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The Influence of Physical Activity on Perimenopause

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LOYOLA UNIVERSITY CHICAGO

THE INFLUENCE OF PHYSICAL ACTIVITY ON PERIMENOPAUSE

A DISSERTATION SUBMITTED TO
THE FACULTY OF THE GRADUATE SCHOOL
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

SCHOOL OF NURSING

BY

SULING LI, R.N., B.S.N., M.S.N.

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DEDICATION

I would like to dedicate this dissertation to my parents, my husband Xiangdong, and my daughter Lilly. Their love and support make this journey possible.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	iii
LIST OF ILLUSTRATIONS	viii
LIST OF TABLES	ix
CHAPTER	PAGE
I. STATEMENT OF THE PROBLEM	1
Introduction	1
Significance of the study	3
II. REVIEW OF THE LITERATURE	5
Evolution of Definitions of Perimenopause	5
Hormonal Aspects of Perimenopause	12
Clinical Aspects of Perimenopause	16
Age and duration of perimenopause	16
Symptoms of perimenopause	18
Concept of Physical Activity	28
Theoretical Speculations	29
Research Studies of Relationship between Physical Activity and Perimenopausal Symptoms	33
Demographic Influences	36
The Aims of the Study	39
Operational Definitions	39
III. METHODS	42
Sample	42
Selection Criteria	42
Design	43
Measurements	43
Procedure	47
Data Analysis	49
Potential Risks	51
Limitations of the Study	51
IV. RESULTS	52
Profile of the Sample	52

Psychometric Performance of Instruments	52
Study Aims	61
Sample Characteristics	62
Aim 1. Frequency and Distress of Perimenopausal Symptoms	62
Aim 2. Effect of Current Physical Activity on Perimenopausal Symptoms	67
Aim 3. Effect of Long-term Physical Activity on Perimenopausal Symptoms	72
Additional Findings	76
Summary of Findings	79

V. DISCUSSION 81

Measurement Statistics of the WHAS and PAQ	81
WHAS	81
PAQ	82
Study Aims	83
Aim 1. Frequency and Distress of Perimenopausal Symptoms	84
Aim 2. Effect of Current Physical Activity on Perimenopausal Symptoms	89
Aim 3. Effect of Long-term Physical Activity on Perimenopausal Symptoms	97
Additional Findings	97
Conclusions, Implications and Limitations	98
Future Research Recommendations	101

APPENDIX

A. HORMONAL ASPECT OF PERIMENOPAUSE	103
B. AGE AND THE DURATION OF PERIMENOPAUSE	107
C. PREVALENCE OF SYMPTOMS DURING PERIMENOPAUSE (%)	110
D. THE RELATIONSHIP BETWEEN MENOPAUSAL STATUS AND SYMPTOMS REPORTING DURING MIDLIFE	113
E. THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND SYMPTOMS REPORTED IN MIDLIFE	122
F. QUESTIONNAIRE BOOKLET	125

G. IRB APPROVAL	146
H. COVER LETTER	149
I. RETEST COVER LETTER	152
J. PILOT COVER LETTER	154
REFERENCES	156
VITA	166

LIST OF ILLUSTRATIONS

Figure		Page
1.	The perimenopausal period	13
2.	Theoretical speculations of physical activity on perimenopausal symptoms	31

LIST OF TABLES

Table	Page
1. Examples of menstrual irregularity during perimenopause	20
2. Homogeneity reliability: WHAS	54
3. Correlations between subscale scores and total scale score of symptom frequency of WHAS55
4. Correlation matrix of symptom frequency dimension of WHAS	55
5. Stability reliability of WHAS	57
6. Correlations between subscale scores and total scale score of symptom distress of WHAS	58
7. Correlation matrix of symptom distress dimension of WHAS	58
8. Stability reliability of Physical Activity Questionnaire	60
9. The correlation between the Physical Activity Questionnaire and American Heart Association Physical Activity Questionnaire . . .	61
10. Demographic characteristics of the sample	63
11. Descriptive data of physical activity	66
12. Descriptive data for perimenopausal symptoms based on levels of current physical activity	69
13. ANOVA for perimenopausal symptoms based on levels of current physical activity	70
14. Multivariate tests of significance for subscales of perimenopausal symptoms based on current physical activity	70
15. Univariate tests for subscales of perimenopausal symptoms based on levels of current physical activity	71

