IS THERE A RELATIONSHIP BETWEEN PRE-NATAL EXERCISE AND POSTPARTUM DEPRESSION.

by

SHERYL LYNN STEPHENSON

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ABSTRACT

Postpartum depression is a phenomenon that has baffled physicians and others involved with the care of childbearing women throughout history. Various theories and explanations of the causes of postpartum depression and suggested treatment have been found in the literature. Since exercise has been shown to be effective in treating and potentially preventing other forms of clinical depression, the purpose of this study was to explore the relationship between regular physical activity during the prenatal period and the incidence of postpartum depression.

This study recruited 220 volunteer subjects from maternity wards of two hospitals in the Lower Mainland area. The subjects were requested to give information about their physical activity schedule before pregnancy, during their pregnancy period and after. Subjects were also given a demographic questionnaire, the Perceived Stress Scale and the Norbeck Social Support Scale to complete while in the hospital in the days immediately following childbirth. At six weeks postpartum, the women completed the Edinburgh Postpartum Depression Scale, a scale specifically developed to measure postpartum depression.

Using two-way ANOVA's, no relationship was found between regular physical activity and postpartum depression. Since perceived stress and social support had been linked to postpartum depression in the literature, a multiple regression analysis was

used to investigate their relationships to the incidence of postpartum depression in the current study. Two profile analyses were used to determine if any relationships existed between demographic characteristics, such as age, income level, occupation, and postpartum depression. Perceived stress was the only variable that was found to be related to postpartum depression.

A lack of significance between postpartum depression and the variables chosen in this study (with the exception of perceived stress) may indicate that there is still an unknown factor that makes postpartum depression unique when compared with other depressions. Further research is needed in the potential use of exercise for the treatment of postpartum depression. A clearer understanding of the exercise postpartum depression relationship is necessary before regular exercise might be used to affect the incidence of postpartum depression. It is also recommended that a more detailed record of physical activity be used to gather information about long term exercise schedule, frequency, duration and intensity of participation in physical activity.

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INTRODUCTION

Psychological responses to childbirth range from a mild to an extreme transient mood disturbance although not all women experience negative feelings. Most commonly, three categories of postpartum depression are reported; postpartum blues (mildest form), postpartum depression, and postpartum psychosis (most severe form). Postpartum blues occur in the first week following childbirth with symptoms peaking on the third to seventh day (Gitlin & Pasnau, 1989). Postpartum psychosis affects one or two women per 1000 births with the majority of new mothers showing initial symptoms before the third week postpartum. Postpartum depression occurs in the weeks following delivery (Gitlin & Pasnau, 1989) and its severity lies between the extremes of postpartum psychosis and postpartum blues. The present study has investigated postpartum depression.

There is little agreement in the literature on a definition of postpartum depression. Postpartum depression has been defined by means of elevated self-report depression scores, by the presence of selected symptoms of depression and by the need to be admitted to a psychiatric facility and to receive medical treatment. Symptoms that persist beyond a two week period and up to one year postpartum may indicate the presence of postpartum depression. The symptoms are mercurial; there can be a sudden onset and decline, which makes them confusing and difficult to diagnose (Hamilton, 1989). Most commonly, postpartum depression is regarded as depression occurring in the first postpartum year

and sharing most if not all characteristics of major, minor or other depressions occurring at other times (Steiner, 1990). The term depression is used to refer to a spectrum of phenomena that are distinguished by duration, severity of symptoms, and extent of psychological impairment (Castell & Blumenthal, 1985).

Postpartum depression was first described in the pre-Freudian mid-nineteenth century. At that time, the prevailing etiology implicated organic causes. More recently, postpartum depression has been clustered with various other psychiatric disorders occurring during the period following childbirth (Selby, Calhoun, Vogel & King, 1980).

All childbearing women undergo endocrine and biochemical changes yet some experience postpartum depression and some do not. Postpartum depression is likely caused by a factor or factors other than the endocrine and biochemical changes that occur after childbirth. The social stress theory offers one explanation of why postpartum depression occurs (Landy, Montgomery & Walsh, 1989). This theory focuses upon social support and life stresses as important variables in the onset of postpartum depression.

In many studies that investigated postpartum depression, a lack of social support and the incidence of life stress events appeared to be the strongest predictors of the onset of postpartum depression (Paykel, Emms, Fletcher & Rassaby, 1980; O'Hara, 1986; Mercer & Ferketich, 1988).

A lack of consistency in both defining and measuring

postpartum depression is evident. Steiner (1990) reported a postpartum depression incidence of 10% to 28%. Dimitrovsky, Perez-Hershberg and Itskowitz (1983) cited 16.67% to 31.48%, and Landy, Montgomery and Walsh (1989) found that 10% to 20% of childbearing women experienced postpartum depression. Previous studies, including the three cited above, often used generalized depression scales (ie. the Zung self-report depression scale and the Beck Depression Inventory). The variable incidence of postpartum depression found in childbearing women is partly a reflection of the variety of measurement scales used. The Edinburgh Depression Scale (Cox, Holden & Sagovsky, 1987) was the first scale designed specifically to measure postpartum depression.

Prevention and treatment of postpartum depression is important not only because of the impact on the mother but also because of the effect it has on the infant. Landy, Montgomery and Walsh (1989) indicate that studies have found that a mother's depression can also have a negative effect on the early development of her infant. For example, Cogill, Caplax, Alexandra, Robson and Kumar (1986) found that children of mothers who had experienced postpartum depression showed either behavior disturbance at three years or cognitive deficits at four years.

The optimal strategy is to prevent postpartum depression from occurring because treatments for postpartum depression are often only partly successful (Unterman, Posner & Williams, 1990). Exercise has been used to effectively treat general depression

and may even aid in reducing its occurrence (Morgan, 1987). Since exercise has been associated with improvement in general depression, it may also be effective in cases of postpartum depression. Ismail (1987) found a positive association between measures of physical fitness (VO2 max and heart rates) and emotional stability. Evidence suggests that regular physical activity of a cardiovascular nature may be at least equal to and possibly more effective than other intervention modalities such as meditation and pharmacological means (deVries, 1987).

As an alternative to antidepressant medication (used to treat mild, moderate and severe depression), regular physical activity has been employed to treat clinically depressed patients (Greist, Klein, Eischens, Faris, Gurman & Morgan, 1979; Greist, 1987). Aerobic exercise, a variety of exercises that stimulate heart and lung activity for a time period sufficiently long to produce beneficial changes in the body (Cooper, K.H., 1970), has been found to reduce neuromuscular tension levels and therefore create a more relaxed total body state (deVries, 1987). It is believed that the ability to relax leads to optimal mental health over time (Morgan, 1987) which might then reduce the possibility of developing depression, or postpartum depression.

In a recent preliminary investigation, Stephenson (1991) found some support for the hypothesis that aerobic exercise prior to pregnancy and during pregnancy is associated with a diminished occurrence of postpartum blues. Women experiencing postpartum blues have an increased risk of also experiencing postpartum

depression (Cox, Connor & Kendell, 1982). Since exercise during pregnancy seems to help prevent the occurrence of postpartum blues, it may also help to prevent the occurrence of postpartum depression. Previous studies have found cardiovascular exercise during pregnancy to be physiologically safe for both the fetus and the pregnant woman (Clapp & Dickstein, 1984; Goodlin & Buckly, 1984; Snyder & Carruth 1984; Logering, Gilbert & Longo, 1984).

The present study combines several interesting research areas; postpartum depression, pregnancy, exercise, and mental health. Although each area alone has generated considerable research interest, no studies have investigated the relationships between these important topics. As well, there is no integrated theoretical framework that addresses a combination of the topics of postpartum depression, pregnancy, exercise and mental health. The basis for the present research therefore, lie in the findings of individual studies on each of the four topics.

The purpose of the present study was: to investigate whether regular physical activity prior to pregnancy and during pregnancy was associated with a reduced mean score (for the physical activity group) of postpartum depression. This study was also interested in other associated variables (particularly stress and social support) to postpartum depression as well as relationships between other related factors and physical activity. In addition, the present study also generated descriptive data about patterns of exercise that pregnant women follow.

LITERATURE REVIEW

There are two main foci in the literature review: exercise and mental health; and postpartum depression. Each of these topics will be discussed separately. In the exercise and mental health realm, studies are reviewed under four headings: 1. Theoretical perspectives on exercise and mental health; 2. General exercise and mental health knowledge; 3. Behaviorial studies on exercise and mental health and 4. Physiological studies concerning exercise and mental health. Six areas are discussed under postpartum depression: 1. Theories of postpartum depression; 2. Descriptions of postpartum depression; 3. Postpartum depression-physiological studies; 4. Risk factors for postpartum depression; 5. The influence of postpartum depression on the mother and 6. The influence of postpartum depression on the mother-child relationship.

Again it must be noted that no one has integrated the topics of exercise/mental health and postpartum depression into a theory or theories that address the combined topics. A gap therefore exists in the literature and the purpose of this study was to investigate the combination of exercise, mental health and postpartum depression.

Theoretical Perspectives On Exercise and Mental Health

In the literature, many theories attempt to explain why

exercise benefits mental health but no single theory is
sufficient on its own. A variety of social, physiological and
cognitive forces interact to bring about and/or maintain positive
mental health.

Three theoretical perspectives on exercise and mental health
are outlined by Folkins and Sime (1981). 1. Somatopsychic
theory: Humans are involved with physical activity and sport
because the movement, exertion and performance of the body
inspires behavior (Folkins & Sime, 1981). 2. Physiological
viewpoints: follow assumptions that are based on an organismic
view of the mind-body relationship. For example, DeVries (1968)
found a reduction in resting muscle action potential following
exercise training. This in turn is thought to explain tension
relief. Another popular current hypothesis is that exercise
indirectly causes the release of enkephalins, which in turn
results in a feeling of euphoria. The effects of morphine are
similar to those of the newly discovered endorphins of which
enkephalin is a subunit. Morgan, Roberts, Brand and Feinerman
(1970) propose the hypothesis that exercise, by increasing the
efficiency of the adrenal glands and the autonomic nervous
system, may improve the body's adaptation to stress. In response
to stress, the adrenal cortex secretes corticosteroids while
amines, epinephrine and norepinephrine are released by the
adrenal medulla and the autonomic nervous system. 3.
Psychological viewpoints: include a variety of explanations
regarding exercise and mental health. One explanation is that

the improved fitness resulting from exercise provides a sense of mastery. This sense of mastery is interpreted as improved mental health. Aerobic exercise trains one to have an increased awareness and sensitivity to internal sensations of one's own body (biofeedback training) (Danskin & Crow, 1981). Exercise is also a distraction from stress provoking thoughts. A cognitively oriented model puts biofeedback research into a theory of adaptation and emotion (Lazarus 1975). This theory of adaptation and emotion proposes that physiological changes associated with fitness training affect the adaptation strategies used to handle stress and emotions. In the same manner, a variety of social and psychological variables are related to the way in which training effects are cognitively appraised. Finally a self-regulation (coping) process, or training effect, improves adaptation to a person's changing environment.

The theories of exercise and mental health outlined above are very diverse. Similarly research findings concerning exercise and mental health are quite varied. For the purposes of the present paper, the term exercise denotes any one form of physical activity that is undertaken to improve or maintain physical fitness. Physical fitness can be thought of as a set of attributes that people have or achieve through exercise training (Castell & Blumenthal, 1985).

General Exercise And Mental Health Knowledge

Most studies concerning exercise and mental health can be grouped into the categories outlined by the American National Institute of Mental Health. Based on previous research, the American National Institute of Mental Health has produced a set of consensus statements (Biddle & Fox, 1989) concerning exercise and mental health. There is general agreement that in terms of current knowledge:

1. exercise is associated with reduced state anxiety;

2. exercise is associated with a decreased level of mild to moderate depression;

3. long-term exercise is usually associated with reductions in traits such as neuroticism and anxiety;

4. exercise may be an adjunct to the professional treatment of severe depression;

5. exercise results in the reduction of various stress indices;

6. exercise has beneficial emotional effects across all ages and in both sexes.

Hughes (1984) states that well over 1,000 articles have been published in scientific journals on the psychological effect of exercise. Studies have lacked control groups, have employed small numbers of subjects (Hartz, Wallace & Clayton, 1982; Blue, 1979 & Doyne, Chambless & Beutler, 1983) and most often have been correlational in nature. At the end of their review, Folkins and Sime (1981) summarized by saying that investigations concerning

the effects of physical fitness on psychological health are
poorly designed. In the studies reviewed, they found only 15% to
qualify as controlled experiments (experiments that had randomly
assigned their subjects and used a control group). In addition,
most of these studies used clinical populations. Controlled
experiments (experiments that had randomly assigned their
subjects and used a control group) that used a "normal"
population, generally used children as subjects and only one
study employed a measure of cardiovascular fitness when assessing
exercise.

Including all empirical studies done since 1980, Leith and
Taylor (1990) found 81 data-based studies directly related to the
psychological benefits of exercise involvement. Most of these
studies used exercise as an intervention or treatment for
psychological distress (eg. anxiety, depression). In 65 out of
the 81 (80%) studies reviewed, participation in an exercise
program was found to be beneficial for psychological health. The
amount of improvement in psychological health varied depending on
the type of study conducted. Leith and Taylor (1990) divided the
research into one of three categories: pre-experimental, quasi-
experimental and experimental. Exercise benefited psychological
health in 7 out of the 9 (78%) pre-experimental studies, 36 out
of 46 quasi-experimental studies (78%), and in 13 out of 26 (50%)
experimental studies. Because only 50% of experimental studies
found exercise beneficial to psychological health, these authors
speculate that in experimental studies exercise is not found to

be linked to improvements in mental health as often. Therefore, more controlled studies are needed. Leith and Taylor (1990) also suggest that cardiovascular fitness level should serve as a dependent variable in research examining the relationship between exercise and psychological health. They note that studies concerning fitness at times fail to report the nature of the physical activity. Leith and Taylor (1990) found no attempts to correlate improvements in particular aspects of psychological health with a specific physical activity. Leith and Taylor suggest the need for longitudinal studies to investigate the long term effects of exercise on psychological health.

Plante and Rodin (1990) also examined the literature, since 1980, that concerned physical fitness and enhanced psychological well-being. They found four popular topics on psychological functioning in the studies reviewed: psychological well-being and mood, personality and self-concept, physiological stress responsivity and cognition. Four studies investigated the short term (immediately following exercise) effects of exercise on psychological well-being and nine studies investigated the long term effects of exercise on psychological well-being. In total, ten of these 13 studies reported improvements in psychological well-being among exercisers. Six of the nine studies concerning the long-term effects of exercise used experimental designs with random assignment of subjects to experimental and control groups. Of these six studies using random assignment, four concluded that exercise benefitted the subjects psychologically. Plante and

Rodin (1990) found 16 additional studies that were methodologically less rigorous than the 13 studies mentioned above. Twelve of the 16 methodologically less rigorous studies concluded that exercise is associated with improved psychological well-being and/or mood.

Several themes (anxiety, stress, depression and emotional health) link major studies in the combined areas of exercise and psychological well-being (Biddle & Fox, 1989). For example, favourable changes in emotional health have been reported by Ismail and Young (1976, 1977). Ismail (1987) reported that habitual exercisers were less anxious than non-exercisers. Even though not all reviewed studies reported exercise as having antidepressant effects, the majority of subjects subjectively reported a sense of "exhilaration" and "feeling better" after regular cardiovascular physical activity (Ismail 1987). Overall, Ismail (1987) regards exercise as an important factor in maintaining emotional health as well as in preventing mental disorders from occurring. It is likely that regular moderate cardiovascular exercise (minimum of three sessions a week) has mood elevating properties that can alleviate and possibly reduce clinical depression from occurring (Greist, 1987).

Various forms of regular cardiovascular exercise (jogging, cycling, aerobics) have been linked to benefits in mental health yet no single type of physical activity has been found to have the greatest benefits (Leith & Taylor, 1990). In spite of a lack of experimental control in many of the studies pertaining to

exercise and mental health, there is overwhelming evidence that
exercise is beneficial to mental health. Specific questions
remain concerning the types of activity necessary for
improvement, what aspects of mental health can be improved and
whether exercise may help to prevent mental health problems from
occurring. More specifically, the present review will now
address the influence of exercise on aspects of mental health
that may have similar causes and symptoms to postpartum
depression.

Behaviorial Studies On Exercise And Mental Health

The positive influence of exercise on the cognitions, moods,
depressions and general psychological well-being of normal
populations gives hope that regular exercise may play a role in
helping to prevent postpartum depression. The effect of exercise
on psychological health may depend on a person's expectations for
change as well as the interaction between stress and exercise
(Brown, 1991; Brown & Siegel, 1988). This section examines
studies that investigated, in a variety of subject populations,
the topics of cognitions, moods, depression, general
psychological well-being, expectations for change and the
stress/exercise interaction. Most of the studies explored
exercise as treatment for mental health problems and did not look
at its potential role of prevention of mental health disorders.

There are conflicting reports of the effect of regular

exercise on cognition. Ismail (1967) found that an exercise program led to improved academic performance in school-aged children. O'Connor (1969) found contrasting results in his study. O'Connor randomly assigned children to either a Kephart motor skills program or to a regular classroom physical education program (minimal activity). No difference in academic achievement between the two groups was found. This lack of difference may be because the motor skills program was not fitness oriented like the exercise program used by Ismail (1967).

The effects of exercise on depression are more clearly demonstrated than the effects of exercise on cognition. In a University sample, lower levels of depression were found following a 10 week exercise program (Brown, Ramirez & Taub, 1978). Before the program 101 of the 561 students were classified as clinically depressed. After the 10 week program significant decreases in the depression levels were found for both the depressed and normal subjects who exercised but not for those who did not exercise. Fitness effects were not demonstrated in this study. In another study using high school students, Brown, Ramirez and Taub (1978) found significant decreases in depression after a 10 week program for joggers, wrestlers and tennis players but not for subjects involved in softball or for the controls (no exercise). The Zung Self-Rating Depression Scale was used in both of the above studies.

Morgan, Roberts, Brand and Feinerman (1970) also used the Zung depression scale before and after a 6 week exercise program

involving 101 male professors. The exercise groups participated in jogging, treadmill work, biking, circuit training and swimming. No significant differences in mood improvements were found between the control group and the exercise groups. Before the 6 week program, 11 of the 101 professors were classified as clinically depressed, these same 11 professors experienced a significant improvement in mood at the end of the six week program.

Unlike Morgan, Roberts, Brand and Feinerman (1970), more conclusive results linking exercise to increased mental well-being were evidenced in a study involving undergraduate volunteers (Hayden & Allen, 1984). The undergraduate volunteers were self-selected into one of three groups: sedentary, active non-runners and committed runners. Hayden and Allen's (1984) findings indicated that being involved in some sort of aerobic activity on a consistent basis for a prolonged period was more important to mental well-being than the specific type of exercise one chooses. The authors also noted that their study did not determine any causal relations between increased mental well-being and exercise.

Corresponding to Morgan, Roberts, Brand and Feinerman's study (1970) above, Folkins, Lynch and Gardner (1972) found exercise to only benefit the mental health of those who initially were in the poorest mental and physical condition. Folkins et al. (1972) studied 44 male and female students enrolled in a jogging class. Fifty students from an archery or golf class

formed the control group. They found the scores from the depression scale of the Multiple Affect Adjective Checklist (MAACL) to be significantly higher by the end of the jogging class for the female students than for the male students. At the same time no change in the MAACL scores occurred in students from the archery or golf classes. As well, significant changes in physical fitness for both male and female joggers occurred. Since only the female students showed positive changes in depression scores, the authors of this study concluded that those who were initially in the poorest physical and emotional health acquired physical and psychological benefits from exercise.

