

THE EFFECTS OF AN EXERCISE INTERVENTION ON THE PSYCHOLOGICAL
WELL-BEING OF POSTPARTUM WOMEN

By

Karen Petty Robichaud

A dissertation submitted to
The Faculty of the Graduate School at
Middle Tennessee State University
in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy

August 2008

Murfreesboro, TN

UMI Number: 3322482

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

UMI[®]

UMI Microform 3322482

Copyright 2008 by ProQuest LLC.

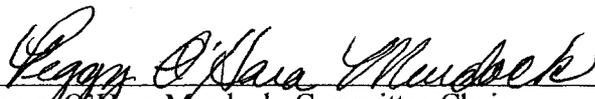
All rights reserved. This microform edition is protected against unauthorized copying under Title 17, United States Code.

ProQuest LLC
789 E. Eisenhower Parkway
PO Box 1346
Ann Arbor, MI 48106-1346

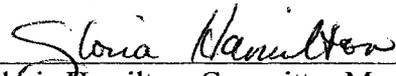
APPROVAL PAGE

THE EFFECTS OF AN EXERCISE INTERVENTION ON THE PSYCHOLOGICAL
WELL-BEING OF POSTPARTUM WOMEN

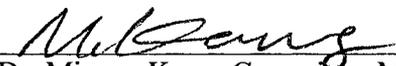
May 1, 2008
Date of Final Defense



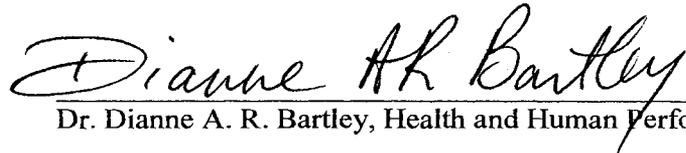
Dr. Peggy O'Hara Murdock, Committee Chair



Dr. Gloria Hamilton, Committee Member



Dr. Minsoo Kang, Committee Member



Dr. Dianne A. R. Bartley, Health and Human Performance Department Chair

Dr. Michael Allen, Dean, College of Graduate Studies

AKNOWLEDGEMENTS

I would like to thank my God for leading me to my passions and guiding me through this research process. I would like to offer a special thanks to my mentor and chairperson, Dr. Peggy O'Hara Murdock, for enthusiastically supporting this endeavor. I thank my committee members, Dr. Gloria Hamilton and Dr. Minsoo Kang for their commitment to helping me complete this research project.

I would like to thank my husband, Shawn Robichaud, for inspiring me to follow my dreams and live a life filled with a zest. I would like to thank my sons, Jackson and Benjamin Robichaud, for indirectly helping me choose this applicable research topic and for motivating me to complete this endeavor. I would like to thank my parents, Ken and Carol Petty, for believing in me and instilling a love of learning. I would like to thank John and Carolyn Robichaud for their support, patience and love during this exciting time.

Robichaud, Karen, PhD. The effects of an exercise intervention on the psychological well-being of postpartum women (2008). Directed by Dr. Peggy O'Hara Murdock.

For women, bearing children is often a complex transition. After pregnancy, relationships, work activities, social behaviors and domestic responsibilities change. Psychological vulnerability may result from feelings of shyness, shame, and heightened self-awareness that appear from concern over body image. The role of exercise in improving psychological outcomes is well documented. Exercise has been demonstrated to improve components of psychological well-being in a number of general populations. Since research is needed to examine all the effects of exercise on psychological well-being in postpartum women, this study utilized a home-based exercise intervention based on Ajzen's Theory of Planned Behavior that addressed exercise barriers specific to the needs of postpartum women.

In this study, 48 postpartum women were randomly assigned to either a treatment group or a wait-list control group. The treatment group ($n = 25$) participated in a scheduled and monitored, 6 week, home-based exercise program. Three times a week participants in the treatment group completed a 30 minute walking routine. Participants in the wait-list control group ($n = 23$) were encouraged to continue their typical routines. At the initial visit, and after 6 weeks, participants in both the treatment group and the control group completed questionnaires measuring psychological well-being. The Edinburg Postnatal Depression Scale (EPDS) measured depression. The Lederman Postpartum Self-Evaluation Questionnaire (PPQ) measured satisfaction with life circumstances, and confidence in the ability to cope with the tasks of motherhood. After 6 weeks, the control

group participants were offered the opportunity to partake in the home-based walking program.

A 2 x 2 multivariate mixed model analysis was used to examine the effect of a 6 week walking program. Psychological well-being was assessed by three dependent variables: depression, life circumstances, confidence in ability to cope with the tasks of motherhood. A significance level was set at .05.

Descriptive statistics were calculated for the whole group and the subgroup for each dependent variable. The overall MANOVA revealed no statistical difference, F (.301), $p = .825$ (Wilks' Lamda= .980, $p > .05$) since, the overall multivariate F was not significant, univariate F statistics were not examined. While there was no statistically significant intervention effect, both the treatment and control groups improved their psychological well-being over time. The adherence rate to the program was exceptionally high ($n = 98\%$). Components of the TPB were examined and support TPB as an explanatory model for gaining adherence to exercise among postpartum women. Future research should employ the TPB model in exercise programs with postpartum women.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	vi
LIST OF FIGURES.....	vii
CHAPTER	
I. INTRODUCTION.....	1
Rationale for the Study.....	2
Purpose of the Study.....	8
Hypotheses.....	9
Delimitations.....	9
Assumptions.....	10
Limitations.....	10
Definition of Terms.....	10
II. REVIEW OF LITERATURE.....	12
Prevalence of Postpartum Depression.....	12
Effects of Depression and Stress.....	17
Psychological Benefits of Exercise.....	18
Exercise Guidelines.....	23
Psychosocial Support.....	25
Role of Social Interaction.....	26
Postpartum Weight Retention.....	27
Physiological Benefits of Exercise.....	29
Compliance of Postpartum Women.....	29
Role of Medical Professionals in Assisting Postpartum Women.....	30
Advantages of Walking Programs.....	32
Justification for Walking Dose.....	33
Adherence to Treatment.....	36
III. METHODOLOGY.....	38
Study Design.....	39
Participants.....	39
Procedures.....	40
Instrumentation.....	44
Exercise Intervention.....	47
Randomization.....	49
Data Analysis.....	49

IV. RESULTS.....	51
Description of Participants.....	51
Data Analyses.....	54
V. DISCUSSION.....	57
Conclusions.....	57
Adherence Rates.....	59
Additional Benefits.....	61
Relation to the TPB.....	62
Limitations.....	63
Recommendations for Further Study.....	64
REFERENCES.....	67
APPENDICES.....	81
Appendix A.Edinburg Postnatal Depression Scale.....	82
Appendix B.Lederman Postpartum Self-Evaluation Questionnaire.....	85
Appendix C. Institutional Review Board Approval.....	91
Appendix D.Informed Consent.....	93
Appendix E.Structured Interview.....	96
Appendix F.Physician Permission Form.....	99
Appendix G.Demographics.....	102

LIST OF TABLES

	Page
Table 1. Demographic Characteristics of the Study Sample.....	52
Table 2. Average Amount of Times Exercised.....	53
Table 3. Education of the Study Sample.....	54
Table 4. Pre and Post-test Differences in Psychological Well-Being.....	55

LIST OF FIGURES

	Page
Figure 1. Study Design.....	41
Figure 2. Study Procedures.....	42
Figure 3. Diagram of the Theory of Planned Behavior.....	43

CHAPTER I

INTRODUCTION

In 2004, 4.1 million women delivered babies in the United States (Centers for Disease and Control [CDC], 2004). Childbearing is often a difficult transition. A woman's relationships, work activities, social behaviors and domestic responsibilities change after pregnancy (Swain, O'Hara, Starr, & Gorman, 1997). A number of biological levels are altered due to fluctuations in lactation, prolactin, progesterone, estrogen, oxytocin, and cortisol levels influencing new mothers' depression levels (Eberhard-Gran, Tambs, Opjordsmoen, Skrondal, & Esklind, 2003). Additionally, reduced sleep brought on by newborns' frequent awakenings can compromise women's sense of well-being and increase depression (Swain et al., 1997). In spite of the complexities of psychological well-being during the postpartum stage, few studies have been published examining interventions that assist women during this tenuous transition (Armstrong & Edwards, 2004).

This study investigated a home-based exercise intervention for postpartum women based on Ajzen's Theory of Planned Behavior (TPB). Specifically, this study was designed to examine whether or not exercise improves psychological well-being among postpartum women. TPB is a social cognitive framework that suggests a woman's beliefs about a behavior influence her way of thinking (i.e., attitude). Furthermore, motivation to comply with the wishes and desires of others (i.e., subjective norm) is influential, as well

as concerns regarding how easy or difficult it will be to adopt the behavior (i.e., perceived behavioral control). In the TPB model, three types of beliefs exist:

1. Behavioral beliefs are determined by an individual's perceived positive or negative consequences of a behavior.
2. Normative beliefs are formed by a person's perception that important others think he or she should engage in a behavior, and they provide the structure for the subjective norm.
3. Control beliefs are developed from an individual's perception that he or she has the necessary resources, skills, and power to engage in a behavior, and they establish the framework of perceived behavioral control.

In brief, the basis of TPB is that a person will intend to engage in a behavior when it is evaluated positively (attitude), believes that significant others want the person to participate in it (subjective norm), and perceives the behavior to be under personal control (perceived behavioral control). Researchers and healthcare providers have employed the TPB framework in an effort to better understand women's exercise beliefs (Downs & Hausenblas, 2004).

Rationale for the Study

The role of exercise in increasing general well-being has been explored, though insufficiently with postpartum populations. Most of the evidence indicates positive effects of exercise on mood (Dimeno, Bauer, Varahram, Proest, & Halter, 2001). Studies find that participation in sports or exercise, or regular physical activities, have had a positive effect on mental health including reduced symptoms of anxiety and depression

and increased general well-being (Larson-Meyer, 2002). In fact, an exercise training program may be considered an alternative to antidepressants for treatment of depression, and exercise programs improve levels of anxiety, self-esteem, life satisfaction, and dysfunctional attitudes (Blumenthal et al., 1999). According to Koltyn (1994), exercise may prove to be an effective non-pharmacological way for women to regulate mood states following pregnancy. Whether these results generalize to non-active or newly active postpartum women still needs further investigation.

Postpartum depression (PPD) is a major public health issue, and there appears to be no single pathway by which women develop it (National Health and Medical Research Council, 1999). Nearly 400,000 women who deliver each year are diagnosed with postpartum depression; more than 13% of women experience postpartum depression, though little is known concerning the effect of exercise on its prevalence or severity (Downs & Hausenblas, 2004; Larson-Meyer, 2002). Therefore, studies designed to assist the psychological well-being of postpartum women are needed (Blum, Beaudoin, & Canton-Lemos, 2004).

Some researchers suggest that depression occurs less in exercising women because exercise gives them a regular break from the 24-hour, 7-day-a-week commitment that comes from a new baby. Furthermore, the same researchers report that exercising women have more positive attitudes about their bodies during and after their pregnancy than do nonexercising women (Larson-Meyer, 2002).

This suggests that healthcare professionals should strongly encourage postpartum women to enroll in a structured diet and exercise program. Although positive outcomes of physical activity have been demonstrated in the population at large, exercise has rarely

been an element of postpartum care plans (Sampselle, Seng, Yeo, Killon, & Oakley, 1999). The potential to explore the options and benefits of exercise programs as a preventative and early intervention option are extensive (Armstrong & Edwards, 2004). However, incorporation of exercise in prenatal and postpartum care is not routine. Guidelines by the American College of Obstetrics and Gynecologists focus on exercise during pregnancy with little mention of postpartum physical activity (Blum et al., 2004). Knowledge about the effect of childbearing on levels of exercise and about potential physical and psychosocial benefits of exercise to the postpartum woman is sparse. A consequence of the paucity of definitive research is that no clear guidelines exist about maternal exercise and, as a result, exercise has not been well-integrated into evidence-based interventions for women during the postpartum period (Sampselle et al., 1999). Hence, investigations with exercise in postpartum populations will contribute to the research.

Well-being improves with exercise. In fact, exercise is generally associated with reduced symptoms of depression (Dunn, Trivedi, & O'Neal, 2001). Exercise is particularly important to women not only for the positive effects on physical and emotional health but also for an empowered sense of self (Sampselle et al., 1999). However, little is known specifically about the relationship between physical activity and maternal well-being during the postpartum period (Blum et al., 2004). Therefore, studies examining such are needed.

The majority of research conducted with mood and the reduction of anxiety and depression has been conducted with male subjects and nonpregnant women (Koltyn, 1994). Future research needs to examine the long-term effects of exercise in different

populations (DiLorenzo et al., 1999). Fewer women than men have been studied, and special groups (i.e., women who have recently given birth) have been given even less attention (Koltyn & Schultes, 1997). Women's fitness programs may be complicated by childbirth (Sampselle et al., 1999). Once a woman becomes pregnant, exercise is compromised by concerns for fetal health. After delivery, exercise is complicated by physiologic changes, maternal adaptations, and childcare (Sampselle et al., 1999). Although pregnancy is a temporary stage in women's lives, unlike lifelong chronic conditions (e.g., disability or diabetes), it is nonetheless an important event that may promote a lifestyle of decreased physical activity (Downs & Hausenblas, 2004). Women in the postpartum period have indicated that they would like to exercise more (69%), but their participation levels in physical activity have reduced since the birth of their first child (Currie & Develin, 2002). In fact, more than half of postpartum women decrease physical activity compared with their non-postpartum counterparts (Sampselle et al., 1999). Hence, pregnancy and postpartum are critical events in a woman's life that may promote a sedentary lifestyle (Downs & Hausenblas, 2004). As a result, interventions that research the effects of exercise on the postpartum period should contribute to the literature.

According to Downs and Hausenblas (2004), the most common belief impeding postpartum exercise was lack of time. Consequently, they suggest that healthcare professionals aim to decrease exercise barriers by employing at home exercise programs tailored to women's specific needs. Moreover, Downs and Hausenblas (2004) reported that healthcare professionals may help postpartum women with their exercise routines by focusing on time management, organization, and goal setting.

Incorporating an exercise regimen postpartum is important because weight retention after pregnancy is problematic and may also lead to depression. According to Ohlin and Rossner (1994), exercise and physical activity during the first year postpartum is of importance for facilitating postpartum weight loss. Significantly, 26% of women age 25-55 years of age are overweight, and childbearing is associated with weight retention. After giving birth, women retain an average of 2 kilograms more than before they were pregnant (Linne & Rossner, 2003). The role of exercise in decreasing weight is well documented. With a postpartum population, women might not see immediate weight loss benefits from aerobic exercise; however, there are significant long-term benefits in terms of weight gain and BMI (Rooney & Schauburger, 2003). Preconception weight gain is a primary determinant of weight. However, one's postpartum behaviors are also thought to be strongly related to long-term weight, though there is limited research on this topic, and the available information is equivocal (Olson, Strawderman, Hinton, & Pearson, 2003). According to the median data from 2004 studies, pregnant women gained 30.5 pounds during their pregnancies. This number has stayed constant since 1990 (CDC, 2004). The problem of excessive postpartum weight retention is far reaching and of great public health importance, as it can contribute to ill health for mothers and infants (Olson, et al., 2003). Weight retention at the end of the postpartum year predicts future overweight tendencies 15 years later (Linne, Dye, Barkeling, & Rossner, 2004). In fact, excess weight gain during pregnancy and failure to lose weight 6 months after pregnancy are important predictors of higher body mass index (BMI) and long-term weight gains many years after pregnancy (Rooney & Schauburger, 2003).

After giving birth women often feel shyness, shame, and a heightened self-awareness as a result of concern over body image, which further contributes to mothers' increased depression (Izard, Libero, Putnam, & Haynes, 1993). Indeed, 75% of women in the United States are concerned about their weight in the first few weeks of the postpartum period (Downs & Hausenblas, 2004). Women who were overweight before pregnancy are unlikely to lose the pregnancy related weight without the help of a formal intervention.

