Group ($p > .05$; Table 2.12). A Univariate test (Greenhouse-Geisser adjustment to meet assumptions of sphericity) indicated a significant effect for Time for exercise behavior (F (1.63) = 20.46, $p < .001$, $\eta^2_p = .11$).

Bonferroni post-hoc analyses were conducted to test the hypothesis that an increase in TPB intention and minutes of exercise behavior would be observed from the first to the second

trimester, while a decrease would be observed from the second to the third trimester for both pregnant women with and without children. First, no significant differences ($p > .05$, $d = -.10$) in intention from the first ($M = 14.6$, $SD = 4.8$) to the second ($M = 15.1$, $SD = 4.9$) trimester (Table 2.9) were observed. However, significantly higher ($p < .001$, $d = .42$) intention was observed in the second trimester ($M = 15.1$, $SD = 4.9$) compared to the third pregnancy trimester ($M = 12.9$, $SD = 5.6$; see Table 2.8). Similarly, Bonferroni analyses indicated no significant differences ($p > .05$, $d = .01$) in exercise behavior from the first ($M = 110.5$ min/wk, $SD = 119.9$) to the second ($M = 109.4$ min/wk, $SD = 87.4$) trimester. However, significantly higher ($p < .001$, $d = .29$) exercise behavior was observed in the second trimester ($M = 109.4$ min/wk, $SD = 87.4$) compared to the third pregnancy trimester ($M = 86.5$ min/wk, $SD = 71.2$; Table 2.9).

Purpose 2: Examining the Moderating Influence of Motherhood Status on the Associations between the TPB Constructs for Explaining Exercise Behavior and Intention

To prospectively examine the moderating influence of motherhood status on the associations between: (1) first trimester intention and perceived behavioral control for predicting second trimester exercise behavior, (2) second trimester intention and perceived behavioral control for predicting third trimester exercise behavior, (3) first trimester attitude, subjective norm, and perceived behavioral control for predicting second trimester intention, and (4) second trimester attitude, subjective norm, and perceived behavioral control for predicting third trimester intention, while controlling for targeted socio-demographic influences (i.e., participant age and occupation status), pre-pregnancy weight status, and depressive symptoms, four hierarchical regression analyses (HRA) were conducted (Tables 2.11-2.14). The order and content of the blocks of variables were based on previous research and theoretical assumptions of the TPB

(Ajzen, 1991). For all four of the HRAs, age, occupation status, pre-pregnancy weight status, and depressive symptoms were controlled for in Block 1 in the analyses.

To reduce the impact of multicollinearity among the independent variables, the means for the predictor variables were centered (i.e. the sample mean was subtracted from the mean of each independent predictor variable) and entered into the HRA (Aiken & West, 1991). Subsequently, an examination of the tolerance values revealed no multicollinearity (values > .2) in the regression model (tolerance value range = .3 - .9; Meyers, Ganst, & Guarino, 2006). Based on the guidelines for the number of predictor variables in regression models, power of 0.80, and alpha of 0.05, adequate power was obtained to conduct these analyses (Green, 1991). Furthermore, a term-by-term strategy was used to explore the interaction effects through a step-down elimination (i.e., trimming) of non-significant predictors (Aiken & West, 1991). That is, the least significant interaction term was dropped and the regression was conducted without the least significant interaction term. This would be repeated until one of the interaction terms emerged as a significant predictor, or only one interaction term remained, albeit nonsignificant. If no interaction terms were found to be significant, the original model with all interaction terms included would be used to report results. This method was used because it gives more power to the analyses and unveils potentially significant interactions by permitting additional degrees of freedom (Aiken & West, 1991).

Predicting Second Trimester Exercise Behavior with First Trimester Intention and Perceived Behavioral Control. To test the hypothesis that after accounting for the selected socio-demographic variables, pre-pregnancy weight status, and depressive symptoms, motherhood status would moderate the associations between perceived behavioral control and exercise intention for predicting exercise behavior from the first to the second trimester, and

intention would be the strongest predictor of exercise behavior, second trimester exercise behavior (DV) was regressed on participant age, occupation status, pre-pregnancy weight status, and depressive symptoms (Block 1), motherhood status, and first trimester intention and perceived behavioral control (Block 2), and first trimester intention*motherhood status (MHS), and first trimester perceived behavioral control*MHS (Block 3). In Block 1, participant age (β = -.09, $p > .05$), occupation status (β = -.06, $p > .05$), pre-pregnancy weight status (β = -.10, $p > .05$), and depressive symptoms (β = -.21, $p < .01$; see Table 2.11) explained 7% of the variance in second trimester exercise behavior. Including motherhood status (β = -.03, $p > .05$), first trimester exercise intention (β = .39, $p < .001$), and first trimester perceived behavioral control (β = .16, $p > .05$) in Block 2 explained an additional 27% of the variance in exercise behavior. Finally, the addition of the interaction terms first trimester intention*MHS (β = -.09, $p > .05$) and first trimester perceived behavioral control*MHS (β = .20, $p > .05$) in Block 3 explained an additional 1% of the variance in exercise behavior.

Because neither of the interaction terms were significant, the model was trimmed (i.e., a step-down elimination of non-significant predictors) by dropping the least significant interaction term (i.e., first trimester intention*MHS) and the regression was conducted with only one interaction term (i.e., first trimester perceived behavioral control*MHS) in Block 3. In the final model, first trimester perceived behavioral control (perceived behavioral control*MHS; β = .26, $p < .05$) influenced second trimester exercise behavior to a greater extent for pregnant women with children compared to those women without children. To further examine this interaction for perceived behavioral control and motherhood status, mean tertile splits were conducted. High perceived behavioral control for pregnant women with children (mean (M) = 132.68, SD = 93.49) and those without children (M = 143.38, SD = 83.76); and low perceived behavioral

control for pregnant women with children (M = 45.58, SD = 70.28) and those without children (M = 107.21, SD = 93.41) was examined. Figure 2.1 illustrates that perceived behavioral control influences exercise behavior for pregnant women with children to a greater extent than for pregnant women without children, particularly among pregnant women who self-reported having low perceived behavioral control.

Predicting Third Trimester Exercise Behavior with Second Trimester Intention and Perceived Behavioral Control. To test the hypothesis that after accounting for the selected socio-demographic variables, pre-pregnancy weight status, and depressive symptoms, motherhood status would moderate the associations between perceived behavioral control and exercise intention for predicting exercise behavior from the second to the third trimester, and intention would be the strongest predictor of exercise behavior, third trimester exercise behavior (DV) was regressed on participant age, occupation status, pre-pregnancy weight status, and depressive symptoms (Block 1), motherhood status, and second trimester intention and perceived behavioral control (Block 2), and second trimester intention*MHS and second trimester perceived behavioral control*MHS (Block 3). In Block 1, participant age (β = -.07, p > .05), occupation status (β = -.17; p > .05), pre-pregnancy weight status (β = -.07, p > .05), and depressive symptoms (β = -.11, p > .05; see Table 2.12) explained 5% of the variance in third trimester exercise behavior. Including motherhood status (β = -.02, p > .05), second trimester exercise intention (β = .33, p < .01), and second trimester perceived behavioral control (β = .12, p > .05) in Block 2 explained an additional 18% of the variance in exercise behavior. Finally, the addition of the interaction terms second trimester intention*MHS (β = -.24, p > .05) and second trimester perceived behavioral control*MHS (β = .27, p > .05) in Block 3 explained an additional 1% of the variance in third trimester exercise behavior.

Because neither of the interaction terms were significant, the model was trimmed by dropping the least significant interaction term (i.e., second trimester intention*MHS) and the regression was conducted with only one interaction term (i.e., second trimester perceived behavioral control*MHS) in Block 3. There were no significant interaction terms in the final model, and thus, only second trimester intention (β = .50, p < .05) provided a significant contribution for predicting third trimester exercise behavior.

Predicting Second Trimester Intention with First Trimester Attitude, Subjective Norm, and Perceived Behavioral Control. To test the hypothesis that after accounting for the selected socio-demographic variables, pre-pregnancy weight status, and depressive symptoms, motherhood status would moderate the associations between exercise attitude, subjective norm, and perceived behavioral control for predicting exercise intention from the first to the second trimester, and attitude would be the strongest predictor of exercise intention, second trimester intention (DV) was regressed on participant age, occupation status, pre-pregnancy weight status, and depressive symptoms (Block 1), motherhood status, and first trimester attitude, subjective norm, and perceived behavioral control (Block 2), and first trimester attitude*MHS, first trimester subjective norm*MHS, and first trimester perceived behavioral control*MHS (Block 3). In Block 1, participant age (β = -.02, p > .05), occupation status (β = -.02, p > .05), pre-pregnancy weight status (β = -.05, p > .05), and depressive symptoms (β = -.09, p > .05; see Table 2.13) explained 1% of the variance in second trimester exercise intention. Including motherhood status (β = -.14, p > .05), first trimester attitude (β = .08, p > .05), subjective norm (β = .08, p > .05), and perceived behavioral control (β = .34, p < .01) in Block 2 explained an additional 23% of the variance in exercise intention. Finally, the addition of the interaction terms first trimester attitude*MHS (β = -.24, p > .05), first trimester subjective norm*MHS (β =

-.17, $p > .05$), and first trimester perceived behavioral control*MHS ($\beta = .65$, $p < .001$) in Block 3 explained an additional 10% of the variance in exercise intention.

In the final model, both first trimester attitude ($\beta = .44$, $p < .05$) and first trimester perceived behavioral control*MHS ($\beta = .65$, $p < .001$) provided significant contributions for predicting second trimester exercise intention. Specifically, perceived behavioral control influenced second trimester exercise intention to a greater extent for pregnant women with children compared to those women without children. To further examine this significant interaction for perceived behavioral control and motherhood status for predicting second trimester intention, mean tertile splits were conducted. High perceived behavioral control for pregnant women with children (mean (M) = 16.62, SD = 4.02) and those without children (M = 17.06, SD = 3.09); and low perceived behavioral control for pregnant women with children (M = 10.38, SD = 6.75) and those without children (M = 15.17, SD = 3.88) was examined. Figure 2.2 illustrates that perceived behavioral control influences exercise intention for pregnant women with children to a greater extent than for pregnant women without children, particularly among pregnant women who self-reported having low perceived behavioral control.

Predicting Third Trimester Intention with Second Trimester Attitude, Subjective Norm, and Perceived Behavioral Control. To test the hypothesis that after accounting for the selected socio-demographic variables, pre-pregnancy weight status, and depressive symptoms, motherhood status would moderate the associations between exercise attitude, subjective norm, and perceived behavioral control for predicting exercise intention from the second to the third trimester, and attitude would be the strongest predictor of exercise intention, third trimester intention (DV) was regressed on participant age, occupation status, pre-pregnancy weight status, and depressive symptoms (Block 1), motherhood status, and second trimester attitude, subjective

norm, and perceived behavioral control (Block 2), and second trimester attitude*motherhood status, second trimester subjective norm*motherhood status, and second trimester perceived behavioral control*motherhood status (Block 3). In Block 1, participant age (β = .02, p > .05), occupation status (β = -.03; p > .05), pre-pregnancy weight status (β = -.06, p > .05), and depressive symptoms (β = -.04, p > .05; see Table 2.14) explained 1% of the variance in third trimester exercise intention. The addition of motherhood status (β = -.05, p > .05), second trimester attitude (β = .24, p < .01), subjective norm (β = .25, p < .01), and perceived behavioral control (β = .23, p < .05) in Block 2 explained an additional 38% of the variance in exercise intention. Finally, including the interaction terms second trimester attitude*MHS (β = -.05, p > .05), second trimester subjective norm*MHS (β = -.15, p > .05), and second trimester perceived behavioral control*MHS (β = .32, p < .05) in Block 3 explained an additional 2% of the variance in third trimester exercise intention.