16. Descriptive data for perimenopausal symptoms based on levels of long-term physical activity	73
17. ANOVA for perimenopausal symptoms based on levels of long-term physical activity	74
18. Multivariate tests of significance for subscales of perimenopausal symptoms based on levels of long-term physical activity	74
19. Univariate tests of significance for subscales of perimenopausal symptoms based on levels of long-term physical activity	75
20. The correlations between perimenopausal symptoms and overall quality of life	77
21. Multiple regression of quality of life on perimenopausal symptoms .	78

CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

Menopause is a natural biological event in the reproductive cycle of women usually experienced around their 50th birthday (MacPherson, 1981). It has been defined as the last menstruation in a woman's life (WHO, 1981). Menopause signals the end of a woman's reproductive ability and is accompanied by profound hormonal changes (Upton, 1982).

Menopause has long been viewed as the onset of "the change", a lay term for menopause, for a midlife woman. In actuality, menopause may only signal the end of "the change" rather than the beginning, since many changes, physical, psychological, and physiological, occur years before the actual menopause, that is, during the perimenopausal period.

Perimenopause is a process of gradual depletion of ovarian follicles leading to eventual cessation of ovarian function (Richardson & Nelson, 1994). Over the last few years, perimenopause has been increasingly recognized as not only a separate entity but also as more important than the actual menopausal or postmenopausal period. Many physical symptoms such as hot flashes and night sweats and/or psychosomatic symptoms such as depression, irritability, headache and sleep disturbance may occur more frequently at this time.

It is estimated that there are currently more than 13 million

perimenopausal women in the United States. By the year 2000, there will be about 19 million women going through this perimenopausal transition (Bachmann, 1994a). Evidence exists that a third to one half of midlife women are affected by perimenopausal symptoms (McKinlay, Brambilla, & Posner, 1992). With the increasing number of perimenopausal women in the United States, prevention and management of perimenopausal symptoms for midlife women becomes critical and must be emphasized.

Traditional treatment for symptoms associated with perimenopause has been the administration of estrogens, either alone or in combination with progestin. However, hormone replacement therapy (HRT) is not without risk. Well-designed studies have demonstrated there is a significant linkage between estrogen and endometrial cancer. In addition, it has been reported that there was a 10% added risk of breast cancer among postmenopausal women who took estrogen for an average of 5.7 years, a risk that was slightly increased with the addition of progestin (Wilbur, Dan, Hedricks, & Holm, 1990). Although the general consensus is that the benefits outweigh the risks, the concern remains.

The evaluation of alternatives to estrogen therapy for symptom control during perimenopause is receiving increased attention. It is known that regular physical activity is beneficial in lessening a number of physical and mental symptoms. Thus it is reasonable to ask whether physical activity will impact on symptoms associated with perimenopause as well. Further, the idea of a

protective effect of long term patterns of physical activity on perimenopausal symptoms is also plausible with precedence established for the beneficial effects of long term physical activity on coronary heart disease, hypertension, diabetes mellitus, and breast cancer (Pate et al., 1995).

Thus, physical activity may be one of the most promising alternatives to hormone therapy. However, to date the literature has been sparse concerning the relationships between symptom control at perimenopause and physical activity. Thus, the purpose of this study was to determine the relationships between physical activity and symptoms in perimenopausal women.

Significance of the Study

The information obtained from this study will contribute to the growing body of knowledge on determining the effectiveness of physical activity, an intervention that presents with minimal health risk, on symptoms associated with perimenopause. Nurses as well as physicians can become more knowledgeable regarding the effect of physical activity on perimenopausal symptoms. Nurses can play a significant role in encouraging, supporting, and teaching perimenopausal women to engage in regular physical activities. The development of regular physical activity habits in young girls and women of all ages could be an alternative and/or complementary solution for preventing and reducing perimenopausal symptoms. The introduction of physical activity regimens and the support of women engaged in regular physical activities could reduce human suffering from perimenopausal symptoms and enhance quality

of life of midlife women.

CHAPTER II

REVIEW OF THE LITERATURE

Evolution of Definitions of Perimenopause

Perimenopause has long been incorporated into the concept of menopause. In fact, perimenopause still is not listed in the Cumulated Index Medicus as a separate subject heading. Therefore, in order to understand the concept of perimenopause, the concept of menopause needs to be analyzed first.