A myriad of health benefits accrue as a direct result of exercise. Aerobic fitness improves high density lipoprotein-cholesterol level and insulin sensitivity in postpartum women (Larson-Meyer, 2002). Likewise, decreased prevalence of cardiovascular disease, colon cancer, noninsulin dependent diabetes, and overweight are associated with exercise (Sampselle et al., 1999). Other possible benefits of exercise for mothers include the following: preventing obesity through promotion of body/fat weight loss; promoting aerobic fitness and strength, leading to an improved ability to perform activities of mothering; optimizing bone health by increasing bone mineral density; improving mood- or self-esteem; and encouraging regular physical activity in her offspring (Larson-Meyer, 2002). However, additional inquiry is needed to elucidate the role of exercise intensity in exercise-induced affective response, particularly in naturalistic settings (Daley & Huffman, 2003).

There are limited, well controlled trials that assess the benefits of individual and group treatment approaches for improved psychological outcomes (Armstrong & Edwards, 2004). This research controlled social interaction. Blumenthal et al. (1999) stated that research studies on exercise need to control for the level of social involvement

by examining the effects of the exercise setting through employing home-based programs on response to treatment. Limited published research exists as to the effectiveness of individual and group intervention programs. The treatment literature related to lack of well-controlled intervention trials has major gaps. It has been suggested that programs organized to accommodate the mother's needs would ease the burden, provide motivation to find the time for exercise, and provide guidance for physical activity (Currie & Develin, 2002).

According to Armstrong and Edwards (2004), studies are needed with strategies and innovative ways to support postpartum women and their families in the community. Further quantitative research is needed to establish the effectiveness of the exercise program over longer periods of time. Other control modalities of exercise (mode, intensity, duration) need to be investigated and to determine what is most appropriate for postpartum women. Therefore, research evaluating exercise programs in postpartum women is warranted. There is a paucity of information on the topic, and the few studies investigating the subject are post-hoc, self-reported designs. Controlled intervention studies are needed to examine the effect of exercise on psychological well-being in postpartum women (Armstrong & Edwards, 2004; Larson-Meyer, 2002). By incorporating a physician encouraged, home-based exercise intervention, and measuring psychological health of these unique participants, the methodology presented in this study yielded benefits to an important segment of the population.

Purpose of the Study

The purpose of this study was to determine the effects of a 6 week home-based walking program on psychological health in postpartum women.

Hypotheses

1. At the end of the 6 weeks exercise intervention, postpartum women participating in the treatment group will score healthier on the EPDS than postpartum women in the control group.
2. At the end of the 6 weeks exercise intervention, postpartum women participating in the treatment group will score healthier on the anxiety section of the PPQ than postpartum women in the control group.
3. At the end of the 6 weeks exercise intervention postpartum, women participating in the treatment group will score healthier on the satisfaction with life section of the PPQ than postpartum women in the control group.
4. At the end of the 6 weeks exercise intervention, postpartum women participating in the treatment group will score healthier on the confidence in the ability to cope with the tasks of motherhood section of the PPQ than postpartum women in the control group.

Delimitations

First, the findings are limited to a small sample of women from one geographical area in the Southeastern United States. Second, the participants with intense PPD (according with the EPDS scores above 11) were notified by their physicians and treated accordingly; therefore, individuals with extreme PPD were removed from the study if the physician deemed antidepressants a necessary treatment. Finally, as in most other studies with psychological well-being, it is impossible to rule out the chance that some larger factor such as parental competence caused both the exercise group and the control outcomes of higher psychological well-being with the parenting role.

Assumptions

The study design relied on the self-report from the PPD and the EPDS rather than actual measures of psychological well-being of the participants.

Limitations

Some of the participants dropped out of the exercise program or may have falsely reported completing the 6 week exercise routine. Furthermore, extraneous circumstances affected the general well-being of the population that cannot be controlled for by the researchers.

Definitions of Terms

1. In this study, improved psychological well-being- is defined by lower scores on the PPQ and the EPDS.

Note: Individuals in this study are described as having PPD if they score above 11 on the EPDS.

2. In this study, exercise is defined as planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness.

3. In this study, Home-based Exercise Program is defined as a 30 minute walking video/DVD directed by Leslie Sansone, titled *Walk Away the Pounds Express*. The movements from the video/DVD will be completed three times a week for 6 weeks.

4. In this study, postpartum depression is defined as the onset of depression within 4 weeks postpartum. Symptoms that are common in postpartum-onset episodes, though not specific to postpartum onset, include fluctuations in mood, mood lability, and preoccupation with infant well-being, the intensity of which may range from over concern to frank delusions. The presence of severe ruminations or delusional thoughts

about the infant is associated with a significantly increased risk of harm to the infants.

Women with postpartum Major Depressive Episodes often have severe anxiety and even Panic Attacks. Maternal attitudes toward the infant are highly variable but can include disinterest, fearfulness of being alone with the infant, or overintrusiveness that inhibits adequate infant rest, as defined by the American Psychiatric Association (1994).

(Diagnostic and statistical manual of mental disorders, DSMV IV-TR).

5. In this study, postnatal depression is the British word for postpartum depression.

CHAPTER II

REVIEW OF THE LITERATURE

Women often find their lives transformed after giving birth. Some have difficulty embracing the new roles involved in motherhood. The responsibility involved with caring for a new baby can overwhelm a new mother. Frequent mood changes are a natural part of a mother's life with an infant; however, extensive feelings of melancholy and depression may require more support. The prevalence of postpartum depression (PPD) is high and the effects often long lasting. Help in the form of an exercise intervention may increase psychological health, and benefit physiological health. Key elements of the intervention in this study included exercise prescription, weekly phone calls, a model based on the Theory of Planned Behavior, the walking program, psychosocial support, and physicians' recommendations.

Prevalence of Postpartum Depression

Postpartum depression is pervasive in today's society. The prevalence of major postpartum depression (PPD) at 4 to 8 weeks postpartum was found to be 9.1% and 8% respectively with minor PPD occurring in an additional 13.5% and 12.6% (Dennis, 2003). However, the prevalence of depressive symptoms is higher; 17% of women experience it during late pregnancy, 17% in the maternity ward, 18% at 6-8 weeks postpartum, and 13% at 6 months postpartum (Josefsson, Berg, Nordin, & Sydsjo, 2001). Eberhard-Gran et al. (2003) explained that among all women, mothers who give birth for the first time were significantly more anxious than multipara women. Moreover, women who had a

history of depression, a high score in the life event scale, a somatic disease, a history of being pressed or forced to have sexual relations, and a history of severe premenstrual tension were significantly more anxious than women who had not experienced PPD.

Trends for general depression have changed significantly in recent years. Outpatient treatment for depression increased from .73 per 100 persons in 1987 to 2.33 per 100 persons in 1997. Also, the proportion of individuals who used antidepressant medications increased from 37.3% to 74.5%, whereas the proportion who received psychotherapy declined from 12.6% to 8.7% (Olfson et al., 2005).

Some women are more vulnerable to PPD. For example, consider women with unplanned pregnancies. Not only do these individuals often have a difficult time adjusting to motherhood, they may also be at a higher risk for inadequate prenatal care, perinatal morbidity, and significant postpartum psychological problems. In fact, women with unplanned pregnancies experience greater hostility, irritability, dejection, depression, confusion, and bewilderment after giving birth than their counterparts with planned births (Eberhard-Gran et al., 2003).

The psychological distress of delivering a premature infant also evokes much distress in mothers. According to Davis, Edwards, Mohay, and Wollin (2003), 40% of mothers who give birth prematurely (i.e., before 32 weeks gestation) reported significant depressive symptoms as indicated by the EPDS. The ongoing day to day medical crises, and the possibility that their infant may have continuing health or developmental problems can be the impetus for much depressive symptomology for the parents of premature infants (Davis et al., 2003).

Sleep deprivation is another factor that plays a role in postpartum women's mood. Postpartum women's quality of sleep is associated strongly and consistently with their self-reported mood ratings; women with more sleep experienced more positive moods. Though postpartum women and their same age counterparts without children sleep a similar amount of time, postpartum women's night sleep is interrupted and the quality of sleep is much poorer than that of women who are not mothers. This disrupted sleep may increase negative daytime mood and exacerbate baby blues and postpartum depression (Swain et al., 1997).

The effect of a mother's age on PPD is unclear. For example, mothers' age has seemed to be a more significant factor for the incidence of PPD; mothers aged 30 years or younger have shown more depression than those aged older than 30 years. However, this information is equivocal (Hiltunen, Raudaskosko, Ebeling, & Moilanen, 2004). Tammentie, Tarkka, Asted-Kurki, and Paavilainen (2002) report no differences in EPDS scores between women of varying ages. Hormonal changes with age may contribute to these differences, for there is a significant correlation between age and plasma cortisol and prolactin levels. These hormonal changes may contribute to PPD (Abou-Saleh, Ghubash, Karim, Krymski, & Bhai, 1998).

Weather can affect the mood of new mothers. According to Hiltunen, Jokelainen et al. (2004), there was more depression during the dark seasons than the light seasons of year. The light seasons may in the long term act as a protective factor for postpartum depression. Some mothers may compound the stresses of new roles of motherhood with seasonal affective disorder, or perhaps less stress is put on mothers during the warmer months because spouses may help more during spring/summer vacations; additionally,

infants do not need to be heavily dressed against the cold, and they do not need to stay inside as often as they must during cold weather months.

Sociodemographic factors of families have also been evaluated for effects on PPD, and the results are mixed. Researchers reported that mothers who had depressive symptoms had fewer years of education, shorter duration of breast-feeding, and were more dissatisfied with family life compared with mothers who exhibited no depressive symptoms. The families of mothers with depressive symptoms had also experienced more problems and changes in family dynamics compared with other mothers (Tammentine, Tarkka, Astedt-Kurki, & Paavilainenm, 2002). Despite Tammentine's (2002) findings, other researchers suggest economic status, marital status, ethnic background, and number of children are not risk factors for PPD (Bloch, Rotenberg, Koren, & Klein, 2006).

Special populations have been examined for PPD prevalence. For example, Halman, Oakley, and Lederman (1995) examined the effects of infertility treatment on women's ability to adapt to pregnancy. They concluded that women with fertility problems did not suffer from latent effects of stress; in fact, the subfecund and fecund primarous women adapted to motherhood in similar ways. Women in the military on active duty reported nearly twice the rate of PPD, in addition to high rate of suicidal ideation, compared with nonmilitary populations. Several stressors unique within this population may exacerbate PPD such as limited salary, low rank, and distance from family (O'Boyle, Magann, Ricks, Doyle, & Morrison, 2005).

Finally, women with mental health problems seem especially vulnerable to PPD. Women with anxiety disorders during pregnancy are three times more likely to present with intense PPD (Sutter-Dallay, Giaccone-Marcesche, Glatigny-Dallay, & Verdoux,

2004). Risk factors of PPD include a history of mental illness, such as a past history of PPD, other depression, or other psychiatric illness and family history of affective disorders (Bloch et al., 2006). Additionally, Matthey, Barnett, Ungerer, and Waters (2000) report that a woman's interpersonal sensitivity and neuroticism is associated with postpartum depressed mood.

Researchers dispute several other factors contributing to PPD. Some social scientists dispute whether the prevalence of PPD is biological or cultural (Huang, 2000). According to Abou-Saleh et al. (1998), PPD is affected by biological factors. Women with PPD have shown significantly lower plasma prolactin and significantly greater progesterone levels than those without depression. Furthermore, women who breast-fed had significantly lower EPDS scores and higher plasma prolactin levels than those who did not breast-feed their infants. Some of the most current research (Bloch et al., 2006) indicates hormonal factors are significantly associated with PPD.

Trends with the initial birth experience may also help medical staff better understand PPD and its causes. Type of birthing method, for example, has been examined. Researchers investigated caesarean section deliveries versus planned vaginal deliveries as potential impetuses for PPD. According to Patel, Murphy, and Peters (2005), there was no evidence that caesarean section delivery altered the odds of postpartum depression compared with planned vaginal delivery. Furthermore, women discharged from the hospital early after childbirth do not have an increased risk of developing symptoms of postpartum depression during the following 6 months (Thompson, Roberts, Currie, & Ellwood, 2000).

Effects of Depression and Stress

Women with higher EPDS scores have not been shown to bond as well with their newborn infants as women with lower EPDS scores (Taylor, Atkins, Kumar, Adams, & Golver, 2005). According to Cadzo, Armstrong, and Fraser (1999), elevated EPDS score is a significant risk factor associated with heightened physical abuse potential for infants. In fact, it can be estimated that if EPDS is elevated immediately after birth there is 3.5 times the odds of heightened abuse potential for infants. In addition to EPDS score, financial stress and maternal stress have proven to be the most powerful predictors of child abuse potential during the postpartum period. Furthermore, postpartum depression has a significant negative impact on breast-feeding duration. For postpartum women with early onset of depression, the median duration of breast-feeding was 26 weeks. For postpartum women with late onset depression, the median duration of breast-feeding was 28 weeks, compared to 39 weeks for women without depression. Hence, babies of mothers with depression are less likely to receive the health and nutritional advantages of prolonged breast-feeding (Henderson, Evans, Straton, Priest, & Hagan, 2003).

Postpartum depression can cause reduced quality of mother-child interaction. Boyd, Zayas, and McKee (2006) suggest that maternal life events positively predicted infant interactional summary ratings, while negative life events were inversely associated with maternal interactional summary ratings. Reissland, Shephard, and Herrera (2003) state that mothers reporting a depressed mood as indicated by the EPDS had a different pattern of interaction with their babies compared with non-depressed mothers. The maternal mood affected the way each mother read picture books, which may be a mediating factor that results in lower reading and language skills for children with

depressed mothers. Maternal speech during reading may indicate the depressed mothers are less attuned to their babies (Reissland et al., 2003).

Additionally, the partners of women with PPD suffer. Davey, Dziurawiec, and O'Brien-Malone (2006) stated that men experienced their partners' PPD as overwhelming, isolating, stigmatizing, and frustrating. Therefore, family dynamics are often disturbed.

PPD can have long-term effects even after the depression is alleviated. Fifteen months after mothers gave birth, those who had previously experienced PPD were less affectionate with their infants and more anxious than the women without PPD. The infants with mothers who experienced PPD demonstrated less verbal interactions and less playing interactions than infants whose mothers did not have PPD. Moreover, children of mothers with PPD were more insecurely attached to their mothers and performed less well on cognitive tasks than their counterparts whose mothers did not have PPD (Righetti-Veltema, Bousquet, & Manzano, 2003).

Children of mothers with PPD are at greater risk for developmental problems, which may increase the risk of anxiety and PPD that the mothers experience. Mothers with undersized infants have been shown to have twice the risk of depressive illness than mothers with infants that are growing well (O'Brien, Heycock, Hanna, Jones, & Cox, 2004). Since parent-child interactions are compromised between mothers with PPD and their infants, feeding problems ensue (O'Brien et al., 2004).

Psychological Benefits of Exercise

To combat PPD, numerous psychological benefits accrue as a direct result of exercise. According to Weyerer and Kupfer (1994), it could be demonstrated that aerobic

exercise plus counseling is more effective in the treatment of depressive disorders than counseling alone, and the risk of depression is significantly higher for sedentary individuals compared with those who exercise. Some researchers hypothesize that depression occurs less in exercising postpartum women because exercise gives them a regular break from the ubiquitous responsibility that comes from a new baby. The same researchers reported that exercising women have more positive attitudes about their bodies during and after their pregnancy than do non-exercising women (Larson-Meyer, 2002). In fact, exercise was shown to positively influence mood in most new mothers in a study by Sampsel et al. (1999). Currie and Develin (2002) deduced that exercise is one strategy that could be used to improve psychological well-being for mothers.

Furthermore, results from Armstrong and Edwards's (2004) study showed that mothers with PPD who were randomly assigned to a walking group improved their depressive symptoms significantly more than mothers with PPD randomly assigned to a support group. The pram-walking group's mean scores at both week 6 and week 12 indicated that their psychological disturbance reduced over the period of the intervention, though the disturbance level of the control group did not (Armstrong & Edwards, 2004). The intervention demonstrated that the exercise made a clinical difference to depressive symptoms. Therefore, researchers suggest a 12 week, pram-walking intervention has the potential to improve both fitness levels and depressive symptoms for women who experience PPD. Better overall maternal well-being was found in those subjects who were able to either maintain prepregnancy levels or increase sport and exercise activity postpartum (Blum et al., 2004).

Therefore, researchers suggest a 12 week, pram-walking intervention has the potential to improve both fitness levels and depressive symptoms for women who reported experiencing PPD. The intervention demonstrated that the exercise made a clinical difference to depressive symptoms (Armstrong & Edwards, 2004). Better overall maternal well-being was found in those subjects who were able to either maintain prepregnancy levels or increase sport and exercise activity postpartum (Blum et al., 2004).