In the final model, both second trimester attitude (β = .31, p < .05), second trimester subjective norm (β = .36, p < .05), and second trimester perceived behavioral control*MHS (β = .32, p < .05) provided significant contributions for predicting second trimester exercise intention. Specifically, perceived behavioral control influenced second trimester exercise intention to a greater extent for pregnant women with children compared to those women without children. To further examine this significant interaction for perceived behavioral control and motherhood status for predicting second trimester intention, mean tertile splits were conducted. High perceived behavioral control for pregnant women with children (M = 15.54, SD = 4.52) and those without children (M = 16.17, SD = 4.53); and low perceived behavioral control for pregnant women with children (M = 8.46, SD = 5.01) and those without children (M = 11.20, SD = 5.35) was examined. Figure 2.3 illustrates that perceived behavioral control influences

exercise intention for pregnant women with children to a greater extent than for pregnant women without children, particularly among pregnant women who self-reported having low perceived behavioral control.

Table 2.1

Analyses of Variance: Preliminary Analyses to Identify Motherhood Status Group Differences

	Pregnant Without Children (n = 78)		*Pregnant With Children (n = 88)*				
Continuous Variables	*M*	*SD*	*M*	*SD*	*F*	*df*	*p*
Age (years)	28.8	4.0	31.2	3.6	**16.13**	1, 164	**.001**
Depressive Symptoms	18.1	6.8	19.6	6.6	**1.88**	1, 164	**.09**

Note. Abbreviations: *M* = mean, *SD* = standard deviation, *df* = degrees of freedom, min = minutes.

Table 2.2

Chi Square Analyses: Preliminary Analyses to Identify Motherhood Status Group Differences

		Pregnant Without Children (n = 78)	*Pregnant With Children (n = 88)*			
Categorical Variables		%	%	x^2	*df*	*p*
Pre-pregnancy Weight Status	Normal	64%	80%	**4.92**	1	**.02**
	Overweight	36%	20%			
Occupation Status	Full-time	82%	45%	**38.66**	3	**.001**
	Part-time	10%	17%			
	Homemaker	3%	38%			
	Unemployed	5%	0			
Marital Status	Married	85%	91%	2.80	3	.42
	Single	9%	5%			
	Divorced	3%	1%			
	Other	3%	3%			
Race/Ethnicity	Caucasian	93%	91%	5.93	4	.21
	African American	0	1%			
	Asian	5%	5%			
	Hispanic	0	3%			
	Other	2%	0%			
Education Status	Grad/Prof	47%	42%	.96	3	.81
	College	46%	50%			
	High School	6%	6%			
	< High School	1%	2%			
Family Income	< $10,000	3%	0	3.98	4	.41
	$10-20,000	6%	8%			
	$20-40,000	20%	17%			
	$40-100,000	50%	51%			
	> $100,000	20%	24%			

Note. Abbreviations: *M* = mean, *SD* = standard deviation, *df* = degrees of freedom, η^2 = eta squared, min = minutes, wk = week.

Table 2.3

Final Participant Sample Characteristics (N = 166)

Variable	*Total Sample (N=166)*			*Pregnant Without Children (N=78)*			*Pregnant With Children (N=88)*		
	M	*SD*	*%*	*M*	*SD*	*%*	*M*	*SD*	*%*
Motherhood Status									
No children			47.0			100			0
1 child			25.4			0			47.7
2 children			15.8			0			29.9
3 children			8.4			0			15.9
> 3 children			3.4			0			6.5
Age (years)	30.1	4.0		28.8	4.0		31.2	3.6	
Occupation Status									
Full-time			62.7			82.0			45.0
Part-time			13.9			10.0			17.0
Homemaker			21.1			3.0			38.0
Unemployed			2.4			5.0			0
Marital Status									
Married			85.0			85.0			91.0
Single			7.0			9.0			5.0
Divorced/Other			8.0			6.0			4.0
Education									
Graduate			43.3			46.8			42.7
College			45.8			45.7			48.5
High School			6.4			6.4			6.8
Race/Ethnicity									
Caucasian			91.9			93.0			91.0
Asian			5.1			5.0			5.0
Hispanic			1.5			0			3.0
African American/Other			1.5			2.0			1.0
Family Income									
> $100,000			22.6			20.0			24.0
$40 -100,000			50.0			50.0			51.0
< $40,000			25.8			30.0			25.0
Pre-pregnancy BMI									
Normal Weight (kg/m^2)	21.9	1.7	72.3	21.8	1.6	64.1	22.0	1.8	79.5
Overweight (kg/m^2)	30.2	5.7	27.7	29.3	4.7	35.9	31.5	6.6	20.5
Depressive Symptoms	18.7	6.3		18.1	6.6		19.7	6.2	

Note. Abbreviations: *M* = mean, *SD* = standard deviation, kg/m^2 = kilograms per meters squared, BMI = body mass index, min = minute.

Table 2.4

Means (M) and Standard Deviations (SD) for Attitude, Subjective Norm, Perceived Behavioral Control, Intention, and Exercise Behavior for Women in Each Pregnancy Trimester and by Motherhood Status Group

	Trimester 1						*Trimester 2*						*Trimester 3*					
	Total		*Pregnant Without Children*		*Pregnant With Children*		*Total*		*Pregnant Without Children*		*Pregnant With Children*		*Total*		*Pregnant Without Children*		*Pregnant With Children*	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Attitude	38.6	8.6	39.9	7.9	37.5	9.1	41.3	6.1	41.5	6.2	41.1	6.0	37.0	8.7	37.3	9.2	36.7	8.4
Subjective Norm	16.5	4.4	17.1	4.0	15.9	4.7	17.5	3.6	18.2	2.9	16.8	4.0	15.1	4.9	15.6	4.8	14.6	5.0
PBC	13.3	5.1	14.9	4.4	11.8	5.2	14.8	4.2	15.9	3.5	13.8	4.6	13.0	4.8	13.7	4.8	12.5	4.8
Intention	14.6	4.8	15.8	4.3	13.6	5.0	15.1	4.9	16.2	3.6	14.2	5.6	12.9	5.6	13.7	5.3	12.1	5.7
Ex Beh (min/wk)	110.5	119.9	129.6	139.6	93.7	97.0	109.4	87.4	127.1	85.6	101.0	93.7	86.5	71.2	84.4	76.8	56.4	63.5

Note. Abbreviations*:* PBC = Perceived Behavioral Control, Ex Beh = Exercise Behavior, min = minutes, wk = week.

Table 2.5

Pearson Correlations for the TPB Constructs and Exercise Behavior by Motherhood Status Group Within Each Pregnancy Trimester

Variables	Subjective Norm		Perceived Behavioral Control		Intention		Exercise Behavior	
	Pregnant Without Children	*Pregnant With Children*	*Pregnant Without Children*	*Pregnant With Children*	*Pregnant Without Children*	*Pregnant With Children*	*Pregnant Without Children*	*Pregnant With Children*
Attitude								
Tri 1	**.62****	**.58****	**.61****	**.62****	**.78****	**.65****	**.32***	**.50****
Tri 2	*.67***	*.63***	*.68***	*.56***	*.79***	*.72***	*.25**	*.43***
Tri 3	.73**	.78**	.83**	.57**	.85**	.73**	.52**	.42**
Subjective Norm								
Tri 1	1	1	**.30****	**.49****	**.53****	**.66****	**.30***	**.46***
Tri 2	1	1	*.50***	*.58***	*.60***	*.65***	*.23*	*.42***
Tri 3	1	1	.75**	.49**	.75**	.63**	.28*	.37**
Perceived Behavioral Control								
Tri 1			1	1	**.70****	**.75****	**.35****	**.72****
Tri 2			1	1	*.67***	*.77***	*.20*	*.61***
Tri 3			1	1	.84**	.69**	.41**	.49**
Intention								
Tri 1					1	1	**.40****	**.64****
Tri 2					1	1	*.43***	*.65***
Tri 3					1	1	.54**	.71**

Note. Abbreviations: T1 = first trimester; T2 = second trimester; T3 = third trimester. *Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed); *** Correlation is significant at the 0.001 level (2-tailed). Trimester 1 correlations are **bolded**, and Trimester 2 correlations are *italicized*, Trimester 3 correlations are in the original text.

Table 2.6

Repeated Measures Multivariate Analysis of Covariance (MANCOVA) of TPB Attitude, Subjective Norm, and Perceived Behavioral Control for Pregnant Women by Motherhood Status from the First to the Second and the Second to the Third Pregnancy Trimesters, Adjusting for Occupation Status, Age, Pre-pregnancy Weight Status, and Depressive Symptoms

Within Subjects Effects	*Wilks' lambda*	*F*	*df*[1]	*p*
ATT, SN, & PBC				
Time	.96	1.04	6, 155	.40
Time*OccStat	.97	.84	6, 155	.54
Time*Age	.97	.83	6, 155	.55
Time*PPWS	.96	1.21	6, 155	.31
Time*DepSymp	.97	.68	6, 155	.66
Time*MHS	.94	1.59	6, 155	.15

Note. Abbreviations: TPB = Theory of Planned Behavior, ATT = attitude, SN = subjective norm, PBC = perceived behavioral control, *df* = degrees of freedom, OccStat = occupation status, PPWS = pre-pregnancy weight status; DepSymp = First Trimester Depressive Symptoms; MHS = motherhood status.

[1] The Univariate ANOVAs were also conducted, and the findings were the same.

Table 2.7

Repeated Measures Multivariate Analysis of Variance (MANOVA) of TPB Attitude, Subjective Norm, and Perceived Behavioral Control for Pregnant Women by Motherhood Status from the First to the Second and the Second to the Third Pregnancy Trimesters, Not Adjusting for Covariates

Within Subjects Effects	*Wilks' lambda*	*F*	*df*[1]	*p*
ATT, SN, & PBC				
Time	.65	14.05	6, 159	.001
Time*MHS	.94	1.67	6, 159	.13

Note. Abbreviations: TPB = Theory of Planned Behavior, ATT = attitude, SN = subjective norm, PBC = perceived behavioral control, *df* = degrees of freedom, MHS = motherhood status.

[1] The Univariate ANOVAs were also conducted, and the findings were the same.

Table 2.8

Bonferroni Comparisons for TPB Variables from the First to the Second and the Second to the Third Pregnancy Trimesters for Pregnant Women With and Without Children

				95% CI		
Variable	*Comparisons*	*Mean Time Difference*	*Std. Error*	*Lower Bound*	*Upper Bound*	*Cohen's d*[1]
Attitude	Trimester 1 vs. Trimester 2	-2.61**	0.62	-4.11	-1.11	-.36
	Trimester 2 vs. Trimester 3	4.24***	0.57	2.87	5.62	.58
Subjective Norm	Trimester 1 vs. Trimester 2	-0.99**	0.31	-1.75	-0.23	-.25
	Trimester 2 vs. Trimester 3	2.41***	0.31	1.48	1.64	.56
PBC	Trimester 1 vs. Trimester 2	-1.48**	0.34	-2.31	-0.66	-.32
	Trimester 2 vs. Trimester 3	1.76***	0.34	0.95	2.58	.40
Intention	Trimester 1 vs. Trimester 2	-0.57	0.33	-1.37	0.23	-.10
	Trimester 2 vs. Trimester 3	2.33***	0.31	1.57	3.09	.42
Ex Beh	Trimester 1 vs. Trimester 2	1.21	8.02	-18.20	20.62	.01
	Trimester 2 vs. Trimester 3	40.01***	5.32	27.13	52.90	.29

Note. Abbreviations: kg = kilograms, Std. Error = Standard Error, PBC = Perceived Behavioral Control, Ex Beh = Exercise Behavior; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

[1]Cohen's *d* (*d;* [M_2-M_1/*SD*]; i.e., 0.2 is a small effect, 0.5 is a medium effect, and 0.8 is a large effect) indicates the magnitude of the difference.