Similarly, in a study by Eickhoff, Thorland and Ansorge (1984), improvements in self-concept were only noticed in those subjects who were classified as "low fit" prior to the study. They studied the psychological effects of aerobic dancing on young adult women. Thirty-nine women were randomly assigned to either a 10 week aerobic dance program or to a control group. The counselling form of the Tennessee Self Concept Scale as well as physical fitness tests (resting heart rate, submaximal exercise test and skinfolds) were administered to the subjects. No changes in self concept were found. The authors of this study noted that all the women were originally fairly fit which may have been the reason why no changes in their self concepts occurred. The length of the program may also be a factor in why no differences were evident.

Adding further support to the belief that it is improved

physical fitness rather than just involvement in physical activity that is associated with improvements in mental health, betterments in overall psychological well-being, depression and perceived stress were significantly correlated with improvement in aerobic power (Norwell, Martin & Salamon, 1991). Forty-three post-menopausal women were randomly assigned to one of three 12 week programs: bicycling twice a week for 30 minutes at 70-85% of maximum heart rate; passive exercise; or a sedentary control group that did no exercise. Physical fitness was measured by oxygen uptake, weight, skinfold and girth measures. Psychological functioning was appraised by the Tennessee Self-Concept Scale, the Mental Health Inventory, the Hopkins Symptoms Checklist, the Perceived Stress Scale and the Current Health Subscale.

Contrary to the above finding, Moses, Steptoe, Mathews and Edwards (1989) suggested that it is the increase in the level of physical activity not the improved aerobic fitness that causes psychological changes. Moses et al. (1989) used an inner city population of subjects who had an elevated level of tension and anxiety. The subjects were randomly assigned to 1 of 4 conditions: high exercise (walking or jogging for 30 minutes at 70-75% maximum heart rate four times per week); moderate exercise (20 minutes of walking or jogging at 60% maximum heart rate four times per week); placebo (strength and flexibility exercise done for 30 minutes with the heart rate not above 50% and not done continually, four times per week); or control (waiting list).

Participants were given all psychological measures (Profile of Moods States POMS, the Hospital Anxiety and Depression Scale HAD, and the trait scale of the State-Trait Anxiety Inventory STAI) before and after the 10 week training program. In each of the two experimental conditions, the subject expectations, attention, group attendance and satisfaction with training were well matched. Improvements in aerobic fitness were positively related to increasing activity levels in the four groups. Prior to the 10 week program, subjects had similar scores on the psychological measures. Post-training significant group differences were found on POMS tension-anxiety, mental confusion, depression and on perceived coping assets. A three month follow-up using the same tests was also conducted. The difference between groups was maintained on follow-up despite some reduction of the fitness level gained. Positive psychological changes were reported only by subjects in the moderate exercise condition (Moses et al., 1989).

In a study using first year medical students, both fitness level and exercise behavior were found to be significantly associated with depression, anger, stress and overt pattern A behavior (Buchman, Sallis, Criqui, Michall, Dimsdale et al., 1990). Physical activity was assessed by a five minute step test and the Body Mass Index. Exercise behavior was assessed by a written questionnaire. The subjects were a homogeneous population and the mean fitness level ranged from "very good" to "excellent".

Not only has physical activity been found to be beneficial for a variety of aspects of psychological functioning (mood, cognitions, well-being, self-concept, depression, anxiety) but also for a wide variety of populations. Pre-menopausal women, post-menopausal women, juvenile delinquents, students and clinical patients make up some of the varied populations studied in the exercise and mental health area.

After a 15 week exercise program, mildly obese pre-menopausal women were found to have better ratings of general well-being than a control group (Cramer, Nieman & Lee, 1991). Measures were administered at both six and 15 weeks after starting to exercise. The subjects also completed personal daily log books, were weighed hydrostatically, and their residual lung volume was measured. The exercise program consisted of walking, at 60% of heart rate reserve, for 45 minutes five days a week. At 15 weeks, the exercise group showed improvement on the General Well-being (GWB) scores, particularly the two subscales `energy level' and `freedom from health concern or worry'. State anxiety and the frequency of daily hassles were significantly lower only at the six week testing session. No improvement was shown on the Profile of Mood States (POMS) measure.

Similar improvements in mental health were found in a study by Hilyer, Wilson, Dillon, Carol, Jenkins, Spencer et al. (1982), who randomly assigned 60 institutionalized juvenile delinquents to a 20 week physical fitness program or to a control program. After the 20 week program, the exercise group showed a

significant reduction in state and trait anxiety, depression (as measured by the Beck depression inventory), anger, fatigue and confusion. The state and trait anxiety, depression, (and so on) measures were given to both the exercise group and the control group before and after the 20 week exercise program.

Goldwater and Collis (1985) found that physical conditioning led to improvement in psychological health. Their study used males from 19-30 years who were randomly assigned to either the "high" (vigorous cardiovascular exercise) exercise group or the control group (activities in which the cardiovascular benefits were minimized). The volunteers were also given paper and pencil tests (104 T/F items made up from the Taylor Manifest Anxiety Scale, the Lie Scale and the Welshes R-Scale from the MMPI) and a cardiovascular fitness test (UVIC step test) before and after the six week program. Cardiovascular fitness improvements were significantly greater in the high exercise group than in the control group. Although not statistically significant the experimental group appeared to have lower ratings of anxiety and higher ratings of subjective well-being than the control group.

Many studies, on both normal and clinical populations, have found positive changes in psychological health to be associated with regular physical activity. In addition, findings show that individuals who are both physically unfit and have poor psychological health gain the most from exercise (Castell & Blumenthal, 1985; Roberts, Brand & Feinerman, 1970). Since methodological problems still plague researchers, Castell and

Blumenthal (1985) question whether it is exercise training alone that improves psychological health. Brown and Siegel (1988) propose that it is the interaction of stress and exercise that plays a role in both our physical and mental health.

Three hundred and sixty-four females, grades 7-11 completed the Life Events Survey and the modified version of the Seriousness of Illness Rating Scale at two different times; time 1 and time 2 (Brown & Siegel, 1988). A questionnaire was also given to the subjects to assess their level of physical activity. The responses at time 1 indicated that stress, not exercise, was related to illness scores. The interaction of both exercise and stress improved the prediction of illness. The health of subjects who were less physically active was influenced negatively by stress. At time 2, the results were the same except that the stress by exercise interaction did not significantly contribute to the prediction of illness. Overall the study showed that the negative impact of stressful life events on health declined as exercise levels increased. This finding supports the stress buffering hypothesis of exercise (exercise helps to negate the effects of stress).

Brown (1991) conducted a stricter test of the stress buffering hypothesis. He studied the health records of university students and then administered a bike test as well as the Physical Activity Questionnaire (PAQ), the Life Experiences Survey (LES) and an Illness checklist. Three scales were also used to measure psychological distress: the CES-D, the Rosenburg

Self-esteem Scale and a mood measure. Through a hierarchical regression analysis, the interaction of exercise/fitness and stressful life events was examined to see if it predicted physical health status. Brown's results supported the claim that the harmful effects of life stress can be cushioned by physical fitness. High life stress was also found to be related to physical illness but not in physically fit individuals.

Physically fit individuals were also found to be less likely to develop depressive symptoms in a large community sample. Physical inactivity was found to be associated with depressive symptoms (Farmer, Locke, Moscicki, Dannenberg, Larson & Radloff, 1988). The relationship between depressive symptoms and physical activity was investigated in an epidemiologic follow-up study to the First National Health and Nutrition Examination Survey. This survey was conducted on healthy subjects ranging from 25 to 77 years of age (Farmer et al., 1988). The original study was conducted from 1971-1975 and measured depressive symptoms and physical activity for 3,059 subjects. The 1982-1984 follow-up study had only 1,900 subjects because subjects who had physical conditions that might limit physical activity were excluded from the study. The average length of follow-up was eight years. Subjects involved with recreational types of physical activity were found to be less likely to be suffering from depressive symptoms. Twice as many depressive symptoms were evident among subjects who did not participate in recreational physical activities than in those who were active. This relationship was

not explained by differences in age, education, income, employment status, or chronic conditions. Physically inactive women who originally did not have depressive symptoms were found to have depressive symptoms eight years later. Conversely, physically inactive men, who initially had depressive symptoms, were found to have depressive symptoms eight years later at follow up.

In another of the few studies that employed longer term follow-ups, Sime (1987) found depression levels to be lower following vigorous exercise. Sime's investigation was a quasi-experimental study that put 15 moderately depressed subjects through an aerobic exercise program. The lower depression level was also maintained (and perhaps lowered) at the 21 month follow-up (Sime, 1987).

Contrary to the above finding of lasting beneficial effects from exercise, King, Taylor, Haskell & DeBusk (1989) did not find exercise to be associated with any lasting psychological benefits. Sixty male and 60 female employees were randomly assigned to a treatment condition, which was a six month home based exercise program, or to a control group (King et al., 1989). The subjects were given the Beck Depression Inventory (BDI), the Profile of Mood States (POMS), a short form of the Taylor Manifest Anxiety Scale and the Hamilton Rating Scale of Depression bi-weekly. No significant differences were found between the exercisers and controls on scores that measured expectations of change. The bi-weekly measures indicated

significant changes in perception of fitness and satisfaction with physical shape and weight. There was no difference between the treatment group and the control group on the psychological variables at the end of the six months.

As well as studies being done on exercise and general depression, studies have been conducted on clinically depressed patients. Many of these studies have compared exercise with other treatment modalities such as counselling and drugs.

In a study by Stern, Gorman and Kaslow (1983) 106 MI patients participated in a 12 week program. The patients were randomly assigned to 1 of 3 groups; exercise, counselling, control. Both anxiety and depression were significantly reduced in the exercise group but only depression was reduced in the counselling group. There was no change in levels of anxiety or depression in the control group.

In place of antidepressant medication (often used to treat mild, moderate and severe depression), regular physical activity has been used to treat clinically depressed patients. For example, Greist, Klein, Eischens, Faris, Gurman and Morgan (1979) found that exercise (walking and jogging) was at least as effective as psychotherapy in the treatment of mild to moderate depression. In a second study using the Symptom Checklist-90 (NIMH), Greist et al. (1987) found that exercise effectively treated subjects with moderate depression. This study found running, 30-45 minutes three times per week for 10 weeks, to decrease the depression level of male and female outpatients.

Comparable results were found in a study using volunteer inpatients at a psychiatric clinic who were randomly assigned to an anaerobic or aerobic treatment group (Martinsen, Hoffart & Solberg, 1989). All subjects (38 men and 61 women) completed the Montgomery and Asberg Depression Rating Scale (MADRS), the Beck Depression Inventory (BDI) and a submaximal bicycle ergometer test both when they entered and finished the program. At the end of the eight week program, both groups showed significantly reduced depression levels. The only significant difference found between the two groups was the increase of maximal oxygen uptake found in the aerobic group.

In another study by Ransford (1982), 29 depressed patients were randomly assigned to psychotherapy or to exercise. Those in the exercise group jogged three times a week with a therapist for 45-60 minutes. After 10 weeks of exercising, 6 of 8 patients originally diagnosed as depressed by NIMH Research Diagnostic Criteria were no longer classified as clinically depressed. Both methods of therapy (exercise or psychotherapy) were equally effective in treating depression (Ransford, 1982).

The behaviorial studies reviewed above lend general support to the hypothesis that exercise and physical fitness influence psychological health in a positive manner. Some lend themselves to a physiological type of theory and some to a psychological type of theory. More specifically, exercise has been used successfully to treat both clinical and general depression. The initial fitness level and final improved fitness level have been

shown to be related to the amount of improvement experienced in psychological well-being. It is unclear whether it is participation in physical activity alone or whether fitness benefits are needed in order to affect mental health positively.

Questions remain concerning how much and what types of exercise are associated with improvement in psychological health. Some studies show only aerobic exercise to be of psychological benefit and others include anaerobic activities as being beneficial. Further investigation is needed in this area. A look at some of the physiological changes occurring during exercise may help to explain the beneficial effects of exercise on mental health.

Physiological Studies Concerning Exercise And Mental Health

Physiological studies concerning exercise and mental health add further support to the hypothesis that exercise benefits mental health. This next section discusses some of the findings concerning the physiological effects of exercise that positively influence mental health. Physiological based studies reviewed below suggest that exercise has been found to help delay the onset of Premenstrual Syndrome (PMS) and has reduced climacteric (the most intense) symptoms of PMS. It seems that some physiological similarities exist between postpartum depression and PMS although they have never been connected in any way. Physiologically, exercise has been found to reduce the incidence

of hot flushes in post-menopausal women. These studies suggest that exercise enhances aminergic synaptic transmissions and causes changes that are similar to those changes caused by other antidepressants (ie. medications and ECT).

Post-menopausal women have been found to benefit from exercise therapy. Wallace, Louell, Talano, Webb and Hodgson (1982) found that a moderate intensity conditioning program appeared to change the climacteric symptomatology of post-menopausal women as well as delay the onset of menopause in pre-menopausal women. They concluded that the exercise did so through mechanisms that increased the serum concentrations of estradiol. Wilbur, Dan, Hendricks Holm (1990) carried the previous study further with the hopes that physical activity may offer a safe alternative to ERT (estrogen replacement therapy) for treatment of menopausal women. Aerobic fitness and participation in leisure activity were found to be associated with lower nervous and general health symptoms. Only the vasomotor symptoms were not correlated with leisure activity and aerobic fitness.

As well as delaying the onset of menopause and changing climacteric symptomatology of post-menopausal women, regular physical activity is also thought to help decrease post-menopausal hot flushes (Hammar, Berg and Lindgren, 1990). The incidence of post-menopausal hot flushes was thought to decrease due to the effect of regular physical activity on central opioid activity. Hammar et al. (1990) found that the number of

postmenopausal physically active women with moderate or severe
hot flushes was significantly lower than in a control group.
They found the total number of hot flushes to be the same in both
groups but the hot flushes experienced by the controls were
significantly more severe. Canty (1984) suggested the use of
regular aerobic exercise as treatment for premenstrual depression
and tension. No study has investigated the effect of an aerobic
exercise program on symptoms of Premenstrual Syndrome (PMS).

Aerobic exercise (exercise that stimulates heart and lung
activity for a time period sufficiently long to produce
beneficial changes in the body) also causes a reduction of
neuromuscular tension levels (deVries, 1987). Reduced
neuromuscular tension means a more relaxed total body state. In
two experiments, deVries (1987), found evidence for the
tranquillizing effect of exercise on the human body. The
tranquillizing (relaxing) effect of exercise was found to be
higher than that of meprobate (a frequently prescribed
tranquillizer drug). It is believed that the ability to relax
leads to sustained mental health over time (Morgan, 1987).
Sustained mental health suggests a diminished possibility of
developing depression, or postpartum depression.

Exercise as an antidepressant may be related to alteration
of central amine activity (Ransford, 1982). Neurons secrete
amines (chemicals) into spaces between them and transmit
information to neighboring neurons. Therefore, any changes in
the intensity of aminergic synaptic transmission can influence

nervous system functioning. The amine hypothesis of depression
associates impaired transmission at certain central aminergic
synapses with depression. The decreased levels of amine
metabolites found in the urine of depressed subjects support the
amine hypothesis of depression (Ransford, 1982). The lowered
levels of amine metabolites show that there is a reduced rate of
amine release at central synapses and a hypofunction (reduced
role) of these synapses. Anti-depression medications, ECT
(electroconvulsive therapy) and REM (rapid eye movement) sleep
deprivation all enhance the synaptic transmission at
hypofunctional aminergic synapses. Since the treatments
previously listed are all said to enhance aminergic synaptic
transmission and help to alleviate depression, they also support
the amine hypothesis of depression (Ransford, 1982). It is
possible that exercise is an effective treatment for depression
because it also enhances aminergic synaptic transmission.

Stern and Morgane (1974) stated that both anti-depressant
medication and ECT (Electroconvulsive therapy) do not suppress
REM (Rapid Eye Movement) sleep but replace it. They found that
both antidepressant medications and ECT increase aminergic
synaptic transmission and theorize that REM sleep may do the
same. They found that exercise, like medication and ECT, also
decreases REM sleep. Because exercise acts the same as ECT and
medication it may also replace REM sleep (Stern & Morgane, 1974).
It is likely that if exercise helps to compensate for REM sleep
it also enhances aminergic synaptic transmission. Exercise and

antidepressants were found to have similar physiological effects (decrease REM sleep, effect the function of neurotransmitters, alter central amine activity) on the body (Ransford, 1982). The alteration of central amine activity and other biochemical factors are another area that have not been investigated with regards to postpartum depression.

Gordon, Spector, Sjoerdsma and Udenfriend (1966) in a study with rats concluded that the synaptic release of brain norepinephrine was enhanced by exercise. Bliss and Ailion's (1971) study using mice found a relationship between dopamine and exercise. Significant increases in the levels of HVA (homovanillic acid) were found in active mice (Bliss & Ailion, 1971). Ransford (1982) summarizes that synaptic transmission in neurons containing norepinephrine or dopamine are enhanced by exercise.

The level of catecholamine metabolites, particularly MHPG (3-methody-4hydroxy-phenylglycol, an important metabolite of noradrenaline), has been shown to be a biochemical indicator of certain depressive disorders (Sothmann & Ismail, 1984). It is suggested above that exercise acts as an antidepressant that enhances aminergic synaptic transmission in the central nervous system (Ransford, 1982). Sothman and Ismail (1984) administered the Minnesota Multiphasic Personality Inventory (MMPI) to 34 healthy males. The researchers defined anxiety and depression to be stable personality characteristics resulting from everyday stress. Urine specimens were obtained from these males at two

different times. One sample was taken after eight hours of restful sleep and one was collected during the subjects normal occupational activities. The study found no significant univariate relationship between MHPG, and personality or physical fitness. The correlations between depression, physical fitness and MHPG, though not statistically significant, were in the expected direction. Physical fitness and depression were inversely related (r= -0.31) as well as MHPG and depression (r= -0.28). These findings support the hypothesis that increased CNS noradrenergic activity from long-term exercise helps to reduce self-reported depression.

Since exercise does not alleviate depression all of the time, questions remain concerning exercise and its effects on depression. It is also this lack of consistency that makes it hard to narrow to one theory. Ransford (1982) comments that low levels of amines may have a negative psychological effect on only certain types of people. He also notes that the physiological and psychological benefits of exercise may not be generalizable to all types of people. Over time, the improved synaptic transmission resulting from long term exercise may be lost (Ransford, 1982). Longitudinal exercise studies with depressed patients are needed to show how long physiological benefits of exercise last. If physical activity has potential to affect postpartum depression it is not known if the physiological benefits of physical activity would last long enough to affect depression occurring in the postpartum period.