Exercise propagates psychological benefits. Babyak et al. (2000) stated that lower rates of depression were found in participants in an exercise group (30%) than participants taking antidepressants (52%) in a clinically depressed population. In this study, each 50-minute increment in exercise per week was associated with a 50% decrease in the odds of being classified as depressed. Hence, one positive psychological aspect of an exercise program is the development of a sense of mastery and positive self-regard, which is likely to influence the depression-reducing effects of exercise.

In young females, exercise has been shown to be significantly related to scores for physical and psychological well-being. Young people who engage regularly in exercise are characterized by lower anxiety and depression and much less social behavioral inhibition compared to their less active counterparts (Kirkcaldy, Shephard, & Siefen, 2002). Improved body image may explain this; participants who exercised demonstrated lower levels of anxiety, higher self-concepts, and overall improved psychological well-being than their non-exercising counterparts (DiLorenzo et al., 1999). Babayak et al. (2000) also stated that medication may undermine the benefit by prioritizing an alternative, less self-confirming attribution for one's improved condition.

Indeed, psychological mechanisms may also be responsible for the positive effects on mood, including increased feelings of self-efficacy, improved self-concept, and reduced dysfunctional or negative thought patterns (Blumenthal et al., 1999).

Abraham, Taylor and Coutu (2001) stated that there are no reports in the literature of the relationship between low-intensity exercise and postpartum distress. They later deduced that females exercising at low-intensity levels during pregnancy were less distressed following childbirth than their non-exercising counterparts. These researchers felt exercise may also help alleviate the worry and concern about weight gain in new mothers (Abraham et al., 2001).

Exercise improves sleep. According to Sherrill, Kotchou, and Quan (1998), a program of regular exercise may be a useful therapeutic modality in the treatment of patients with sleep disorders. Reduced risk of any sleep disorder was associated with regular activity at least once a week. Driver and Taylor (2000) reported that only moderate effect sizes have been noted; meta-analytical techniques have shown that exercise increased total sleep time and delayed rapid eye movement (REM) sleep onset by 10 minutes and increased slow-wave sleep. It seems the most beneficial sleeping effect comes from improved fitness with aerobic endurance training.

Researchers suggest that patients with depression tend to feel better after exercising. The alleviation of some depressive symptomology motivates depressed patients to continue to exercise, and continuing to exercise may make it less likely that the patient will suffer a return of depressive symptoms (Babyak et al., 2000). In Cramer, Nieman and Lee's (1990) randomized controlled study, they concluded that 15 weeks of moderate exercise training was associated with improved general well-being in sedentary,

mildly obese women. Indeed, most of the evidence indicates positive effects of exercise on mood (Dimeo et al., 2001). According to DiLorenzo et al. (1999), exercise participants experienced positive fitness change and psychological improvement over the initial 12 week program compared to counterparts in the control group. At a 1 year follow-up, physiological and psychological benefits remained significantly improved from baseline.

Exercise may have long-term psychological implications. For example, among research patients who had been assessed as being in full remission from depression at the end of the 4 month treatment period, participants in the exercise group were less likely to relapse than participants in the two groups receiving medication (Babyak et al., 2000). This is important because depression patients who improve with antidepressant use are at a significant risk for relapse within 1 year following the completion of treatment (Blumenthal et al., 1999). Furthermore, the number of minutes of exercise per week still predicted depressive status 6 months after treatment (Babyak et al., 2000). The desire to continue exercise may influence many participants after experiencing an intervention. In fact, at the end of one exercise intervention, over half of the participants asked to continue the aerobic training program (Dimeo et al., 2001).

There are numerous proposed mechanisms for the exercise-depression relationship. A thermogenic hypothesis suggests increases in body temperature due to exercise results in short-term tranquillizing effects. Another hypothesis states that psychological improvements that result from exercise are due to the release of endogenous morphine-like chemicals synthesized in the pituitary gland. Exercise enhances the neurotransmission of noradrenaline, serotonin, and dopamine, which results in improved mood and reduction in resting muscle activity potential following exercise

causes tension release (Weyerer & Kupfer, 1994). In addition, participation in exercise provides a distraction from the concerns and worries of daily life, reducing the available time for dysfunctional ideation (DiLorenzo et al., 1999). Ransford (1982) reports that exercise may work as an antidepressant that enhances aminergic synaptic transmission in the central nervous system. However, Weyrer and Kupfer (1994) deduced there is still a lack of an integrated theoretical model for exercise and psychological health remains lacking.

Exercise Guidelines

The Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period encourage exercise in prenatal and postpartum women. In the absence of medical complications, pregnant women and postpartum women should be encouraged to engage in exercise to continue to derive the same associated health benefits as before pregnancy. Risk and benefits should be considered when choosing type, intensity, duration, and frequency of exercise sessions (Artal & O'Toole, & White, 2003). The Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) recommendations for physical activity and health and well-being suggest women accumulate 30 minutes of exercise a day on most if not all days of the week. However, women who have been sedentary before pregnancy should follow a gradual progression of up to 30 minutes a day. Aerobic exercise can consist of any activities that use large muscle groups in a continuous rhythmic manner. The most easily measured activities, walking and stationary cycling, are particularly useful. There are no data to support the restriction of pregnant women from engaging in these activities (Artal et al., 2003).

Some new mothers worry that exercise will impede their infant's breast milk consumption. However, Wright, Quinn, and Carey (2002) report that moderate or even high-intensity exercise during lactation does not impede infant acceptance of breast milk consumed 1 hour post-exercise. In addition to exercise, numerous interventions exist to assist the psychological well-being of new mothers, with varying results. Psychological intervention for postpartum depression improves maternal mood as indicated by the EPDS in the short term. However, the benefits gained were not superior to spontaneous remission in the long term (Cooper, Murray, Wilson, & Romaniuk, 2003). Information about depression provided after delivery but before 6 weeks postpartum has shown to lead to effective reduction in depressive symptoms in postpartum women compared with postpartum women who do not receive information (Heh & Fu, 2003). In another study Honey, Bennett, and Morgan (2002) reported that women with mild PPD who participated in a controlled psycho-educational group intervention for postpartum depression significantly reduced the level of depressive symptoms compared with women with mild PPD who experienced routine primary care. In Onozawa, Glover, Adams, Modi & Kumar's 2001 study, EPDS scores fell in depressed mothers after baby massage techniques were taught, and significant improvement of mother-infant interaction was seen in the group who attended an infant massage class. A midwife-led debriefing session after an operative delivery did not reduce subsequent maternal depression, increase satisfaction with postpartum care, or improve overall maternal health status compared with new mothers who experienced standard care (Small, Lumley, Donohue, Potter, & Waldenstrom, 2000).

Psychosocial Support

Social support may be an impetus for postpartum women's exercise participation. It appears that support from the partner/husband and family and friends was important for participation in postpartum sports and exercise by women and thus adapt to the postpartum period (Blum et al., 2004). Currie and Develin (2002) reported that 20% of depressed mothers participating in their study enjoyed having a friend come walk with them; furthermore, 12% enjoyed joining a group of mothers to walk. However, in Armstrong and Edwards's (2004) research investigating women with PPD, social support did not improve PPD for either an exercise group or the interaction group.

Healthy social support from family may also help to prevent PPD. Among the social support variables, spousal support was found to be the factor most significantly correlated with PPD (Cronenwett, 1985; Leung, Martinson, & Arthur, 2005). According to Huang (2000), postpartum depression may be exacerbated in Western cultures compared with Eastern cultures. In many non-Western societies, routine behaviors and rituals for postpartum women (i.e., rest, seclusion, dietary restraints, and other taboos) may improve mothers' self-esteem, increase social support, decrease physical fatigue, and alleviate stress in mother/partner relationship. Leung et al. (2005) also examined the role of Asian PPD. They report that Chinese women with PPD had major negative experiences with controlling, powerful in-laws. Competition for the love and loyalty of the man between the mother and daughter-in-law has been a culture-specific phenomenon for centuries in Chinese society. In the Tammentie, Tarkka, Astedt-Kurki, Paavilainen, & Laippala (2004) study, mothers having depressive symptoms reported more negative family dynamics, less family stability, and poorer levels of communication compared

with mothers not experiencing depressive symptoms. Similarly, Tammentie et al. (2002) report similar family problems for PPD, mothers with change having a profound effect on mothers with PPD and their families. For both new mothers and new fathers, the relationship with each parent's own mother and father is indirectly related to postpartum depressed mood (Matthey et al., 2000). According to Cronenwett (1985), emotional support and family were important predictors for fathers' satisfaction with parenting and infant care, whereas the same factors were inversely related to women's confidence in the ability to cope with the tasks of parenting due to boundary problems.

Role of Social Interaction

Social interaction often impedes researchers' ability to discern whether or not exercise programs alone improve participants' psychological well-being, since numerous exercise programs are completed in a group setting (Blumenthal et al., 1999). McNeil, LeBlanc, and Joyner's (1991) research investigates the role of social support in exercise and reports more psychological improvements for the individuals who walk as opposed to their counterparts in a social-supported control group. However, even in the walking group, the experimenter accompanied the participants during the exercise.

Weekly phone calls and e-mails (to those with Internet access) took place in this study to encourage participants' adherence. A less time-consuming interaction such as brief telephone contact and automated telephone contact have been shown to increase adherence to exercise programs (Albright et al., 2000). In fact, exercise levels were higher in an intervention group who received just 3 phone calls a month, compared to a control group that did not receive the encouraging calls (Green et al., 2002). Dennis (2003) reported telephone-based supportive interventions for new mothers have been

evaluated positively in several studies. Weekly phone calls to the participants helped mothers stay motivated to complete exercise protocol. Indeed, phone contact is a time-efficient and effective method of monitoring involvement in a home-based exercise program (Jette et al., 1999). The use of the video tape as part of the exercise training may have contributed to the high participation rate that complemented the periodic contact and monitoring (Jette et al., 1999).

Postpartum Weight Retention

Exercise and physical activity can be the impetus behind weight loss in postpartum women. Uzendoski, Latin, Berg and Moshier (1990) suggested that if a postpartum woman desires to return to her pre-pregnancy weight within 1 year after delivery and average weight gain during pregnancy, she would need to participate in some form of aerobic activity or reduce food intake proportionately. Ohlin and Rossner (1994) reported that postpartum weight retention is more affected by a change in lifestyle during, and above all, after pregnancy than by factors before pregnancy. Women who retained more than 5 kilograms after 1 year postpartum were less physically active in their leisure time than women with smaller weight gain; physical activity during the follow-up year was of importance for facilitating postpartum weight loss. Moreover, exercise frequency in addition to gestational weight gain, change in food intake, and breast-feeding were each significantly related to postpartum weight retention (Olson et al., 2003). Rooney and Schauberger postulated (2003) that 6 months was too soon to see major changes in the fat stores for women who are exercising; it took longer to see the benefits of exercise.

Motherhood has long-term implications for weight gain. For example, in both black and white women the most important predictors of postpartum weight were pre-pregnancy weight, gestational weight gain, parity, and prenatal exercise. After these factors were controlled, black women retained 6.4 pounds more than white women. The discrepancy between the races in weight gain may be the result of higher mean energy intake and significantly lower exercise level (Boardley, Sargent, Coker, Hussey, & Sharpe, 1995). Multiparous women are predicted to have a 3.2 pound increase in weight retention associated with number of children, and breast-feeding was not a significant predictor of weight loss (Boardley et al., 1995).

In longitudinal studies on postpartum weight gain, patterns emerge. According to Linne, et al. (2004), weight retention at the end of the postpartum year predicts being overweight 15 years later, and postpartum women who had retained the most weight in the 1 year follow-up assessment had gained the most during pregnancy and had higher prepregnancy weight. According to Rooney and Schauburger (2003), excess weight gain and failure to lose pregnancy weight by 6 months postpartum are important markers for risk of subsequent obesity.

Moreover, Rooney and Schauburger (2003) report that women who lost all pregnancy weight by 6 months postpartum were 6 kg smaller than women who retained their pregnancy weight for longer periods. Linne and Rossner (2003) reported that there were no differences regarding weight gain between women who have more than 2 years between their pregnancies and those who do not have more than 2 years between pregnancies. However, women who have gained a considerable amount of weight during the first pregnancy or retained weight after delivery have a higher risk of doing so in the

subsequent pregnancies and should receive appropriate advice and support. Furthermore, women over 40 years and less than 20 years at delivery, lower income women, and single women retained significantly more weight than their counterparts (Olson, et al., 2003).

Physiological Benefits of Exercise

According to DiLorenzo et al. (1999), some current studies suggest that physiological change may not be necessary for psychological benefit. However, numerous physiological benefits accrue as a result of exercise. For example, exercisers display a reliable improvement in aerobic fitness over time compared to control wait-listed participants (DiLorenzo et al., 1999).

Compliance of Postpartum Women

After delivery women are in a period of transition, making them more open to new behavior choices. After delivery women have a readiness to adopt healthy lifestyle behaviors that relate to healthy parenting. The postpartum period is ideal for identification of families at risk for depression or child abuse, for it allows preventive measures prior to discharge from hospital and establishment of a trusting relationship with the family (Cadzo et al., 1999). There is also a readiness to adopt healthy lifestyle behaviors after delivery. Exercise regimens or sedentary behaviors can be established postpartum, and activity patterns can ensue. The postpartum period represents a prime opportunity to educate women from all economic backgrounds about proper nutrition, exercise, and benefits of maintaining a healthy lifestyle. It is likely that exercise plays as crucial a role for women in the postpartum year as at any other time across the lifespan (Sampselle et al., 1999).

Role of Medical Professionals in Assisting Postpartum Women

Medical professionals can utilize this teachable period to encourage exercise programs for postpartum women. Since health professionals have substantial pre- and postpartum contact with women, the potential to explore the options and benefits of exercise programs as a preventive and early intervention option are extensive (Armstrong & Edwards, 2004). According to Craft and Perna (2004), primary care providers can promote behavioral choices, such as exercise, that complement pharmacological treatment and may ultimately provide relief from depression as well as enhance overall physical well-being. Although positive outcomes of physical activity have been demonstrated in the population at large, exercise has rarely been an element in postpartum care plans. Nurses who care for women after childbirth should assess women's exercise goals and support them in their desired activities (Sampselle et al., 1999). Downs and Hausenblas (2004) recommend that researchers and healthcare professionals empower women by using beliefs about exercise as the framework for designing their intervention programs in an attempt to increase women's pregnancy and postpartum exercise behavior. According to Albright et al. (2000), physicians were receptive to helping patients implement weight loss strategies. Physicians expressed the desire to advise patients about preventive health behaviors and were willing to use time within the patients' visit to offer advice. In fact, 83% of the doctors in the study reported that the advice during the clinical encounter with the patients took less than 6 minutes to deliver. Hence, physician advice about preventive health did not substantially add to the overall length of the clinical encounter or further burden the clinics' staff (Albright et al., 2000).

Child health nurses have direct contact with patients who have postpartum disorders and, if provided with training in exercise prescription, would be in an ideal position to conduct the programs. The aims of the programs would be to enhance current available management and to work with women and health professionals. Indeed, child health nurses are in a key position as primary healthcare workers to be trained to conduct the sessions (Armstrong & Edwards, 2004).

According to Wilkinson, Huang, Walker, Sterling, and Kim (2004), the 6 week postpartum visit presents an excellent opportunity for nurses to assess women's physical activity practices and to counsel them to engage in regular physical activity. However, one should note that 20% of all delivered women never attend any postpartum check-up (Josefsson et al., 2001). Therefore, earlier promotion of exercise for new mothers would be beneficial.

Physician-encouraged preventative health programs have been shown to be more efficacious in producing results than non-physician led programs. In fact, minimal physician counseling for improved physical activity (3 to 5 minutes in length per visit) and a booster call tailored to the patient's needs produced meaningful increases among initially sedentary patients (Calfas et al., 1996).

According to O'Brien et al. (2004), physicians may also utilize the postpartum visits to identify PPD. The mother should particularly be screened for PPD by the pediatrician when there is an infant who is identified with poor weight gain. Counseling and goal setting should be adapted to women's childcare responsibilities, lifestyles, and any physical or neighborhood barriers to physical activity (Wilkinson et al., 2004).