Table 2.9

Repeated Measures Analyses of Covariance (ANCOVA) of TPB Intention and Exercise Behavior for Pregnant Women by Motherhood Status from the First to the Second and the Second to the Third Pregnancy Trimesters, Adjusting for Occupation Status, Age, Pre-pregnancy Weight Status, and Depressive Symptoms

Effects	*Wilks' lambda*	*F*	*df*	*p*
Intention				
Time	.99	.96	2, 159	.39
Time*OccStat	.99	.32	2, 159	.73
Time*Age	.99	.51	2, 159	.60
Time*PPWS	.98	1.97	2, 159	.14
Time*DepSymp	.99	1.04	2, 159	.36
Time*MHS	.99	.20	2, 159	.82
Exercise Behavior				
Time	.98	1.38	2, 159	.25
Time*OccStat	.98	1.68	2, 159	.19
Time*Age	.99	.05	2, 159	.95
Time*PPWS	.99	.83	2, 159	.44
Time* DepSymp	.98	2.04	2, 159	.13
Time*MHS	.99	.51	2, 159	.60

Note. Abbreviations: TPB = Theory of Planned Behavior, *df* = degrees of freedom, OccStat = occupation status, PPWS = pre-pregnancy weight status; DepSymp = First Trimester Depressive Symptoms; MHS = motherhood status.

Table 2.10

Repeated Measures Analyses of Variance (ANOVA) of TPB Intention and Exercise Behavior for Pregnant Women by Motherhood Status from the First to the Second and the Second to the Third Pregnancy Trimesters, Not Adjusting for Covariates

Within Subjects Effects	*Wilks' lambda*	*F*	*df*	*p*
Intention				
Time	.7150	**27.49**	2, 163	**.001**
Time*MHS	.99	.36	2, 163	.70
Exercise Behavior				
Time	.73	**30.82**	2, 163	**.001**
Time*MHS	.99	.17	2, 163	.84

Note. Abbreviations: TPB = Theory of Planned Behavior, *df* = degrees of freedom, MHS = motherhood status.

Table 2.11

Hierarchical Regression Analyses of First Trimester TPB Intention and Perceived Behavioral Control Predicting Second Trimester Exercise Behavior for Both Pregnant Women With and Without Children

Variable	*F*	*Df*	R^2 change	β^1	β^2	β^1
Block 1	3.11**	4, 161	.07			
Age				-.09	-.11	-.10
Occupation Status				-.06	-.01	.01
PPWS				-.10	-.15*	-.17*
DepSymp				-.21**	-.10	-.09
Block 2	11.47***	7, 158	.27			
MHS					-.03	-.05
First Trimester Intention					.39***	.45***
First Trimester PBC					.16	-.04
Block 3[1]	9.40***	9, 156	.02			
First Trimester Intention*MHS						-.09
First Trimester PBC*MHS						.26

Note: Abbreviations: TPB = Theory of Planned Behavior, *df* = degrees of freedom, β = beta, PPWS = pre-pregnancy weight status, DepSymp = depressive symptoms, MHS = Motherhood Status, PBC = Perceived Behavioral Control; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1]After dropping the least significant interaction term (First Trimester Intention*MHS), the regression analysis was conducted again with only one interaction term (First Trimester PBC*MHS). Along with First Trimester Intention ($\beta = .39$, $p < .001$), First Trimester PBC*MHS was now found to be significant ($\beta = .26$, $p < .05$) for predicting Second Trimester Exercise Behavior.

Table 2.12

Hierarchical Regression Analyses of Second Trimester TPB Intention and Perceived Behavioral Control Predicting Third Trimester Exercise Behavior for Both Pregnant Women With and Without Children

Variable	*F*	*Df*	R^2 change	β^1	β^2	β^3
Block 1	2.25*	4, 161	.05			
Age				-.07	-.06	-.04
Occupation Status				-.17*	-.15*	.16*
PPWS				-.07	-.06	-.09
DepSymp				-.11	-.06	-.06
Block 2	6.96***	7, 158	.18			
MHS					-.02	-.03
Second Trimester Intention					.33**	.50**
Second Trimester PBC					.11	-.08
Block 3[1]	5.67***	9, 156	.01			
Second Trimester Intention*MHS						-.24
Second Trimester PBC*MHS						.27

Note: Abbreviations: TPB = Theory of Planned Behavior, *df* = degrees of freedom, β = beta, PPWS = pre-pregnancy weight status, DepSymp = depressive symptoms, MHS = Motherhood Status, PBC = Perceived Behavioral Control; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1]After dropping the least significant interaction term (Second Trimester Intention*MHS), the regression analysis was conducted again with only one interaction term (Second Trimester PBC*MHS). This interaction term was not found to be significant ($p > .05$) for predicting Third Trimester Exercise Behavior. In the final model, only Second Trimester Intention ($\beta = .50$, $p < .01$) significantly explained Third Trimester Exercise Behavior.

Table 2.13

Hierarchical Regression Analyses of First Trimester TPB Attitude, Subjective Norm, and Perceived Behavioral Control Predicting Second Trimester Exercise Intention for Both Pregnant Women With and Without Children

Variable	*F*	*Df*	R^2 change	β^1	β^2	β^3
Block 1	.53	4, 161	.01			
Age				-.02	.01	.01
Occupation Status				-.02	.09	.11
PPWS				-.05	-.12	-.17
DepSymp				-.09	.02	.08
Block 2	6.24***	8, 157	.23			
MHS					-.14	-.18
First Trimester Attitude					.08	.44**
First Trimester Subjective Norm					.08	.19
First Trimester PBC					.34***	-.15
Block 3[1]	7.22***	11, 154	.10			
First Trimester Attitude*MHS						-.24
First Trimester Subjective Norm *MHS						-.17
First Trimester PBC*MHS						.65***

Note: Abbreviations: TPB = Theory of Planned Behavior, *df* = degrees of freedom, β = beta, PPWS = pre-pregnancy weight status, DepSymp = depressive symptoms, MHS = Motherhood Status, PBC = Perceived Behavioral Control; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1]No trimming of the model was necessary as First Trimester PBC*MHS ($\beta = .65$, $p < .01$) significantly explained Second Trimester Exercise Intention.

Table 2.14

Hierarchical Regression Analyses of Second Trimester TPB Attitude, Subjective Norm, and Perceived Behavioral Control Predicting Third Trimester Exercise Intention for Both Pregnant Women With and Without Children

Variable	*F*	*Df*	R^2 change	β^1	β^2	β^3
Block 1	0.29	4, 161	.01			
Age				.02	.04	.05
Occupation Status				-.03	-.04	-.04
PPWS				-.06	-.13	-.16
DepSymp				-.04	.07	.08
Block 2	12.37***	8, 157	.38			
MHS					-.05	-.07
Second Trimester Attitude					.24**	.31*
Second Trimester Subjective Norm					.25**	.36*
Second Trimester PBC					.23*	-.04
Block 3[1]	9.56***	11, 154	.02			
Second Trimester Attitude*MHS						-.06
Second Trimester Subjective Norm *MHS						-.15
Second Trimester PBC*MHS						.32*

Note: Abbreviations: TPB = Theory of Planned Behavior, *df* = degrees of freedom, β = beta, PPWS = pre-pregnancy weight status, DepSymp = depressive symptoms, MHS = Motherhood Status, PBC = Perceived Behavioral Control; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1]No trimming of the model was necessary as Second Trimester PBC*MHS ($\beta = .32$, $p < .01$) significantly explained Third Trimester Exercise Intention.

FIGURE CAPTIONS

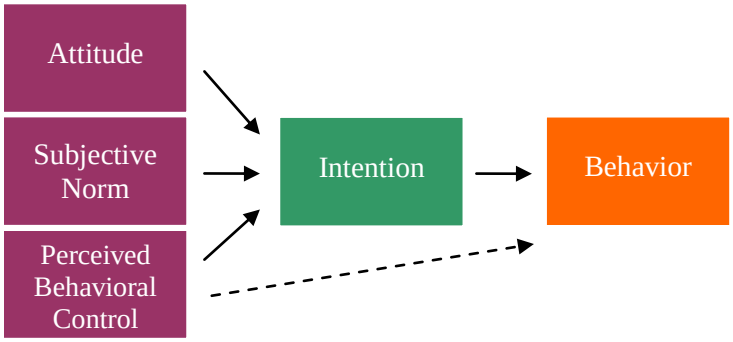
Figure 1.1. Conceptual Model of the Theory of Planned Behavior (TPB; Ajzen, 1991)

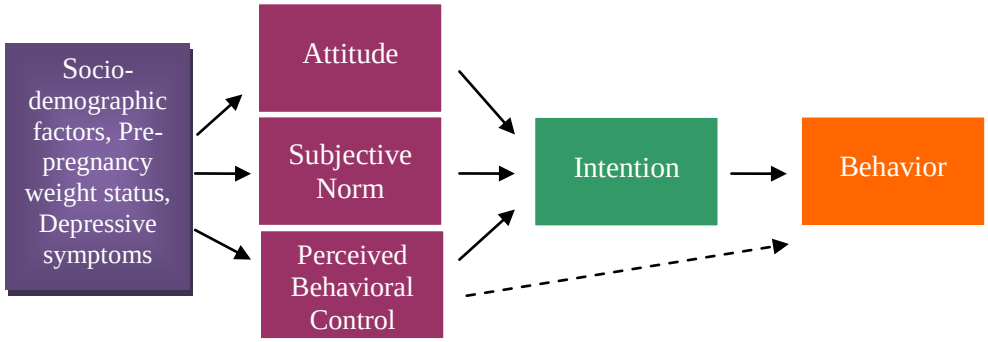
Figure 1.2. External Variables Impacting the Theory of Planned Behavior Constructs

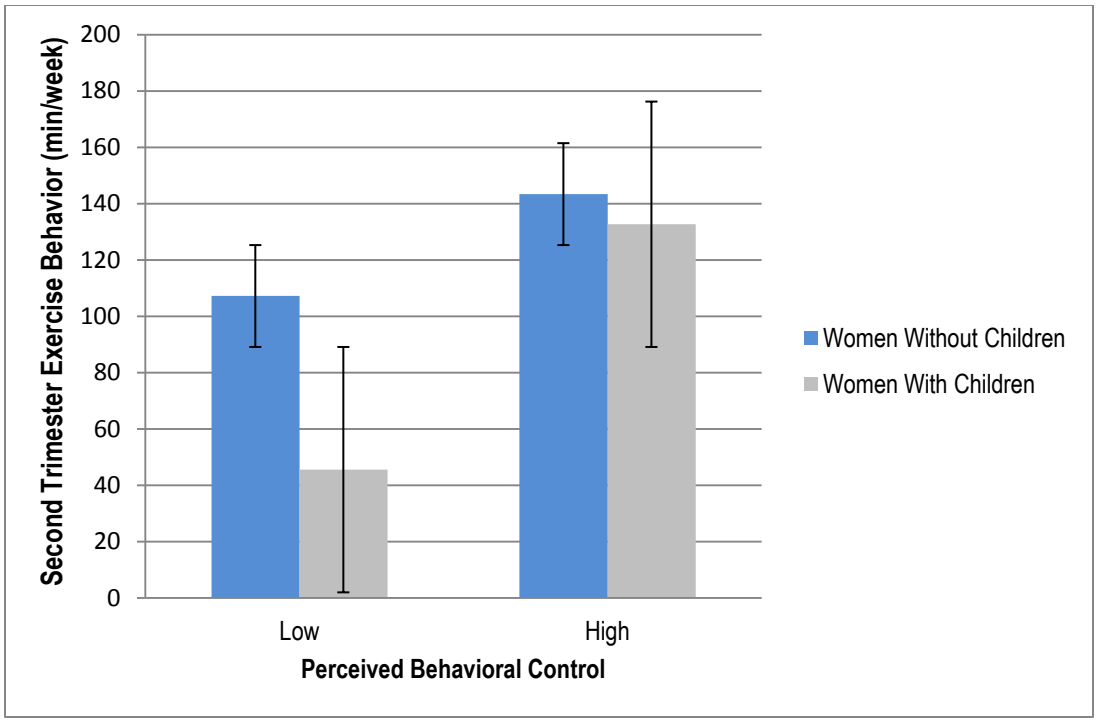
Figure 2.1. Illustration of the Interaction of Perceived Behavioral Control*Motherhood Status Group for Predicting Second Trimester Exercise Behavior