Physiological benefits of exercise may be more evident in athletes because they have been involved in physical activity more intensely and longer than most people. For example, blood endorphin levels were higher after acute bouts of exercise in well-trained athletes (Fraioli, Moretti & Paolucci, 1980). According to Usdin, Bunney and Kline (1979), clinically depressed patients become less depressed and anxious when beta-endorphin is given intravenously. It is also thought that self-confidence and emotional stability in the normal population may be enhanced by endorphin peptides (Lobstein, Mosbacher & Ismail, 1983). Enhanced self-confidence and emotional stability indicate a lower level of depression. Further, it is known that single episodes of aerobic exercise increase the production, excretion, turnover, or transmission of norepinephrine, serotonin and dopamine whose levels are known to be low in depressed patients (Farmer, Locke, Moscicki, Dannenberg, Larson & Radloff, 1988). Physiological changes caused by exercise help to reduce the severity of depression. It is not known whether exercise can help to reduce the incidence of depression.

Studies reviewed up to this point have shown an association between exercise and increased mental health, particularly exercise and its relationship to lower depression levels. Both behaviorial studies and physiological studies have been discussed. Exercise has not been linked specifically to postpartum depression. Postpartum depression has been shown to be a unique depression (Pitt, 1968) that has potential to be

influenced by exercise.

Postpartum Depression

There are three recognized categories of postpartum psychiatric disorders: postpartum blues, postpartum depression and postpartum psychoses. This review will focus on postpartum depression. Postpartum depression is defined here as a depression that occurs in the weeks and months following childbirth. In spite of the fact that researchers are still struggling over its definition, postpartum depression has been recognized since the time of Hippocrates when lactation was thought to be the origin of problems and it was commonly referred to as "milk fever". Reported incidences of postpartum depression vary between 3% and 27% although most studies give a figure of 10% (Harding, 1989). Postpartum depression is an illness that affects up to 27% of new mothers. Since postpartum depression is often disregarded by health professionals, the majority of affected mothers and their families are left confused and untreated.

Postpartum Depression Theories

Gruen (1990) outlines four basic postpartum depression theories: organic, psychodynamic, cognitive and situational stress. The organic theories consider radical changes in

estrogen and progesterone to be the prevailing factors involved
(Hamilton, 1984). Clayton (1986) considered thyroid depletion to
be the cause. Ramsay (1986) also reported that a biological
disorder of postpartum thyroiditis disease was evident in up to
9% of postpartum women. He said that this disease often begins
after the routine postpartum examination and therefore gets
missed. Postpartum theyroiditis (an often unrecognized disease)
may play a role in causing postpartum depression.

In contrast with the above theories, the psychodynamic
theory hypothesizes that postpartum depression is results from
unresolved personal issues prior to childbirth that become more
troublesome after childbirth (Hopkins, Marcus & Campbell, 1984).
Painful experiences from before childbirth surface again after
childbirth and become too much for the mother to bear. This pain
caused from pre-childbirth experiences is then translated into
depression.

Cognitive theories assume that those who experience
postpartum depression have predisposed personality
characteristics that make them susceptible to depression
(Hopkins, Marcus & Campbell, 1984). According to cognitive
theories, mothers that had unrealistic expectations of childbirth
and parenting would be at risk for developing postpartum
depression.

The situational stress theory (Gruen, 1990) speculates that
a lack of social support plays an important role in the onset of
postpartum depression. After childbirth, the mother is

particularly vulnerable and needs social support more than she
did previously. If the social support is not there, she will
likely suffer from postpartum depression.

Since many variables, both behaviorial and physiological,
may play a role in the onset of postpartum depression, an
interactive theory warrants consideration. Kraus and Redman
(1986) proposed a family interaction theory of causation for
postpartum depression. Some of the main assumptions from other
postpartum depression theories are woven into the interaction
theory. For example; 1. postpartum depression is a unique
disorder, 2. hormonal and bodily changes occur both during and
after pregnancy and 3. postpartum blues is a natural occurrence
following childbirth. Kraus and Redman (1986) propose that the
way in which the family of a postpartum woman handles the above
assumptions determines whether the mother of that family will or
will not experience postpartum depression. They describe in
detail the interactions occurring between family members after
the birth of a child. The authors note the specific kinds of
interactions between the mother and other family members that
lead to the development of postpartum depression. Kraus and
Redman (1986) also suggest a pattern of intervention strategies
to combat the unhealthy interactions. Specific steps are given
outlining ways to help the mother and family realize that the new
emotions from childbirth are normal (Kraus & Redman, 1986).

Affonso and Domino (1984) concluded that there is no single
theory that can explain or predict postpartum depression.

Postpartum depression is caused by a combination of factors some of which are yet to be identified. Affonso and Domino list risk factors that seem to be consistently related to postpartum depression. Of the 10 factors they list, eight of them have to do with either stressors or social support.

Parenthood is a dramatic developmental stage in life. It is a time of transition and emotional upheaval during which the adults involved feel a lack of control. Feelings are intensified. Expectations towards childrearing and conforming to social expectations are often idealistic. Most psychological preparation is done for the delivery but not for what comes after the delivery. It is a time of loss for the parents, a loss of control, identity, spontaneity, freedom and sometimes of income and employment (Gruen, 1990). For the reasons above, both stress and social support are considered to be important factors in predicting postpartum depression.

Descriptions Of Postpartum Depression

Postpartum depression has been studied less than postpartum psychoses because the condition (postpartum depression) is rarely referred to psychiatrists for treatment. Postpartum depression studies have mainly occurred in the last 20 years (Kendell, 1985). Studies concerning postpartum depression have used postal questionnaires, general practice consultations and interviews by investigators to identify postpartum depression. As well, the

time of assessment has varied from six weeks to six months after delivery. Few studies have used operational criteria to define what they meant by postpartum depression. A lack of consistent operational criteria for identifying postpartum depression as well as discrepancies concerning the time of diagnosis for postpartum depression exist. There is also disagreement concerning the nature of the risk factors for the development of postpartum depression (Kendell, 1985).

Cooper, Campbell, Day, Kennerly and Bond (1988) examined 483 women six weeks prior to delivery and then again at three, six and 12 months postpartum. The Interview for Recent Life Events, the General Health Questionnaire, the Present State Examination and the Montgomery and Asberg Depression Rating Scale (MADRS) were used to determine the incidence of postpartum depression. At three months postpartum, a similar incidence rate to that of the depression rate for the normal population was found for postpartum depression (7%). The authors concluded that in the 12 months postpartum, no increased risk for non-psychotic psychiatric disorder (depression) occurs. They also do not support the view that distinctive clinical features of non-psychotic disorder (postpartum depression) occur after childbirth.

As suggested above, some researchers doubt that postpartum depression is a separate and unique depression (Whiffen, 1991). Symptoms that have been found to be unique to postpartum depression as well as the large number of studies conducted on

postpartum depression provide evidence that postpartum depression is distinct from other depressive disorders. Higher incidences of psychotic symptoms are reported in postpartum depression than non-postpartum depressions. The existence of symptoms of disorientation, emotional liability, perplexity, and confusion (which suggest an organic brain syndrome) are more prominent in postpartum depressions than in other depressions (Harding, 1989). In his classic postpartum depression study, Pitt (1968), describes the symptoms of postpartum depression as "atypical" (different than the symptoms of other depressions). Higher rates of major and minor depression (as defined by the Research Diagnostic Criteria) have been found to be more common in the postpartum than at other times. The RDC defines major depression as i) depressed mood or loss of interest, and ii) at least four symptom groups, including appetite disturbance, sleep disturbance, agitation or retardation, loss of interest, fatigue, self-deprecation or guilt, indecisiveness or lack of concentration, and suicidal ideation. A RDC diagnosis of Minor depression consists of a mood disturbance and only two of the associated symptoms identified above. Postpartum depression seems to dissipate at a faster rate than non-postpartum depressions (Whiffen, 1991). The above factors all point to postpartum depression being a unique disorder.

The pattern of depressive illnesses in women may also support the opinion that postpartum depression is a unique disorder. In a study on 2,257 women who bore children in 1970,

99 women were classified as having "new" episodes of psychiatric illnesses in either the two years before or the two years after the birth of their children (Kendell, Wainwright, Hailey & Shannon, 1976). The pattern of illnesses was as follows: the new episode rate of depressive illnesses and functional psychoses sharply increased in the three months immediately after childbirth while a second more sustained but less dramatic rise occurred in the 10 to 24 months following delivery. This information was gathered from the psychological consultation records of women who bore children in 1970.

Similarly, Kumar and Robson (1984) found that more women sought psychiatric help in the year after delivery than in the year prior to conception. Three quarters of these women sought help before their babies were six months old and half of the women continued to seek help for the next three years. The secondary rise of depressive illnesses and functional psychoses (said to occur in the 10 to 24 months after delivery) found in the study by Kendell, Wainwright, Hailey and Shannon (1976) was not supported by Kumar and Robson's (1984) study. More than half of the women with persisting emotional difficulties had never needed medical help for emotional problems before. This study found postpartum depression to occur in 28.6% of the women studied.

Pitt (1968) conducted a well known survey of National Health Service patients having babies in London Hospital. The patients were assessed at the beginning of the last trimester and at 6-8

weeks following delivery. Random interviews were conducted with patients according to their MMPI scores. All subjects who had depressive symptoms since delivery, who had unusual and disabling symptoms, and who had symptoms lasting for more than two weeks were classified as postpartum depression cases (10.8% of the sample, 33 out of 356 subjects). Of the depressed subjects, 27 of the 33 were diagnosed by interview and six by post-natal inquiry. The duration of marriage, presence of social stress, psychological stresses, previous psychological illness, anxiety in pregnancy, parity, time in labour and complications in delivery of depressed women were not significantly different from control subjects. Complications during pregnancy (18 controls, N=323 and 9 depressives, N=33) and transitory teariness (12 controls and 21 depressives) were the only significant differences between the controls and the depressives. At the one year follow-up, 16 of the 28 depressives who completed the follow-up (there were 33 depressives originally but only 28 of the 33 completed the follow-up) were no longer depressed but 3.9% of the sample showed little if any improvement. As mentioned earlier, Pitt refers to postpartum depression as "atypical" depression. He describes "atypical" depression as a milder form of psychological depression commonly seen in younger women or immature individuals. The prominence of neurotic symptoms, such as anxiety, irritability and phobias, overshadowing the depression and the presence of some features that are opposite to those of classical depression (ie. worsening at the end rather

than the beginning of the day, early rather than late insomnia), make the depression "atypical" (Pitt, 1968). Pitt's (1968) study suggests that a large proportion of "atypical" depression in the community must arise after childbirth.

From the information given above, postpartum depression can be considered to be a specific depression occurring after childbirth. The next sections are concerned with both physiological and behaviorial factors associated with postpartum depression.

Physiologically Based Studies

On the organic and psychodynamic sides, physiological studies have revealed that biological and hormonal changes occurring after childbirth may play a significant role in the onset of postpartum depression or other puerperal depressions (Bearn, Fairhall, Robinson, Lightman & Checkley, 1990; Whalley, Robinson & Fink, 1982). This section reports on specific findings concerning biological changes occurring after childbirth.

An altered ESN (estrogen or stimulated neurophysin) response was found to coincide with the period of maximum risk for puerperal psychosis (Bearn, Fairhall, Robinson, Lightman & Checkley, 1990). This study developed a neuroendocrine test that reflects a central response to activation of estrogen receptors achieved by measurement of plasma levels of estrogen or

stimulated neurophysin (ESN). This central response occurred after an estrogen challenge. Bearn, Fairhall, Robinson, Lightman and Checkley (1990) used six healthy women (controls), seven patients with anorexia nervosa, and 12 puerperal women in a dose response study. They found a dose-dependent response of ESN to oral ethinyl oestradiol. Compared to the response of normal menstruating women in the early follicular phase of their cycles, the response to 50 ug (micrograms) ethinyl oestradiol in normal postpartum women is lower. The ESN response in the women with anorexia nervosa was the same as that in normal women. At five days postpartum, women showed an attenuated ESN response despite having similar oestradiol levels when compared with the control group. The anorexics, who had lower levels of oestradiol than both the control group and the puerperal group on day five, showed a normal response. A trend was also found for post-stimulation ESN levels to be higher on day 28 compared to both day six and day 12 in postpartum women. The authors speculated that the altered puerperal response may have resulted from the acute estrogen withdrawal that occurred following delivery. This ESN response to estrogen provides a new neuroendocrine measure that tests the relevance of changes in central estrogen receptor responsiveness in the pathogenesis of puerperal psychosis.

Oxytocin secretion was found to be increased at 3-4 weeks prior to the onset of postpartum "mania" in six women studied (Whalley, Robinson & Fink, 1982). Increased oxytocin secretion was accompanied by high levels of oxytocin related neurophysin.

Both of these increases occur during pregnancy. Oxytocinase interferes with oxytocin assays in late pregnancy plasma and, therefore, is thought to be the most likely culprit of postpartum "mania". Being a relatively non-specific peptidase, oxytocinase may degrade a number of peptides active in the central nervous system besides oxytocin (Whalley et al., 1982). Limited data showed that rapidly changing amounts of a relatively non-specific placental peptidase affected the symptoms and signs of postpartum "mania". More research in this area is needed.

The studies reviewed previously found an altered ESN (estrogen or stimulated neurophysin) response from exercise. This may have been precipitated by the acute estrogen withdrawal occurring at delivery. As well, the secretion of oxytocin was higher prior to the onset of postpartum "mania". Because of this, it is thought that other peptides affecting the central nervous system may also drop at this time. The evidence in this area is not overwhelming yet an altered ESN response still may play a role in explaining the occurrence of postpartum depression. Further research on physiological changes arising during the postpartum period is needed.

Risk Factors For Postpartum Depression

Many studies have been conducted concerning other factors that may be related to the onset of postpartum depression. The literature does not present a clear picture of what factors are

associated with the onset of postpartum depression. Both low social support and high stress seem to be the elements that are most consistently related to postpartum depression. The following section will review studies concerning factors that put the mother at risk for developing postpartum depression.

Postpartum depression was not found to be consistently related to pregnancy complications, obstetric difficulties, social class, age, or parity. Harding (1989) suggested that only past psychiatric history is of any predictive value for postpartum depression. Whiffen (1991) found marital tension, low levels of social support and negative life stress occurring during pregnancy and in the postpartum to be the variables most consistently associated with the development of postpartum depression.

Coinciding with the findings above, Paykel, Emms, Fletcher and Rassaby (1980) found both life events and lack of social support to be the main predictors of postpartum depression. The Raskin Three Area Depression Scale was used to measure postpartum depression in this study. O'Hara, (1986) found that women experiencing postpartum depression reported more stressful life events and less support from their spouses than nondepressed women. For O'Hara's study, an adapted version of the Schedule for Affective Disorders and Schizophrenia was used as the postpartum depression measure. Mercer and Ferketich (1988) also reported high stress and lack of social support as predictors of depression during pregnancy.

Several other factors such as weaning (Meltzer & Kumar, 1985), severe or no nausea during pregnancy (Unterman, Posner & Williams, 1990), previous psychiatric history (Unterman, Posner & Williams, 1990) and economic problems (Unterman, Posner & Williams, 1990) have been found to be associated with the occurrence of postpartum depression. Susman and Katz (1988) described four women who developed severe depression within two weeks after beginning to wean their infants. Unterman, Posner and Williams (1990) discovered that both postpartum psychosis and postpartum depression were unrelated to obstetric variables such as type of delivery and complications during pregnancy. Gotlib, Whiffen, Mount, Milne and Cordy (1989), in looking at demographic characteristics such as socioeconomic status, formal education, and parity, found these variables to be unrelated to depression in the postpartum period. They did find that women who listed their occupations as housewives were over represented in the cases of postpartum depression. Many variables seem to play a role in the onset of postpartum depression.

Kumar and Robson (1984) also note that there is no clear consensus and much disagreement about factors that predict postpartum depression. In their study of 119 first time mothers, measures were given throughout pregnancy, well into the postpartum period, and at follow-up (4 years later). A child assessment was made at follow-up. In the three months after childbirth, 15 of the 19 cases of postpartum depression were new cases of depression. All but one of these new cases reported

their symptoms beginning when their babies were around 4 to 6
weeks old. They found neither weaning nor the blues to predict
postpartum depression at three months. RDC (Research Diagnostic
Criteria) ratings confirmed previous findings that the post-natal
depressions were usually more severe and persistent than those
seen in early pregnancy. Two factors were common to both pre-
natal and post-natal depressions: marital difficulties and
serious doubts about having the child.

Kumar and Robson (1984) also found that pre-natal depression
but not post-natal problems were predicted by high scores on the
`neuroticism' and `psychotisism' scales of the Eysenck
personality questionnaire. Social class, employment status,
domestic or financial problems, chronic illness and individual
life events were not associated with pre-natal or postpartum
depression. Both women who had a history of trying to conceive
for more than two years and older women with uneventful
pregnancies were found to be at higher risk for postpartum
depression. Women who had been separated from their husbands the
month prior to the onset of depression and women who had
difficult relationships with their own mothers were also found to
be at risk for postpartum depression. The only obstetric
variable found to be significantly associated with postpartum
depression was premature birth. Another factor found to be
significantly associated with the onset of depression was
bereavement in mid and/or late pregnancy.

The presence of stress as a factor in the onset of

postpartum depression again appears in Dean and Kendell's (1981)
study. All women in Edinburgh, within a seven year period, who
had had a psychiatric admission within 90 days of delivery, were
identified and matched for age, year of admission and Research
Diagnostic Criteria (RDC) with another non-puerperal psychiatric
patient who had a similar case note diagnosis (Dean & Kendell,
1981). A peaking of admissions for postpartum depression was
found in the first two weeks following delivery. Findings showed
that subjects who had a diagnosis of major depressive disorder
were significantly more deluded, labile and disorientated than
non-postpartum controls with the same diagnosis. Dean and
Kendell's (1981) study also showed additional stressful life
events to be present in 80% (27 out of 33) of postpartum women
with RDC diagnosis of major depressive disorder, in 75% (9 out of
12) of postpartum women with diagnosis of manic disorder or
schizoaffective disorder and in 3 of the 5 postpartum women with
an unspecified functional psychosis. Reported long term
difficulties were marital disharmony, single status, or poor
social circumstances.

O'Hara, Neunaber and Zekoski (1984) focused on the cognitive
vulnerability hypothesis of postpartum depression and also found
the presence of stress to be a factor in postpartum depression.
The cognitive vulnerability hypothesis suggests that the external
circumstances are more stressful or negative according to the way
some people have learned to perceive, interpret, or evaluate
events or situations. Of the 99 women studied, 9% were found to

have a major or minor depression in their second trimester of pregnancy and 12% had a major or minor depression in the first nine weeks postpartum. Two of these 9 women were depressed both before and after childbirth. The cognitive vulnerability model accounted for about 50% of the variance in postpartum depression symptoms with the main vulnerability factors being depression in pregnancy and dysfunctional self-control attitudes. Through hierarchical regression different factors were found to be associated with women who had a diagnosis of depression than with women who just suffered from symptoms of depression. The number of previous depressions and depressions in first degree relatives were the two most significant vulnerability factors. Depression during pregnancy was not at all associated with postpartum depression. Childcare stressors were significantly associated with a diagnosis of postpartum depression. Only stressful life events occurring since childbirth and over a short period of time were found to be significantly related to a diagnosis of postpartum depression (O'Hara et al., 1984).

In another study based on the cognitive vulnerability model (Cutrona, 1983), the number of child-related events were found to be a much better predictor of postpartum depression than cognitions about the causes of these events. At most only 10% of the variance in postpartum depression was explained by results using the Attributional Style Questionnaire.