Advantages of Walking Programs

A walking program is ideal for new mothers for several reasons. In a study by Currie & Develin (2002), 92% of survey respondents agreed that pram-walking would be beneficial to the mental well-being of participants; 65% of survey respondents found pram-walking to be the most popular activity. Another 65% of participants were involved in a walking program; hence, mothers may feel confident about giving it a try. Furthermore, 24% of mothers reported wanting to participate more in walking activities. Palmer (1995) has reported that walking programs are both easy to implement and inexpensive.

Group exercise interventions such as pram-walking for women with PPD provide cost-effective ways of managing women with mild to moderate depression (Armstrong & Edwards, 2004). The cost of treating depression by a running program is one-fifth that of psychotherapy (Griest et al., 1979). Integrating a walking program into routine activities at the community health centers can be cost-effective (Armstrong & Edwards, 2004). It has been advised that organized programs to accommodate mothers' needs would ease the burden, provide motivation to find the time, and provide direction for physical activity. One should also note that women with PPD generally agreed that pram-walking could be beneficial in relieving PPD due to interaction with other mothers (51%), getting out of the house (26%), benefitting for mind and body (23%), reducing fatigue and stress (14%), decreasing depression (12%), and forming of friendships (4%) (Currie & Develin, 2002).

A home-based program should be less difficult to maintain for mothers of infants than a pram-walking program, for there are many barriers impeding participation in

pram-walking programs. For instance, in the Currie and Devlin (2002) study of the participants, 11% reported a child being difficult in a stroller, 9% reported poor-quality foot paths, 5% reported lack of curbs and gutters, 4% reported road crossing, 2% reported steep hills, 69% reported wet/windy weather, 52% reported lack of time, and 40% reported no footpaths. Other participants listed varying barriers such as unattractive starting time, difficulty taking older children, perception that the group was made up of power walkers, and a lack of private transport.

Home-based exercise programs are effective. In fact, Jette et al. (1999) stated that home-based residence exercise holds promise as an effective and feasible public health strategy for achieving physical activity.

Justification for Walking Dose

With any exercise program intensity and dose should be carefully considered. Researchers for this study investigated numerous trends that will work for our population. According to Cramer et al. (1990), general well-being significantly increased in exercise subjects by 6 weeks of exercise. Researchers reported that only 29% were able to walk three times per week or more, while 15% walked twice and 19% exercised only once per week; hence, many women are not incorporating adequate exercise into their routine (Currie & Develin, 2002). Furthermore, in a population of moderately depressed elderly, the participants walked 20 to 40 minutes three times a week for 6 weeks and experienced a greater decrease in somatic symptoms and more improved psychological symptoms compared to the control group that was wait-listed (McNeil et al., 1991). In Armstrong and Edwards's (2004) study, postpartum women in the pram-walking group attended two sessions per week 40 minutes each at a moderate intensity. Predepression scores

decreased significantly by week 6 ($p < .001$) and again by week 12 ($p < .05$). Dunn et al. (2001) reviewed numerous quasi-experimental studies and examined the efficacy of each treatment, finding several studies to have effective programs for reducing depression and anxiety. Studies that utilized a dose of 30 minutes a day, three sessions per week, for 6 weeks include these: Conroy, Smith, & Felthous, 1982; Doyne, Chambless, & Beutler, 1983; Sexton, Maere, & Dahl, 1989; McNeil et al., 1991; Blumenthal et al., 1999; and Babyak et al., 2000.

There is research to suggest that programs need to be at least 9 weeks in duration at a moderate intensity (60-75%) for a minimum of three sessions per week for 30-40 minutes to achieve a fitness effect (Armstrong & Edwards, 2004). Just 30 minutes of treadmill walking for 10 consecutive days was sufficient to produce a clinically relevant and statistically significant reduction in depression, according to Dimeo et al. (2001) for adult women. An exercise prescription of 20 minutes per day, 3 times per week at a moderate intensity is sufficient to significantly reduce symptoms of depression (Craft & Landers, 1998). Within exercise training groups that measured anxiety and stress using the Daily Hassle Scales, there was a significant effect in improved scores after 6 weeks of exercise. According to Szabo, Mesko, Caputo, and Gill (1998), physical exertion activity was positively related to exercise-induced effect that is comparable to and on some aspects is greater than higher intensity aerobic exercise. Furthermore, Berger and Owen (1988) indicated that moderate intensity exercise is best for producing reductions in negative affect and increases in positive affective responses. According to Dimeo et al. (2001), training that consisted of 30 minutes of daily walking on a treadmill for 10 days with breaks on Sundays was enough time to substantially improve the severity of

symptoms in depression scores in a population with major depression. In a depressed elderly population, exercisers who walked 3 times a week, for 20-40 minutes during each session for 6 weeks reduced a broader range of psychological and somatic symptoms than the control group that sought social contact (McNeil et al., 1991).

Walking programs are deemed safe in pregnant populations and should therefore not induce harm in postnatal populations. McMurray, Hackney, Guion, and Katz (1996) reported that 40 minutes of walking or aerobic dance does not expose pregnant women to serious metabolic consequences that might adversely affect the fetus. Furthermore, blood glucose levels show reductions as a result of exercise but do not cause hypoglycemia, and these metabolic fluctuations do not adversely affect the fetus.

Safety for the population is a primary concern when designing for women in the postpartum period. Therefore, a sensible dose of an hour and a half weekly (i.e., three 30-minute sessions per week) at an intensity of 3-4 METS was employed for this research. Some investigations with postpartum populations that have not set exercise guidelines at such a conservative level. In Kardel and Trygve's (1998) study investigating the effects of vigorous exercise during and after pregnancy in competitive athletes, she found that well-trained women can benefit substantially from training at high volumes during an uncomplicated pregnancy. In fact, exercising 8.4 hours a week at 10.5 METS did not compromise fetal growth and development judged by birth weight and complications in the course of pregnancy or labor. Furthermore, high volume training does not pose any health risk for the mother or the unborn child, prepartum or postpartum (Kardel, 2005; Uzendoski et al., 1990). A prepartum aerobic exercise program helps maintain the mother's aerobic fitness during pregnancy and possibly benefits the mother throughout

the pregnancy. Additionally, postpartum aerobic exercise is a desirable means to expedite the alteration of body composition to prepregnancy levels (Uzendoski et al., 1990).

Varying intensities can be beneficial; Dunn et al., (2001) reported that light, moderate, and vigorous-intensity exercise can reduce symptoms of depression.

Adherence to Treatment

Hinton and Olson (2001) examined the relationships between psychosocial characteristics and change in exercise and food intake of women during the first year postpartum. They discovered higher exercise self-efficacy and having intention to exercise were associated with more frequent exercise at one year postpartum. Therefore, these researchers conclude interventions that aim for regular exercise during the postpartum period should focus on self-efficacy specific to targeted behaviors (e.g., setting realistic exercise goals and modeling exercise strategies).

A significant epidemiological research study describing the benefits associated with reported patterns of postpartum physical activity was longitudinal in design. A questionnaire was completed by 1,003 women at a 6 week postpartum doctor's visit. Women that exercised (35%) adapted better than the non-exercisers. The active postpartum women reported a higher sense of well-being, satisfaction with life circumstances, satisfaction with motherhood, confidence in the tasks of motherhood, and satisfaction with partner relationships than their inactive counterparts. However, due to the retrospective nature of this design, the researchers could not adequately defend the alternative hypothesis, i.e., the personality characteristics of women that foster physical activity also affects their ability to have a positive birth experience. The researchers concluded that the association between exercise and indicators of well-being is consistent

with research conducted with nonchildbearing women and merits further investigation with postpartum women (Sampselle et al., 1999).

Another noteworthy retrospective study investigated women's exercise beliefs and behaviors during their pregnancy and postpartum. The 74 research participants completed the self-reported Leisure-Time Exercise Questionnaire (LTEQ) between 6 days and 5 months following the birth of their baby. The women reported exercising more before pregnancy than during pregnancy and postpartum. Women's motivations for desiring to exercise changed. During pregnancy women were motivated to exercise for improved mood, whereas postpartum participants exercised in an effort to control weight. Women's husbands or fiancés influenced the participants' activity levels more than other individuals in the women's lives. Support from a partner is a significant factor in maintaining or increasing exercise patterns in postpartum women (Blum et al., 2004). The most reported impediment to exercise during pregnancy was physical limitations, whereas postpartum the most reported impediment to exercise was not having a sufficient amount of time. The researchers concluded that pregnancy and postpartum are critical events in a woman's life that may further promote sedentary lifestyles (Downs & Hausenblas, 2004).

CHAPTER III

METHODOLOGY

The purpose of this study was to determine the effects of a home-based walking program on psychological health in postpartum women. Psychological well-being of the postpartum population was determined by a questionnaire with questions from both the PPQ and the EPDS. The duration of the program was 6 weeks in length and took place within a year of each of the participant's delivery.

In this study the following main research questions were investigated:

1. What are the effects of a 6 week, home-based walking program on depressive symptomology, as measured by the EPDS, in postpartum women participating in the treatment group compared to the depressive symptomology of postpartum women in the control group?
2. What are the effects of a 6 week, home-based walking program on anxiety, as measured by the PPQ, in postpartum women participating in the treatment group compared to the anxiety of postpartum women in the control group?
3. What are the effects of a 6 week, home-based walking program on satisfaction with life circumstances, as measured by the PPQ, in postpartum women participating in the treatment group compared to satisfaction with motherhood and infant care in postpartum women in the control group?

4. What are the effects of a 6 week, home-based walking program on confidence in tasks of motherhood, as measured by the PPQ, in postpartum women participating in the treatment group compared to the confidence and ability to cope with the tasks of motherhood of postpartum women in the control group?

Study Design

This project was designed to examine the effects of a 6 week, home-based exercise intervention on psychological well-being in postpartum women. At the baseline visit, women were randomly assigned to participate in one of two groups. Group 1, the treatment group, participated in the exercise intervention. Group 2, the control group, did not receive an intervention during the 6 week period, although they were offered the exercise program at the end of 6 weeks. Both groups completed baseline questionnaires. Group 1 participants enrolled in a 6 week walking program along with Leslie Sansome's *Walk Away the Pounds Express* videotape or DVD (whichever was most desirable for the participant) over a 42 day span. Upon completion of the 6 weeks of intervention, posttest measures were collected for both groups.

Participants

Participants of this study were recruited from a Nashville-based gynecology and obstetrics practice. Each potential participant completed a screening form to insure her eligibility for this study after her 6 week postpartum checkup. This screening was conducted by each participant's doctor. The obstetrician granted or denied permission for the participant after viewing her health history and reviewing major complications during late pregnancy, labor and delivery, or early postpartum period. Physicians were able to judge if the potential participant would be able to exercise safely. The research included

51 women who had given birth in the last 6 weeks to 12 months. Since many of the physiological and morphological changes of pregnancy persist for 4 to 6 weeks postpartum, our participants did not start this structured exercise routine until 6 weeks after pregnancy, once medical clearance for exercise had been established. The study invited English-speaking women who were between the ages of 20 to 40 years and were within 6 weeks to a year of delivery and who had been granted physician approval for an exercise intervention. Additionally, women were excluded from this study if they were taking antidepressants or if they have been diagnosed with high blood pressure. During the screening, potential participants were asked to sign an informed consent form. Participants agreed to accept random assignment to either the experimental or wait-listed group and voluntarily signed an informed consent statement approved by the Middle Tennessee State University Institutional Review Board.

Procedures

Women who were identified by health researchers as eligible for the study were given brochures about this study. The investigator contacted the physician's staff several times a week to receive contact information for potential participants. The researcher then contacted the potential participant and set up a time for the initial home visit. Freedom was given to the participants to withdraw consent at any time.

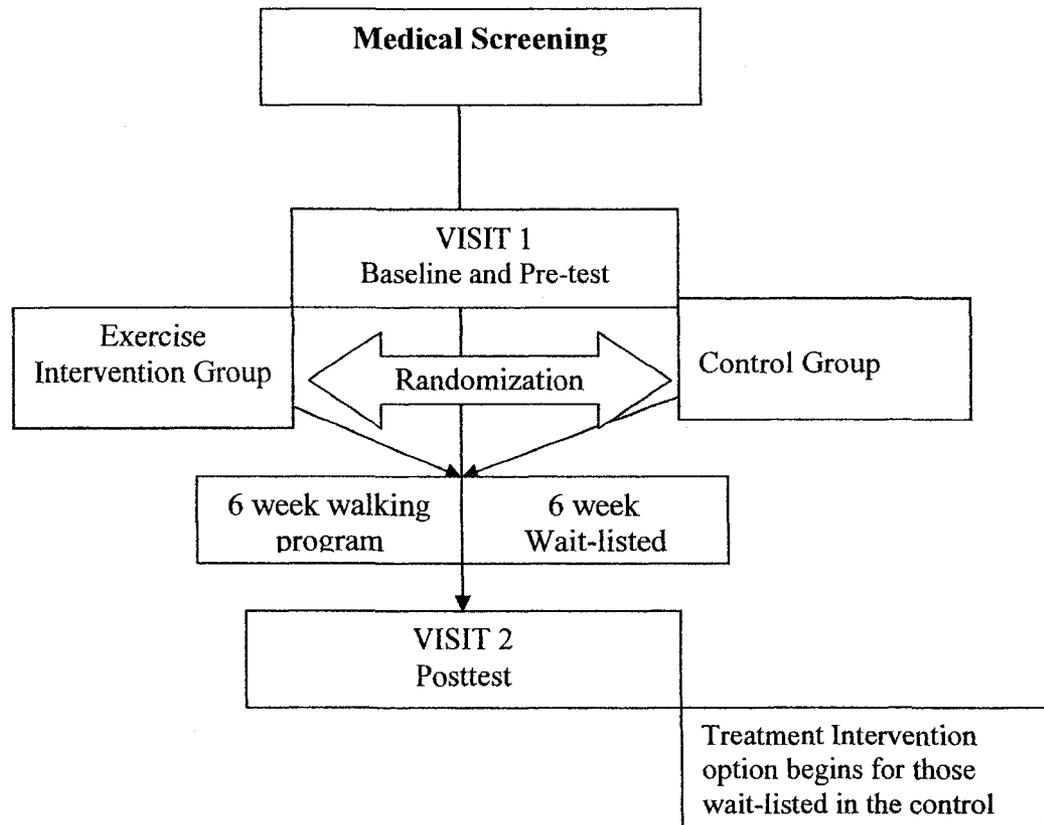


Figure 1. Study Design

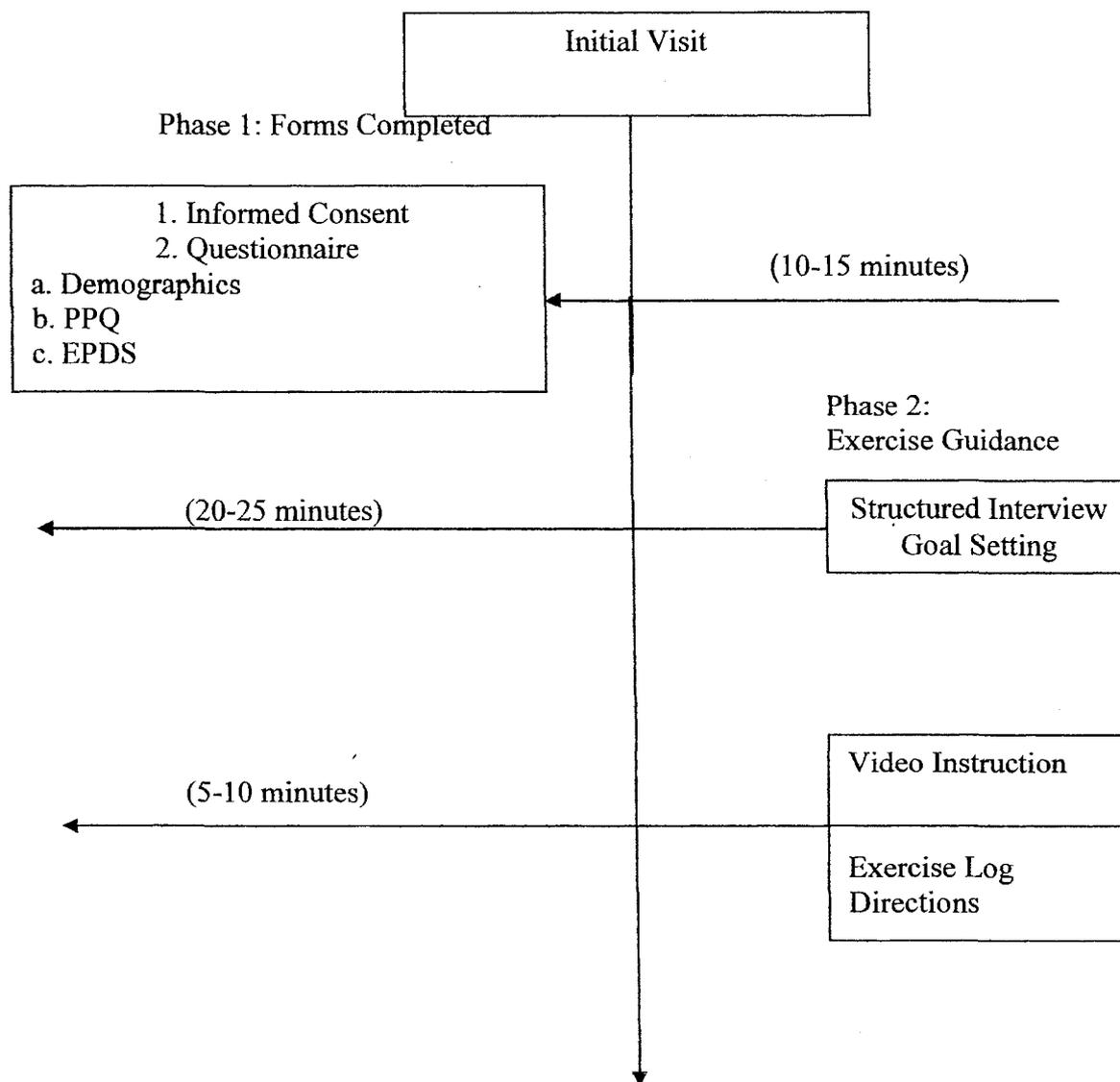


Figure 2. Study Procedures

During this initial visit, the participant completed a number of tasks. The following forms and surveys were completed in approximately 10 to 15 minutes: the informed consent letter, the demographics sheet, and the baseline questionnaire with questions from both the PPQ and the EPDS. Once the paperwork was done, the researcher guided the participant in a 20 to 25 minute structured interview with a goal setting session using the TPB.