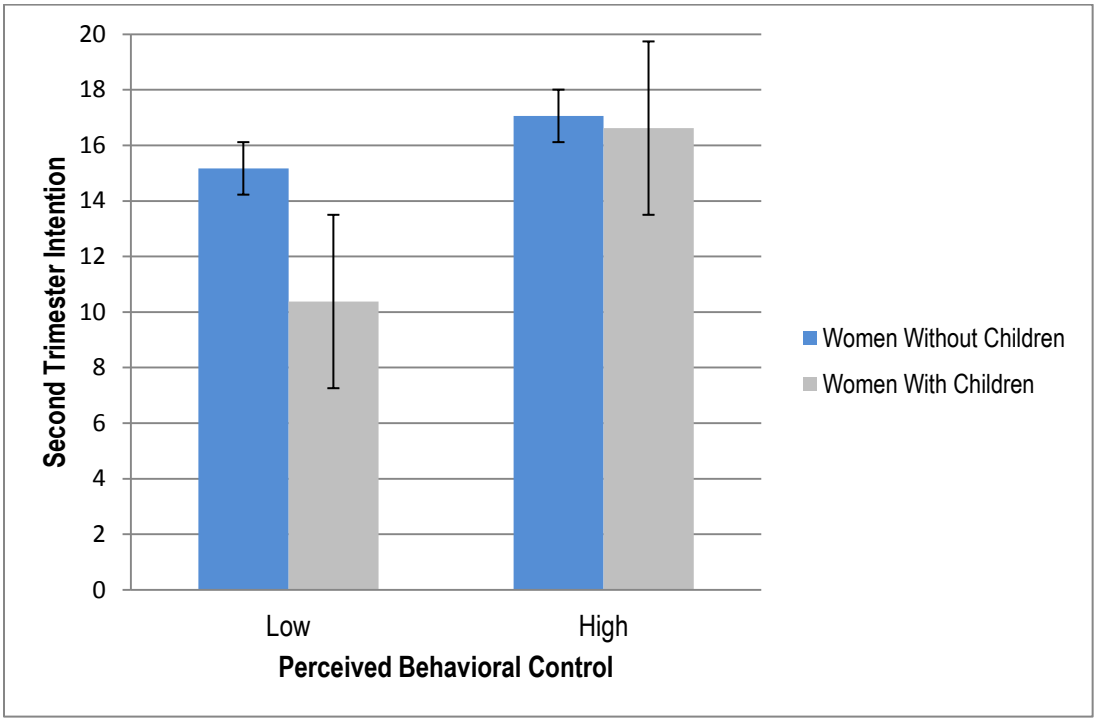
Figure 2.2. Illustration of the Interaction of Perceived Behavioral Control*Motherhood Status Group for Predicting Second Trimester Exercise Intention

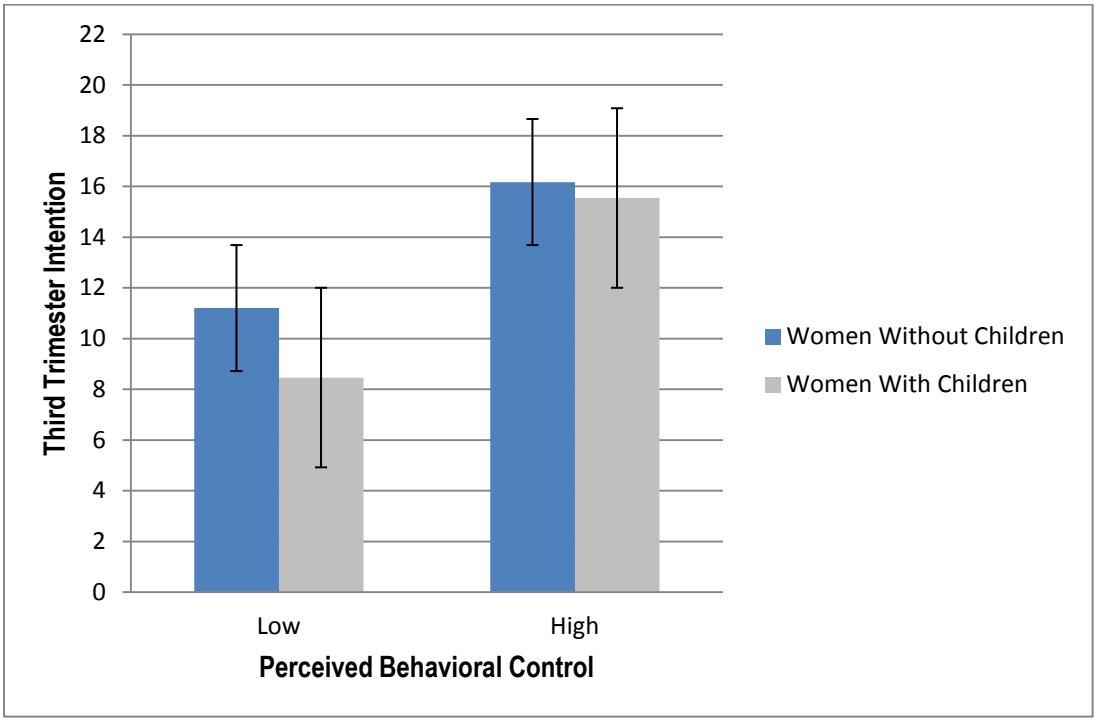
Figure 2.3. Illustration of the Interaction of Perceived Behavioral Control*Motherhood Status Group for Predicting Third Trimester Exercise Intention


Attitude
Subjective Norm
Perceived Behavioral Control
Intention
Behavior


Socio-demographic factors, Pre-pregnancy weight status, Depressive symptoms
Attitude
Subjective Norm
Perceived Behavioral Control
Intention
Behavior


Second Trimester Exercise Behavior (min/week)
200
180
160
140
120
100
80
60
40
20
0
Low
High
Perceived Behavioral Control
Women Without Children
Women With Children


20
18
16
14
12
10
8
6
4
2
0
Second Trimester Intention
Low
High
Perceived Behavioral Control
Women Without Children
Women With Children


22
20
18
16
14
12
10
8
6
4
2
0
Third Trimester Intention
Low
High
Perceived Behavioral Control
Women Without Children
Women With Children

CHAPTER 3

Discussion

The overall objective of this dissertation was to better understand how women's exercise motivation and behavior during pregnancy vary by motherhood status. This was the first study to examine the moderating effect of motherhood status on the psychosocial determinants of women's exercise motivation and behavior in the context of the Theory of Planned Behavior (TPB; Ajzen, 1991) from the first to the second and the second to the third pregnancy trimesters. The findings support the use of the TPB framework for identifying how pregnant women's psychological determinants of exercise intention and behavior vary for women with and without children. In general, this study found a moderation effect for motherhood status in early pregnancy such that perceived behavioral control influenced both exercise intention and behavior, from the first to the second trimester, to a greater extent for pregnant women with children compared to pregnant women without children. Similarly, a moderation effect was observed in late pregnancy, such that perceived behavioral control influenced third trimester exercise intention to a greater extent for pregnant women with children compared to pregnant women without children. Although no moderating effect of motherhood status was observed for predicting third trimester exercise behavior, intention was the most important psychosocial predictor. Furthermore, similar trends were observed for women with and without children such that exercise attitude, subjective norm, perceived behavioral control, intention, and behavior increased from the first to the second trimester and then decreased from the second to the third trimester. A more detailed discussion of these findings is found below.

The first study purpose was to: (a) examine how changes in attitude, subjective norm, perceived behavioral control, intention, and exercise behavior from the first to second and the

second to third pregnancy trimesters vary by motherhood status; and (b) understand the influence of motherhood status on these constructs after controlling for the impact of socio-demographic factors (i.e., participant age and occupation status), pre-pregnancy weight status, and depressive symptoms. The first hypothesis was that pregnant women without children would report significantly more minutes of exercise behavior and higher attitude, subjective norm, perceived behavioral control, and intention from the first to the second trimester and the second to the third trimester compared to pregnant women with children. Contrary to this hypothesis, no significant repeated measures multivariate effects of motherhood status were found for attitude, subjective norm, and perceived behavioral control from the first to the second trimester and from the second to the third pregnancy trimester. Similarly, no significant repeated measures Univariate effects were noted for intention or exercise behavior from the first to the second or the second to the third pregnancy trimesters. These findings were consistent regardless of the inclusion of the socio-demographic variables (i.e., age and occupation status), pre-pregnancy weight status, and depressive symptoms as covariates in the analyses. It is important to mention that a trend emerged in the multivariate analyses for a time by motherhood status interaction. However, the longitudinal effects of these constructs did not vary significantly for pregnant women with children compared to pregnant women without children.

The second hypothesis was that an increase in the TPB constructs and exercise behavior would be observed from the first to the second trimester, while a decrease would be observed from the second to the third trimester for both pregnant women with and without children. In partial support, exercise attitude, subjective norm, and perceived control increased from the first to the second trimester among all women, regardless of motherhood status. This finding is logical because women are typically feeling better by the second trimester when most of the

negative symptoms (e.g., nausea, vomiting) have diminished. An improvement in negative pregnancy symptoms would likely improve pregnant women's attitude and perceived control for exercise behavior. However, contrary to the hypothesis, no significant changes were observed in intention or exercise behavior from the first to the second pregnancy trimester. There are some plausible explanations for the non-significant findings. First, these variables may simply not have been affected by a hypothesized improvement in pregnancy symptoms from early to mid pregnancy. Second, women's pregnancy symptoms are typically not visible (i.e., weight gain) by the second trimester, and thus an improvement in other symptoms such as nausea and fatigue would not likely impact their exercise motivation and behavior.