Using a matched sample of non-childbearing women, O'Hara, Schlechte, Lewis and Vurner (1991) replicated and extended the

findings of an earlier study (O'Hara, Neunaber & Zekoski, 1984).
The model used for this study was that stressful events trigger
depression vulnerability. They also assessed hormonal factors.
Hormone assays for serum prolactin, serum progesterone and
estradiol were taken. The vulnerability-stress model was found
to account for 40% of the variance in the diagnosis of postpartum
depression. Very little association between postpartum
depression and hormonal variables was found. Only the
vulnerability by life stress interaction was significant in
accurately predicting depression.

Whiffen (1988) studied 115 women in their third trimester of
pregnancy and in the postpartum period. Using the Beck
Depression Inventory (BDI), 16.5% were found to have depression,
6.1% a major depression, and 10.4% a minor depression. High life
stress during pregnancy, perception of the infant as
temperamentally difficult and optimistic prepartum expectations
about infants were all factors found to be related to women
experiencing symptoms of depression but not associated with women
who were not diagnosed as having depression. Diagnosis of
depression was predicted only by marital tension/vulnerability.

The effect of life events was looked at in another study by
Dowlatshahi and Paykel (1990) who compared 33 matched puerperal
controls with 33 women who were admitted to a mother and baby
unit within one month postpartum. No differences in Paykel's
life interview schedule scores were found between the two groups
in the three months before pregnancy, during the three trimesters

of pregnancy and in the months after delivery to onset of postpartum psychosis. Paykel suggested that when sociodemographic factors are taken into account the effect of life events disappears. Marks, Wieck, Checkley and Kumar (1991) in a study concerning life events and postpartum psychosis, suggest from their findings that postpartum depression may be preceded by life events, but that life events do not play an important role in the etiology of postpartum psychosis.

Using the Life Events and Difficulties Schedule (LEDS), Martin, Brown, Goldberg et al. (1989) investigated the association of life events with the onset of postpartum illness severe enough to warrant admission to a psychiatric hospital. They found that, during the period from delivery to onset of postpartum depression, significantly more events occurred in the lives of those with postpartum depression than in the lives of controls. The same study also found that, during pregnancy, a major event or severe difficulty occurred in the lives of only 9 out of 26 subjects who were depressed postpartum. The only psychosocial stressors found to be associated with postpartum depression were a lack of a confiding relationship and marked housing problems.

Conversely, psychosocial stressors were found to be important in a study by Watson, Elliott, Rugg and Brough (1984) who studied women throughout their pregnancy and during their first postpartum year. They found depression to occur most often during the first three months postpartum and least often in the

second trimester of pregnancy. Long-standing difficult circumstances and problematic life-events were thought to play an important role in the onset of emotional difficulties in 26 of the 29 women who had affective disorders. The case histories, of all but two women who had postpartum depression six weeks after birth, provided a plausible psychosocial etiological model for postpartum depression. Because the case histories provided adequate explanations for postpartum depression with the majority of women, the authors suggested that a biological explanation for postpartum depression is applicable to a minority of patients.

Unlike the above study, biological explanations for postpartum depression were contemplated in a study by Cox, Connor and Kendell (1982). On four separate occasions, Standardised Psychiatric Interviews were conducted on women who attended pre-natal clinics at the Simpson Memorial Maternity Pavilion between January 1978 and November 1979 (Cox et al., 1982). The finding that a deterioration of the marital relationship was associated with reduced libido caused Cox et al. (1982) to suggest that considerable family vulnerability was associated with postpartum depression. Postpartum depression persisted for several months with the seven subjects who initially experienced postpartum blues. They described the blues as often incorrectly thought of as being a fleeting or trivial event and suggested that the blues may be a meaningful predictor of women at risk for developing postpartum depression later on (Cox et al., 1982). This study also provided indirect support for the endocrine hypothesis in

that, during the ten days after delivery when the fall in estrogen and progesterone levels is maximal, psychiatric symptoms were also maximal. These psychiatric symptoms were found to be unrelated to social factors, marital status or obstetric complications. This study did not find pre-natal anxiety to be predictive of postpartum depression.

Cox, Connor and Kendell (1982), found only the blues to be a meaningful predictor for postpartum depression. In contrast to their findings; personality traits, genetic factors, previous psychiatric history, psychosocial stressors of pregnancy and physiological factors/hormonal changes have all been considered to be predictors for postpartum depression. Petrick (1984), in a case study, graphically demonstrated how the preceding variables interacted with one another to produce postpartum depression. Her subject was a 26 year old who was overconcerned with how she was viewed by others, had a family history of depression, had experienced several psychosocial stressors during pregnancy, experienced anxiety in early pregnancy and elation towards the end, and breastfed her baby. Petrick (1984) suggested giving patients a checklist in the prenatal period to identify high risk mothers. A caution in using this type of check list would be not to assume that all women interpret psychosocial stressors and various difficulties encountered in the same manner. For example, some women may find moving to a new location very hard to deal with whereas other women may adjust with little or no difficulty.

Unlike the above case study, Carothers and Murray (1990) concluded by the use of logistic regression that only the Edinburgh Depression Scale (EPDS) score and to a limited extent, reported psychiatric history, were predictive of postpartum depression. Contrary to Carothers and Murray's (1990) findings, Hopkins, Marcus and Campbell (1984) reported that the majority of women diagnosed as having postpartum depression have never before been diagnosed with any previous psychiatric disorder. Boyce, Parker, Barnett, Cooney and Smith (1991) found that a previous episode of depression did not increase the risk of women developing postpartum depression. Similarly, as reviewed above, Kumar and Robson (1984) found that high neuroticism was associated with pre-natal depression but not with postpartum depression.

In another attempt to predict postpartum depression, Bellow and Hill (1990) found a recall bias in depressed groups when given a mixture of positive and self-esteem threatening (SET) words. Further, they hypothesized that women who were not depressed but showed the depressive SET recall bias pre-natally and who also experienced self-esteem threatening life events would show an increased level of depression at three months postpartum. The 156 women, who by the Beck Depression Inventory (BDI) were not depressed pre-natally, completed a recall task during their 28th to 37th week of pregnancy. At three months postpartum, they were reassessed using the BDI and a structured interview. The study failed to find a significant interaction

between recall bias and depression (Bellew & Hill, 1991).

According to Pfost, Stevens and Lum (1990), only depressive symptoms occurring during the pregnancy period (Cutrona, 1982: Gotlib, Whiffen, Mount, Milne & Cordy, 1989; O'Hara, Nuenaber & Zekoski, 1984; O'Hara, Rehm & Campbell, 1982; Pfost, Lum & Stevens, 1989; Whiffen, 1988) and stress intensified by a lack of social support (Cutrona & Troutman, 1986; Hopkins, Campbell & Marcus, 1987; O'Hara et al., 1984; O'Hara et al, 1982; Whiffen, 1988) emerge as being consistently related to postpartum depression. Pfost, Stevens and Lum (1990) in their study of 69 women from Lamaze classes, found the best predictor of postpartum depression to be pre-natal depressive symptoms. In this study they used the Beck Depression Inventory, a demographic data sheet and a post-delivery questionnaire. These were filled out during the last trimester of pregnancy and three weeks after delivery. They did not find stressors that were specific to delivery and childcare to predict postpartum depression.

The prevalence of postpartum depression and existence of unique depressive symptoms show postpartum depression to be distinct from other depressions. As well, the literature has found many factors to be predictive of postpartum depression. Marital difficulties, single status, poor social circumstances, serious doubts about having the child, postpartum blues, older women with uneventful pregnancies, difficulties in relationships with own mothers, family history of depression, previous psychiatric history, stressful events occurring since the birth

of their child, stressful life events, lack of a confiding
relationship and housing problems include some of the risk
factors for postpartum depression. Some studies reviewed above
have found conflicting results. Many of the risk factors for
postpartum depression reported throughout the reviewed studies
fit into one of two general categories; 1. a lack of social
support or 2. stress. More studies are needed to explain
postpartum depression.

The effect of Postpartum Depression On the Mother

Postpartum depression has been said to be a debilitating
illness that is often left unassessed and untreated (Gruen,
1990). Pitt (1968) describes postpartum depressed mothers as
experiencing depressive symptoms since delivery that have been
unusual to them and somewhat disabling. These symptoms last for
more than two weeks and are described as "atypical" as compared
to regular depression. These "atypical" symptoms are prominently
neurotic symptoms such as anxiety, irritability and phobias.

Constant adaptation for parents, newborn and family is
undergone following childbirth. This time consists of emotional
highs and lows. For some, it is a period of growth and for
others a period of growth arrest or even retardation (Butnarescu,
1978). A phenomenological study by Tatano Beck (1992) describes
the essential structure of the lived experience of postpartum
depression. Seven mothers who attended a local postpartum

depression support group comprised the subjects for the study. Eleven clusters of themes were organized from 45 statements that were originally extracted from the women's transcripts. The 11 clusters of themes make up what Tatano Beck refers to as the essential structure of postpartum depression. The eleven themes are as follows: 1. An unbearable loneliness that was due to discomfort with others and a belief that no one else understood what they were experiencing enveloped the mothers. 2. A glimmer of hope for the end of their living nightmare was provided by contemplating death. 3. The mothers' waking hours were consumed with obsessive thoughts of being a bad mother and questioning what was happening to them. 4. The mothers grieved for their loss, haunted by the fear that any normalcy in their lives was irretrievable. 5. Loss of all previous interests and goals made life empty. 6. Pondering harming their infants created a suffocating burden of fear and guilt. 7. Mothers were unable to concentrate, shrouded in fogginess. 8. Just going through the motions, mothers envisioned themselves as robots stripped of all positive feelings. 9. A feeling of being on the edge of insanity was brought on by uncontrollable anxiety attacks. 10. Acceptance of the loss of control of mothers' emotions was alarming and difficult. 11. The mothers needed to be mothered themselves because they were besieged with insecurities. From this phenomenological study, two additional variables, self-hatred and hypochondriasis, are also incorporated in the fundamental structure of postpartum depression.

Tatano Beck's phenomenological study helps to make the clinical signs and symptoms of postpartum depression, such as feelings of inadequacy, anxiety, despair, lack of energy, loss of interest in sexual activities and compulsive thoughts, into a real experience with lasting memories and effects on the women who suffer and have suffered from postpartum depression. When interviewed for Tatano Beck's study, the length of time since delivery for the seven mothers ranged from 3 months to 2 1/2 years. Postpartum depression was not experienced for a fleeting moment but affected their lives for an extended period of time.

The Influence Of Postpartum Depression On The Mother Child Relationship

Not only does postpartum depression have a negative impact on the mother but it also has a negative impact on the infant and continues to influence the child later in life. This final section looks specifically at studies that have dealt with the impact of postpartum depression on the relationship between the mother and child. Since postpartum depression affects both child and mother, it is especially desirable to prevent or at least minimize the occurrence of postpartum depression in the future.

Lynne's (1991) study found that, at 18 months, infants of depressed mothers showed poorer outcome on object-concept tasks, were more likely to have mild behaviorial problems (particularly sleep disturbances), and were more insecurely attached to their

mothers. Even though postpartum depressed mothers had recovered from their depression by three months postpartum, the negative impact from depression was still evident when the infants were 18 months old.

Wrate, Booney, Thomes and Cox (1985) studied two intensity levels of depression (mild or severe) and no depression and found that those in the mildly depressed group perceived their children as maladjusted. This study was less conclusive than Lynne's (1991) study and used a standardized interview to assess disturbance in three year olds whose mothers had been assessed for depression at 3 to 5 months postpartum.

Another study (Whiffen, 1990) used the Beck Depression Inventory (BDI) and the Ames Crying Questionnaire (a measure of infant temperamental difficulty), which were completed at an average of 45 days postpartum. Two years later, the same mothers completed the BDI and the Infant Characteristics Questionnaire (ICQ) again. Fathers of these children were also asked to complete the ICQ independently. Subjects scoring nine and over on the BDI were classified as being depressed. At 45 days postpartum, 17.2% of the sample were considered to be depressed. Two years later, 18.5% of the sample were found to be depressed. Findings showed depression to be associated with negative perceptions of the child at both time 1 and time 2. Paternal ratings of child temperamental difficulty were also correlated (r = .18, $p < .05$) with maternal depression. Findings also showed that postpartum depression was significantly correlated with the

objective ratings of the two year old child as temperamentally difficult and dependent. From the measure at 45 days postpartum to the measure at two years, a remarkable stability was shown in depressed mood scores. Since women who had experienced postpartum depression were also more likely to be depressed two years later, Whiffen (1990) suggested that women who suffer from postpartum depression may be more vulnerable to dysphoric mood states. No cause and effect relationships were established as a result of this study.

Women were assessed for postpartum depression at three, six and 12 months after delivery. Postpartum depression was identified in 60 of the 483 women on at least 1 of the 3 postpartum assessments (Cooper, Campbell, Day, Kennerley & Bond, 1988). Stein, Gath, Bucher, Bend, Day and Cooper (1991) continued this investigation and studied 49 of the 60 depressed subjects with their infants 19 months after birth. They also used a control group of 49 women who had not experienced postpartum depression. Five independent assessments were made of each mother and child. At 19 months, 9 of the 49 women who were originally diagnosed with depression using the Present State Examination (PSE) were still found to be depressed cases as diagnosed using the PSE. The study's two main findings were that: 1. A reduced quality of the mother-child interaction 19 months after the birth of the child was significantly associated with maternal depression during the postnatal year. 2. This association held for mothers who had recovered from their

depression by 19 months after delivery (although this association was less strong).

In a three year follow-up study, 91 of 103 mothers, who took part in an earlier study on postpartum depression, were interviewed again and the Richman's Behaviourial Screening Questionnaire (BSQ) was used to assess their children's behaviour (Wrate, Rooney & Cox, 1985). Increased BSQ scores were found to be associated with those mothers who had previously experienced postpartum depressive symptoms. Increased BSQ scores were also found to be associated with mothers who had postpartum depression after the birth of their first child, mothers who experienced postnatal complications, and mothers who had a higher neuroticism score. Another surprising finding was that behavior disturbance in children was associated with mothers who had shorter postnatal depressive episodes. Long term postpartum depression (for one year or more) had no effect on increased behavior disturbance of the child. The overall duration of depressive symptoms was shorter for postpartum depressive symptom (PS) mothers than postpartum depressive illness (PD) mothers. PS mothers also were more reluctant to continue breastfeeding and were more anxiously preoccupied with their baby than PD mothers. The authors speculate that only when a depressed mother is excessively concerned about her child or uncertain about her maternal role does a depressed mood in the puerperium have an enduring effect on the interaction between mother and child. Wrate et al. (1985) suspect biological factors, not mothering difficulties, to be the

cause of long term postpartum depression.

The mother-child relationship was influenced by postpartum depression. Children (18 months old) of mothers who had experienced postpartum depression have done poorly on object-concept tasks, had mild behavior problems and were insecurely attached to their mothers. Mothers who suffered from postpartum depression had negative perceptions of their children. More long term studies are needed to establish what the specific repercussions of postpartum depression are as well as determining what can be done to prevent it from occurring.

Summary

This literature review addressed two broad topics: postpartum depression and the relationship between exercise and mental health. From the review of these topics, it is suggested that a relationship between postpartum depression and exercise exists although a theory base is lacking.

Exercise has been shown to improve mental health. Unfortunately some of the studies done in this area have lacked experimental quality. As well as needing more choice experimental studies, longitudinal studies are needed to show how long the beneficial effects of exercise last. Some of the aspects of mental health that exercise has been shown to benefit are; psychological well-being and mood, personality and self-concept, physiological responses to stress and cognition. This

review has focused on areas of psychological well-being that have similarities with and are possibly related to postpartum depression.

A variety of theoretical perspectives on exercise and mental health were explored but it was from the individual studies reviewed that the present study derived its purpose. The various reviewed studies used different theoretical frameworks as a basis for their studies. As well as differing theoretically, some studies contradicted findings from other studies. All in all, both physical activity and physical fitness have been found to be related to improved mental health in a variety of subject populations. More specifically, exercise has been shown to be an effective treatment for depression (both general depression and clinical depression). Physical activity also seems to have much potential to have lasting beneficial effects on mental health and it is suggested that it may play a role in preventing some mental health problems from occurring.

Postpartum depression is a unique depression occurring after the birth of a child. Although various theoretical perspectives have attempted to explain postpartum depression, no theory can describe and predict the occurrences of postpartum depression completely. Complicating the matter further, studies have made a distinction between being diagnosed with and experiencing symptoms of postpartum depression. Contradictions among findings also occur in the postpartum depression literature. The most consistent predictors of postpartum depression found in the

literature are a lack of social support and high life stress.

Postpartum depression has been shown to be a debilitating illness for the mother as well as having a negative impact on the mother-child relationship. It has also been shown to have lasting negative effects on the children of mothers who have suffered from postpartum depression. Because of the negative impact on the mother and her children, much research has focused on determining predictors of postpartum depression in order to identify mothers who are at risk for developing postpartum depression. When mothers at risk for postpartum depression are identified they can be treated and observed more effectively. The question of whether it is possible to prevent or minimize postpartum depression has not been addressed in the research. No studies have been found that explore a relationship between exercise and postpartum depression.

The American National Institute of Mental Health produced a set of consensus statements concerning future directions in the field of exercise and mental health. Some significant questions posed were:

1.   What is the role of exercise in primary prevention?

2.   What is the effect of exercise on the rehabilitation of people with physical and mental disorders?

3.   What are the mechanisms that mediate the effects of exercise on stress?

4.   What are the effects of exercise on the stress reactivity on different groups, such as those differing by age, sex,

socioeconomic status and personality?

5. What are the optimal exercise doses required to produce effective responses to mental stress?

6. What is the effect of exercise compared with other interventions?

7. What are the effects of exercise on the mental health of children?

8. What are the mechanisms underlying exercise effects? (Biddle & Fox, 1989).

Questions that might explore the relationship between postpartum depression and exercise can be derived from a number of the questions posed by the American National Institute of Mental Health (ie. the role of exercise in prevention, optimal doses of exercise, the effect of exercise compared to other interventions and the underlying mechanisms of). Exercise can prevent physical health problems. Can it also prevent psychological health disorders such as depression, specifically postpartum depression?

METHODOLOGY

Introduction

This study was a retrospective correlational pencil and paper study. The main purpose was: to investigate whether regular physical activity prior to pregnancy and during pregnancy was associated with a reduced mean score (for the physical activity group) of postpartum depression. This study also identified additional variables that were also associated with lower ratings of postpartum depression on the Edinburgh Depression Questionnaire. It was hoped that in identifying related variables, suggestions might be possible to help women reduce their postpartum depression rating. Selected variables included physical activity, perceived stress, social support and demographic characteristics. These were all acquired retrospectively. The postpartum depression measure (Edinburgh Depression Questionnaire) was completed at a later time than the other measures.

Subjects

Two hundred and twenty volunteer female subjects between the ages of 20 and 35 were recruited from selected community hospital maternity wards in the lower mainland area of British Columbia. Of the 220 subjects initially consenting to be in the study, 104 women completed all five questionnaires (see Figure 1). The questionnaires were all distributed at the same time and in the

same order to each subject. The numbers of subjects responding to the questionnaires drops as each questionnaire demands more of their time to complete and their interest wanes in completing paper work. The number of subjects that completed the EDPS and the number that completed all 5 questionnaires was different. The completion of the final questionnaire (the EDPS) did not ensure that the subjects also completed the first four measures.