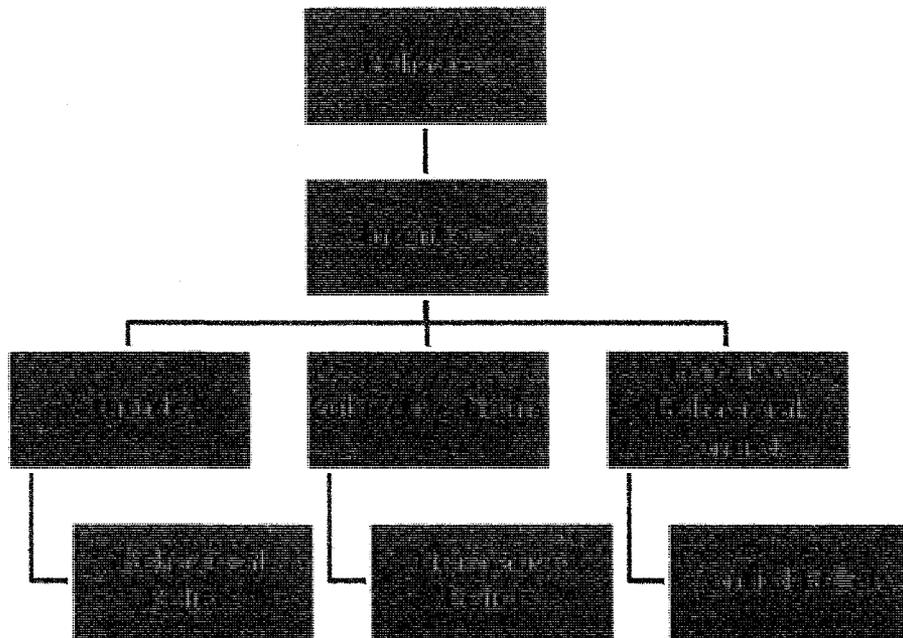


Figure 3. Diagram of TPB

Upon completion of the goal setting session, the researcher instructed the participant on how to use the video and complete the exercise log. Participants gave

permission for the research team to contact the physician concerning elevated EPDS scores on the consent form. If a participant scored above 11 on the EPDS, her physician was contacted. If, upon consultation, the physician deemed it necessary for the participant to take antidepressants, the participant was no longer a part of the data collection.

During the first meeting with each participant in the treatment, the researcher reviewed the DVD or video and reviewed exercise schedules and routines with the mother. The researcher guided the participants in the treatment on walking techniques, and participants were directed on the guidelines for progression and how to complete either weekly exercise e-mail or a written exercise log. The researcher performed the semi-structured TPB interview to enhance participants' attitudes related to exercise and to maximize adherence to the exercise program. (These questions are in Appendix E.) Furthermore, the researcher answered any questions about the program. The initial baseline visit took approximately 45 minutes to 60 minutes.

Group 2 participants were not involved with the exercise intervention for 6 weeks. After 6 weeks from baseline, psychological well-being was assessed once more, using the same questionnaire employed for the baseline collection. Group 2, the former control group, then had the opportunity to engage in the home-based exercise sessions of Leslie Sansone's *Walk Away the Pounds Express* video or DVD (whichever was most desirable for the participant) over a 42-day span.

Instrumentation

To measure depression levels, participants completed the EPDS. The EPDS is used to assess depressive symptomology in postpartum women. The EPDS is a 10-item, self-report questionnaire which is user-friendly, simple, and can be completed by women

in 5 to 10 minutes (Cox, Holden, & Sagovsky, 1987). The EPDS was designed to be acceptable by women during the postpartum period and does not require that the health worker administering the scale have a specialist understanding of psychiatry (Cox et al., 1987). The instrument was validated in a study with 84 postpartum mothers whose EPDS scores were validated against the Goldberg's Evidence. This suggests that the EPDS has proven to be highly effective in assessing women who are likely to be experiencing depressive symptomology, and that it is well-validated as a measure of a woman's emotional well-being if participants provided affirmative answers or high ranking to questions (Armstrong & Edwards, 2004). Results from the pretest EPDS and the posttest EPDS of this study are represented in Table 4 under the subheading "depression." Lower scores on the 10-question Likert-scale indicate lower depression scores. The complete EPDS is located in Appendix B.

The PPQ was used to assess psychosocial well-being. The PPQ consists of 7 subscales made up of 10-13 questions. The subjects responded to questions by choosing one of four options that best reflected their feelings from "very much so," "moderately so," "somewhat so," or "not at all." The responses were scored from 1 to 4, with lower scores indicating better adaptation, or well-being, since the birth of the baby. This questionnaire has demonstrated good psychometric properties (i.e., reliability) with Cronbach's alpha, ranging from .73 to .90 for the subscales. The seven PPQ scales were 1) quality of partner relationship; 2) perception of partner's participation in childcare; 3) gratification from labor and delivery experience; 4) satisfaction with life circumstances; 5) confidence and ability to cope with tasks of motherhood; 6) satisfaction with motherhood and infant care; and 7) support for maternal role from family and friends.

Higher sports/exercise levels were associated with a better perception of partner's participation in childcare (Blum et al., 2004). In this study, the PPQ was used to measure life circumstances and confidence in the tasks of motherhood. The questionnaire was specifically developed to provide quantifiable measures of factors frequently cited in the literature as relevant to maternal adaptation. Pre- and posttest results from the PPQ are represented in Table 4 under the subheadings "Life Circumstances" and "The Confidence in the Ability to Cope with the Tasks of Motherhood" (Lederman, Weingarten, & Lederman, 1981). (A complete list of questions from the PPQ can be found in Appendix C.)

In addition to completing the EPDS and the PPQ, participants in both groups completed some demographic information in Appendix G. Also, participants' answers from a structured interview (located in Appendix E) assisted in the computerized randomization process and offered important information for the TPB.

Once eligibility and consent were established and the baseline questionnaires were complete, the participants were randomized into either Group 1 or Group 2. Group 1, the exercise treatment participants, received a video cassette, "Walk Away the Pounds Express," upon the investigator's initial visit. The video standardizes the workout and controls for extraneous variability in the walking programs within each participant's home. Each participant was expected to walk for 30 minutes, 3 times a week, on 18 separate occasions over a span of 6 weeks.

Group 2, the control group, consisted of individuals interested in completing an exercise program. They were wait-listed until 6 weeks after their baseline period. Wait-listed individuals in the control group were instructed to continue with their normal

activities and received the exercise program at the end of a 6 week period. The exercise intervention for Group 2 began within 1 week of completion of the questionnaires. The 6 week exercise program followed all recommendations from the Guidelines of the American College of Obstetrics and Gynecologists for exercise during the postpartum period (Artal, & O'Toole, 2003).

Each participant received a phone call to set up a desirable time to deliver the video cassette or DVD, to review exercise schedules and routines, and to answer questions about the program. The approximate time on the phone during the first conversation took less than 10 minutes to establish when to meet the participant at her home. The first visit to her house took approximately 45 to 60 minutes. At the initial baseline visit, once eligibility and consent were established, Group 1, the exercise treatment participants, received the video cassette *Walk Away the Pounds Express*

Exercise Intervention

Using the video, the participants walked 3200 meters (2 miles) during each 30-minute, home-based session. Each session was guided using the video cassette recorder or digital versatile disc by walking expert Leslie Sansone via video cassette. Leslie Sansone has coordinated fitness programs for public schools and hospital-based weight loss groups and has served on the Leadership Council for IDEA International Fitness Professionals. Leslie Sansone's other certifications include endorsements as a group exercise leader from both American College of Sports Medicine (ACSM) and the Cooper Institute. The *Walk Away the Pounds Express* video guides women throughout the 2 mile walk with side stepping, backward walking, forward motions, varying arm-movements, and stretches. Participants completed three sessions of the 30-minute video each week

with an exercise scientist checking in with each participant weekly. Control members in Group 2 did not participate in an aerobic exercise program during the initial 6 weeks, but instead were asked to maintain typical activity levels.

On the first visit the exercise scientist met with each of the participants in Group 1 to review the home-based routine before the participant commenced the walking program. The exercise scientist assisted and consulted each participant with any questions that arose during the program using ACSM, CDC, and ACOG guidelines. Moreover, the exercise scientist helped with scheduling a walking routine that was most advantageous to each participant's time parameters. An exercise scientist also monitored frequency, intensity, and duration of daily exercise, and any changes such as sleep patterns or postpartum bleeding. Participants were given an exercise log and were encouraged to record each exercise session with the *Walk Away the Pounds Express* video. Participants were instructed to cease exercising if sleep patterns or postpartum bleeding ensued until a physician offered exercise clearance for her. The exercise scientist encouraged the participants' weekly progress with the program by phone and e-mail check-ups. Each of the phone calls lasted no longer than 10 minutes. During the conversation, each of the participants reported from the exercise log, stating when and how many walking sessions were completed during the previous week.

At the conclusion of the 6 week intervention, the investigator met the participants from the two groups, so that the participants could complete the posttest. The meeting lasted no more than 30 minutes. The exercise logs were turned in at that time.

Randomization

Randomization was necessary to maximize the validity of this study. Therefore, a Computerized Adaptive Randomization Program was employed in this research in an effort to balance sample size and baseline characteristics among the treatment intervention group and the control group (Kang, Ragan, & Park, 2008). This program ensured the two groups were comparable and that ultimately the difference between the treatment intervention and the control was a result of treatment effect. The four factors that were controlled included the following: mother's physical activity level before pregnancy, father's/partner's physical activity level, and significant others' physical activity level.

Data Analysis

A 2X2 multivariate mixed model analysis was used to examine the effect of a 6 week walking program on the 51 study participants. A between-subject factor is group (i.e., control and treatment groups) and a within-subject factor is time (i.e., pretest and posttest). Psychological well-being was assessed by four dependent variables: depressive symptomology, anxiety, confidence and the ability to cope with the tasks of motherhood, and satisfaction with life circumstances. As the study was designed to confirm exercise participation, those individuals who skipped four or more sessions were not posttested nor included in the main analyses. In this study, a Likert-type of scale of dependent variables was treated as an interval scale with an assumption of equal distance across the scale, when proper parametric statistics could be applied (e.g., summation of each item response). First, descriptive statistics were calculated for the whole group and the subgroup for each dependent variable. To answer the research hypothesis, the overall

multivariate F statistic was examined first. Then, if the overall multivariate F statistic was significant, univariate F statistics would have been performed to identify where significant intervention effect size existed. Statistical significance level was set at .05.

CHAPTER IV

RESULTS

The purpose of this study was to determine if a 6 week, home-based exercise program improved components of psychological well-being (depression, satisfaction with life circumstances, and confidence in ability to cope with the tasks of motherhood) in postpartum women. This chapter is organized to present the results under the following main sections: description of participants, results, and summary. Data analysis and calculations were performed using SPSS version 15.0.

Description of Participants

A total of 51 women took part in this research. Each had given birth in the past year. Of the 27 participants in the treatment, 26 completed the 6 week exercise intervention, with 24 of 24 participants completing the wait-listed control. It should be noted that one participant from each of the groups began taking antidepressants during the study. The data for these two women were eliminated from the analysis, as antidepressant usage was an exclusionary factor.

All participants live in the Southeastern United States. The majority of the participants are Tennesseans; three live in Alabama, one resides in Georgia, and another lives in Texas. All were white ($N = 48$), all were married, and on the average, the participants had one or two children.

There were no significant differences between the two sample groups regarding number of children or in weight change from time of delivery to the time of the initial meeting. During this study, work status was similar between the two groups. In the treatment group, 20% of the participants worked full-time outside of the home postpartum, 24% worked part-time outside of the home postpartum, and 56% stayed at home postpartum. In the control group, 35% of the participants worked full-time outside of the home postpartum, 26% worked part-time outside of the home postpartum, and 39% stayed at home postpartum. A demographic description is included in Table 1.

Table 1

Demographic Characteristics of the Study Sample (N = 48)

	<u>Treatment (n = 25)</u>	<u>Control (n = 23)</u>
Years of Age	31.1	30.4
Years Married	7.00	5.32
Age of Infant in months	6.34	5.54
Type of Delivery (vaginal)	48 (%)	52 (%)

Computerized Adaptive Randomization program (Kang et al., 2008) balanced the sample to ensure comparable groups with other important variables, including activity during pregnancy, activity level of partner, and activity level of significant others. In past research these variables were deemed predictors for exercise behavior (Hinton & Olsen, 2001). The characteristics of the two groups were similar (see Table 2).

Table 2

Average Amount of Times Exercised

	<u>Treatment (n = 25)</u>	<u>Control (n =23)</u>
Partners' average exercise time		
0-1 times per week	5	6
2-4 times per week	12	10
5-7 times per week	8	7
Participants' average exercise time before pregnancy		
0-1 times per week	6	7
2-4 times per week	16	15
5-7 times per week	3	1
Friends' exercise time		
0-1 times per week	8	7
2-4 times per week	16	14
5-7 times per week	1	2

Note: The values represent frequency of occurrence of times per week.

The majority of participants were college educated, with 47 of the 48 participants having completed undergraduate degrees. Many others ($n = 22$) graduated with advanced degrees.

Table 3
Education of the Study Sample

	<u>Treatment (n = 25)</u>	<u>Control (n = 23)</u>
Bachelor of Arts	2	2
Bachelor of Science	13	11
Master of Business Administration	1	2
Master of Science	7	5
Doctor of Philosophy	2	1
Juris Doctor	2	
Doctor of Medicine		1

Data Analyses

To represent the components of psychological well-being, the three variables of depression, satisfaction with life circumstances, and confidence in ability to cope with the tasks of motherhood were measured. As represented in Table 4, the treatment group's and control group's scores improved significantly over a 6 week time period. However, between the treatment and wait-list control groups, there was no significant difference.

The data were analyzed with a 2X2 multivariate mixed model analysis. This MANOVA was used to compare pretest and posttest data collected on selected measures of psychological well-being, including depression, satisfaction with life circumstances, and confidence in ability to cope with tasks of motherhood. The overall MANOVA

revealed no statistical difference, $F(3, 4) = .301, p = .825$ (Wilks' Lamda = .980) $p > .05$ for measures of psychological well-being. Since overall multivariate F test was not significant, univariate analysis was unnecessary.