Next, in support of the second hypothesis, a significant decline was found from the second to the third pregnancy trimester for attitude, subjective norm, perceived behavioral control, intention, and exercise behavior for both women with and without children. The fact that exercise behavior and the TPB motivational determinants decreased from mid to late pregnancy, for all women regardless of motherhood status, reflects the impact of the symptoms that women experience as pregnancy progresses toward delivery. For example, symptoms like fatigue, anxiety, and depression are characteristic of late pregnancy (Symons Downs et al., 2008; Symons Downs & Hausenblas, 2007), and may negatively influence pregnant women's attitude toward exercise. Furthermore, the motivational determinants of late pregnancy exercise may be negatively influenced by the information women receive from important others about exercising during pregnancy, particularly as pregnancy progresses toward delivery. It is possible that women place more emphasis on advice from significant others when they lack prior experience or are unfamiliar with a situation (Courneya & Friedenreich, 1999). Evidence suggests that pregnant women view their husband, doctors, and nurses as the most important influences of

exercise behavior in the third trimester (Symons Downs & Hausenblas, 2007). Unfortunately, healthcare providers are often reluctant to advise on diet and activity changes during pregnancy (Ringdahl, 2006), or lack the breadth of knowledge to provide adequate advice on the established guidelines. Existing research suggests that women may begin to receive cautionary advice about exercising as pregnancy progresses toward delivery (Entin & Munhall, 2006). In other words, many people, including physicians, may question the safety of exercising in late pregnancy when women have gained more weight and their balance and coordination are compromised. Also, as the rate of gestational weight gain increases in mid to late pregnancy (IOM, 2009), women's balance, coordination, and mobility may decline (Cheng et al., 2006), and negatively influence women's perceived control for exercising at this time. This is illustrated in these study findings as perceptions that important others are supportive of exercising during pregnancy were stable in early and mid-pregnancy, but appeared to decrease toward the end of pregnancy.

Finally, it is likely that women's exercise motivation and behavior decreased from the second to the third pregnancy trimester, regardless of their motherhood status, due to the increased physical and psychological challenges (e.g., fatigue, increases in weight, stress, anticipation) that all women experience during late pregnancy. These study findings are instructive for future researchers because they highlight a potentially critical time during pregnancy (i.e., mid pregnancy) when intervention efforts are most influential on late pregnancy exercise behavior. That is, it is important to influence women's exercise motivation throughout each pregnancy trimester, and to pay particular attention to their motivation in late pregnancy. Using goal setting strategies as well as self-regulation and planning strategies (i.e., implementation intentions; Gollwitzer & Schaal, 1998) may be useful to encourage pregnant women to be active. In other words, when women are feeling tired and unmotivated to exercise, having a specific activity

planned in terms of frequency, intensity, type, and time may help them to reach their short- and long-term goals. Meeting these objectives will help to increase women's sense of control over that behavior, and ultimately increase their exercise motivation and behavior that may persist throughout pregnancy and postpartum (Gollwitzer, 1999; Symons Downs & Hausenblas, 2003). Research is also needed examining both the positive and negative influence of significant others to determine who should be included in future interventions targeting the promotion and adherence of exercise behavior among pregnant women.

The second study purpose was to prospectively examine the moderating influence of motherhood status on the associations between: (1) first trimester intention and perceived behavioral control for predicting second trimester exercise behavior, (2) first trimester attitude, subjective norm, and perceived behavioral control for predicting second trimester intention, (3) second trimester intention and perceived behavioral control for predicting third trimester exercise behavior, and (4) second trimester attitude, subjective norm, and perceived behavioral control for predicting third trimester intention, while controlling for targeted socio-demographic influences (i.e., participant age and occupation status), pre-pregnancy weight status, and depressive symptoms. The first hypothesis was that after accounting for the selected socio-demographic variables, pre-pregnancy weight status, and depressive symptoms, motherhood status would moderate: (1a) the associations between exercise intention and perceived behavioral control for predicting exercise behavior from the first to the second trimester, and also from the second to the third trimester; and (1b) the associations between attitude, subjective norm, and perceived behavioral control for predicting exercise intention from the first to the second trimester, and also from the second to the third trimester. In partial support of the first hypothesis and consistent with previous unpublished pilot data (Symons Downs et al., 2007), motherhood status

significantly moderated the associations between first trimester perceived behavioral control and second trimester exercise behavior, first trimester perceived behavioral control and second trimester intention, and second trimester perceived behavioral control and third trimester intention. That is, the perceived behavioral control-behavior relationship in the second trimester and perceived behavioral control-intention relationships in the second and third trimesters were stronger for pregnant women with children compared to those without children. The main effect of perceived behavioral control did not emerge as a significant predictor of second trimester exercise behavior or intention; however, the interaction of perceived control and motherhood status significantly predicted second trimester exercise behavior and intention. Symons Downs and colleagues (2007) also found that the perceived behavioral control-intention relationship was higher for women with children compared to those without children. It is possible that the physical and psychological demands of the first trimester of pregnancy along with having children at home influenced women's perceived control, impacting their motivation to exercise, and ultimately their exercise behavior in the second trimester. Understanding the influence of having children on pregnant women's perceived behavioral control for influencing exercise behavior in mid-pregnancy and intention in mid and late pregnancy can help to inform intervention design. For example, employing components in an intervention that may increase women's perceived control for exercising, such as time management skills, childcare, and including children in exercise sessions (e.g., stroller walking classes) may be particularly helpful for pregnant women with children. However, further research more clearly defining the needs of pregnant women with children as well as the elements that are most likely to aid these women in meeting the current exercise guidelines is needed.

In contrast to the first hypothesis, motherhood status did not significantly moderate the association between intention and exercise behavior in the second trimester, nor did it moderate the associations among attitude and subjective norm for predicting second trimester exercise intention. That is, the contributions of these variables for predicting exercise behavior and intention did not vary by motherhood status in this study population. Symons Downs et al. (2007) also found no motherhood status moderation effect for the intention-behavior relationship. However, in contrast to the current study findings they found that in the second trimester the attitude-intention relationship was higher for pregnant women without children compared to those with children. It is likely that attitude, subjective norm, and intention would be positively influenced, regardless of motherhood status, by knowledge about the benefits of exercising during pregnancy. While most women in this study were not actually meeting the exercise recommendations, approximately 90% of the participants reported having a college/graduate degree, and thus the education level of the women in this study was rather high. This is somewhat in contrast with the findings from previous research (Evenson et al., 2004) that more education was significantly associated with meeting the exercise recommendations among pregnant women. That is, in the current study population, the education level of the participants was high, but most were still not meeting the recommendations. On the other hand, there is research to support both conclusions such that existing literature suggests that most women, regardless of other characteristics (e.g., age, education, pre-pregnancy exercise behavior), decrease their exercise behavior across the duration of pregnancy (Borodulin, Evenson, & Herring, 2009; Clarke, Gross, & Psychol, 2004; Cramp & Bray, 2009; Haakstad et al., 2009; Hausenblas & Symons Downs, 2005; Hausenblas et al., 2008; Melzer et al., 2010).

In contrast to the hypothesis that motherhood status would moderate the association between perceived behavioral control and intention for predicting exercise behavior from second to the third trimester, and the associations between attitude and subjective norm for predicting exercise intention from the second to the third trimester, but consistent with the findings of Symons Downs et al. (2007), motherhood status did not moderate any of the associations from the second to the third pregnancy trimester. That is, no moderation effects for motherhood status were observed for the following relationships: second trimester intention-third trimester behavior; second trimester perceived behavioral control-third trimester behavior; or second trimester attitude or subjective norm-third trimester exercise intention. It appears that the psychological determinants of exercise behavior in late pregnancy did not vary by motherhood status. It is well-documented that exercise behavior declines in late pregnancy (Evenson et al., 2004; Symons Downs & Hausenblas, 2007; Symons Downs et al., 2007), thus, it is possible that exercise becomes so uncomfortable in late pregnancy that women choose to participate in less of these exercise behaviors, regardless of whether they already have children. To date, no published research examining motherhood status and exercise behavior among pregnant women has been located.

As mentioned above, one unpublished pilot study examined the cross-sectional impact of motherhood status on women's exercise intention in the second trimester (Symons Downs et al., 2007); however, no existing research has extended these findings from the first to the second and the second to the third pregnancy trimesters. Logically, it would appear that motherhood status would impact exercise behavior and intention among pregnant women in late pregnancy. Since this is the period of time that pregnant women are experiencing extreme fatigue and accelerated weight gain, one would anticipate that having children to care for would exacerbate women's

fatigue and negatively impact the motivation to be active. One explanation for the lack of support for the hypothesis is that this period of time represents the unknown particularly among women without children or for all women who have not exercised in a prior pregnancy. This lack of experiences could negatively influence women's sense of personal control over exercise behavior. Thus, the unknown of the upcoming delivery for women without children, along with the additional duties and fatigue among women with children, reduces the hypothesized impact of motherhood status on exercise behavior in late pregnancy.

Another explanation could be that the participants were categorized dichotomously as with or without children, rather than by the number of children. More research on this topic is needed potentially examining a larger sample of women to understand the impact of having one, two, three, or more children on exercise behavior and motivation during pregnancy. Late in pregnancy, it is possible that the differences in mothers' exercise behaviors occur between those pregnant women with only one child and those women with more than one child. Existing research findings on parenthood and exercise among non-pregnant populations (Bellows-Riecken & Rhodes, 2008) are equivocal regarding whether the age of the children or the number of children in a household was most predictive of parents' exercise behavior. That is, four of fourteen (29%) studies supported that the number of children in the household was the most important variable influencing parent exercise behavior (Cody & Lee, 1999; Sternfeld et al., 1999; Urizar et al., 2005; Verhoef & Love, 1992). However, the other ten studies (71%) in the review reported that the child(ren)'s age was the most important predictor of parent exercise behavior, or that no association among either age or number of children was found.

The second hypothesis was that after accounting for the influence of the selected socio-demographic variables, pre-pregnancy weight status, and depressive symptoms, intention would

be the strongest predictor of exercise behavior and attitude would be the strongest predictor of exercise intention among both pregnant women with and without children in the second and third trimesters. Consistent with this hypothesis and previous TPB and exercise research (Hausenblas & Symons Downs, 2004; Symons Downs & Hausenblas, 2003; 2007), the contributions of first trimester intention, perceived behavioral control, and the interaction terms explained 36% of the variance in second trimester exercise behavior. First trimester intention and the perceived behavioral control*MHS interaction maintained their significance as predictors of second trimester exercise behavior. These findings are consistent with previous research conclusions (Symons Downs & Hausenblas, 2003) in which intention and perceived behavioral control explained 47% of the variance in second trimester exercise behavior. Also similar to previous research (Symons Downs & Hausenblas, 2003; Symons Downs et al., 2008), findings from the current study indicated that intention was a significant determinant of second trimester exercise behavior as it maintained its significance even when the interaction terms were added to the model. While Symons Downs and Hausenblas (2003) did not examine motherhood status, they did find that exercise intention was the most important determinant of whether pregnant women would exercise in the second pregnancy trimester. Similarly, the pilot study by Symons Downs and colleagues (2007) which examined the impact of motherhood status in the second trimester of pregnancy also found that intention was an important predictor of women's exercise behavior, but that this intention-behavior relationship was not moderated by motherhood status. Researchers, clinicians, and practitioners aiming to increase exercise behavior during pregnancy may want to focus on strategies that strengthen women's motivation, particularly for women with children. Moreover, this information may be useful specifically for obstetricians, nurses,

and nurse midwives so that they can promote women's exercise behavior by helping them to set specific goals that identify where, when, and how their exercise behavior will occur.