Figure 1

Response rates for measures.

Consent Form	Dem Q	PSS	Life H	NSSQ	EDPS	Completion of all 5 questionnaires
220	171	168	163	151	116	104

For details concerning the treatment of consenting subjects as well as the specific procedures and information given to the subjects (see Appendix F). The subject population consisted of both primiparous (first time mothers) and multiparous (having had children before) individuals. Women who had no social support, who were unwed teen mothers and who were separated from their babies for 48 hours or more immediately after birth were not included in the study because they were deemed to be at extreme risk for postpartum depression. Women who fell into one of the above categories also are known to have many other social and psychological problems and negative feelings that are distinctive to this population. These women are often initially depressed and represent unique populations. Maternity ward hospital nurses, therefore, screened the women who were at high risk for postpartum depression and did not give them project descriptions or consent forms.

Definitions of Terms

Exercise. In this study, exercise constitutes any regular activity or program that is designed to improve or maintain physical fitness. This definition of exercise is contained in the question used to measure physical activity (see Appendix C, The Lifestyle Habit Questionnaire). Exercise is one application of physical activity that is undertaken to enhance or sustain physical fitness. Physical fitness can be thought of as a set of

characteristics that people have or accomplish through exercise training (Castell & Blumenthal, 1985). Health related physical fitness is associated with cardiorespiratory endurance, muscular strength/endurance, body composition and flexibility.

Postpartum Depression. Postpartum depression is a form of depression that occurs in the weeks following delivery. Its severity lies between the extremes of puerperal psychosis and maternity blues. For the purpose of this study, it is defined by a score of 10 or higher on the Edinburgh Depression Scale.

Perceived Stress. Perceived stress is the degree to which situations in one's life are appraised as stressful. Stress therefore occurs when life situations are appraised as threatening and when there are insufficient resources available to cope with the circumstances. A rating of high perceived stress is defined in the present study as a high score on the Perceived Stress Scale and inversely a low score means low perceived stress.

Social Support. Social Support is defined as interpersonal interactions that consist of one or more of the following: the demonstration of positive affect of one person toward another; the approval of behaviors of one person toward another, understandings, or communicated views; the giving of symbolic or tangible assistance to another (Kahn, 1979). This definition of social support has also been used in the development of the Norbeck Social Support Questionnaire. Therefore for the purposes of the present study high social support is a high NSSQ score and

low social support is a low NSSQ score.

Measures

Five Self-report Questionnaires were used in this study.

Demographic Information Questionnaire. (Appendix A) The

Demographic Information Questionnaire was designed by the

researcher to gain information about possible predictors of

postpartum depression. This questionnaire also provided a

general description of the subject population and information

about the homogeneity of the subjects. Additional information

was needed to determine if specific variables besides exercise

might influence the depression level of these women and if these

variables contributed to the intent or ability to exercise. Many

of the variables examined have been investigated in previous

studies concerning postpartum depression.

The last item on the scale was included specifically because

attitudes towards physical activity have been found to be

associated with the degree of participation in physical activity.

Expectations for change from exercise have also been associated

with actual positive changes incurred from exercise (Brown,

1991). Therefore, attitudes towards physical activity were

measured to see if there was a link between these and the action

of physical activity and in turn to look at its effect on

postpartum depression. The Lifestyle Habit Questionnaire was

given to 5 professionals and 5 non-professionals to test for

understanding.

Perceived Stress Scale (PSS). (Appendix B) The PSS was designed to measure the degree to which life situations are appraised as stressful. This measure was included because life stress has been found to be a significant and consistent predictor of postpartum depression (Paykel, Emms, Fletcher & Rassaby, 1980; O'Hara, 1986). This particular questionnaire was chosen because the PSS has been found to be a better predictor of depression than other life-event measures (Cohen, Kamarck & Mermelstein, 1983). Cohen et al. (1983) studied three separate samples and found the coefficient alpha reliability for the PSS to be .84, .85 and .86. In all three samples, the correlations of the PSS with physical and depressive symptomatology were all significant at $p<.001$ (Cohen et al., 1983).

Some work on postpartum depression has investigated attributional styles and how the world is perceived by the mother (Cutrona, 1983; O'Hara, Nuenaber & Zekoski, 1984; Whiffen, 1988). This questionnaire does more than record life-events, it evaluates how these events are perceived by the mother.

Lifestyle Habit Questionnaire. (Appendix C) Exercise was measured by a single question about physical activity. This question about physical activity was adapted to address four separate time periods; the three months prior to pregnancy, the first trimester of pregnancy, the second trimester of pregnancy and the third trimester of pregnancy. An adapted version of the question was asked (reworded) four times, each time addressing

one of the four time periods. This question was validated

using 1,004 subjects enrolled in a worksite health promotion

program (Schecktman, Barzilai, Rost & Fisher, 1991). The mean

age of the 1,004 subjects was 36.6 $\pm$ 9.5 years with 73.1% of the

population being females. The question had a "significant age-

adjusted association with body mass index ($p < 0.0001$ in women

and $p < 0.001$ in men), HDL cholesterol ($p < 0.0001$ in women), and

oxygen capacity ($p < 0.0007$ in women and $p < 0.002$ in men). One

self-reported question can provide useful information about who

is and who is not participating in regular exercise." (Schecktmen

et al., 1991, p.771).

Additional questions were asked to determine the pattern of

activity for pregnant subjects and gain insight into reasons for

the pattern. Since the definition of exercise was stated within

the question measuring physical activity, it is assumed that the

subjects understood what was meant by physical activity when

completing the questionnaire.

Norbeck Social Support Scale (NSSQ). (Appendix D) The NSSQ

was designed to measure multiple dimensions of social support

based on Kahn's (1979) definition of social support. Functional

components measured are affect, affirmation, and aid. The mode

of social support (Kahn's concept of convoy) is measured by three

network properties: number in the network, duration of

relationships, and frequency of contact with network members.

The loss of social support is also addressed by the NSSQ.

The NSSQ was selected because social support has been found

to be a significant factor in the occurrence of postpartum depression (Paykel, Emms, Fletcher & Rassaby, 1980). Marital tension has also been shown to be related to postpartum depression (Whiffen, 1988). Social support encompasses more than just the marital relationship. Since the NSSQ includes information about both general social support and the marital relationship, it was selected instead of a marital questionnaire.

The Norbeck Social Support Scale was chosen because it has been shown to be reliable, (.90 to .96 for the subscales) and valid, (.92 to .94) for a clinically depressed population (Byers & Mullis, 1987). This is important because some subjects who complete the NSSQ may fall into the clinically depressed category. The Norbeck Social Support Scale has also been shown to be reliable (range: .85 to .92 on the functional items) and valid for a normal population (Norbeck, Lindsey & Carrieri, 1981).

The Edinburgh Depression Scale. (Appendix E) The Edinburgh Depression Scale (EDPS) was selected because it was designed specifically for use in the postpartum period. Cox, Holden and Sagovsky (1987) compared it to the 30-item General Health Questionnaire (GHQ) of Goldberg et al. (1970) and the Beck Depression Inventory (BDI) (O'Hara et al., 1983). Only 37 of 89 women, originally obtaining a high score on the GHQ, were confirmed as psychiatric cases (Nott and Cutts, 1982). Similarly, only 11 of 19 women, whose BDI scores showed them to have depression, were confirmed to have depression by the

Research Diagnostic Criteria (RDC). Four out of the 23 women, whose BDI scores indicated they did not have depression, were found to have depression by the RDC (Cox et al., 1987).

The Edinburgh Depression Scale was specifically designed to screen for postpartum depression. It was not intended to be a substitute for a clinical assessment of postpartum depression. All, but one woman, in Cox, Holden and Sagovsky's (1987) study, were identified by the EDPS and confirmed by the RDC to have a diagnosis of Definite Major Depressive Illness. The EDPS is measured using an interval scale with possible scores ranging from 0 to 30 (a higher score indicates greater depression). Cox et al. (1987) used an EDPS threshold score of 12/13, meaning those scoring 12 or higher were classified as having postpartum depression. One woman who was not identified by her EDPS score as having postpartum depression was confirmed by the RDC to have a diagnosis of Probable Major Depressive Illness. Cox et al. (1987) warned that an EDPS score just under the cut-off of 12 should not be taken to mean an absence of depression for that subject.

The EPDS had a sensitivity (the % of genuine cases identified) of 95% and a specificity (the % of genuine non-cases identified) of 93% (Harris, Huckle, Thomas, Johns & Fung, 1989). This study also found the scale to be easily understood by childbearing women and able to be completed in five minutes. The Edinburgh Depression Scale found 22% of the population studied to score higher than 12 (the predetermined cut off point for

postpartum depression) (Harris et al., 1989). Harris et al. (1989) concluded that the value of the EDPS can be increased by lowering the predetermined cut off point for postpartum depression to 10 and over. Using the cut off point of 10 on the EDPS, 10% of the total number of postpartum cases would go undetected. This is a smaller percentage than if the predetermined cut off point remains at 12. Therefore, the present study used a cut off score of 10 and people with scores of 10 or higher were classified as postpartum depression cases.

Research Protocol

Four questionnaires (the Demographic Questionnaire, the Perceived Stress Scale, the Exercise Questionnaire and the Norbeck Social Support Scale) were completed by the subjects while they were in the hospital maternity ward in the days immediately following childbirth. The Edinburgh Depression Scale, the fifth questionnaire, was completed by the subjects at home six weeks after childbirth (see Figure 2). The time of six weeks postpartum was an arbitrary choice and was decided upon because past studies using the Edinburgh Scale measured postpartum depression at the six week mark. depression.

Figure 2

Research Protocol

In the hospital maternity ward	Six weeks after childbirth
The Demographic Questionnaire	The Edinburgh Depression
The Perceived Stress Scale	Scale
The Lifestyle Habit Questionnaire	
The Norbeck Social Support Scale	

Hypothesis

Women who participated in regular physical activity during the pre-pregnancy and pregnancy period will exhibit a significantly lower mean score of postpartum depression.

Procedure

Initial contact with the volunteer subjects was made through the nurses in two British Columbia lower mainland hospitals. In the days following childbirth, the nurses provided selected new mothers with the description of the project and a consent form. The nurses were requested to screen subjects and to exclude women who had a total absence of social support, who were unwed teen mothers, and who were separated from their babies for over 48 hours immediately after birth.

In the hospitals, the researcher or an assistant collected the completed consent forms in person and delivered the questionnaires to the mothers. At this time, the researcher was also able to answer questions that the subjects had.

On the consent form, the researcher also obtained permission to call the subjects in their sixth week postpartum and encourage completion of the postpartum depression scale.

In order to protect subject identity, the questionnaires were coded. The subjects names appeared only on the consent forms.

Volunteer subjects (N=220) received four questionnaires (the

Demographic questionnaire, the Perceived Stress Scale, the

Lifestyle Habit Questionnaire and the Norbeck Social Support

Scale) to complete during their time at the hospital. They were

also given one questionnaire (the Edinburgh Depression Scale) to

be completed at home in their sixth week postpartum (as stated

previously, six weeks was an arbitrary choice) and then mailed to

the researcher in a stamped self-addressed envelope.

<u>Analysis of Results</u>

Participation in physical activity and its relationship to

postpartum depression was analyzed through 2 X 2 factorial

ANOVA's. A separate ANOVA was conducted for the pre-pregnancy

period, the first trimester of pregnancy, the second trimester of

pregnancy and the third trimester of pregnancy. The level of

significance used was α =.10 (to protect against Type II error).

The dependent variable was the depression score and the

independent variables were the classification of physical

activity (involved in physical activity and not involved in

physical activity) and the clinical classification of depression

(those suffering from postpartum depression and those not).

Because both stress and social support have been found

throughout the literature to be significantly associated with

postpartum depression, this study also investigated their

association with postpartum depression. To examine whether

higher levels of perceived stress and lower levels of social

support would be significantly associated with a greater

incidence of postpartum depression, a multiple regression analysis was used. Depression was the dependent variable and stress and social support were the independent variables in the equation. The level of significance used was $\alpha = .05$.

In order to discover other factors that may be significantly related to postpartum depression, this study also measured a variety of demographic characteristics. Two profile analyses that tested for parallelism and coincidence were used to examine whether or not demographic characteristics were significantly associated with postpartum depression. One profile was conducted on all of the demographic items that were answered on a 5-point scale and one on all of the demographic items that were answered on a 4-point scale. Two separate profiles were used because the height of each profile depends on the number of points in the scales. Any differences on 5 point scales would be greater than differences on 4 point scales.

Mann-Whitney U Analyses were conducted to detect additional relationships between physical activity and social support, and physical activity and stress. Again, a significance level of $\alpha = .10$ was used here (to protect against type II error). As well, descriptive statistics were used to obtain an overall picture of the subject population. The frequencies of scores from the life-style habit questionnaire were also examined to determine the pattern of activity for pregnant women and to look at reasons why the women either participated in or did not participate in physical activity.

RESULTS

Introduction

Throughout the four and one half months of data collection, a total of 220 women volunteered to be involved in the study. Of these initial 220 volunteers, 185 completed a minimum of 1 of the 5 questionnaires. The Demographic questionnaire was completed by 171 women, the Perceived Stress Scale by 168 women, the Lifestyle Habit Questionnaire (physical activity questionnaire) by 163 women, the Social Support scale by 151 women, the Edinburgh Depression Scale by 116 women and all five questionnaires were completed by 104 women volunteers (see Figure 1).

The Demographic questionnaire, Perceived Stress Scale, Lifestyle Habit Questionnaire (physical activity questionnaire) and the Norbeck Social Support Scale were completed by the volunteers while they were in the hospital maternity wards. These completed questionnaires were then either collected by the nurses or placed into a drop off box at the nurses station. The Edinburgh Depression Scale was completed six weeks later when the mothers were at home and were then mailed to the researcher. The six week mark was an arbitrary time chosen and they were then phoned on one occasion only to try to encourage completion of the EDPS.

Of the 116 women (this sharp decline in completion rate was due to the EDPS measure being completed six weeks later) who completed the Edinburgh Depression Scale, thirty two subjects

(27%) were classified as having postpartum depression (EPDS score
of greater than or equal to 10). The remaining 84 (72%) were
classified as non-depressed (EPDS score of 0-9). This 27%
classification of depression is within the expected range of
postpartum depression and therefore suggests that response bias
did not occur. The response rate of 52.7% (of those who
consented to be in the study and actually completed the entire
study) in the present study is comparable to the response rate
for other studies using pencil and paper measures. For example,
in Miller and Friedman's (1988) study, 265 individuals consented
to be in the study but only 118 (44.5%) completed the study.

For information on the subject population of the present
study see Appendix G. This appendix supplies information about
the demographic characteristics of the subjects as well as
information about their pattern of physical activity and their
reasons for exercising or not exercising.

Results

The four ANOVA's used data from 104 subjects (the number of
subjects who completed all five questionnaires). The alpha level
used in this analysis was α .10 (to protect for Type II error).
Because the number of subjects who were involved in physical
activity and the number of subjects who were classified as
depressed and not depressed was uneven, a random drawing out of
subjects was done in order to even out the cell sizes for the

ANOVA's. Table 1 shows the original number of subjects in each category. As shown in Table 2., the mean ($\pm$SD) of depression scores for those who participated in exercise and were not depressed are similar to the means ($\pm$SD) of those who did not participate in exercise and were not depressed. Similarly, the mean ($\pm$SD) of depression scores for those who participated in exercise and were depressed are similar to the means ($\pm$SD) of those who did not participate in exercise and were depressed. The F scores in Table 3 (prior to pregnancy $F(1, 52) = 1.000$, first trimester $F(1,44) = .665$, second trimester $F(1,28) = .940$ and third trimester $F(1,24) = .368$) show no apparent association between exercise and depression scores in any of the four time periods.

Table 1

Cell sizes of exercise and depression groups

	depressed	not depressed
prior to pregnancy		
physical activity	16	41
no physical activity	14	38
first trimester		
physical activity	12	36
no physical activity	18	43
second trimester		
physical activity	8	24
no physical activity	22	55
third trimester		
physical activity	7	18
no physical activity	23	61

Table 2

Means and standard deviations of depression scores for exercise
groups of collapsed cell sizes

		Mean	Std. Dev.	N
Prior to pregnancy	exercise			
	not depressed	4.50	2.03	14
	depressed	13.79	2.97	14
	no exercise			
	not depressed	5.57	2.65	14
	depressed	14.86	4.82	14
First trimester	exercise			
	not depressed	5.00	2.49	12
	depressed	12.83	2.59	12
	no exercise			
	not depressed	5.17	2.76	12
	depressed	13.67	2.74	12
Second trimester	exercise			
	not depressed	5.75	2.05	8
	depressed	13.38	2.67	8
	no exercise			
	not depressed	5.13	2.64	8
	depressed	12.63	1.85	8
Third trimester	exercise			
	not depressed	5.14	1.57	7
	depressed	13.57	2.30	7
	no exercise			
	not depressed	5.43	2.37	7
	depressed	12.43	1.90	7

Table 3

Summary table for exercise and depression two-way ANOVA

Time period	Source	df	SS	MS	F	Sig of F
Prior to pregnancy	exercise	1	16.07	16.07	1.49	.228
	depression	1	1207.14	1207.14	111.89	.000
	ex. by dep	1	.00	.00	.00	1.000
	within cells	52	561.00	10.79		
First trimester	exercise	1	3.00	3.00	.43	.516
	depression	1	800.33	800.33	114.33	.000
	ex. by dep	1	1.33	1.33	.19	.665
	within cells	44	308.00	7.00		
Second trimester	exercise	1	3.78	3.78	.70	.411
	depression	1	457.53	457.53	84.21	.000
	ex. by dep	1	.03	.03	.01	.940
	within cells	28	152.13	5.43		
Third trimester	exercise	1	1.29	1.29	.30	.587
	depression	1	416.57	416.57	98.02	.000
	ex. by dep	1	3.57	3.57	.84	.368
	within cells	24	102.00	4.25		

A multiple regression analysis examined whether or not higher levels of perceived stress and lower levels of social support were associated with a greater incidence of postpartum depression. This procedure was conducted on 105 valid and complete pieces of data pertaining to the social support, perceived stress and depression ratings of subjects. A pairwise deletion of missing data was used. The variables of stress and social support accounted for 24% ($r^2 = .2317$, $\underline{F} = 14.6$, d.f. 2,94, $p < .0001$) of the variation in postpartum depression scores. The variable stress was found to be positively associated with postpartum depression (see Table 4). Social support was not found to be significantly associated with postpartum depression however the results were in the expected direction (see Table 4).

The relationship of physical activity and stress as well as the relationship between physical activity and social support was determined through Mann-Whitney U analyses. These results are shown in Appendix H and I. The only significant relationship found ($\propto = .10$) was between physical activity during the first trimester of pregnancy and perceived stress (see table H-1).

Table 4

Multiple regression analysis with postpartum depression as

dependent variable and the indices of perceived stress and social

support as independent variables

Indep Var.	B	SE
Social support	-.007554	.004469
Perceived stress	.277148*	.055737
R Square	.23713	

*P < 0.0001

Two separate profile analyses were conducted on the data from 105 volunteers to examine whether or not demographic characteristics had a relationship with the incidence of postpartum depression. One profile was conducted on all of the demographic items that were answered on a 5 point scale and one on all of the demographic items that were answered on a 4 point scale. The only items from the demographic questionnaire not addressed by one of the profile analyses were marital status and the educational level attained (these were measured on 2 and 8 point scales respectively).