Table 4:
Pretest and Posttest Differences in Psychological Well-Being (N = 48)

	<u>Pretest $M \pm SD$</u>	<u>Posttest $M \pm SD$</u>
Depression		
Control	18.87 \pm 3.22	18.39 \pm 3.68
Treatment	19.76 \pm 4.64	18.08 \pm 3.28
Total	19.33 \pm 4.01	18.23 \pm 3.44
Life Circumstances		
Control	17.83 \pm 4.53	17.04 \pm 4.48
Treatment	18.92 \pm 3.97	17.60 \pm 3.56
Total	18.4 \pm 4.24	17.33 \pm 3.99
Confidence in Ability to Cope with Tasks of Motherhood		
Control	6.09 \pm 3.70	5.43 \pm 3.85
Treatment	7.48 \pm 2.77	5.60 \pm 3.18
Total	6.81 \pm 3.28	5.52 \pm 3.48

Hypothesis 1

There was no significant difference between the treatment group's depression score and the control group's depression score after 6 weeks ($p = .23$) as measured by the EPDS.

Hypothesis 2

There was no significant difference between the treatment group's increased life circumstances and the control group's increased life circumstances after 6 weeks ($p = .09$) as measured by the PPQ.

Hypothesis 3

There was no significant difference between the treatment group's increased confidence and ability to cope with the tasks of motherhood and the control group's increased confidence and ability to cope with the tasks of motherhood after 6 weeks ($p = .49$) as measured by the PPQ.

CHAPTER V

DISCUSSION

To determine if a 6 week walking program improves psychological well-being in postpartum women, the researcher examined depression, life circumstances, and confidence in tasks of motherhood. In the following sections, the investigator discusses the findings, the study's conclusions, relation to the TPB, adherence rates, additional benefits, limitations of the study, and recommendations for further study.

Conclusions

While the main hypotheses were not supported, both treatment and wait-listed control groups' psychological well-being improved over time. As indicated in Table 4, the measured variables, life circumstances, and depression decreased, and confidence in the tasks of motherhood increased. This shows that as time passes women become more acclimated to their role as mothers and psychological well-being tends to progress.

One possible explanation for the finding that the treatment's psychological well-being did not vary from the wait-list control is that the intensity level of 3-4 Mets did not differentiate sufficiently between the two groups. The researchers in this study utilized a light to moderate exercise regimen, as new mothers' safety was imperative, and moderate intensity workouts improved psychological well-being in numerous studies (Armstrong & Edwards, 2004; Doyne et al., 1983; Dunn et al., 2001, and McNeil et al., 1991).

Ultimately, light and moderate workouts may not have been of sufficient intensity to facilitate differential gains with improved depression, improved confidence in the tasks of motherhood, and improved life circumstances. This is consistent with other researchers who suggest that greater aerobic fitness improves psychological well-being levels more than lower aerobic fitness (Sexton et al., 1989). Vigorous exercise was performed by postpartum participants who saw gains in their satisfaction with life circumstances and confidence in the ability to cope with the tasks of motherhood (Sampsel et al., 1999). In past research aerobic exercise at intensity between 60% and 70% of maximal heart rate reserve was associated with improved psychological well-being (Sexton et al., 1989). Utilizing a higher percent maximal heart rate was not a part of the protocol for this research.

Another possible explanation for the results is that a 6 week exercise intervention may have been too brief of a time period to see improved psychological well-being, as other exercise interventions with a postpartum sample were 12 weeks in length (Armstrong & Edwards, 2004). In a study by DiIorio et al (1999), a 12 week exercise intervention proved helpful for non-postpartum adults. The research concerning the length of exercise interventions is equivocal. Numerous researchers have found improvements in psychological well-being with 6 weeks exercise interventions (Babyak et al., 2000; Blumenthal et al., 1999; and Conroy et al., 1982).

Life circumstances did not improve significantly between the treatment and the wait-list control. This finding is inconsistent with the Sampsel (1999) research. In that study, postpartum participants who exercised regularly experienced improved life circumstances compared with postpartum participants who were more sedentary (1999).

Other studies with postpartum populations engaged in walking programs have had a social component with postpartum participants exercising with other new mothers. In those studies it is difficult to discern whether the decreased depression levels were due to the physiological effects of exercise getting out of the house and the social dynamic of being around participants in the same station of life.

The participants in the current study may have found staying indoors to exercise not as stimulating as exercising out in nature. Other exercise interventions for postpartum women have taken place outdoors. It is unknown if this population of postpartum women would respond more favorably to exercising in nature compared to exercising in their own homes.

With the myriad demands placed on postpartum women, it is important to note that psychological well-being did not decrease in the treatment group. Expectations of a new exercise regimen were not perceived as an additional burden distressing the new mothers.

Adherence Rates

Typically, the adherence rate to exercise programs is 50%. This research is consistent with previous researchers' conclusions that weekly phone calls or e-mails from an exercise scientist motivate participants to continue with the program (Albright et al., 2000). In this study, the adherence rate of the participants was extremely high (98%). In fact, the single participant who dropped out of the study due to extreme fatigue was, at the time, unaware that she was pregnant with her third child during the intervention. The high adherence rate of this study is supported by research that concluded walking is the most popular activity among postpartum women (Currie & Devlin, 2002). Future

researchers are encouraged to employ methods that can positively influence commitment to maintain the exercise regimen. From the outset, this program was achievable. The goals participants set with the exercise scientist were realistic, fun, and convenient. Research indicates these qualities are important for compliance (Griest et al., 1979).

Adherence may have been higher due to the region's weather. This study took place in the summer of 2006 and the summer of 2007. The oppressive heat made indoor activity more appealing than at other less inclement seasons, when outdoor activity might have seemed more attractive.

The nature of this walking program reduced barriers to exercise. This is supported by past studies (Currie & Devlin, 2002). The program allowed each participant to work around her infant's specific needs. Feeding and sleeping schedules of infants were taken into consideration.

New mothers feel confident about their ability to walk as exercise; whereas, the same population may feel apprehensive about trying different, less familiar exercise routines. Since walking is recreational and noncompetitive, more women are willing to participate (Currie & Develin, 2002). Moreover, past researchers (Hinton & Olsen, 2001) concur that it is important to consider the sources of self-efficacy when designing exercise interventions.

Adherence rates to future postpartum exercise programs may be high as this program is cost-effective for participants. In addition to removing the financial expense of childcare, it removes the monetary cost of gym membership or a personal trainer. Since some participants had recently quit jobs to embrace stay-at-home mothering, methods without extraneous expenses were appealing. Though the participants in this

study did not suffer from PPD, this walking program may provide a cost-effective way of managing women with mild to moderate depression. Evidence exists that exercise is as effective as psychotherapy and antidepressant medication in treating mild to moderate depression. Research is needed to help medical professionals integrate this program into routine activities for their patients.

Additional Benefits

The involvement of ambulatory children was an unexpected by-product that emerged from this research. In fact, several of the participants' older children completed workouts with their mothers. All of the participants in the study were interested in leaving a legacy of health and fitness to their offspring. By modeling fitness walking within view of children, many of the participants' progeny became more active as a result. Indeed, one participant's kindergartener insisted on bringing the *Walk Away the Pounds Express* DVD to her class's "show and tell" activity. Another participant reported that her 3-year old enjoys walking to the video several times a week.

Participants' recruitment of other loved ones was yet another unexpected by-product of this study. The mothers, fathers, and husbands of the participants were sometimes encouraged to exercise with the DVD/video, as well. In the video adult men and women of varying ages and weight are exercising; thus, older individuals and men are not intimidated.

The ease of this program demonstrated benefits for those who were not fit. Participants with a variety of activity levels were represented in this research; participants ranged from triathletes and marathoners to sedentary individuals. The walking program

adequately met the challenging needs of these extreme levels of exercise while in the postpartum period.

Relation to the TPB

The exercise scientist incorporating the framework of TPB within the initial visit appeared to assist with each participant's adherence. This is consistent with previous research with prepartum participants' exercise programs (Downs & Hausenblas, 2004). The majority of the 25 treatment participants ($n = 19$) claimed they would "work hard" to complete the exercise program. The rest of the participants ($n = 6$) declared they would "work pretty hard" to complete the program. Clearly, this asserted intention increased adherence levels. Each participant's expectations affected her willingness to persevere with the exercise routine for 6 weeks.

As the TPB suggests, including positive subjective norms through social support is an essential key to unlocking behavior change success. This is supported by research that indicates that family support is a recurring social factor related to adherence. Specifically, with postpartum women, social support through positive attitudes with exercise is an important predictor of exercise frequency at 1 year after giving birth (Hinton & Olsen, 2001). A support system seems necessary for postpartum women to maintain exercise habits (Blum et al., 2004). In fact, father's participation in childcare positively influences the mother's perception of the quality of her relationship with her spouse (Cronenwett, 1985).

The attitude toward behavior is another element to TPB that was addressed in this research. The vast majority of the participants viewed exercise as beneficial. This is consistent with past research with postpartum women and walking programs where 93%

agreed that it could improve physical fitness and 92% said it could increase mental well-being (Currie & Develin, 2002).

Perceived control of beliefs plays an integral role in TPB. Control encompasses self-efficacy, in that self-efficacy is the belief in one's ability to perform a behavior. In fact, past research indicates that higher self-efficacy is significantly associated with improved change in physical activity for new mothers (Hinton & Olsen, 2001).

Limitations

Four limitations emerged with this study. The flawed collection of the anxiety measurement, generalizability, the wait-list control group, and the small sample size of the population were all problematic. Due to a mistake by the researcher, the variable anxiety had to be removed from this research study. The total score for the PPQ was deemed an inappropriate measurement of anxiety. Furthermore, the sample was uniquely highly motivated. The women were a homogeneous group according to age, marital status, race, socio-economic level, spirituality, education, planned pregnancy, healthy babies, and a lack of military affiliation. All participants completed intervention in the summer months. The sample was drawn from one geographical area, and generally participants were white, non-Hispanic, well-educated women who had high levels of social support. As a result of their circumstances, the participants in both the treatment and the wait-list control had enhanced psychological well-being compared to women experiencing hardships and more challenging life circumstances (Blum et al., 2004). The design of the wait-list was problematic, as well. The participants in both the treatment and the control were highly motivated to lose weight. In fact, when interviewed, all

($N = 48$) desired to lose weight. Participants in the exercise and control groups were recruited using the same advertisements and interview questions; therefore, participants in both groups were interested in exercise. The wait-list participants were instructed to continue with their normal routine and receive the exercise program at the end of 6 weeks. Many in the wait-listed control exercised frequently of their own volition, as indicated by the activity logs turned into the researcher. Moreover, the sample size was small. A sample size of more than 48 participants may have been more beneficial in achieving higher statistical power for this study. Throughout the literature, studies of exercise interventions with postpartum women measuring psychological well-being often have less than 48 participants (i.e., Armstrong and Edwards (2004) have 24 participants; Cramer et al. (1990) has 35 participants, Kaye, Soothill, Hunt & Lightman (2004) has 14 participants; Kotlyn (1994) has 20 participants; Kotlyn (1997) has 20 participants. Exercise intervention studies measuring psychological well-being in nonpostpartum participants inundate the literature: Chasey, Swartz, & Chasey 1974 ($N = 44$); Daley & Huffman 2003 ($N=35$); Dimeo et al., 2001 ($N = 12$); Gary & Guthrie 1972 ($N = 36$); Greist, et al., 1979 ($N = 28$); McNeil et al, 1991 ($N = 30$); and Prosser et al., 1981($N = 23$); and Stamford, Hambacher, & Fallica, 1983 ($N = 25$).

Recommendations for Further Study

There is limited research regarding the psychological or physiological effects of an exercise intervention in postpartum women. Home-based walking program provides convenience and reduces the personal, social, and economic costs of exercise.

Furthermore, the possible benefits of maternal fitness on the daily physical activities of

mothering, including lifting, carrying, or running after a child are not known and should be investigated.

Future research should take advantage of the benefits of support in participants' families. By involving partners in the program, conflict is reduced between the participant and the partner by promoting mutual fitness goals. If physical activity is fostered in the home, then it evolves into a social norm within the family. This social norm is a powerful influence for adherence to an exercise program. Since the lasting influence of parental exercise is far-reaching, future research should focus on programs that incorporate the offspring of the participants. "Mommy and Me" videos may be ideal to incorporate a workout structure.

No research-based guidelines exist for postpartum women. Deciding on an appropriate exercise prescription for postpartum women's well-being will assist in guiding this population to appropriate exercise length, intensity, frequency, and duration. Some researchers suggest the intensity may need to be reduced at the beginning of a program and then increased gradually, as postpartum women's fitness levels are generally reduced because of the limitations in exercise reported by women after giving birth to a baby. The optimal amount of exercise needed to maintain the psychological benefits accrued from exercise interventions needs to be established.

Breast-feeding was not a variable that was considered in this research. However, it would be advantageous for future researchers to examine the role of breast-feeding in postpartum psychological well-being. Moreover, the research is equivocal concerning the effect of exercise on breast-feeding and the effect of breast-feeding on weight-loss.

Future research should include interventions tailored to postpartum women who are at a higher risk for inactivity. Women who become pregnant at a young age, single mothers, women of low income and lower socioeconomic status, and mothers with little education are under-represented in postpartum research. Moreover, African-American women tend to retain more weight after pregnancy than white women; therefore, studies involving this population would be beneficial (Larson-Meyer, 2002). These groups are vulnerable to inactivity and were not well represented in this research.

Follow-up studies with these participants may include maintenance of the psychological gains over a 12 month period. Long-term effects would be consistent with previous literature. Weight loss, anxiety, and improved life circumstances could be tracked as well.

Exercise may prove to be an effective nonpharmacological way to regulate moods during the postpartum period. Greater attention to postpartum women's psychological well-being is warranted. This study provides important new evidence that home-based exercise programs designed specifically for postpartum women hold promise as an effective and feasible public health strategy for increasing activity levels.

REFERENCES

- Abraham, S., Taylor, A., & Coutu, J. (2001). Postnatal depression, eating, exercise, and vomiting before and during pregnancy. *International Journal of Disordered Eating* 29 (4), 481-486.
- Abou-Saleh, M.T., Ghubash, R., Karim, L., Krymski, M., & Bhai, I. (1998). Hormonal aspects of postpartum depression. *Psychoneuroendocrinology* 23(5), 465-475.
- Albright, C. L., Cohen, S., Gibbons, L., Miller, S., Marcus, B., Sallis, J., et al. (2000). Incorporating physical activity advice into primary care physician delivered advice within the activity counseling trial. *American Journal of Preventive Medicine*, 18 (3), 225-234.
- American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.) Washington, DC: Author.
- Armstrong, K. & Edwards, H. (2004). The effectiveness of a pram-walking exercise programme in reducing depressive symptomatology for postnatal women. *International Journal of Nursing Practice*, 10, 177-194.
- Artal, R., O'Toole, M., and White, S. (2003). Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period. *British Journal of Sports Medicine*, 37, 6-12.

- Babyak, M., Blumenthal, J. A., Herman, S., Khartri, P., Doraiswamy, M., Moore, K., et al. (2000). Exercise treatment for major depression: maintenance of therapeutic benefit at 10 months. *Psychosomatic Medicine* 62, 633-638.
- Berger, B.G., & Owen, D.R. (1988). Stress reduction and mood enhancement in four exercise models: swimming, body conditioning, Hatha yoga and fencing. *Research Quarterly for Exercise and Sport* 59, 148-159.
- Bloch, M., Rotenberg, N., Koren D., & Klein E. (2006) Risk factors for early postpartum depressive symptoms. *General Hospital Psychiatry* 28, 3–8
- Blum, J. W., Beaudoin, C. M., & Canton-Lemons, L. (2004). Physical activity patterns and maternal well-being in postpartum women. *Maternal and Child Health Journal*, 8(3), 163-169.
- Blumenthal, J. A., Babyak, M. A., Moore, K.A., Craighead, W. E., Herman, S., Khatri P., et al. (1999). Effects of exercise training on older patients with major depression. *Archives of Internal Medicine*, 159, 2349-2356.
- Boardley, D.J., Sargent, R.G., Coker, A.L., Hussey, J.R., Sharpe, P.A. (1995). The relationship between diet, activity, other factors, and postpartum weight change by race. *Obstetrics and Gynecology* 86(5), 834-838.
- Boyd, R.C., Zayas, L.H., McKee, M.D. (2006). Mother-infant interaction and prenatal and postnatal depressive symptoms among urban minority women in primary care. *Maternal and Child Health Journal* 10(2) 139-148.