Next, as predicted in the second hypothesis and consistent with previous TPB and exercise research (Hausenblas & Symons Downs, 2003; Symons Downs et al., 2008), first trimester attitude, subjective norm, and perceived behavioral control, along with the interaction terms, explained 34% of the variance in women's second trimester exercise intention. In support of the hypothesis, attitude and the interaction term for perceived behavioral control*MHS emerged as significant predictors of second trimester exercise intention, with the interaction term being the strongest determinant. The variance explained in exercise intention in the current study is similar to the findings of Symons Downs and Hausenblas (2003) in which they observed that the main TPB psychological constructs accounted for 33% of the variance in exercise intention among women in their second pregnancy trimester. Similarly, in an unpublished pilot study, Symons Downs and colleagues (2007) found that attitude, subjective norm, and perceived behavioral control explained 67% of the variance in exercise intention in the second pregnancy trimester. Collectively, these findings support the use of the TPB for explaining women's exercise motivation in mid-pregnancy and can potentially inform the development of interventions to promote women's exercise behavior at this time. Researchers aiming to increase exercise motivation among pregnant women may want to target strategies for promoting a positive attitude or evaluation toward exercise such as educating them on the benefits of exercising during pregnancy. Specifically, by identifying what the evidence-based components (e.g., education, social support, goal-setting strategies, etc.) to effective interventions are, healthcare professionals may be able to positively influence pregnant women's attitude and thus their motivation to exercise.

In partial support of the second hypothesis, second trimester intention, perceived behavioral control, and the interaction terms explained 24% of the variance in third trimester exercise behavior. Furthermore, intention, but not perceived behavioral control, emerged and maintained its significant contribution for explaining exercise behavior in the final model. This is consistent with the findings of Symons Downs and Hausenblas (2007) such that 31% of the variance in third trimester exercise intention was explained by the main TPB psychological constructs. In addition, they found intention to be the strongest determinant of exercise behavior in the third trimester. The current study findings illustrate that women's intention for exercise influenced their exercise behavior in late pregnancy, above and beyond their personal feelings of control. Moreover, perceived control may not have emerged as a strong determinant of exercise behavior in late pregnancy because of the unknown characteristics of pregnancy experienced by women who have not had children. While women may understand the nature of exercise and have intentions to be active throughout pregnancy, they may not be able to accurately report their perceived control for an activity (i.e., exercise) during a situation (i.e., late pregnancy) that they have not experienced before. A better understanding of women's perceived control for exercise in late pregnancy is important because there is evidence that perceived control may influence or be the determining factor for postpartum exercise behavior. Research by McIntyre et al. (2009) found that perceived behavioral control was the critical correlate distinguishing women who continued to exercise in the postpartum period from the women who did not continue to exercise. Thus, it is essential for researchers to design interventions targeting pregnant women's perceived behavioral control, which appears to influences exercise intention in the second and third pregnancy trimesters, and ultimately exercise behavior in pregnancy and postpartum.

By taking into consideration the factors that may influence women's attitude in the second trimester and their intention to exercise in late pregnancy, researchers and health care professionals can target women's individual needs and positively influence their exercise behavior. Using techniques to support women's goals, objectives, and long-term plans may be an effective strategy for promoting the link between women's intention to exercise and their exercise behavior and adherence (Gollwitzer, 1999). Also, it has been suggested by Ajzen (1991) that to change or impact perceived behavioral control, enhancing the strength of or changing the underlying beliefs may be effective. For example, imagine that the accessible underlying belief about participating in exercise in early pregnancy is that it leads to an increased chance of miscarriage, and that this possibility is viewed as negative. A component of an intervention could be to persuade women through education that this is much less likely than they expect, thus changing their belief strength. Further, it may be easier to produce new beliefs altogether, as opposed to changing existing beliefs. That is, women may not associate pregnancy-related exercise with a reduction in daily stress; however, once they believe it, their attitudes toward exercising may become more favorable.

As predicted in the second hypothesis and consistent with prior researchers' conclusions (Symons Downs & Hausenblas, 2007), second trimester attitude, subjective norm, and perceived behavioral control, along with the interaction terms, explained 41% of the variance in third trimester exercise intention. In the final model, the interaction term for perceived behavioral control and motherhood status, along with the main effects of attitude and subjective norm emerged as significant predictors of third trimester exercise intention. Intervention programs that include education on the benefits of exercising in pregnancy, along with childcare, time

management education, and group exercise sessions to increase social support among pregnant women may be effective to increase exercise participation and adherence.

These findings highlight how perceived behavioral control varies by motherhood status for predicting women's exercise motivation among this study population. It is possible that the barriers to exercise that are often associated with motherhood (Bellows-Reicken & Rhodes, 2008) may negatively impact women's sense of control, and thus their intention to perform this behavior. In addition, approximately half of the study participants were in their first pregnancy and may have been more likely to heed the advice of important others when deciding if they should exercise late in pregnancy. In fact, Symons Downs and Hausenblas (2007) examined the normative beliefs of pregnant women revealing that a woman's husband/partner, doctors, and nurses emerged as strong normative influences. Courneya and Friedenreich (1999) reported similar findings with another population of women (i.e., breast cancer patients), suggesting that women's lack of prior experience with a given situation may influence them to trust the views of their significant others (e.g., husband, doctor) with respect to a given behavior in a given situation. Thus, educating women on the benefits and safety of exercising during pregnancy, along with advising them on how to manage common exercise barriers (e.g., fatigue, balance issues) likely to occur in late pregnancy, may help to clarify perceptions and increase women's perceived control for exercise behavior, regardless of motherhood status. It is also important to note that in contrast to the early pregnancy findings, perceived behavioral control did not provide a unique contribution for predicting exercise intention in late pregnancy in either the current or previous research (Symons Downs & Hausenblas, 2007). In short, accurate information attained from important others (i.e., physicians, nurses, spouses/partners) about what to expect during late pregnancy may be the key to increasing women's motivation to be active during this time.

In summary, this dissertation study has extended the exercise and pregnancy research by examining how the motivational determinants of exercise behavior vary among pregnant women with and without children using the TPB as a theoretical framework. Identifying the most salient determinants of exercise motivation among pregnant women with and without children is important. While motherhood status is a factor that cannot be changed or modified, there are factors ideal for exercise promotion that can and should be tailored based on the evidence. In particular, this study found that in early pregnancy perceived behavioral control was most important for influencing both exercise behavior and motivation for women with children compared to those without children in mid and late pregnancy. However, by late pregnancy, motherhood status did not moderate these relationships for predicting exercise behavior. That is, intention was the sole predictor of behavior for all women regardless of motherhood status. Findings from this study can help researchers to design effective interventions to promote exercise behavior among pregnant women with and without children by identifying the most salient determinants of exercise motivation and behavior throughout pregnancy. Pregnancy is a transitional and temporary period of time with many long-lasting outcomes affecting the lives of both mothers and their offspring. Once the impact of the most important factors is understood, then theoretically-driven, well-developed, pregnancy-specific interventions designed to improve the health behaviors and outcomes for women can be designed.

Furthermore, this study illustrates that identifying and understanding the factors that influence perceived control for women with children is essential to better understand how to motivate these women to be active. However, by the third trimester women's exercise behavior appears to be influenced by their level of motivation, regardless of their motherhood status. In addition, based on these findings, it is of utmost importance in late pregnancy to positively influence women's

attitude and subjective norm because of the potential these constructs have for positively impacting their intention to engage in exercise. Educating women on the benefits of exercising in late pregnancy, as well as including important others (e.g., physicians, nurses, husbands/partners) in programs designed to increase exercise behavior are key factors to motivate women for exercise, regardless of their motherhood status. By understanding these differences and similarities among pregnant women with and without children, and applying these findings to the design and implementation of pregnancy-related exercise interventions, researchers and clinicians can more effectively promote exercise behavior during this transitional, yet defining, time point in women's lives.

Strengths and Limitations

It is important to note that this study was unique in that it was the first to examine the factors influencing women's exercise motivation and behavior by motherhood status groups from the first to the second and the second to the third pregnancy trimester. Moreover, using the theoretical framework of the TPB (Ajzen, 1991) is ideal because the main theoretical constructs are likely to be influenced by the processes and symptoms of pregnancy (e.g., nausea, weight gain, fatigue, mood changes; Hausenblas et al., 2008). The TPB is also the most validated theory in the exercise domain for predicting, explaining, and understanding exercise behavior, and has been used among a multitude of special populations, including pregnant women, thus strengthening the study findings (Symons Downs & Hausenblas, 2005). As mentioned, this study also prospectively examined the moderating influence of motherhood status on the TPB psychological determinants of women's exercise intention and behavior across all three pregnancy trimesters, rather than at just one time during pregnancy. This is important to acknowledge because the prospective research design provides the opportunity to follow these

women across time, to collect and study several measures in real time, and to be able to generalize the results to research and clinical practice. That is, these study findings can help to inform the design of interventions to motivate pregnant women to meet the exercise recommendations as pregnancy progresses toward delivery and to improve health outcomes for both the mother and her baby.

There are, however, study limitations that should be mentioned when interpreting these findings. First, the sample population was relatively homogenous. Women were primarily Caucasian from suburban and rural communities in Central Pennsylvania, and college graduates with a middle-to-high family income. Thus, caution is advised in generalizing these findings to a more diverse selection of women until a stronger evidence base is developed. That is, these analyses should be replicated on a non-Caucasian, lower socioeconomic, urban-residing sample of pregnant women to investigate if exercise motivation and behavior by motherhood status groups change as a process of demographic characteristics.

Second, the TPB constructs, as well as exercise behavior, were obtained with self-report measures. There are inherent biases associated with self-report measures of psychological constructs and behaviors perceived as positive. That is, because most individuals understand exercise to be a positive health behavior, yet at least half of all pregnant women are insufficiently active (Evenson et al., 2004), social desirability may have influenced women's responses on this scale. There is also evidence suggesting that a combination of objective measures (e.g., pedometers, accelerometers) and self-report measures should be used to attain the most complete picture of exercise behavior (Troiano, 2009). The use of objective monitors would help to address research limitations such as method biases including social desirability and the over- and

under-reporting of exercise behavior. However, in this study, only self-report assessments of exercise behavior were used to achieve scale correspondence.

Third, although the sample size was adequate to support the examination of the study purposes, it was not large enough to examine additional potential moderators. That is, the TPB psychological determinants for predicting exercise behavior during pregnancy may vary by or be influenced by other psychosocial (e.g., social support, psychological adjustment to pregnancy) and physical (e.g., gestational weight gain, disease status) factors, thus, a larger participant sample would be useful to explore these potential mediators and moderators.

Finally, missing data impacting both the inclusion of pre-pregnancy exercise behavior as a covariate in the study analyses, and the reduced sample size in the repeated measures analyses was a limitation. Unfortunately, pre-pregnancy exercise behavior was not assessed in the beginning of data collection, and thus only 26% of the participants self-reported this variable. In addition, although the sample size was sufficient to conduct study analyses, random missing data within the trimesters occurred. Future research in this area should be sure to include pre-pregnancy exercise behavior, as it has been shown to impact pregnancy exercise behavior (Hinton & Olson, 2001). Follow-up calls to participants who did not complete certain parts of the mailed survey may be helpful as well in preventing these missing data points.

Nonetheless, this dissertation has extended the findings of existing research by examining the moderating influence of motherhood status on the TPB psychological constructs for predicting exercise motivation and behavior among pregnant women. Thus, researchers and clinicians can more effectively promote women meeting the exercise recommendations so that they can achieve health benefits during pregnancy. Currently, the exercise recommendations for special populations of pregnant women are limited to women who have been diagnosed with conditions

such as gestational diabetes and preeclampsia, as well as those who may be diagnosed to a pregnancy on bed rest. The evidence presented from these dissertation study findings elicits consideration for promoting exercise among women based on motherhood status. Importantly, an effective theoretically-based exercise intervention during pregnancy, increasing pregnant women's motivation and exercise behaviors, has the potential to impact exercise behaviors during the transition to motherhood and thereafter.