Literally, the term menopause is defined as a permanent cessation of menstruation resulting from loss of ovarian activity (WHO, 1981). It is a single point in time, the last menstruation. For the sake of accuracy, the diagnosis of menopause is made retrospectively after complete cessation of menses for a period of one year.

Menopause can be natural, premature or artificial. Natural menopause is the spontaneous cessation of menses after the age of 40 years usually occurring around the age of 50 years (MacPherson, 1981). Spontaneous cessation of menses before the age of 40 years is called premature menopause or premature ovarian failure. For the premature menopausal women, the perimenopausal symptoms can occur as early as a few years after menarche (Voda & George, 1986). The etiology for premature ovarian failure is not

known. Surgical or artificial menopause is defined as cessation of menstruation due to surgical removal of the uterus, ovaries, or both, with or without the use of hormone replacement therapy.

A review of literature on menopause indicated that confusion exists regarding the definition of menopause. Menopause has been used in several ways: 1) as the end-point of reproductive life, that is, the last menstruation (WHO, 1981); 2) as a period of time before and after menopause (Hunter, 1992); 3) as a period of time after menopause (MacPherson, 1981); and 4) as a time frame which includes the entire menopausal process of pre-, peri-, and postmenopausal period (Budoff & Sommers, 1979). Using different definitions of menopause results in a lack of conceptual clarity and methodological issues such as the inability to compare research findings across studies but also fails to recognize the distinctions between the different stages of the menopausal experience.

Several terms have been used synonymously with menopause. One of these terms is the "change of life" which is no longer accepted by modern women. Another term used by researchers is climacteric which is defined as a transition from reproductive to nonreproductive life (Uphold & Sussman, 1981). However, the latter concept has been used in an ambiguous manner and most researchers have found the term climacteric too vague to be useful. For example, the term climacteric refers to a time span of 5 to 25 years and its onset and duration is uncertain. Some researchers define it as extending well

into the postmenopausal years (Harper, 1990).

Definitional issues related to menopause were addressed at the First International Congress on Menopause. In that meeting, menopause was defined as "the final menstrual period and occurs during the climacteric" (Utian, 1980, p.3). It would seem that using the cessation of menses as a criterion to define menopause might have the advantage of providing a relatively objective, reliably determined and clearly marked distinction between the pre- and postmenopausal women (Kaufert, 1986). However, this definition gives the faulty impression that there is an abrupt change in ovarian function (i.e. ovarian function is normal one day and ceases functioning the next day). Furthermore, including all premenopausal women in one category fails to discriminate between women who are menstruating regularly and those who have menstrual cycles that become increasingly irregular as they approach menopause. Thus, a new concept was needed to represent women who are approaching menopause.

In 1967, Treloar, Boynton, Behn, and Brown introduced the concept of perimenopause. They indicated that the critical marker of perimenopause was menstrual irregularity, defined as genital bleeding changing to either longer or shorter than its usual flow intervals.

Based on these ideas, the three-stage definition of menopausal status was introduced by Jazmann, van Lith, and Zaat (1969). Their definition of menopause status was as follows:

"Premenopause: Women who had normal menses for the past year; Menopausal: Women reporting a menstrual pattern different from the former pattern, i.e., those who had more or fewer menstrual flows than previously over the past year; Postmenopause: Women who did not menstruate in the past year" (p. 269).

In this article, the period of change in menstrual pattern was recognized as a distinct stage, although the stage was termed menopausal rather than perimenopause. This study marked the emergence of the concept of perimenopause.

The definitions of perimenopause along with the definitions of menopausal status were modified by the World Health Organization's (WHO) technical report (1981), "Research on Menopause". The following definitions were given:

"Menopause: the permanent cessation of menstruation resulting from loss of ovarian, follicular activity; Perimenopause (or climacteric): the period immediately prior to menopause when endocrinological, biological, and clinical features of approaching menopause commence, continuing for at least the first year after the menopause; Postmenopause: a period dating from menopause, although it cannot be determined until after 12 months of spontaneous amenorrhea; Premenopause: the whole of the reproductive period prior to menopause" (p. 8).

Although WHO's (1981) definition of perimenopause was clear, its definition of premenopause was still ambiguous. The premenopausal and perimenopausal phases were not mutually exclusive. The definition of premenopause still included women who had entered the perimenopausal phase. Many researchers still found the definition too confusing to be useful.