The non-significant F scores $F(6)$ = .896 (for the 5 point scales) and $F(8)$ = .887 (for the 4 point scales) from the Wilks Lambda test of significance indicated that both of the profiles were found to be parallel (see Table 5). The finding of parallelism is a necessary prerequisite to go on to the next step of profile analyses and test whether the two profiles are different. The test for coincidence (Table 6) was non-significant $F(1,102)$ = .827 (for the 5 point scales) and $F(1,110)$ = .927 (for the 4 point scales). This indicates that any differences that exist between the profiles of the depressed group and the profiles of the non-depressed group are mere coincidence. No relationship exists between any of the demographic characteristics and postpartum depression. For a visual presentation of the two profiles see Figures 3 (5 point scales) and 4 (4 point scales).

Table 5

The test of parallelism for depression profiles

Scale	Test Name	Value	Approx. F	DF	Error DF	Sig of F
5 pt. scale	Wilks	.97763	.36984	6.00	97.00	.896
4 pt. scale	Wilks	.96607	.45217	8.00	103.00	.887

Table 6

<u>The relationship of Demographic characteristics with depression</u>

Scale		SS	DF	MS	F	Sig of F
5 pt.	depression	.01	1	.01	.05	.827
scale	within cells	15.32	102	.15		
4 pt.	depression	.00	1	.00	.01	.927
scale	within cells	11.64	110	.11		

Figure 3. Depressed and non-depressed profiles for 5 point scale items.
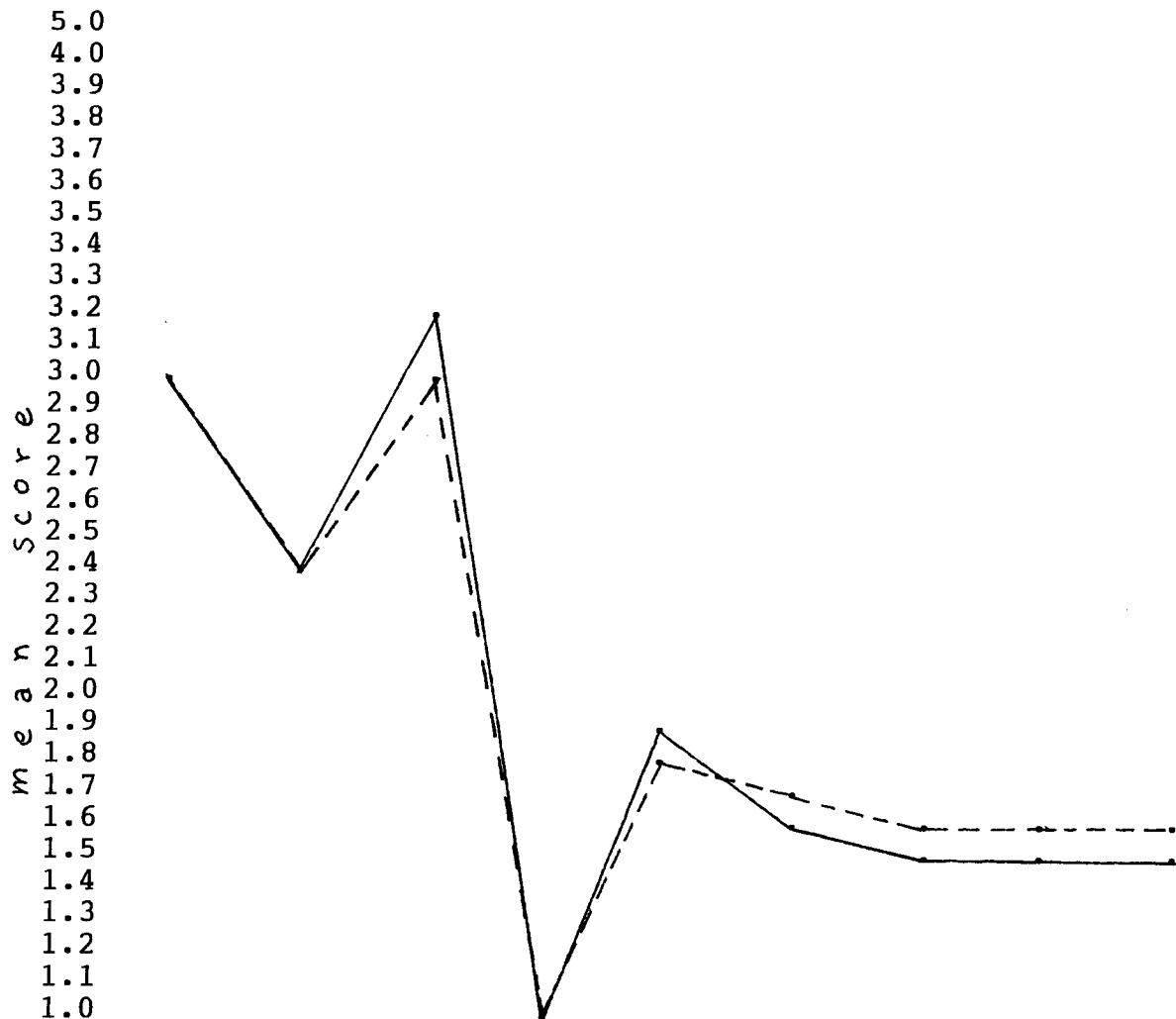
length- length of pregnancy
outcome- birthweight of baby
type- type of delivery
nbcomp- number of complications with birth
mcomp- number of complications with mom
ptotal- number of previous pregnancies
weeks- number of previous pregnancies past 20 weeks
births- number of previous births
children- number of living children

Depressed= _____
Non-depressed= _ _ _ _ _ _ _

Figure 4. Depressed and non-depressed profiles for 4 point scale items.


```
4.0
3.9
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
 .9
0.8
0.7
0.6
0.5
```

D E M O G R A P H I C   C H A R A C T E R I S T I C S
age   income   occup   weight   pregcomp   separate   being
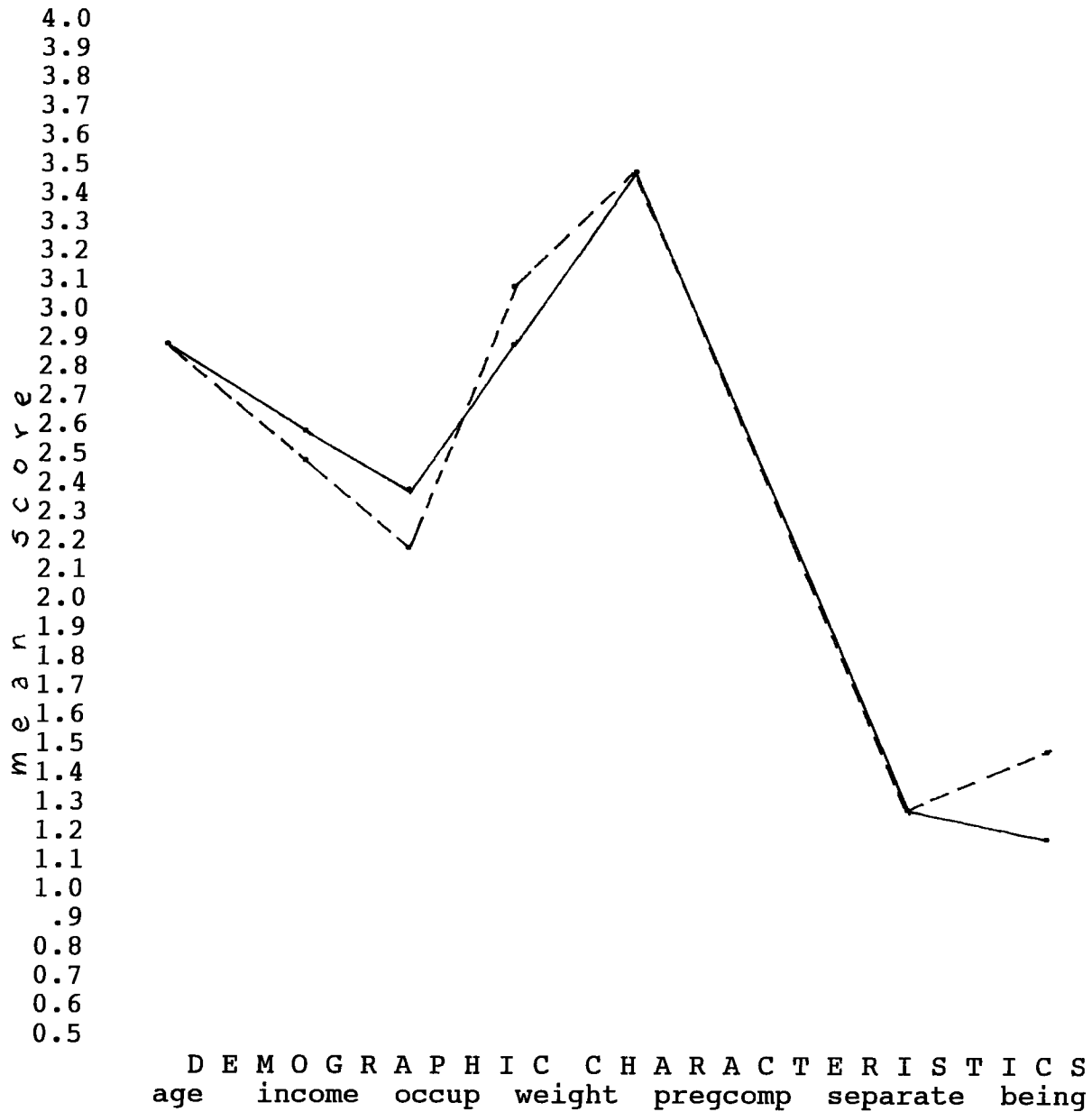
age- age of mother
income- total family income
weight- weight gain during pregnancy
pregcomp- complications during pregnancy
separate- length of separation from baby at birth
being- rating of how physical activity effects well-being

Depressed=_____
Non-depressed= _ _ _ _ _ _

In order to compare the data obtained from this study with data from previous studies, descriptive statistics are shown for each of the standardized questionnaires (the Perceived Stress Scale, the Norbeck Social Support Scale and the Edinburgh Depression Scale). These data are shown in Table 7. The mean score for the Perceived Stress Scale is 25.276 with a range of 42. The mean depression score is 8.086 which lies only two points away from the cut off for classification of postpartum depression (a score of 10 or higher). The range of depression scores is 28 (1 to 29). This table also divides the descriptive data into the subscales of the Norbeck social support scale. The mean for the subscale `affect' is the highest at 67.486 as compared to 62.0 for `affirm' and 59.905 for `aid'. This indicates that `affect' (which measures expressions of positive affect of one person toward another) is generally scored higher than `affirm' (which measures the affirmation or endorsement of another persons behaviors, perceptions, or expressed views) or `aid' (which measures the giving of symbolic or material aid to another). The subscale `aid' is also the lowest scored in other studies using the Norbeck scale (Norbeck, Lindsey & Carrieri, 1983). The range of 516, in the total social support scores, is very large with the scores varying from 19 to 535.

`Loss', another subscale of the Norbeck social support scale, gives information about whether a loss of a significant relationship occurred in the past year. The loss can refer to a loss by moving, job change, divorce or separation, or death. To

determine whether any relationship existed between `loss' and postpartum depression a Mann-Whitney U analyses was conducted (see Appendix J). No significant association between `loss' and postpartum depression was determined.

Table 7

<u>Descriptive statistics for the three standardized scales:</u>
<u>Perceived Stress Scale, Norbeck Social Support Scale and the</u>
<u>Edinburgh Depression Scale</u>

Stand. Scale	Mean	Standard Deviation	Kurtosis	Skewness	Range	Max.
P.S.S.	25.276	7.846	-.300	-.013	42.00	46
NSSQ						
Total	188.714	97.864	.973	1.002	516.00	535
Affect	67.486	35.169	1.372		183.00	188
Affirm	62.000	32.778	.874	1.037	154.00	160
Aid	59.905	32.365	1.458	1.068	182.00	190
EDPS	8.086	4.905	2.127	1.181	28.00	29

Stand. Scale	SE Mean	Variance	SE Kurt.	SE Skew.	Minimum	Sum
PSS	.615	61.559	.378	.190	4	4120
NSSQ						
Total	18.072	9577.34	.397	.200	19	27741
Affect	2.891	1236.837	.396	.199	5	9988
Affirm	2.704	1074.411	.347	.200	6	9114
Aid	2.669	1047.470	.397	.200	8	
EDPS	.479	24.060	.467	.236	1	849

The frequency counts in Table 8 show that the number of women who participated in physical activity diminishes as pregnancy progresses. There are approximately even numbers of women who participated in physical activity prior to pregnancy but by the third trimester of pregnancy, only one quarter of the women, half of the original number of exercisers, participated in physical activity on a regular basis.

Table 8

Frequency counts of women involved in physical activity

Time period	Exercise Yes	percent	Exercise No	percent
Prior to pregnancy	81	51.3%	77	48.7%
First trimester	67	42.4%	91	57.6%
Second trimester	48	30.4%	110	69.6%
Third trimester	39	24.7%	119	75.3%

Summary

Four two-way ANOVA's found that physical activity, during pre-pregnancy, first trimester, second trimester or third trimester of pregnancy, was not significantly related to postpartum depression. Two profile analyses indicated that none of the demographic characteristics were significantly associated with postpartum depression. The only factor found to be significantly associated with postpartum depression was perceived stress (by Multiple regression). A Mann-Whitney U analysis also found Perceived stress to be significantly associated with physical activity during the first trimester of pregnancy.

DISCUSSION

The incidence of postpartum depression in this study corresponded quite closely with that of other studies (Steiner, 1990). In the present study, the reported incidence of postpartum depression, using a cut-off score of 10 or higher on the Edinburgh Depression Scale (EPDS), was 27%. This was slightly higher than rates found in previous studies because the cut-off score used in the present study was lower. A lower cut-off for depression was decided upon because of a recommendation from an earlier study (Harris, Huckle, Thomas, Johns & Fung, 1989). If the cut-off had been 12 here instead of 10, as in some previous studies, the incidence of postpartum depression would have been 17.1%. This percentage corresponds to the range of percentages cited previously (Cox, Holden & Sagovsky, 1987). Because the incidence was within the range of previously reported postpartum depression rates, this study assumed that the cases of postpartum depression found were actual cases.

It must be remembered that since the sample was not a random sample and only 53% (N=220) responded to all questionnaires, no firm conclusions can be made from this study. Since the postpartum measure was completed in the subjects homes six weeks later than the other measures, many subjects forgot or simply did not send in this questionnaire. It was thought important that all subjects complete the postpartum measure at the six week postpartum mark, although this time was arbitrarily

decided upon. To help ensure that this happened, each subject received a phone-call in their sixth week postpartum to remind them to complete and send in their Edinburgh Postpartum Depression Questionnaires. Postpartum depression rates tend to vary depending on the time of measurement, therefore to be consistent within the study the same time of measurement was required for all subjects. The Edinburgh scale itself has been tested for and used previously during the sixth week postpartum (Harris, Huckle, Thomas, Johns & Fung, 1989). For the above reasons, only one follow-up call was made.

Potential relationships of physical activity with postpartum depression can now be explored. Firstly, physical activity, prior to or during any of the three trimesters of pregnancy, was not found to be significantly associated with a lower mean score of postpartum depression. The hypothesis that participation in regular physical activity during the pre-pregnancy and pregnancy period would be associated with a lower mean score of postpartum depression than with those who did not participppate in physical activity was therefore not supported. No relationship between postpartum depression and physical activity was established. The question then is raised as to why no relationship between physical activity and postpartum depression was found.

Four two-way ANOVA's explored the relationship between physical activity and postpartum depression separately for four time periods. These analyses did not take into account a possible cumulative effect of physical activity throughout the

four time periods. For example, did women who exercised during all four time periods have a lower postpartum depression rating? Only 51.3% of the women were involved in physical activity prior to pregnancy. This percentage diminished to 24.7% of women by the third trimester of pregnancy. Again, because of the low response rate and low numbers of women participating in physical activity, a replication study would be in order.

Individual studies in the literature point to the possible preventative powers of physical activity although this avenue has not been explored in depth (Morgan, 1987). For example, it is not known what type, duration, intensity or frequency of physical activity is needed in order to help reduce mental health problems (eg. anxiety, stress, moderate depression) from occurring. Physical activity may also play a role in preventing certain mental health disorders from occurring but not others such as postpartum depression.

The exercise measurement used in this study, although correlated with measures of physical fitness, was not detailed. Since the same information about physical activity was desired for each of the four time periods (pre-pregnancy, first, second and third trimester of pregnancy), one simple questionnaire was preferred over four complex questionnaires. The women were also answering the questions retrospectively, looking back on the last year of their life and answering questions pertaining to that time period. The exact type, frequency, intensity and duration of exercise was not determined. It may be the case that a slight

advantage in preventing postpartum depression does exist for those who exercise at a certain level or at certain times. However, large population studies might be required to detect that advantage and the conclusion would relate to trends within a complex phenomenon, rather than specific cause and effect conclusions.

Since it is not known how long the physiological outcomes of exercise last (Ransford, 1982), it may be that physical activity had no effect on postpartum depression because the physiological changes incurred from exercise had worn off by the time of onset of postpartum depression. It is also not known how long the psychological benefits of exercise last. For example, physical activity has been found to be associated with an increased self-confidence and emotional stability which in turn are associated with lower depression levels (Lobstein, Mosbacher & Ismail, 1983). If indeed physical activity during pregnancy increased self-confidence and emotional stability, these effects may have diminished by six weeks postpartum and therefore would not affect the postpartum depression level.

Something within the mystery of postpartum depression itself could offer an explanation as to why physical activity in the present study was not associated with postpartum depression. The origins of postpartum depression are still not known (Gitlin & Pasnau, 1989). The physiological and psychological changes that occur from exercise do not seem to affect postpartum depression even though they have helped to reduce the severity of other

forms of depression. There may be an unknown factor concerning postpartum depression that makes it impossible to reduce its occurrence through exercise.

In another correlational, pencil and paper, retrospective study, physical activity has been associated with a reduction of postpartum blues (Stephenson, 1991). Postpartum blues has also been linked to postpartum depression (Cox, Connor & Kendell, 1982). However, throughout the literature different factors have been found to be related to postpartum depression than those associated with postpartum blues. It may be that the beneficial effects of physical activity are short term and therefore physical activity was found to be associated with postpartum blues because the blues occur as early as the third or fourth day after childbirth. Postpartum depression does not occur until weeks later and the changes induced from physical activity during pregnancy may not have a sufficientlythat lasting effect.

The present author recommends that future studies on the same topic use a measure of exercise that can indicate the cumulative effect of exercise over time. Also, since physical activity is an effective treatment for clinical depression (Greist, Klein, Faris, Gurman & Morgan, 1979; Greist, 1987), it would be interesting to see if exercise can effectively treat postpartum depression. The reason why no relationship between physical activity and postpartum depression was found in the present study may become evident in further research concerning exercise as treatment for postpartum depression.