Practical Implications of This Dissertation

This dissertation provides practical evidence on the psychological constructs most important for predicting exercise motivation and behavior among women with and without children during pregnancy. For women with children, exercise intervention strategies should be tailored to increase women's sense of personal control in early pregnancy in order to enhance and promote exercise intention and behavior in the second trimester. Next, encouraging women to set realistic short- and long-term goals, as well as to think about the activities they will do to reach these goals, may be helpful to increase their perceived control over their exercise behavior in late pregnancy (Symons Downs & Singer, 2004). If perceived behavioral control can be positively influenced early in pregnancy, it may be possible to motivate women with children to exercise during the third pregnancy trimester; however, this assumption should be empirically tested. Also, in late pregnancy, researchers and clinicians should focus on intervention components that emphasize women's support network, including husbands/partners, childcare, and physicians/nurses, as well as introduce enjoyable types of exercise during pregnancy, such as walking and swimming. Increasing exercise behavior among pregnant women can be difficult due to the unique challenges (e.g., motherhood, depressive symptoms, pregnancy symptoms) women experience during this time; thus, the design of interventions should be evidence-based,

including components that are most likely to influence exercise motivation and behavior of women with and without children.

Conclusion

This dissertation study was an important step toward understanding how the determinants of women's exercise motivation and behavior varies by motherhood status in pregnancy. The study findings illustrate the significant impact of perceived behavioral control on pregnant women's exercise behavior and intention, particularly for women with children. The utility of the TPB (Ajzen, 1991) for understanding the motivational determinants of special populations such as pregnant women are well-supported. Thus, researchers are encouraged to use the TPB as an explanatory framework for guiding future studies designed to explain and predict exercise motivation and behavior during pregnancy. The study limitations and measurement issues presented in this chapter can help future researchers design improved studies and interventions to better understand the determinants and potential moderators and mediators of pregnant women's exercise motivation and behavior. Understanding how the determinants of pregnancy-related exercise behavior vary by motherhood status is essential for promoting exercise during this transitional period of time in life. The next step in this line of research includes the examination of: (1) other potential mediators and moderators for explaining exercise behavior during pregnancy, (2) the predictive utility of the TPB with the use of objective measures of exercise behavior among pregnant populations, (3) the factors that influence women's exercise motivation and behavior during the transition to the postpartum period, and (4) how women's exercise behavior may influence other personal health behaviors and those health behaviors of their children. This information is essential to inform the development of much needed evidence-

based programs that can be used and adapted for varying populations of pregnant women to potentially impact women and children's long-term health behaviors.

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APPENDIX A: HEALTH HISTORY QUESTIONNAIRE

Instructions. Please complete the following health history questions even if you have already completed these items on a previous version of a survey.

Today's Date: ___ ___ / __ ___ / ___ ___
Date of Birth: ___ ___ / ___ ___ / ___ ___ Age: _____ years

Contact phone # (home): _____ (cell): _____
Email address:_____

Occupation: _____ Part-time Full-time Self-Employed
Other _____

Marital Status: Single Married Divorced Widow Common Law Other _____

Race/ethnicity: African American/Black American Indian Asian Caucasian Hispanic Other _____

Highest level of education: < High school High school College Grad/Professional
Other _____

Family income: < $10,000 $10-20,000 $20-40,000 $40-100,000 > $100,000
Other _____

Number of weeks currently pregnant? _____ Due date: _____/_____/_____

Height: _____ *feet* _____ *inches* Current weight: _____ *pounds*

Weight prior to pregnancy: _____ *pounds*

Are you currently on maternity leave? Yes _____ No _____

Are you currently breastfeeding? Yes _____ No _____

Do you plan to: Breastfeed _____ Use formula _____ Use a combination of both _____

APPENDIX B: ATTITUDE ITEMS

Instructions. Answer the following questions by circling the number that best represents your answer. *Regular exercise behavior* = participating in 30 minutes of accumulated moderate exercise on most, if not all, days of the week. This exercise can be done at one time (e.g., 30 min of continuous walking or jogging) or accumulated in the day (e.g., walking 10 min in the morning, and 20 min in the evening).

For me to exercise regularly in my 1st / 2nd / 3rd trimester will be:

Useless						Useful
1	2	3	4	5	6	7

For me to exercise regularly in my 1st / 2nd / 3rd trimester will be:

Harmful						Beneficial
1	2	3	4	5	6	7

For me to exercise regularly in my 1st / 2nd / 3rd trimester will be:

Bad						Good
1	2	3	4	5	6	7

For me to exercise regularly in my 1st / 2nd / 3rd trimester will be:

Foolish						Wise
1	2	3	4	5	6	7

For me to exercise regularly in my 1st / 2nd / 3rd trimester will be:

Unpleasant						Pleasant
1	2	3	4	5	6	7

For me to exercise regularly in my 1st / 2nd / 3rd trimester will be:

Unenjoyable						Enjoyable
1	2	3	4	5	6	7

For me to exercise regularly in my 1st / 2nd / 3rd trimester will be:

Boring						Interesting
1	2	3	4	5	6	7

APPENDIX C: SUBJECTIVE NORM ITEMS

Instructions. Answer the following questions by circling the number that best represents your answer. *Regular exercise behavior* = participating in 30 minutes of accumulated moderate exercise on most, if not all, days of the week. This exercise can be done at one time (e.g., 30 min of continuous walking or jogging) or accumulated in the day (e.g., walking 10 min in the morning, and 20 min in the evening).

Most people who are important to me think that I should exercise regularly in my 1st / 2nd / 3rd trimester:

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Most people who are important to me want me to exercise regularly in my 1st / 2nd / 3rd trimester:

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Most people who are important to me approve of me exercising regularly in my 1st / 2nd / 3rd trimester:

Disagree						Agree
1	2	3	4	5	6	7

APPENDIX D: PERCEIVED BEHAVIORAL CONTROL ITEMS

Instructions. Answer the following questions by circling the number that best represents your answer. *Regular exercise behavior* = participating in 30 minutes of accumulated moderate exercise on most, if not all, days of the week. This exercise can be done at one time (e.g., 30 min of continuous walking or jogging) or accumulated in the day (e.g., walking 10 min in the morning, and 20 min in the evening).

How much control do you have over exercising at least 3 days per week in your 1st / 2nd / 3rd trimester:

Very little control Complete Control

1 2 3 4 5 6 7

For me to exercise at least 3 days per week in my 1st / 2nd / 3rd trimester will be:

Extremely Difficult Extremely Easy

1 2 3 4 5 6 7

If I wanted to, I could easily exercise regularly in my 1st / 2nd / 3rd trimester:

Strongly Disagree Strongly Agree

1 2 3 4 5 6 7

APPENDIX E: INTENTION ITEMS

Instructions. Answer the following questions by circling the number that best represents your answer. *Regular exercise behavior* = participating in 30 minutes of accumulated moderate exercise on most, if not all, days of the week. This exercise can be done at one time (e.g., 30 min of continuous walking or jogging) or accumulated in the day (e.g., walking 10 min in the morning, and 20 min in the evening).

I intend to exercise regularly in my 1st / 2nd / 3rd trimester:

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

I intend to exercise at least 3 days per week in my 1st / 2nd / 3rd trimester:

Definitely Not						Definitely
1	2	3	4	5	6	7

I intend to exercise with the following regularity in my 1st / 2nd / 3rd trimester:

Not at All						Very Much
1	2	3	4	5	6	7

APPENDIX F: PRE-PREGNANCY EXERCISE BEHAVIOR ITEMS

Instructions. Please answer these statements about your exercise behavior prior to becoming pregnant.

I exercised ___ days a week in the year before pregnancy.

0 1 2 3 4 5 6 7 days

The average length of each exercise period was ____ minutes / day during the year before pregnancy.

APPENDIX G: EXERCISE BEHAVIOR ITEMS

Instructions. Please answer these statements about your **1st / 2nd / 3rd** trimester.

Are you currently exercising? YES NO

How many days/week? 0 1 2 3 4 5 6 7

How many minutes/day? _____ *minutes*

APPENDIX H: CENTERS FOR EPIDEMIOLOGICAL STUDIES-DEPRESSION

Instructions. The following questions ask about your feelings during the past week. Using the scale below, indicate your answer by placing it in the space provided after each statement.

1	2	3	4	5
rarely /not at all (< 1 day)	**some (1-2 days)**	**often (3-4 days)**	**most days (5-7 days)**	**does not apply to me**

1. I was bothered by things that don't usually bother me. ___
2. I did not feel like eating, my appetite was poor. _____
3. I felt I could not shake the blues, even with the help of my family. _____
4. I felt that I was just as good as other people. _____
5. I felt depressed. _____
6. I had trouble keeping my mind on what I was doing. _____
7. I felt that everything I did was an effort. _____
8. I felt hopeful about the future. _____
9. I thought my life had been a failure. _____
10. I felt fearful. _____
11. My sleep was restless. _____
12. I was happy. _____
13. I talked less than normal. _____
14. I felt lonely. _____
15. People were unfriendly. _____
16. I had enjoyed life. _____
17. I had crying spells. _____
18. I felt that people disliked me. _____
19. I felt like I couldn't do what I needed to do. _____
20. I felt sad. _____

APPENDIX I: IRB APPROVAL FORM

Date: September 12, 2010

From: Jodi L. Mathieu, Assistant Director – IRB Operations

To: Danielle S. Downs

Subject: Results of Review of Continuing Progress Report - Expedited **(IRB #29315)**

Approval Expiration Date: September 11, 2011

"Exercise Beliefs and Behaviors During Pregnancy and Postpartum"

The Continuing Progress Report for your project was reviewed and approved by the Institutional Review Board (IRB). By accepting this decision, you agree to obtain prior approval from the IRB for any changes to your study. Unanticipated participant events that are encountered during the conduct of this research must be reported in a timely fashion.

Attached is/are the dated, IRB-approved informed consent(s) to be used when enrolling participants for this research. Participants must receive a **copy** of the approved informed consent form to keep for their records.

If signed consent is obtained, the principal investigator is expected to maintain the original signed consent forms along with the IRB research records for at least three (3) years after termination of IRB approval. For projects that involve protected health information (PHI) and are regulated by HIPAA, records are to be maintained for six (6) years. The principal investigator must determine and adhere to additional requirements established by the FDA and any outside sponsors.

If your study will extend beyond the above noted approval expiration date, the principal investigator must submit a completed Continuing Progress Report to the Office for Research Protections (ORP) to request renewed approval for this research.

On behalf of the committee and the University, thank you for your efforts to conduct research in compliance with the federal regulations that have been established for the protection of human participants.

Please Note: The ORP encourages you to subscribe to the ORP listserv for protocol and research-related information. Send a blank email to: L-ORP-Research-L-subscribe-request@lists.psu.edu

JLM/jlm
Attachment

APPENDIX J: STUDY CONSENT FORM

KEEP THIS FORM FOR YOUR RECORDS

INFORMED CONSENT FORM FOR SOCIAL SCIENCE RESEARCH
The Pennsylvania State University

Title of Project: Exercise Beliefs and Behaviors during Pregnancy and Postpartum **(IRB # 29315)**
Principal Investigator: Dr. Danielle Downs, Associate Professor of Kinesiology and Obstetrics and Gynecology, 266 Recreation Bldg,
University Park, PA 16802, (814) 863-0456, dsd11@psu.edu

1. *Purpose of the study:* The purpose of this research study is to examine your beliefs and behaviors about exercising and related health behaviors during your pregnancy and/or postpartum and your child's sleeping and feeding behaviors in the first two years of life. You are not being asked to exercise as a part of this study, so even if you do not exercise, your participation is still needed.