The three-stage definition of menopause status was further developed and modified (Kaufert et al., 1986) based on the previous works of Treloar et al. (1967) and Jazmann et al. (1969) and the assumption of hormonal change. Women who reported no change in menstrual flow or frequency during the last 12 months were defined as pre-menopausal. The underlying assumption is that menstrual pattern stability reflects hormonal stability. Women who reported no menses for twelve consecutive months or longer were defined as postmenopausal. The assumption is that after 12 months of amenorrhea, it is certain that ovulation has ceased and that hormonal levels within the ovary have stabilized at the postmenopausal level. Women who reported changes in menstrual flow or frequency during the last 12 months are categorized as perimenopausal. The basic assumption underlying perimenopause is that changes in menstrual pattern signify that menopause is inevitable (Kaufert et al., 1986). Therefore, perimenopause is defined as changes in menstrual flow or frequency or no menses for three to eleven months.

The standard three-stage definition of menopausal status given by Kaufert et al., 1986 is useful because it recognizes the differences in

experience between pre-, peri- and postmenopausal women. In addition, researchers could use the same criterion to define status, and comparisons could be made between different study populations.

Based on the three-stage definitions of menopausal status, perimenopause is generally a period of a few years before and one year after the menopause. It starts when the active ovary begins to fail and ends with the final lapse of the ovary into inactivity. During this period maximal reproductive hormone fluctuation occurs prior to the final menses (Kaufert, 1986). It is characterized endocrinologically by evidence of decreasing ovarian activity, biologically by decreasing fertility, and clinically by alteration in menstrual cycle intervals and maybe by a variety of symptoms (Upton, 1982). However, the criteria used to define perimenopause in clinical research generally include only changes in menstrual flow and/or regularity indicated by unusually long or short menstrual cycles, diminished menstrual flow, or intermittent menstrual cycles that terminate in menopause (Feldman, Voda, & Gronseth, 1985). The biological and endocrinological parameters are often not included because 1) measuring the hormone levels requires drawing blood and ordering lab tests which are inconvenient and costly and 2) it is inappropriate to determine a woman's fertility only for the purpose of menopausal research.

In the perimenopausal literature, however, not all authors have used the standard three-stage definitions of perimenopause as described above. Some investigators loosely and inaccurately defined perimenopause as a period of

time around menopause (Cutick, 1984). Perimenopause has been used to refer to different age groups. For example, it was used to describe women 35 to 50 years of age (Feldman, Voda, & Gronseth, 1985) or 25 to 74 years of age (VanHall, Vardel, & Velden, 1994). These studies used subjects with an age range of 15 years or more and considered these women as perimenopausal. Apparently women who were clearly "premenopausal and postmenopausal" were included in the perimenopausal category.

Several other definitions of perimenopause have been used. First, perimenopause has been defined as an indefinite period of time that begins with the onset of the first hot flash and terminates when hot flashes disappear (Voda, 1984). This definition implies that perimenopause is not experienced by women who do not have hot flashes; women who do have hot flashes may experience them many years before menopause as well as many years after menopause. Although this definition provides an objective indicator of the onset and duration of perimenopause, it has little empirical value in terms of categorizing women, since not every woman has hot flashes during the menopausal process and not every woman who has hot flashes is perimenopausal.

Finally, perimenopause has also been defined as a period which includes all three stages of menopause (Harper, 1990), thus the duration of perimenopause would be about 25 years (women aged 35-60). Obviously, this definition, including all menopausal women in the same group, fails to

demonstrate the difference in menopause experienced between the different stages of menopausal women.