A multiple regression analysis addressed the question of whether higher perceived stress and lower social support would be related to a higher incidence of postpartum depression. Perceived stress was found to account for 22% of the variance in depression scores. Perceived stress was also found to be significantly associated with postpartum depression but social support was not found to be significantly associated with postpartum depression. The relationship between perceived stress and postpartum depression is that a higher perceived stress score is related to a higher likelihood of postpartum depression. The relationship of social support with postpartum depression was not statistically significant (see Appendix I) although it was in the expected direction (low social support and high depression).

The above findings give partial support to previous studies that found low social support and high life stress to be predictors of postpartum depression (Paykel, Emms, Fletcher & Rassaby, 1980; O'Hara, 1986; Mercer & Ferketich, 1988). These studies were only partially supported because stress and not social support was found to be significantly related to postpartum depression. This study also supported Paykel et al's (1980) statement that perceived stress is a better predictor of depression than other life event scores (Paykel, Emms, Fletcher & Rassaby, 1980 and O'Hara, 1986) because of the significant relationship found between perceived stress and postpartum depression.

The relationship between physical activity during the first

trimester of pregnancy and perceived stress was significant (see Appendix H, Table H-1). Physical activity during pre-pregnancy and during the second and third trimesters of pregnancy were not found to be significantly related to perceived stress. Specifically, the relationship between physical activity during the first trimester of pregnancy and perceived stress suggested that those involved in physical activity during the first trimester of pregnancy had lower ratings of perceived stress. This relationship of physical activity with perceived stress supported previous studies that found physical activity to be related to reduced stress (Plante & Rodin, 1990 and Norwell, Martin, & Salamon, 1991).

It is interesting to note that perceived stress was found to be associated with postpartum depression and that physical activity (during the first trimester of pregnancy) was associated with perceived stress yet physical activity was not associated with postpartum depression. Perceived stress appears to be a mediating variable between postpartum depression and physical activity.

Fleming, Baum and Singer (1984) describe stress as closely linked with coping and part of a process involving environmental events, psychosocial processes, and physiological response. They also describe a link between coping and perceived control. The relationship between physical activity and stress may lie in the link between perceived control and coping. Physical activity, as mentioned in the literature review, gives participants a feeling

of mastery and therefore more control and general confidence about various situations (Danskin & Crow, 1981). It could be that because of this sense of mastery, individuals involved in physical activity perceive a lower level of stress and are in turn better able to cope with the stress they experience. Lazarus (1975) proports that physiological changes associated with fitness training affect the adaptation strategies used to handle stress and emotions.

Practical clinical applications can be drawn from the information that perceived stress was a mediating variable between physical activity and postpartum depression. Physical activity may indirectly have an effect on postpartum depression. Clinicians could recommend physical activity to pregnant women, especially in the second and third trimesters, with the hopes of those women also having a lower stress level and in turn a lower score of postpartum depression. It was found that stress during pregnancy was associated with postpartum depression, which occurs months later, yet physical activity during pregnancy may affect the stress during pregnancy which in turn may affect postpartum depression.

Possible relationships of various demographic characteristics (such as age, income level, education, complications with pregnancy) with postpartum depression were explored by two profile analyses. The two profiles were both found to be parallel, but there was no significant difference found between the profiles (see Figures 3 and 4). Specifically,

this indicated that the demographic characteristics of: age; household income; occupation; weight gain during pregnancy; complications during pregnancy; being separated from baby at birth; ratings of how physical activity affects well-being; length of pregnancy; birthweight of baby; type of delivery; number of complications with baby; number of complications with mom; the total number of pregnancies; number of pregnancies past 20 weeks; number of births; and number of children, were all unrelated to postpartum depression. These findings are consistent with findings of past studies on postpartum depression (Unterman, Posner & Williams, 1990; Gotlib, Whiffen, Mount, Milne & Cordy, 1989).

Descriptive statistics were used to compare the social support and perceived stress scores with normative data from previous studies. The mean scores on the subscales of the Norbeck Social Support Scale (NSSQ) (mean total social support= 188, mean affect= 67, mean affirm= 62 and mean aid= 59) were found to be substantially lower than those reported by Norbeck, Lindsey and Carrieri (1981) (mean total social support= 281, mean affect= 101, mean affirm= 92 and mean aid= 87) and Byers and Mullis (1987) (mean total social support= 263, mean affect= 91, mean affirm= 86 and mean aid= 86). In the two studies cited above, the NSSQ was administered to psychiatric inpatients (Byers & Mullis, 1987), to primarily female first-year graduate (M.S.) students in nursing and to senior nursing students (Norbeck, Lindsey & Carrieri, 1981). The differences in subject

populations may explain the differences found in the scores. In this study, lower ratings of social support may have been found for a variety of reasons. One reason may be that the subjects were in the hospital when completing the questionnaire. Since childbirth is a traumatic experience for some women, the volunteers may have been more tired and emotional than usual. Their extreme emotions and lack of energy may have had an effect on the way they scored on the social support scale. The difference in means of social support scores between the present study and previous studies may also indicate that the NSSQ is not reliable when used on different populations or situations. The difference in means may also signify that this population did not have as much social support as other populations.

The perceived stress scores (measured by the Perceived Stress Scale) were found to be comparable to those in previous data. For example, this study found the mean perceived stress score to be 25.28 and previous studies have found means of 23.18, 23.67 in male and female student samples, 25.0 in a smoking cessation sample, 23.57 and 25.71 in female student samples and 25.6 in a community sample (Cohen, Kamarck & Mermelstein, 1983). The standard deviations and ranges for the perceived stress scores in this study are also similar to those found in Cohen, Kamarck & Mermelstein's (1983) study. The perceived stress of the present population coincided with the norms from previous studies.

The frequency counts of women participating in physical

activity during the four time periods lend support to the general belief that the activity level of pregnant women drops as women progress through their pregnancies (see Table 8). For specific information of the reasons why women in this study changed their physical activity level see Appendix G.

In review, no relationship was found between physical activity during pre-pregnancy or during the three trimesters of pregnancy and postpartum depression. Perceived stress scores were found to be significantly related to postpartum depression but no relationship between low social support and postpartum depression was found. No demographic characteristics were found to be related to postpartum depression. The relationship found between physical activity during the first trimester of pregnancy and perceived stress implied that stress was a mediating variable between physical activity and postpartum depression. The amount of physical activity during pregnancy decreases as the pregnancy progresses.

Recommendations for further research are made in the following areas: exercise as treatment for postpartum depression, the potential of exercise in reducing the occurrence of depression, and the relationship between physical activity and perceived stress, and the role of stress as a mediator between physical activity and postpartum depression.

SUMMARY

This study combined the two topics of exercise/mental health and postpartum depression. Postpartum depression over the years generated considerable research interest while never revealing the mystery of its cause or giving hints of factors that could play a role in preventing or limiting its occurrence. The relationship between exercise and mental health has also been extensively studied. While many studies have been concerned with exercise as treatment for various mental health problems including depression, studies have only begun to investigate the role that exercise may play in reducing the occurrence of mental health problems such as depression. While attempting to connect the two broad topics of postpartum depression and exercise/mental health, this study also retrospectively investigated the role of exercise in prevention of postpartum depression. The general purpose of the study was to identify variables that might be useful in preventing postpartum depression from occurring in the future, specifically looking at whether physical activity (an unexplored variable up until this point) had any relationship to postpartum depression and in turn whether physical activity was associated with other variables (such as perceived stress and social support) that were related to postpartum depression.

The present study also chose to measure stress and social support, the two variables found to be most consistently related to postpartum depression (Paykel, Emms, Fletcher & Rassaby, 1980;

O'Hara, 1986; Mercer & Ferketich, 1988) in the literature.
Information about the demographic characteristics of the subjects
was also acquired.

The Demographic Questionnaire, developed by the researcher,
was checked for understanding. The other four questionnaires
used were standardized questionnaires. The Perceived Stress
Scale was chosen because perceived stress has been shown to be a
better predictor of depression than life stress (Cohen, Kamarck &
Mermelstein, 1983). The Norbeck Social Support Scale was chosen
to measure social support because it has been shown to be both
valid and reliable for a clinically depressed population (Byers &
Mullis, 1987). Exercise was measured by a question about
physical activity and was included in the Lifestyle Habit
Questionnaire. The physical activity question used is associated
with measures of physical fitness (Schecktman, Barzilai, Rost &
Fisher, 1991). This question was asked four times, once
pertaining to physical activity during pre-pregnancy, once for
the first trimester of pregnancy, once for the second trimester
of pregnancy and once for the third trimester of pregnancy.
Finally, the Edinburgh Depression Scale was used to measure
postpartum depression because it is the only standardized scale
designed specifically for postpartum depression (Cox, Holden &
Sagovsky, 1987).

Volunteer subjects (104) from two Lower Mainland hospitals
were contacted to participate in the study. Those consenting to
participate (220) were given five questionnaires to complete.

The demographic questionnaire, the Perceived Stress Scale, the
Norbeck Social Support Scale and the physical activity
questionnaire (which also included additional items) were
completed in the days following childbirht while the subjects
were in the hospitals after having their babies. The fifth
questionnaire, the Edinburgh Depression Scale, was taken home and
completed by the subjects when their babies were six weeks old.
This questionnaire was mailed to the researcher.

Four two-way ANOVA's addressed the question of whether or
not postpartum depression was related to physical activity during
pre-pregnancy or during each of the three trimesters of
pregnancy. Postpartum depression was not shown to be related to
participation in physical activity during any of the four time
periods.

A Multiple Regression analysis found perceived stress to be
significantly associated with postpartum depression but did not
find social support to be significantly related to postpartum
depression. This only partially agreed with previous literature
that found high stress as well as low social support to be
associated with postpartum depression. A Mann-Whitney U analysis
found physical activity during the first trimester of pregnancy
to be associated with perceived stress. This finding as well as
the finding of a significant relationship between perceived
stress and postpartum depression implied that perceived stress
was a mediating factor between physical activity and postpartum
depression.

No demographic characteristics were found to be associated with postpartum depression. This was shown through two profile analyses that tested for parallelism and coincidence. It was also found that participation in physical activity diminished as pregnancy progressed.

As mentioned previously, this study did not totally support the main thesis question of whether physical activity during pre-pregnancy and pregnancy was related to postpartum depression but did find that physical activity (during the first trimester of pregnancy) was associated with perceived stress (the only variable found to be significantly associated with postpartum depression). In spite of the lack of a direct relationship of physical activity with postpartum depression, the possibility remains that physical activity may be an effective treatment for postpartum depression. The likelihood that stress was a mediator between physical activity and postpartum depression also has practical clinical implications. Physical activity in the first trimester of pregnancy may have an indirect effect on postpartum depression.

Much remains to be investigated regarding the possible preventative powers of physical activity. More longitudinal controlled studies on physical activity and its relationship to mental health are needed. A combination of physiological and psychological theories must be developed that combine physical activity and depression. The factors that induce postpartum depression must be found so that the frequency with which it

occurs may be reduced.

Delimitations

Even though there are many confounding variables, this study only controlled for the two main predictors of postpartum depression: social support and perceived stress. In an attempt to rule out extremes, women who were at particularly high risk for incurring postpartum depression were eliminated from the study. These included women with a total absence of social support, women who were unwed teen mothers and women who were separated from their infants for 48 hours or more immediately after birth.

The question used to measure physical activity was designed to determine whether or not women were involved in physical activity that would maintain or improve fitness. It did not obtain information about the type of physical activity they were involved in, or frequency and length of exercise period.

Limitations

There are several limiting conditions or restrictive weaknesses of the study. The use of self-report measures assumes that the subjects are answering honestly. There was no check to validate their actual responses and it was not known if the subjects understood the questions. The retrospective nature of

the study also creates a problem in that again there was no confirmation of the responses with the action that took place.

The response rate of 52% and lack of randomization of subjects raises questions about the subjects that dropped out of the study. Those that did respond may be unusual in some way. The sample was likely biased because of self-selection to participate or not participate in the study.

Not all women who had postpartum depression may have been identified. The women may have developed postpartum depression at the eight week mark yet the postpartum depression measure was completed at six weeks postpartum.

Future directions

As a result of the 52% response rate, a replication study would be in order to detect any advantage that may exist for those who exercise at a certain intensity level or at specific times. A large population sample may be required to detect that advantage.

Physical activity did not have any long term effects on mental health (postpartum depression) in the present study yet previous studies have found physical activity to be associated with long term changes in mental health. This area of the long term effects of physical activity and its effect on mental health (general depression) needs to be explored further. It is not known what duration, frequency, intensity and type of exercise is

needed in order for long term and lasting effects on mental health to occur.

A confirmation study of the relationship between postpartum blues and physical activity is needed as many of the weaknesses of the present study were also evident in the postpartum blues study.

The use of exercise as treatment for postpartum depression is another avenue to explore. The fact that no relationship was found between pre-natal exercise and postpartum depression (measured six weeks after childbirth) does not mean that exercise would not be an effective treatment for postpartum depression. Similarly it would also be interesting to do a longitudinal study of postpartum women with exercise as the manipulated variable and depression as the dependent variable and to conduct this study through the first postpartum year.

Lastly it would be interesting to explore the finding that perceived stress is a mediator between postpartum depression and physical activity during the first trimester of pregnancy when the exercise level might still be quite rigorous. Along with this, further study is also needed concerning the relationship between stress and physical activity.

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Appendix A

<u>Demographic Information Questionnaire</u>

AGE a) under 20 yrs
      b) 20 to 25 yrs
      c) 26 to 30 yrs
      d) 31 to 35 yrs
      e) over 35

MARITAL STATUS married single common-law (please circle one)

EDUCATIONAL LEVEL ATTAINED
      a) grade 8 or less
      b) high school
      c) 1yr technical school or college
      d) 2yr technical school or college
      e) university degree
      f) graduate degree
      g) other (specify)

FAMILY INCOME BRACKET
      a) 20,000 or less
      b) 21,000-40,000
      c) 41,000-60,000
      d) 61,000-75,000
      e) over 75,000

OCCUPATION
      a) housewife
      b) professional
      c) business
      d) trade
      e) other

LENGTH OF PREGNANCY (in weeks)
      a) under 32 weeks
      b) 32 to 36 weeks
      c) 37 to 42 weeks
      d) over 42 weeks
      e) over 42 weeks

WEIGHT GAIN DURING PREGNANCY (in pounds)
      a) 20 lbs or less
      b) 21 to 25 lbs
      c) 26 to 35 lbs
      d) 36 to 46 lbs
      e) 47 lbs or more

COMPLICATIONS DURING PREGNANCY
    a) gestational diabetes
    b) bleeding
    c) high blood pressure
    d) nothing out of the ordinary
    e) other (please specify)

BIRTH OUTCOME (weight of baby)
    a) under 5 lbs
    b) 6 to 8 lbs
    c) 9 or 10 lbs
    d) over 10 lbs

TYPE OF DELIVERY
    a) caesarian
    b) forceps
    c) suction/vacuum
    d) spontaneous vaginal

COMPLICATIONS WITH BABY yes no   If yes what?
    a) breathing problems
    b) jaundice
    c) birth defects
    d) spent time in special care nursery
    d) other (please specify)

COMPLICATIONS WITH MOM yes no   If yes what?
    a) excessive bleeding
    b) infection
    c) high blood pressure
    d) other (please specify)

WERE YOU SEPARATED FROM YOUR BABY?   If yes for how long?
    a) less than 24 hours
    b) one or two days
    c) three to five days
    d) more than five days

REPRODUCTIVE HISTORY
    total # of pregnancies
        a) one
        b) 2 - 3
        c) 4 - 6
        d) more than 6

    # of pregnancies past 20 weeks
        a) one
        b) 2 - 3
        c) 4 - 6
        d) more than 6

# of births
    a) one
    b) 2 - 3
    c) 4 - 6
    d) more than 6

living children
    a) one
    b) 2 - 3
    c) 4 - 6
    d) more than 6

Rate how regular exercise affects emotional well being on a scale of 1 to 5.

1. always influences positively
2. sometimes influences positively
3. has no effect
4. sometimes influences negatively
5. always influences negatively

Appendix B

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

For each question choose from the following alternatives:
0. never
1. almost never
2. sometimes
3. fairly often
4. very often

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. In the last month, how often have you dealt successfully with irritating life hassles?
5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?
6. In the last month, how often have you felt confident about your ability to handle your personal problems?
7. In the last month, how often have you felt that things were going your way?
8. In the last month, how often have you found that you could not cope with all the things that you had to do?
9. In the last month, how often have you been able to control irritations in your life?
10. In the last month, how often have you felt that you were on top of things?
11. In the last month, how often have you been angered because of things that happened that were outside of your control?
12. In the last month, how often have you found yourself thinking about things that you have to accomplish?
13. In the last month, how often have you been able to control the way you spend your time?
14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Appendix C

Lifestyle Habit Questionnaire

1. Prior to pregnancy were you participating in any regular activity or program (either on your own or in a formal class) which would improve or maintain your physical fitness? yes or no

2a. In your first three months of pregnancy were you participating in any regular activity or program (either on your own or in a formal class) designed to improve or maintain your physical fitness? yes or no

2b. Was this more, less or the same amount of activity from the period prior to pregnancy?

2c. If your pattern of activity changed from prior to pregnancy to your first trimester of pregnancy what was the most important reason for this change?
    a) advice from a professional
    b) encouragement from significant others
    c) sickness
    d) tiredness
    e) uncomfortableness
    f) cultural reasons
    g) other (please specify)

3a. In your second three months of pregnancy were you participating in any regular activity or program (either on your own or in a formal class) which would improve or maintain your physical fitness? yes or no

3b. Was this more, less or the same amount of activity from the period prior to pregnancy?

3c. If your pattern of activity changed was what was the one most compelling reason for this change?
    a) advice from a professional
    b) encouragement from significant others
    c) sickness
    d) tiredness
    e) uncomfortableness
    f) cultural reasons
    g) other (please specify)

3d. Did your activity in the second three months of pregnancy change from the first three months of pregnancy?

3e. Was this more or less activity?

3f. If your pattern of activity changed what was the one most compelling reason for this change?
      a) advice from a professional
      b) encouragement from significant others
      c) sickness
      d) tiredness
      e) uncomfortableness
      f) cultural reasons
      g) other (please specify)

4a. In the last three months of pregnancy were you participating in any regular activity or program (either on your own or in a formal class) designed to improve or maintain your physical fitness? yes or no

4b. Was this more, less or the same amount of activity from the period prior to pregnancy?

4c. If your pattern of activity changed what was the one most compelling reason for this change?
      a) advice from a professional
      b) encouragement from significant others
      c) sickness
      d) tiredness
      e) uncomfortableness
      f) cultural reasons
      g) other (please specify)

4d. During the last three months of pregnancy did your activity change from the second three months of pregnancy? yes or no

4e. If your pattern changed was this more, less or the same amount of activity from the second three months?

4f. If your pattern of activity changed what was the one most compelling reason for this change?
      a) advice from a professional
      b) encouragement from significant others
      c) sickness
      d) tiredness
      e) uncomfortableness
      f) cultural reasons
      g) other (please specify)

Appendix D

Norbeck Social Support Scale

List each significant person in your life on the right. Consider all the persons who provide personal support for you or who are important to you now.