- Cadzo, S.P., Armstrong, K.L., & Fraser, J.A. (1999). Stressed parents with infants: reassessing physical abuse risk factors. *Child Abuse and Neglect* 23(9) 845-853.
- Calfas, K.J., Long, B.J., Sallis, J.F., Wooten, W.J., Pratt, M., & Patrick, K. A. (1996). A controlled trial of physician counseling to promote the adoption of physical activity. *Preventive Medicine* ,25, 225-233.
- Centers for Disease Control and Intervention. (2004b). Pediatric and Pregnancy Nutrition Surveillance System---United States, 2004. *Pregnancy Data Tables*, 58, 1-64
Retrieved October 8, 2005 from <http://ww.cdc.gov/pednss-tables/index.htm>.
- Chasey, W.C., Swartz, J.D., & Chasey, C.G. (1974). Effects of motor development on body image scores for institutionalized mentally retarded children. *American Journal of Mental Deficiency*, 78, 440-445.
- Conroy, R.W., Smith, K., & Felthous, A.R. (1982). The value of exercise on a psychiatric hospital unit. *Hospital Community Psychiatry* 33, 641-645.
- Cooper, P.J., Murray, L., Wilson, A., & Romaniuk, H. (2003). Controlled trial of the short and long-term effect of psychological treatment of postpartum depression. *British Journal of Psychiatry*182, 412- 419.
- Cox, J.L., Holden, J.M., & Sagovsky, R. (1987). Detection of postnatal depression development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry*, 150, 782-785.

- Craft, L. L., & Landers, D. M. (1998) The effects of exercise on clinical depression and depression resulting from mental illness: A meta-analysis. *Journal of Sport & Exercise Psychology* 20, 339–357.
- Craft, L.L., & Perna, F.M. (2004). The benefits of exercise for the clinically depressed. *Primary Care Companion Journal of Clinical Psychiatry*, 6(3), 104-111.
- Cramer, S.R., Neiman, D.C., & Lee, J.L. (1990). The effects of moderate exercise training on psychological well-being and mood state in women. *Journal of Psychosomatic Research*, 35(4/5) 437-449.
- Cronenwett, L. (1985). Network structure, social support, and psychological outcomes of pregnancy. *Nursing Research*, 34(2), 93-99.
- Currie, J.L., & Develin, E. (2002). Stroll your way to well-being: a survey of the perceived benefits, barriers, community support, and stigma associated with pram walking groups designed for new mothers, Sydney, Australia. *Health Care for Women International* 23, 882-293.
- Daley, A.J., & Huffman, C. (2003). The effects of low and moderate intensity exercise on subjective experiences in a naturalistic health and fitness club setting. *Journal of Health Psychology* 8(6), 685-691.
- Davey, S.J., Dziurawiec, S., & O'Brien-Malone, A. (2006). Men's voices: postnatal depression from the perspective of male partners. *Qualitative Health Research* 16(2) 206-220.

- Davis, L., Edwards, H., Mohay, H. & Wollin, J. (2003). The impact of very premature birth on the psychological health of mothers. *Early Human Development* 73, 61-70.
- Dennis, C. (2003). The effect of peer support on postpartum depression: a pilot randomized controlled trial. *Canadian Journal of Psychiatry* 48(2), 115-125.
- DiLorenzo, T.M, Bargman, E.P., Stucky-Ropp, R., Brassington, G.S., Frensch, P.A., & LaFontaine, T. (1999). Long-term effects of aerobic exercise on psychological outcomes. *Preventive Medicine* 28, 75-85.
- Dimeo, F., Bauer, M., Varahram, I., Proest, G., & Halter, U. (2001). Benefits from aerobic exercise in patients with major depression: a pilot study. *British Journal of Sports Medicine* 35, 114-117.
- Downs, D.S., & Hausenblas, H.A. (2004). Women's exercise beliefs and behaviors during their pregnancy and postpartum. *Journal of Midwifery & Women's Health* 49(20), 138-144.
- Doyne, E.J., Chambless, D.L., & Beutler, L.E. (1983). Aerobic exercise as treatment for depression in women. *Behavior Therapy* 14, 434- 440.
- Driver, H.S. & Taylor, S.R. (2000). Exercise and sleep. *Sleep Medicine*. 4(4) 387-402.
- Dunn, A.L., Trivedi, M.H., & O'Neal. H.A. (2001). Physical activity dose-response effects on outcomes of depression and anxiety. *Medicine and Science in Sports and Exercise*, S587-S597.

- Eberhard-Gran, M., Tambs, K., Opjordsmoen, S., Skrandal, A., Esklind, A. (2003). A comparison of anxiety and depressive symptomatology in postpartum mothers. *Social Psychiatry Epidemiology* 38, 551-556.
- Gary, V., & Gutherie, D. (1972). The effect of jogging on physical fitness and self-concept in hospitalized alcoholics. *Quarterly Journal Studies of Alcohol* 33, 1073-1078.
- Green, B.B., McAfee, T., Hinmarsh, M., Madsen, L., Caplow, M., & Buist, D. (2002). The effectiveness of telephone support in increasing physical activity levels in primary care patients. *American Journal of Preventive Medicine* 22(3), 177-183.
- Griest J.H., Klein M.H., Eischens R.R., Faris, J., Gurman, A.S., & Morgan, W.P. (1979). Running as Treatment for Depression. *Comprehensive Psychiatry*, 41-54.
- Halman, L.J., Oakley, D., Lederman, R. (1995). Adptation to pregnancy and motherhood among sebfecund and fecund primiparous women. *Maternal-Child Nursing Journal* 23(3). 90-99.
- Heh, S., & Fu, Y. (2003). Effectiveness of informational support in reducing the severity of postnatal depression in Taiwan. *Journal of Advanced Nursing*, 42(1), 30-36.
- Henderson, J.L., Evans, S.F., Straton, J. A., Priest, S.R., & Hagan, R. (2003). Impact of postnatal depression on breast-feeding duration. *BIRTH* 30(3), 175-180.

- Hiltunen, P., Jokelainen, Jari, Ebeling, H., Szajnberg, Moilanen, I. (2004). Seasonal variation in postnatal depression. *Journal of Affective Disorders* 78, 111-118.
- Hiltunen, P., Raudaskosko, T., Ebeling, H., & Moilanen, I. (2004). Does pain relief during delivery decrease the risk of postnatal depression? *Acta Obstetrica et Gynecologica Scandinavica* 83, 257-261.
- Hinton, P.S., & Olson, C. (2001). Postpartum exercise and food intake: the importance of behavior-specific self-efficacy. *Journal of the American Dietetic Association* 101(12), 1430-1437.
- Honey, K.L., Bennett, P., & Morgan, M. (2002). A brief psycho-educational group intervention for postnatal depression. *British Journal of Clinical Psychology* 41, 405-409.
- Huang, Y. (2000). Postnatal depression-biological or cultural? A comparative study of postnatal women in the UK and Taiwan. *Issues and Innovations in Nursing Practice* 33(3), 279-287.
- Izard, C. E., Libero, D. Z., Putnam, P., & Haynes, O. M. (1993). Stability of emotion experiences and their relations to traits of personality. *Journal of Personality and Social Psychology* 64 (5), 864-860.
- Jette, A.M., Lachman, M., Giorgetti, M., Assmann, S.F., Harris, B.A., Levenson, C., Wernick, M., & Krebs, D. (1999). Exercise—it's never too late, the strong-for-life program. *American Journal of Public Health* 89(1), 66-72.

- Josefsson, A., Berg, G., Nordin, C., & Sydsjo, G. (2001). Prevalence of depressive symptoms in late pregnancy and postpartum. *Acta Obstetrica et Gynecologica Scandinavica* 80, 251-255.
- Kang, M., Ragan, B.G., & Park, J.H. (2008). Issues in outcome research: An overview of randomization techniques for clinical trials. *Journal of Athletic Training*, 43(2), 215-221.
- Kardel, K.R. (2005). Effects of intense training during and after pregnancy in top-level athletes. *Scandinavian Journal of Medicine and Science in Sports* 15, 79-86.
- Kardel, K.R. & Trygve, K. (1998). Training in pregnant women: Effects on fetal development and birth. *American Journal of Obstetrics and Gynecology* 178(2) 280-286.
- Kaye, J., Soothill, P., Hunt, M., & Lightman, S. (2004). Responses to the 35% challenge in postpartum women. *Clinical Endocrinology* 61, 582-588.
- Kirkcaldy, B.D., Shephard, R.J., & Siefen, R.G. (2002). The relationship between physical activity and self-image and problem behaviour among adolescents. *Social Psychiatry Psychiatric Epidemiology* 37, 544-550.
- Koltyn, K.F. (1994). Mood changes in pregnant women following an exercise session and a prenatal information session. *Women's Health Issues* 4(4), 191-195.

- Koltyn, K.F., & Schultes, S.S. (1997). Psychological effects of an aerobic exercise session and a rest session following pregnancy. *Journal of Sports Medicine and Physical Fitness* 37, 287-291.
- Larson-Meyer, D. E. (2002). Effect of postpartum exercise on mothers and their offspring: a review of the literature. *Obesity Research*, 10, 841-853.
- Lederman, R.P., Weingarten, C.G., & Lederman, F. (1981). Postpartum self-evaluation questionnaire: measure of maternal adaptation. *Birth Defects* 17(6), 201-231.
- Leung, S.S. Martinson, I.M., & Arthur, D. (2005). Postpartum depression and related psychosocial variables in Hong Kong Chinese women: findings from prospective study. *Research in Nursing and Health* 28, 27-38.
- Linne, Y., Dye, L., Barkeling, B., Rossner, S. (2004). Long-term weight development in women: A 15-year follow-up of the effects of pregnancy. *Obesity Research* 12(7), 1166-1177.
- Linne, Y., & Rossner, S. (2003). Interrelationships between weight development and weight retention in subsequent pregnancies: the SPAWN study. *Acta Obstetricia et Gynecologica Scandinavica* 82, 318-325.
- Matthey, S., Barnett, B., Ungerer, J., & Waters, B. (2000). Paternal and maternal depressed mood during the transition to parenthood. *Journal of Affective Disorder* 60, 75-85.

- McMurray, R.G., Hackney, A., Guion, W.K., & Katz, V. (1996). Metabolic and hormonal responses to low-impact aerobic dance during pregnancy. *Medicine and Science in Sports and Exercise* 28(1), 41-46.
- McNeil, J. K., Leblanc, E. M., & Joyner, M. (1991). The effect of exercise on depressive symptoms in the moderately depressed elderly. *Psychology of Aging*, 6, 487-488.
- National Health and Medical Research Council. (1999). Postnatal Depression a Systematic Review of Published Scientific Literature to 1999---Australia, 2000. *Postnatal Depression*, 118-126. Retrieved September 28, 2005 from www.nhmrc.gov.au/publications/synopses/_files/wh29_a.pdf.
- O'Boyle, A.I., Magann, E.F., Ricks, R.E., Doyle, M., Morrison, J.C. (2005). Depression screening in the pregnant soldier wellness program. *Southern Medical Association* 98(4), 416-418.
- O'Brien, M.L., Heycock, E.G., Hanna, M., Jones, P.W., & Cox, J.L. (2004). Postnatal depression and faltering growth: a community study. *Pediatrics* 113, 1242-1247.
- Ohlin, A., & Rossner, S. (1994). Trends in eating patterns, physical activity and socio-demographic factors in relation to postpartum body weight development. *British Journal of Nutrition* 71(4), 457-470.

- Olfson, M., Marcus, S.C., Druss, B., Elinson, L., Tanielian, T., & Pincus, H.A. (2005). National trends in the outpatient treatment of depression. *The Journal of American Medical Association*, 287(2) 203-209.
- Olson, C.M., Strawderman, M.S., Hinton, P.S., & Pearson, T.A. (2003). Gestational weight gain and postpartum behaviors associated with weight change from early pregnancy to 1 year postpartum. *International Journal of Obesity* 27, 117-127.
- Onozawa, K., Glover, V., Adams, D., Modi, N., & Kumar, C. (2001). Infant massage improves mother-infant interaction for mothers with postnatal depression. *Journal of Affective Disorders* 63, 201-207.
- Palmer, L.K. (1995). Effects of a walking program on attributional style, depression, and self esteem in women. *Perceptual and Motor Skills*, 81, 891-898.
- Patel, R.R., Murphy, D.J., & Peters, T. J. (2005). Operative delivery and postnatal depression: a cohort study. *British Medical Journal* 330, 879-883.
- Prosser, G., Carson, P., Phillips, R., Gelson, A., Buch, N., Tucker, H., et al. (1981). Morale in coronary patients following an exercise programme. *Journal of Psychosomatic Research* 25, 587-593.
- Ransford, C.P (1982). A role for amines in the antidepressant effect of exercise: a review. *Medicine and Science in Sports and Exercise* 14(1) 1-10.
- Reissland, N., Shephard, J., & Herrera, E. (2003). The pitch of maternal voice: a comparison of mothers suffering from depressed mood and non depressed

mothers reading books to their infants. *Journal of Child Psychology and Psychiatry* 44(2) 255-261.

Righetti-Veltema, M., Bousquet, A., & Manzzno, J. (2003). Impact of postpartum depressive symptoms on mother and her 18-month-old infant. *European Child & Adolescent Psychiatry* 12, 75-83.

Rooney, B.L., & Schauberger, C.W. (2003). Excess pregnancy weight gain and long-term obesity: One decade later. *Obstetrics and Gynecology* 100(2) 245-252.

Sampselle, C.M., Seng, J.S., Yeo, S., Killon, C., & Oakley, D. (1999). Physical activity and postpartum well-being. *Journal of Obstetric, Gynecologic, and Neonatal Nursing* 28(1) 41-49.

Sexton, H., Maere, A., & Dahl, N.H. (1989). Exercise intensity and reduction of neurotic symptoms: a controlled follow-up study. *Acta Psychiatria Scandinavica* 80, 231-235.

Sherrill, D.L., Kotchou, K., & Quan, S.F. (1998). Association of physical activity and human sleep disorders. *Archives of Internal Medicine* 158, 1894-1898.

Small, R., Lumley, J., Donohue, L., Potter, A., & Waldenstrom, U. (2000). Randomized controlled trial of midwife led debriefing to reduce maternal depression after operative childbirth. *British Medical Journal* 321, 1043-1047.

- Stamford, B.A., Hambacher, W., & Fallica, A. (1983). Effects of a daily physical exercise on the psychiatric state of institutionalized geriatric mental patients. *Research Quarterly in Exercise Science* 45, 35-41.
- Sutter-Dallay, A.L., Giaccone-Marcеше, V., Glatigny-Dallay, E., & Verdoux, H. (2004). Women with anxiety disorders during pregnancy are at increased risk of intense postnatal depressive symptoms: a prospective survey of the MATQUID cohort. *European Psychiatry* 19, 459-463.
- Swain, A. M., O'Hara, M. W., Starr, K. R., & Gorman, L. L. (1997). A prospective study of sleep, mood, and non-postpartum women. *Obstetrics & Gynecology*, 90(3), 381-386.
- Szabo, A., Mescio, A., Caputo, A., & Gill, E.T. (1998) Examination of exercise-induced Feeling states in four modes of exercise. *International Journal of Sport Psychology* 29, 376-390.
- Tammentie, T., Tarkka, M.T., Astedt-Kurki, P., & Paavilainen, E. (2002). Sociodemographic factors of families related to postnatal depressive symptoms of mothers. *International Journal of Nursing Practice* 8, 240-246.
- Tammentie, T., Tarkka, M.T., Astedt-Kurki, P., Paavilainen, E., & Laippala, P. (2004). Family dynamics and postnatal depression. *Journal of Psychiatric and Mental Health Nursing* 11, 141-149.