2. *Procedures to be followed:* You will be asked to complete questions about your exercise beliefs and behaviors and related health behaviors during your pregnancy and/or postpartum. The questions will be sent to you in the mail during each trimester and at 6-weeks, 6-months, 1-year, and 2-years postpartum. You will be asked to complete the questionnaires and return them in the stamped addressed envelope provided for you.

3. *Discomforts and risks:* There are no risks in participating in this research beyond those experienced in everyday life. Some of the questions are personal and might cause discomfort. If you find that any of the questions posed during the research started feelings of distress beyond normal daily living, please call 1-800-273-8255 or the Centre County Women's Resource Center at 814-234-5050 or go to the Community Health Center (http://www.communityhelpcentre.com). If you are living around the Hershey, PA area, you can also call 1-800-243-1455 or visit Penn State Women's Health at http://www.hmc.psu.edu/womens/.

4. *Benefits:* The anticipated benefits of your participation include: (a) you might learn more about yourself and your physical activity and health beliefs and behaviors by participating in this study, (b) you might learn more about your child's sleeping and feeding behaviors during the first two years of life, and (b) you might have a better understanding of your exercise and health behaviors during your pregnancy and/or postpartum.

5. *Duration:* It will take approximately 45 minutes to complete the study questions at each time point.

6. *Statement of confidentiality:* Your participation in this research is confidential. The information about you on the questionnaire will be stored separately from responses and code numbers will be used instead. Penn State's Office for Research Protections, the Institutional Review Board, and the Office for Human Research Protections in the Department of Health and Human Services may review records related to this research study. In the event of any publication or presentation resulting from this research, no personally identifiable information will be shared because your name is in no way linked to your responses.

7. *Right to ask questions:* Please contact Dr. Danielle Downs at 814-863-0456 with questions, complaints, or concerns about this research. You can also call this number if you feel this study has harmed you. If you have any questions, concerns, problems about your rights as a research participant or would like to offer input, please contact The Pennsylvania State University's Office for Research Protections (ORP) at (814) 865-1775. The ORP cannot answer questions about research procedures. All questions about research procedures can only be answered by the principal investigator.

8. *Voluntary participation:* Participation in this study is voluntary. You can withdraw at any time and decline to answer any questions that you do not want to answer. You can end your participation at any time by telling the persons in charge. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise.

You must be 18 years of age or older to consent to participate in this research study. Completion and return of the questionnaire implies that you have read the information in this form and consent to participate in this follow-up research study.

Please keep this form for your records or for future reference.

APPENDIX K: STUDY RECRUITMENT FLYER

Dear Study Participant,

My name is Danielle Downs and I am a researcher in the Department of Kinesiology and the director of the Exercise Psychology Laboratory at Penn State University Park campus. I am interested in learning more about your **exercise and health behaviors during your pregnancy and postpartum**. With the help of the staff at **Centre Medical and Surgical Associates**, my research team is able to ask women like yourself (e.g., ages 18 and older) if you would be willing to take 10-15 minutes to complete questionnaires that will be mailed to you about your feelings toward exercising during your pregnancy/postpartum.

Even if you do/are not currently exercising – you are still eligible to participate in this study!

Unfortunately, there is not a lot of research available regarding pregnant/postpartum women's exercise thoughts and habits, so this study's aim is to better understand how women feel about exercise and related health issues during this time.

In addition, you may be eligible for upcoming additional studies that include walking on a treadmill and wearing activity monitors (small beeper-like device measuring your movement and worn on the waist band of your pants) or participating in exercise programs in pregnancy and postpartum. **You may receive financial compensation for your participation in these studies.** If you are interested, please check the box below. *Your answers are confidential and at no time will you be personally identified for participating in this study.*

☐ **Yes**, I will participate in your survey study. I also understand that I may be eligible for additional studies depending on the time of the study enrollment and my pregnancy/postpartum status. I understand that I may receive compensation for these additional studies. Please contact me:

Name: _____ Phone: _____ Email: _____@_____

Address: _____

☐ No, I am not interested in participating in your studies because: _____

If you have any questions or would like information regarding exercise during pregnancy/postpartum please contact me at: (814) 865-0840. I wish you all the best during your pregnancy/postpartum and congratulations!

APPENDIX L: STUDY COVER LETTER- FIRST TRIMESTER

Dear Study Participant,

Thank you for agreeing to participate in this study examining your exercise thoughts and habits during your pregnancy and postpartum. Enclosed is the survey asking about your exercise beliefs and behaviors for your **first trimester** of pregnancy. Please complete the enclosed survey and return it to the Exercise Psychology Laboratory at 18 Recreation Building in the envelope provided for you.

Even if you are not currently exercising – you are still eligible to participate in this study!

Unfortunately, there is not a lot of research available regarding pregnant/postpartum women's exercise thoughts and habits, so this study's aim is to better understand how women feel about exercise and related health issues during this time. *Your answers are confidential and at no time will you be personally identified for participating in this study.*

I want to thank you in advance for participating in this study. Your responses can provide us with a great deal of insight regarding how to develop exercise programs for pregnant and postpartum women.

If you have any questions or would like information regarding exercise during your pregnancy please contact me at: (814) 865-0840. I wish you all the best during your first trimester!

Sincerely,

Dr. Danielle Symons Downs, The Pennsylvania State University

APPENDIX M: STUDY COVER LETTER- SECOND TRIMESTER

Dear Study Participant,

Thank you for agreeing to participate in this study examining your exercise thoughts and habits during your pregnancy and postpartum. Enclosed is the survey asking about your exercise beliefs and behaviors for your **second trimester** of pregnancy. Please complete the enclosed survey and return it to the Exercise Psychology Laboratory at 18 Recreation Building in the envelope provided for you.

Even if you are not currently exercising – you are still eligible to participate in this study!

Unfortunately, there is not a lot of research available regarding pregnant/postpartum women's exercise thoughts and habits, so this study's aim is to better understand how women feel about exercise and related health issues during this time. *Your answers are confidential and at no time will you be personally identified for participating in this study.*

I want to thank you in advance for participating in this study. Your responses can provide us with a great deal of insight regarding how to develop exercise programs for pregnant and postpartum women.

If you have any questions or would like information regarding exercise during your pregnancy please contact me at: (814) 865-0840. I wish you all the best during your second trimester!

Sincerely,

Dr. Danielle Symons Downs, The Pennsylvania State University

APPENDIX N: STUDY COVER LETTER- THIRD TRIMESTER

Dear Study Participant,

Thank you for agreeing to participate in this study examining your exercise thoughts and habits during your pregnancy and postpartum. Enclosed is the survey asking about your exercise beliefs and behaviors for your **third trimester** of pregnancy. Please complete the enclosed survey and return it to the Exercise Psychology Laboratory at 18 Recreation Building in the envelope provided for you.

Even if you are not currently exercising – you are still eligible to participate in this study!

Unfortunately, there is not a lot of research available regarding pregnant/postpartum women's exercise thoughts and habits, so this study's aim is to better understand how women feel about exercise and related health issues during this time. *Your answers are confidential and at no time will you be personally identified for participating in this study.*

I want to thank you in advance for participating in this study. Your responses can provide us with a great deal of insight regarding how to develop exercise programs for pregnant and postpartum women.

If you have any questions or would like information regarding exercise during your pregnancy please contact me at: (814) 865-0840. I wish you all the best during your third trimester!

Sincerely,

Dr. Danielle Symons Downs, The Pennsylvania State University

APPENDIX O: PHONE SCRIPT REMINDER

►HI, CAN I PLEASE SPEAK TO: _____?

►MY NAME IS _____ AND I'M CALLING FROM THE EXERCISE PSYCHOLOGY LAB.

►I AM CALLING TODAY ABOUT THE EXERCISE SURVEY STUDY THAT YOU ARE ENROLLED IN AT PENN STATE.

►HAVE YOU RECEIVED AND MAILED BACK THE SURVEY WE SENT YOU?

►IF **YES** – ASK WHEN IT WAS MAILED BACK TO US AND THEN SAY "THANK YOU SO MUCH. IT MUST BE CAUGHT UP IN THE MAIL PROCESS. WE SHOULD RECEIVE IT IN THE NEXT FEW DAYS."

►IF **NO** – SAY, IF YOU HAVE NOT RECEIVED THIS SURVEY, OR HAVE MISPLACED IT, WE WOULD BE HAPPY TO MAIL YOU A NEW SURVEY.

►WOULD YOU LIKE ME TO SEND YOU A NEW SURVEY?

►IF **YES** – SAY – CAN I CONFIRM YOUR ADDRESS? I HAVE [READ THE ADDRESS THAT WE HAVE] …

►IF **NO** – SAY – "OK, WOULD YOU LIKE TO BE REMOVED FROM OUR STUDY AT THIS TIME"?

[YES OR NO]

►THANK YOU FOR YOUR TIME.

IF YOU HAVE TO LEAVE A MESSAGE ON A VOICEMAIL, SAY:

►MY NAME IS _____ AND I AM CALLING TODAY ABOUT THE EXERCISE SURVEY STUDY THAT YOU ARE ENROLLED IN AT PENN STATE. IF YOU HAVE NOT RECEIVED THIS SURVEY, OR HAVE MISPLACED IT, WE WOULD BE HAPPY TO MAIL YOU A NEW SURVEY. PLEASE CALL ME AT YOUR EARLIEST CONVENIENCE AT 814-865-0840.

VITA

JENNIFER M. DINALLO

DEGREES RECEIVED

2011 Doctor of Philosophy in Kinesiology, Exercise Psychology
The Pennsylvania State University, University Park, PA
Advisor: Dr. Danielle Symons Downs
Minor: Human Development and Family Studies; Advisor: Dr. Leann Birch

2000 Master of Arts in Exercise and Sports Science, Specialization: Exercise Physiology; East Carolina University, Greenville, NC
Advisor: Dr. Matthew Mahar

1995 Bachelor of Science in Health and Physical Education, Specialization: Fitness Specialist; West Chester University, West Chester, PA
University of Hawaii, Honolulu, HI (*National Student Exchange Program*)

RESEARCH EXPERIENCE

2010-current Research Scientist & Evaluation Specialist; Clearinghouse for Military Family Readiness, The Pennsylvania State University, University Park, PA

2004-2010 Graduate Research Assistant; Department of Kinesiology, The Pennsylvania State University, University Park, PA

SELECTED PEER-REVIEWED PUBLICATIONS

1. **DiNallo, J. M.**, Symons Downs, D., & Le Masurier, G. C. (Feb, 2012). Objectively Assessing Treadmill Walking During the Second and Third Pregnancy Trimesters**.** *Journal of Physical Activity & Health.*

2. Savage, J. S., **DiNallo, J. M.,** & Symons Downs, D. (2009). Adolescent Body Satisfaction: The Role of Perceived Parental Encouragement for Physical Activity. *International Journal of Behavioral Nutrition and Physical Activity*, *6*: 90, 1-8. This article is available from: http://www.ijbnpa.org/content/6/1/90.

3. **DiNallo, J. M.**, Le Masurier, G. C., Williams, N. I., & Symons Downs, D. (2009). Walking for Health in Pregnancy: Assessment by Indirect Calorimetry and Accelerometry. *Research Quarterly for Exercise & Sport, 79(1),* 28-35.

4. Symons Downs, D., **DiNallo, J. M.**, & Le Masurier, G. C. (2009). Baby steps: Pedometer-determined and self-reported physical activity behaviors of pregnant women. *Journal of Physical Activity and Health, 6(1),* 63-72.

5. **DiNallo, J.M.**, & Symons Downs, D. (2008). The Role of Exercise in Preventing and Treating Gestational Diabetes: A Comprehensive Review and Recommendations for Future Research. *Journal of Applied Biobehavioral Research, 12, (3-4),* 141-177.