Number _____
Date   _____

PERSONAL NETWORK

First name or initials   Relationship

1. _____   _____ (34)
2. _____   _____ (35)
3. _____   _____ (36)
4. _____   _____ (37)
5. _____   _____ (38)
6. _____   _____ (39)
7. _____   _____ (40)
8. _____   _____ (41)
9. _____   _____ (42)
10. _____   _____ (43)
11. _____   _____ (44)
12. _____   _____ (45)
13. _____   _____ (46)
14. _____   _____ (47)
15. _____   _____ (48)
16. _____   _____ (49)
17. _____   _____ (50)
18. _____   _____ (51)
19. _____   _____ (52)
20. _____   _____ (53)

For each person you listed, please answer the following questions
by writing in the number that applies.

1= never
2= a little
3= moderately
4= quite a bit
5= a great deal

Question 1.	Question 2.
How much does this person make you feel liked or loved?	How much does this person make you feel respected or admired?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Question 3.
How much can you confide in this
person?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Question 4.
How much does this person agree
with or support your actions or
thoughts?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Question 5.
If you needed to borrow $10, a
ride to the doctor, or some
other immediate help, how much
could this person usually help?
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Question 6.
If you were confined to bed for
several weeks, how much could
this person help you?
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

For each person you listed please answer the following questions
by writing in the number that applies.

Question 7.   Question 8.
How long have you known this   How frequently do you usually
person?   have contact with this person?
                                     (phone calls, visits, or
                    letters)

1= less than 6 months   1= once a year or less
2= 6 months to 1 year   2= two or three times a year
3= 2 to 3 years   3= once a month
4= 4 to 5 years   4= once a week
5= more than 5 years   5= daily

 1. _____   1. _____
 2. _____   2. _____
 3. _____   3. _____
 4. _____   4. _____
 5. _____   5. _____
 6. _____   6. _____
 7. _____   7. _____
 8. _____   8. _____
 9. _____   9. _____
10. _____   10. _____
11. _____   11. _____
12. _____   12. _____
13. _____   13. _____
14. _____   14. _____
15. _____   15. _____
16. _____   16. _____
17. _____   17. _____
18. _____   18. _____
19. _____   19. _____
20. _____   20. _____

Question 9.
During the past year, have you lost any important relationship
due to moving, a job change ,divorce or separation, death, or
some other reason?

If YES, check the category(s) of persons who are no longer
available to you.

Spouse or partner
Family or Relatives
Friends
Work or School Associates
Neighbours
Health Care Providers
Counsellor or Therapist
Minister/Priest?Rabbi
Other

How much support did this person (or persons) provide for you
during the past six months?
0= none at all
1= a little
2= moderately
3= quite a bit
4= a great deal

Appendix E

Edinburgh Postnatal Depression Scale (EPDS)

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.

Here is an example, already completed.
I have felt happy:
   Yes, all the time
   Yes, most of the time
   No, not very often
   No, not at all
This would mean: "I have felt happy most of the time" during the past week. Please complete the other questions in the same way.

In the past 7 days
   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
      Yes, quite a bit
      Hardly ever
      Yes, sometimes
      No, not much
      No, not at all
   5. I have felt scared or panicky for no 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 F

<u>Ethical review documents</u>

Project Description

LIFESTYLE HABITS AND COPING AFTER CHILDBIRTH

RESEARCHERS: Sheryl Stephenson   882-4152   UBC
               Dr. Sharon Bleuler 822-4267   UBC

This project is a requirement of graduation for a Masters degree from the University of British Columbia.

This project is designed to investigate the relationship between lifestyle habits of the pregnant woman and the ability to adjust to life after childbirth. This information may help others in adjusting to life after childbirth.

Confidentiality will be maintained by the use of codes instead of names on the questionnaires. The completed questionnaires will then be accessible only to the researchers and members of the student's MPE Committee (Dr. Sue Crawford and Ms Alison Rice).

The total amount of time required for your participation is approximately 1 hour (for responding to five questionnaires).

Please feel free to direct any further enquiries to one of the researchers above.

You have the right to refuse to participate or to withdraw at any time during the study. Be assured that refusal to participate or withdrawal at anytime will not jeopardize your health care.

If you can assist by volunteering for this project please complete the attached consent form and return it to the nurse or a research assistant. The first four questionnaires can be filled out at any time. The fifth questionnaire is to be filled out in the sixth week after the birth of your child. You will also be given a stamped self-addressed envelope in which to mail the questionnaires to the researcher. If you are unable to do this you have the option of calling the researcher to come and pick it up. You will also be receiving a phone call in your 6th week after the birth of your child to check on your progress.

Thank-you for taking time to read this.

Sincerely

Sheryl Stephenson
MPE UBC Student

Consent Form

     I (print name) _____
have read the description of the project and understand that any
individual responses and my identity will be kept confidential: I
understand what will be required of me and the time involved: I
am aware that it is my right to refuse to participate or withdraw
at any time and that refusal to participate or withdrawal will
not jeopardize my health care. I have read who the investigators
are and what the procedures of this project are and consent to
being a volunteer for this research project.

            SIGNED_____   PHONE#_____
            ADDRESS_____

            DATE_____

☐Please check this box if you have received and read the
description of the project and have received a copy of this
consent form for your records.

Ethical review certificate of approval

30 June 1992

Sheryl Stephenson
7600 Glover Road
Langley, BC
V3A 6H4

Dear Sheryl:

On behalf of the Nursing Research Committee, I would like to inform you that your request to conduct research at Surrey Memorial Hospital has been accepted.

I understand that the one outstanding issue regarding who would obtain consent from the participants has been addressed. I look forward to receiving your written notification of this change.

Please contact Mrs. Morah Avery, Head Nurse, 3 East as soon as you are ready to begin your study.

We look forward to hearing about the results you obtain and the implications these findings will have on the fields of education and nursing.

Good luck.

Yours truly,

Vivian

Vivian Giglio
Head Nurse, 2 South

VG:mkj

c.c. Research Committee
     Morah Avery, Head Nurse, 3 East
     Kathy Kinloch, Vice President (Nursing)
     Alison Rice, UBC, Faculty of Nursing
     Dr. Sharon Bleuler, UBC, Faculty of Physical Education

HNS\2S\RESEARCH.LTR

Hospital letter of approval

The University of British Columbia   B92-115
Office of Research Services
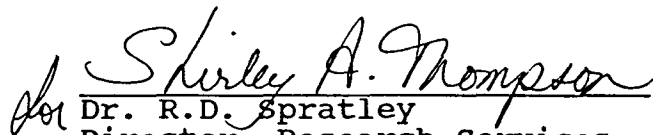
BEHAVIOURAL SCIENCES SCREENING COMMITTEE FOR RESEARCH
AND OTHER STUDIES INVOLVING HUMAN SUBJECTS

C E R T I F I C A T E   of   A P P R O V A L

INVESTIGATOR: Bleuler, S.

UBC DEPT: Phys Ed & Recreation

INSTITUTION: UBC Campus

TITLE: Regular physical activity during the
                prenatal period and its relationship to the
                incidence of postpartum depression'

NUMBER: B92-115

CO-INVEST: Stephenson, S.

APPROVED: **APR 30 1992**

The protocol describing the above-named project has been
reviewed by the Committee and the experimental procedures were
found to be acceptable on ethical grounds for research
involving human subjects.

Dr. R.D. Spratley
Director, Research Services
and Acting Chairman

THIS CERTIFICATE OF APPROVAL IS VALID FOR THREE YEARS
FROM THE ABOVE APPROVAL DATE PROVIDED THERE IS NO
CHANGE IN THE EXPERIMENTAL PROCEDURES

Appendix G

Frequency Scores of the Demographic variables and items from The
Lifestyle Habit Questionnaire

    To gain a picture of the subjects from this study the
frequency of scores from the demographic questionnaire were
outlined below. This gave important information about the
characteristics of this population.

AGE	frequency	percent
<20 years	8	4.8%
20-25 years	47	28.3%
26-30 years	67	40.4%
31-35 years	39	23.5%
>35 years	5	3.0%
	166	

MARITAL STATUS	frequency	percent
married	133	80.1%
single	13	7.8%
common-law	3	12.0%
	166	

EDUCATIONAL LEVEL	frequency	percent
<grade 8	1	.6%
grade 9-12	20	12.0%
high-school	70	41.9%
1 yr technical	29	17.4%
university degree	24	14.4%
graduate degree	12	7.2%
other	7	6.6%
	167	

TOTAL HOUSEHOLD INCOME	frequency	percent
<20,000	29	18.8%
21,000-40,000	40	26.0%
41,000-60,000	50	32.5%
61,000-80,000	27	17.5%
81,000-100,000	8	5.2%
	154	

OCCUPATION	frequency	percent
homemaker	68	41.0%
professional	35	21.1%
business	29	13.3%
trade	9	5.4%
other	5	19.3%
	166	

LENGTH OF PREGNANCY	frequency	percent
<31 weeks	2	1.2%
31-36 weeks	5	3.0%
36-42 weeks	146	88.5%
42 or more	12	7.3%
	165	

WEIGHT GAIN DURING PREGNANCY	frequency	percent
<20 lbs	25	15.1%
21-25 lbs	27	16.3%
26-35 lbs	63	38.0%
36-46 lbs	35	21.1%
47 lbs +	16	9.6%
	166	

COMPLICATIONS DURING PREGNANCY	frequency	percent
gestational diabetes	14	8.4%
bleeding	15	9.0%
high blood pressure	11	6.6%
nothing out of the ordinary	112	67.5%
other	14	8.4%
	166	

OUTCOME OF BABY (WEIGHT OF BABY)	frequency	percent
<5 lbs	1	.6%
5-8 lbs	104	62.3%
8-10 lbs	59	35.3%
over 10 lbs	3	1.8%
	167	

TYPE OF DELIVERY	frequency	percent
caesarian	37	22.2%
forceps	8	4.8%
suction	17	10.2%
spontaneous vaginal	105	62.9%
	167	

COMPLICATIONS WITH THE BABY	frequency	percent
no complications	131	78.4%
complications present	36	21.6%
	167	

NUMBER OF COMPLICATIONS WITH THE BABY	frequency	percent
0	130	77.8%
1	29	17.4%
2	7	4.2%
3	1	.6%
	167	

COMPLICATIONS WITH MOTHER DURING OR AFTER DELIVERY	frequency	percent
no complications	146	87.4%
complications present	21	12.6%
	167	

NUMBER OF COMPLICATIONS WITH MOTHER	frequency	percent
0	146	87.4%
1	17	10.2%
2	4	2.4%
	167	

BABY AND MOTHER SEPARATED AT BIRTH

	frequency	percent
not separated	125	74.9%
yes, for < 24 hrs.	37	22.2%
yes, for 1-2 days	3	1.8%
yes for more than 5 days	5	1.2%
	167	

TOTAL NUMBER OF PREGNANCIES EXPERIENCED

	frequency	percent
1	58	34.7%
2-3	82	49.1%
4-6	27	16.2%
	167	

NUMBER OF PREGNANCIES EXPERIENCED THAT HAVE GONE PAST 20 WEEKS

	frequency	percent
1	73	43.7%
2-3	79	47.3%
4-6	15	9.0%
	167	

NUMBER OF BIRTHS EXPERIENCED

	frequency	percent
1	71	42.5%
2-3	81	48.5%
4-6	15	9.0%
	167	

NUMBER OF CHILDREN

	frequency	percent
1	71	42.5%
2-3	81	48.5%
4-6	15	8.4%
	167	

RATING OF THE INFLUENCE OF PHYSICAL ACTIVITY ON WELL BEING

	frequency	percent
always influences positively	97	59.1%
sometimes influences positively	61	37.2%
has no effect	5	3.0%
sometimes influences negatively	1	.6%
always influences negatively	0	0
	164	

The frequencies of items from the Lifestyle Habit Questionnaire were outlined below. These items gave information about the exercise habits of the women and how these habits may be different than the habits of non-pregnant women.

PHYSICAL ACTIVITY PRIOR TO PREGNANCY

	frequency	percent
yes	81	51.3%
no	77	48.7%
	158	

PHYSICAL ACTIVITY IN 1ST TRIMESTER OF PREGNANCY

	frequency	percent
yes	67	42.4%
no	91	57.6%
	158	

PHYSICAL ACTIVITY IN 2ND TRIMESTER OF PREGNANCY

	frequency	percent
yes	48	30.4%
no	110	69.6%
	158	

PHYSICAL ACTIVITY IN 3RD TRIMESTER OF PREGNANCY

	frequency	percent
yes	39	24.7%
no	119	75.3%
	158	

PHYSICAL ACTIVITY LEVEL IN 1ST TRIMESTER OF PREGNANCY AS COMPARED TO PRIOR TO PREGNANCY

	frequency	percent
more	9	5.7%
less	48	30.6%
equal	100	63.7%
	157	

PHYSICAL ACTIVITY LEVEL IN 2ND TRIMESTER OF PREGNANCY AS COMPARED TO PRIOR TO PREGNANCY

	frequency	percent
more	13	8.3%
less	51	32.5%
equal	93	59.2%

PHYSICAL ACTIVITY LEVEL IN 3RD TRIMESTER OF PREGNANCY AS COMPARED TO PRIOR TO PREGNANCY

	frequency	percent
more	13	8.3%
less	81	51.6%
equal	63	40.1%

REASON FOR CHANGE IN ACTIVITY LEVEL BETWEEN PRIOR TO PREGNANCY AND 1ST TRIMESTER OF PREGNANCY

	frequency	percent
advice from a professional	9	5.8%
encouragement from sig. other	7	4.5%
sickness	19	12.2%
tiredness	24	15.4%
uncomfortableness	3	1.9%
cultural reasons	1	.6%
other reason	7	6.4%
no change	83	53.2%

REASON FOR CHANGE IN ACTIVITY LEVEL BETWEEN PRIOR TO PREGNANCY
AND 2ND TRIMESTER OF PREGNANCY

	frequency	percent
advice from a professional	12	7.7%
encouragement from sig. other	6	3.8%
sickness	8	5.1%
tiredness	27	17.3%
uncomfortableness	12	7.7%
cultural reasons	1	.6
other reason	12	7.7%
no change	78	50.0%

REASON FOR CHANGE IN ACTIVITY LEVEL BETWEEN PRIOR TO PREGNANCY
AND 3RD TRIMESTER OF PREGNANCY

	frequency	percent
advice from a professional	17	10.9
encouragement from sig. other	7	4.5%
sickness	2	1.3%
tiredness	42	26.9%
uncomfortableness	25	16.0%
cultural reasons	0	0
other reason	12	7.7%
no change	51	32.7%

CHANGE IN LEVEL OF PHYSICAL ACTIVITY DURING 2ND TRIMESTER FROM
1ST TRIMESTER OF PREGNANCY

	frequency	percent
yes, it changed	64	40.8%
no, it remained the same	93	59.2%

CHANGE IN LEVEL OF PHYSICAL ACTIVITY DURING 3rd TRIMESTER FROM
2nd TRIMESTER OF PREGNANCY

	frequency	percent
yes, it changed	88	56.1%
no, it remained the same	69	43.9%

LEVEL OF PHYSICAL ACTIVITY DURING 2ND TRIMESTER AS COMPARED TO
THAT OF THE FIRST TRIMESTER OF PREGNANCY

	frequency	percent
more	22	14.0%
less	45	28.7%
equal	90	57.3%

LEVEL OF PHYSICAL ACTIVITY DURING 3rd TRIMESTER AS COMPARED TO
THAT OF THE 2nd TRIMESTER OF PREGNANCY

	frequency	percent
more	13	8.3%
less	81	51.6%
equal	63	40.1%

REASON FOR CHANGE IN ACTIVITY LEVEL BETWEEN THE 2nd TRIMESTER OF
PREGNANCY AND THE 3RD TRIMESTER OF PREGNANCY

	frequency	percent
advice from a professional	13	8.3%
encouragement from sig. other	7	4.5%
sickness	4	2.5%
tiredness	24	15.3%
uncomfortableness	10	6.4%
cultural reasons	1	.6
other reason	19	12.1%
no change	79	50.3%

REASON FOR CHANGE IN ACTIVITY LEVEL BETWEEN THE 2ND TRIMESTER OF
PREGNANCY AND THE 3RD TRIMESTER OF PREGNANCY

	frequency	percent
advice from a professional	18	11.5%
encouragement from sig. other	3	1.9%
sickness	2	1.3%
tiredness	36	22.9%
uncomfortableness	30	19.1%
cultural reasons	0	0
other reason	15	9.6%
no change	53	33.8%

MOTHERS EXPERIENCING A LOSS OF AN IMPORTANT RELATIONSHIP WITHIN
THE LAST YEAR

	frequency	percent
yes	46	31.3%
no	101	68.7%

Appendix H

The relationship of physical activity and perceived stress

Data from 158 subjects was analyzed to obtain information on physical activity and its relationship to perceived stress. A separate Mann-Whitney U was conducted separately for the level of physical activity prior to pregnancy, during the first trimester of pregnancy, during the second trimester of pregnancy and during the third trimester of pregnancy.

As can be seen in Table H-1, results showed no significant 2-tailed P (p = .30) indicating no relationship of physical activity in the pre-pregnancy period with perceived stress. The results, in Table H-1, also showed no significant 2-tailed P scores (p = .86 and p = .84 respectively) indicating no relationship of physical activity during the second or third trimester of pregnancy with perceived stress. The 2-tailed P of .067 (p< .10) shown in Table H-1 suggested that a relationship exists between physical activity during the first trimester of pregnancy and perceived stress.

Table H-1

Frequency of participation in physical activity pre-pregnancy and during pregnancy and mean rating of Perceived Stress Scores.

	Number Partici-tion in Phy. Act.	Mean Stress Score Rank	Number Not Part-icipation in Phy. Act.	Mean Stress Score Rank	Sig.
Prior to Pregnancy	80	70.35	75	81.83	.3028
First Trimester	66	70.35	89	83.67	.0673
Second Trimester	47	78.91	108	77.60	.8669
Third Trimester	38	79.22	117	77.60	.8465

Appendix I

The relationship of participation in physical activity and social support

The data from 158 subjects was also analyzed to study physical activity and its relationship to Social Support. This analyses was conducted separately for physical activity during pre-pregnancy, during the first trimester of pregnancy, during the second trimester of pregnancy and during the third trimester of pregnancy. As shown in Table I-1 no significant 2-tailed P (p= .35, p= .73, p= .29 and p= .73 respectively) was indicated. Physical activity was not found to be related to social support.

Table I-1

Frequency of participation in physical activity pre-pregnancy and during pregnancy and mean rating of Social Support Scores.

	Number Partici- tion in Phy. Act.	Mean Support Score Rank	Number Not Part- icipation in Phy. Act.	Mean Support Score Rank	Sig.
Prior to Pregnancy	75	75.57	69	69.16	.3566
First Trimester	61	73.86	83	71.50	.7372
Second Trimester	43	78.10	101	70.11	.2928
Third Trimester	35	70.41	109	73.17	.7338

Appendix J

<u>Loss (measured by the Norbeck Social Support Questionnaire) and
its relationship to postpartum depression</u>

A Mann-Whitney U was used to determine whether or not loss
of an important relationship would be related to postpartum
depression. A subscale of the Norbeck Social Support Scale
measured the loss of an important relationship within the
previous year. Data from 105 subjects was obtained. As shown in
Table 8, the nonsignificant 2-tailed P (p = .15) indicated that
loss was not related to postpartum depression.

Table J-1

The relationship between loss of an important relationship and
postpartum depression.

# who experienced Loss	Mean Dep Score Rank	# who did not experience Loss	Mean Dep Score Rank	Sig
32	50.14	57	42.11	.1585