- Taylor, A., Atkins, R., Kumar, R., Adams, D., & Golver, V. (2005). A new mother-to-infant bonding scale: links with early maternal mood. *Archives of Women's Mental Health* 8, 45-51.
- Thompson, J.F., Roberts, C.L., Currie, M.J., and Ellwood, D.A. (2000). Early discharge and postnatal depression: a prospective cohort study. *Medical Journal of Australia* 172, 532- 536.
- Uzendski, A.M., Latin, R.W., Berg, K.E., & Moshier, S. (1990). Physiological responses to aerobic exercise during pregnancy and postpartum. *The Journal of Sports Medicine* 30(1), 77-82.
- Weyerer, S., & Kupfer, B. (1994). Physical exercise and psychological health. *Sports Medicine* 17(2) 108-116.
- Wilkinson, S., Huang, C., Walker, L.O., Sterling, B.S., & Kim, M. (2004). Physical activity in low-income postpartum women. *Journal of Nursing Scholarship*, 36(2) 109-114.
- Wright, K.S., Quinn, T.J., & Carey, G.B. (2002). Infant acceptance of breast milk after maternal exercise. *Pediatrics*, 109(4) 585-589.

APPENDICES

APPENDIX A

Edinburg Postnatal Depression Scale

APPENDIX A

Edinburg Postnatal Depression Scale

Name: _____

Address: _____

Baby's Age: _____

As you have recently had a baby, we would like to know how you are feeling. Please UNDERLINE the answer which comes closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today.

1. I have been able to laugh and see the funny side of things.

As much as I always could
Not quite so much now
Definitely not so much now
Not at all

2. I have looked forward with enjoyment to things.

As much as I ever did
Rather less than I used to
Definitely less than I used to
Hardly at all

3. * I have blamed myself unnecessarily when things went wrong.

Yes, most of the time
Yes, some of the time
Not very often
No, never

4. I have been anxious or worried for no good reason.

No, not at all
Hardly ever
Yes, sometimes
Yes, very often

5. * I have felt scared or panicky for not very good reason.

Yes, quite a lot
Yes, sometimes

No, not much
No, not at all

6. * Things have been getting on top of me.

Yes, most of the time I haven't been able to cope at all
Yes, sometimes I haven't been coping as well as usual
No, most of the time I have coped quite well
No, I have been coping as well as ever

7. * I have been so unhappy that I have had difficulty sleeping.

Yes, most of the time
Yes, sometimes
Not very often
No, not at all

8. * I have felt sad or miserable.

Yes, most of the time
Yes, quite often
Not very often
No, not at all

9. * I have been so unhappy that I have been crying.

Yes, most of the time
Yes, quite often
Only occasionally
No, never

10. * The thought of harming myself has occurred to me.

Yes, quite often
Sometimes
Hardly ever
Never

APPENDIX B

Lederman Postpartum Self-Evaluation Questionnaire

APPENDIX B

Lederman Postpartum Self-Evaluation Questionnaire

POSTPARTUM SELF-EVALUATION QUESTIONNAIRE

Directions

The statements below have been made by mothers of young infants. Read each statement and decide which response best describes your feelings. The circle the appropriate letter next to each statement.

	(4) Very Much So	(3) Moder- ately So	(2) Some- what So	(1) Not at All
1. I know what my baby likes and dislikes.	A	B	C	D
2. My husband/partner participates in the care of the baby.	A	B	C	D
3. It bothers me to get up for the baby at night.	A	B	C	D
4. My husband/partner is understanding (calms me) when I get upset.	A	B	C	D
5. The baby is a financial burden for us now.	A	B	C	D
6. Childbirth gave me a feeling of accomplishment.	A	B	C	D
7. My husband/partner feels that caring for the baby is not his responsibility.	A	B	C	D
8. We need more things than we can afford to buy.	A	B	C	D
9. My recent delivery made me proud of myself.	A	B	C	D
10. I feel close to my husband/partner.	A	B	C	D
11. It is boring for me to care for the baby and do the same things over and over.	A	B	C	D
12. I am uncertain about whether I can make the right decisions for my baby.	A	B	C	D
13. My husband/partner helps as little as possible with child care.	A	B	C	D
14. When the baby cries, I can tell what s/he wants.	A	B	C	D
15. I have friends or relatives who reassure me as a mother.	A	B	C	D
16. My husband/partner spends time with the baby.	A	B	C	D

Principal Investigator (Last, first, middle): Lederman, Regina P

	Very Much So	Moder- ately So	Some- what So	Not at All
17. My patience with the baby is limited.	A	B	C	D
18. I am concerned about raising children in the neighborhood we live in.	A	B	C	D
19. My parent(s) criticize me as a mother	A	B	C	D
20. I am unhappy with the amount of time I have for activities other than child care.	A	B	C	D
21. My husband/partner gets annoyed when I ask him to help with the care of the baby..	A	B	C	D
22. I enjoy taking care of the baby.	A	B	C	D
23. I am upset about having too many responsibilities as a mother.	A	B	C	D
24. It is hard to talk to my husband about problems I have.	A	B	C	D
25. When bathing and diapering the baby, I would like to be doing something else.	A	B	C	D
26. I have doubts about whether I am a good mother.	A	B	C	D
27. I would like to be a better mother than I am.	A	B	C	D
28. I remember labor as unpleasant and frightening.	A	B	C	D
29. I can talk to some of my friends or relatives about questions I have concerning motherhood.	A	B	C	D
30. My budget allows me to get the help I need with housework and other tasks.	A	B	C	D
31. My husband/partner criticizes me as a wife/partner.	A	B	C	D
32. My husband/partner wants to share in the care of the baby.	A	B	C	D
33. I am glad I had this baby now.	A	B	C	D
34. I get annoyed if the baby frequently interrupts my activities.	A	B	C	D
35. I am concerned about having a steady income for my family.	A	B	C	D

Principal Investigator (Last, first, middle): Lederman, Regina P

	Very Much So	Moder- ately So	Some- what So	Not at All
36. I feel that I know my baby and what to do for him/her.	A	B	C	D
37. My husband/partner would rather spend time at work or a hobby than be with me.	A	B	C	D
38. My husband/partner cares about how I feel.	A	B	C	D
39. My husband/partner makes me feel I am a burden to him.	A	B	C	D
40. I have friends or relatives who encourage me to care for the baby in my own way.	A	B	C	D
41. My I am able to hire a babysitter when I need one.	A	B	C	D
42. I enjoy being a mother.	A	B	C	D
43. When I am feeling down or depressed, my husband/partner reassures me.	A	B	C	D
44. Feeding the baby gives me a feeling of satisfaction.	A	B	C	D
45. My husband/partner and I are having problems with our marriage.	A	B	C	D
46. My parent(s) are interested in the baby.	A	B	C	D
47. I feel joyful when I remember the birth of the baby.	A	B	C	D
48. I feel I reacted badly to the pain of labor.	A	B	C	D
49. I can share my thoughts and feelings with my husband/partner.	A	B	C	D
50. I am concerned about being able to meet the baby's needs.	A	B	C	D
51. There is enough money for all my family's basic needs.	A	B	C	D
52. I don't know how to care for the baby as well as I should.	A	B	C	D
53. I play with the baby between feedings when s/he is awake and quiet.	A	B	C	D
54. My husband/partner shows an interest in the baby.	A	B	C	D

Principal Investigator (Last, first, middle): Lederman, Regina P

	Very Much So	Moder- ately So	Some- what So	Not at All
55. Discussions I have with my husband/partner end in arguments.	A	B	C	D
56. My husband/partner lets me down when I need him.	A	B	C	D
57. When the baby cries, my husband/partner ignores it.	A	B	C	D
58. I have regrets about how I coped with labor.	A	B	C	D
59. I trust my own judgment in deciding how to care for the baby.	A	B	C	D
60. Our home is too small for all of us.	A	B	C	D
61. I know what my baby wants most of the time.	A	B	C	D
62. I can rely on friends or relatives to help me with the baby when necessary.	A	B	C	D
63. I am unsure about whether I give enough attention to the baby.	A	B	C	D
64. I feel burdened with the many demands made on me as a mother.	A	B	C	D
65. My husband/partner dislikes caring for the baby.	A	B	C	D
66. My parent(s) makes me feel like there is little I can do right.	A	B	C	D
67. Overall, my labor and delivery was a good experience.	A	B	C	D
68. I feel disappointed in the delivery experience I had.	A	B	C	D
69. I have friends or relatives who are interested in the baby.	A	B	C	D
70. I worry about how we'll manage on our present income.	A	B	C	D
71. My husband/partner enjoys holding the baby.	A	B	C	D
72. My parent(s) think I should take better care of the baby.	A	B	C	D

Principal Investigator (Last, first, middle): Lederman, Regina P

	Very Much So	Moder- ately So	Some- what So	Not at All
73. Giving birth was gratifying to me.	A	B	C	D
74. My husband/partner avoids helping with child care.				
75. I would prefer to go to work or classes and have someone else care for the baby.	A	B	C	D
76. I am unsure of what to do for the baby when s/he cries.	A	B	C	D
77. My parent(s) seem to like the way I care for the baby.	A	B	C	D
78. I have friends or relatives who think I am a good mother.	A	B	C	D
79. I feel good about how I handled myself during labor and delivery.	A	B	C	D
80. My parent(s) show little interest in the baby.	A	B	C	D
81. I feel secure about my future financial situation.	A	B	C	D
82. I have confidence in my ability to care for the baby.	A	B	C	D

APPENDIX C

Institutional Review Board Approval Letter

Institutional Review Board Approval

Office of Compliance
P.O. Box 114
Middle Tennessee State University
Murfreesboro, Tennessee 37132
Office: (615) 494-8918 • Fax: (615) 898-5028
www.mtsu.edu/~research/compliance.html



11/23/2005

Protocol Title: The Effects of an Exercise Program in Postnatal Women's...

Protocol Number: 06-053

karenpettyrobichaud@hotmail.com; pohara@mtsu.edu

Dear investigator:

The MTSU Institutional Review Board or representative of the IRB has reviewed your research proposal, and with the addition of the items requested, has approved your protocol.

Please note that any unanticipated harms to subjects or adverse events must be reported to the Office of Sponsored Programs at (615) 898-5005.

Approval is granted for one (1) year from the date of this letter for 80 subjects

You will need to submit an end-of-project report to the Office of Research and Sponsored Programs upon completion of your research.

Please note that any change to the protocol must be submitted to the IRB before implementing this change.

Sincerely,

A handwritten signature in black ink that reads "Robert K. Kalwinsky" with a stylized flourish at the end.

Robert K. Kalwinsky, Ph.D.
rkalwins@mtsu.edu

APPENDIX D
Informed Consent

APPENDIX D

Informed Consent

Informed Consent Letter

You are invited to participate in a study that involves the effects of an exercise program on general well-being for postnatal women.

This study, involves an 11 hour time commitment over a six week period. First you will be asked to complete a questionnaire that takes 15 to 20 minutes. You will be asked some questions about yourself (age, race, gender, marital history, number of offspring), and then you will be asked to complete parts of two additional questionnaires that will ask you questions about how you are adapting to motherhood. In six weeks, you will be asked to repeat the 15-20 minute questionnaire.

Once you consent to participate, you will be randomized into one of two groups. Group A participants begin an exercise intervention immediately following the completion of the questionnaires. Group B participants will delay the exercise intervention for a six week period after completion of the questionnaires. Over the six week exercise intervention period, both groups of participants will be asked to complete three, 30 minute exercise sessions per week by following a video-guided, home-based walking program. An exercise scientist will meet with you to familiarize you with the walking program and tailor your time of exercise to your individual needs. Each week the exercise scientist will contact you through telephone or e-mail to check on your progress with the walking program.

RISKS

There are no reasonable foreseeable risks to you as a participant in this study, although we recognize that some of the questions on the survey are personal, and some participants may be uncomfortable answering some of the questions. If you do become distressed while completing the survey and wish to talk about these thoughts, you will be encouraged to meet with your physician for counseling. If there are specific questions that you prefer not to answer, you may leave those blank. Your participation in this research study is completely voluntary.

You may experience some mild muscle soreness in your calf, quadriceps, or hamstring muscles at a period 24-48 hours after your first walking sessions until your body gets acclimated to the program. Such mild discomfort is typical upon initiating a new exercise regimen. If at any time there are problems that you encounter, you will be encouraged to return to your physician. If at any point while you are exercising, you decide that you no longer wish to participate, you may stop wherever you are. Funds to compensate for physician visits due to injury or distress are not routinely available by this study.

BENEFITS

You have the benefit of receiving a home-based exercise intervention with consultation from an exercise scientist at no cost. We anticipate that you will experience improved health and increased energy from participating in this research. Furthermore, this study will add significantly to the literature on the benefits of exercise for postnatal women.

CONFIDENTIALITY

Some of the information we will be asking you might not be information that you would want others to know about. As a result, all data will be kept confidential. Subject names will be removed and an identifying code will be placed on all data. In addition, data will be stored in a

locked file cabinet within the researcher's office. This is a secure, locked office. Your name will not be used in any report.

As a participant in this study, you have a right to a full explanation of the study, as well as the results. If you have any questions while filling out the survey, or if you have questions about the research after you leave, please contact Karen Robichaud at 615-479-4139 or via email at karenpettyrobichaud@hotmail.com or Dr. Peggy O'Hara, MTSU faculty supervisor pohara@mtsu.edu. Thank you for participating in this research. If you have any questions about your rights as a research participant, you may contact the MTSU Institutional Review Board Administrator at 615-898-5005.

Agreement:

I have read the procedures described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Participant: _____ Date: _____

Researcher _____ Date _____

APPENDIX E

Structured Interview

APPENDIX E

Structured Interview

1. Describe your feelings about exercise.
2. How useful is it you to exercise three times a week for 30 minutes?
3. What are the benefits of exercise to you?
4. What barriers would prevent you from completing your 30 minute walking program 3 times a week?
5. How often and at what intensity does your partner or the person closest to you think you should try to exercise?
6. Describe your spouse or partner's exercise routine.
7. Describe your friends' exercise routines.
8. What are the exercise patterns of other important people in your life?
9. How hard do they think you should exercise in the next six weeks?
10. How confident do you feel about completing this intervention?
11. In the next six weeks, how hard do you intend to try to complete the walking program?

12. What are your personal fitness goals for the next several weeks?

13. What would you like your fitness legacy to be for your baby?

APPENDIX F

Physician Permission Form

APPENDIX F

Physician Permission Form

PHYSICIAN PERMISSION FORM**FOR :Walking Program**

Dear Physician:

Ms _____ a patient of yours, wishes to participate in an exercise research program sponsored Middle Tennessee State University. Since your patient is in the postpartum period, we require that she receive written permission from you before being allowed to participate. We need documentation that exercise is not contraindicated for your patient or any modifications that you wish to be made.

The walking program has been designed to meet the specific needs of its postpartum participants. The exercise program will consist of three, 30 minute, home-based, walking sessions per week. The Centers for Disease Control (CDC) and the American College of Sports Medicine (ACSM) recommend that post partum women accumulate 30 minutes a day of exercise on most if not all days of the week to derive healthy benefits. In the absence of either medical or obstetric complications, members of our population will adopt this recommendation. Furthermore, the CDC and ACSM recommend an intensity rate of at least 3-4 METS. Therefore, this study will employ a walking program at 3-4 METS intensity which is the equivalent of METS used while cleaning the house, shopping for groceries, bathing a child, or playing shuffleboard.

If you have any questions regarding this research please call the lead investigator Karen Robichaud at 615-479-4139.

Sincerely,

Karen Robichaud,

Please Fax to 615-269-1806

As the physician for Ms. _____, it is my opinion that she may participate in the above exercise program. If there are any modifications, please indicate them below.

Comments:

Date: _____ Physician's Signature _____

Date: _____ Physician's Signature _____

I _____ hereby acknowledge that I have been
print name

informed and understand the procedures involved with the research study that Megan Mitchell, under the supervision of Dr. Peggy O'Hara Murdock, will conduct and grant permission for the research project titled "Health Belief Model and Nutritional Supplement Use among High School Athletes: A Structural Equation Model" to be conducted once Internal Review Board (IRB) approval is attained.

Print name

Signature

Date

APPENDIX G
Demographics

APPENDIX G
Demographics

Demographics

Name:

Address:

Age:

Marital Status _____

If you are married, how long have you been married? ____ If you are not married, do you live with a partner who assists in the care of your child?

Type of delivery caesarean or vaginal,

Natural childbirth of medicated during delivery

Work status before pregnancy

Work status during pregnancy

Work status after pregnancy

How many times per week did you exercise per week before this pregnancy?

How many times per week did you exercise per week during this pregnancy?

How many times per week did you exercise per week before after this pregnancy?

Weight before pregnancy _____

Weight the week of delivery _____

Weight today _____

Please list any serious illness you have or have had in the past.

Are you currently taking antidepressants?

Have you been diagnosed for high blood pressure?