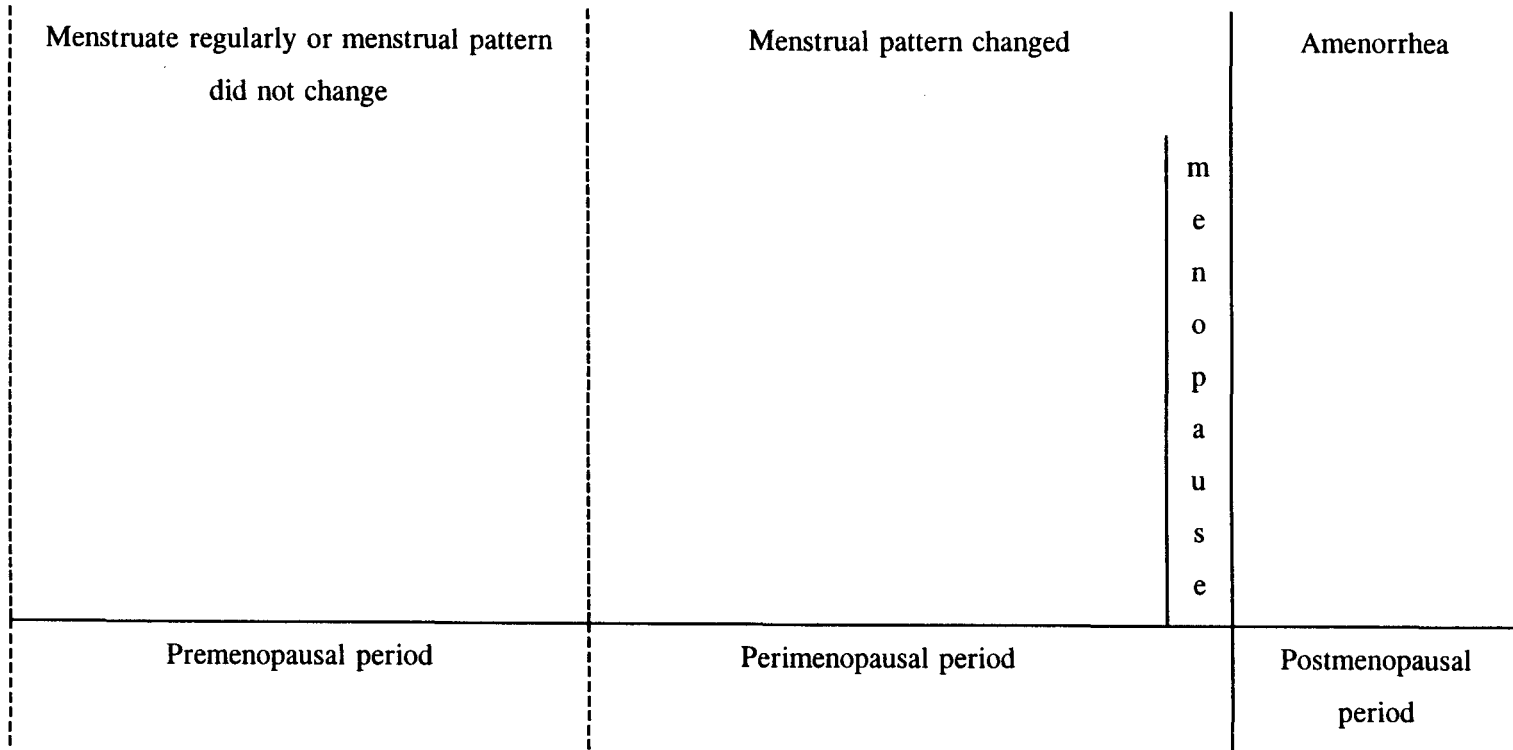
In summary, for the purpose of this study, perimenopause is defined as a few years before the actual menopause is diagnosed. It is primarily operationalized as the changes in menstrual pattern which includes menstrual cycle and/or flow irregularity and/or no menstruation for more than three and less than 12 months (Figure 1) in the past year. Since women who have a premature or surgical menopause have an atypical perimenopause experience, this study only focuses on natural perimenopause.

Hormonal Aspects of Perimenopause

Several studies (Hee, MacNaughton, Bangah, & Burger, 1993; Longcope, Franz, Morello, Baker, & Johnston, 1986; Richardson, Senikas, & Nelson, 1987; Shideler, DeVane, Kalra, Benirschke, & Lasley, 1989; Trevoux, Brux, Castanier, Nahoul, Soule, & Scholler, 1986) have been conducted to describe the endocrine characteristics of menstrual cycles in perimenopausal women. Information was obtained from both cross-sectional and longitudinal data.

Hormonal profiles of perimenopausal women are characterized by a great deal of variability and lack of predictability. According to Richardson and Nelson (1994), the human ovary steadily loses follicles from mid-fetal life. The number of follicles remaining in the mature ovary is the major determinant of the timing of both perimenopause and menopause. In a study of follicle number in ovaries in 17 healthy women aged 45 to 55 years, Richardson, Senikas, &

Figure 1. The perimenopausal period



Nelson (1987) found that the mean number of primordial follicles in the ovaries of women who were still menstruating regularly was ten-fold greater than in the ovaries of perimenopausal women of the same age. Follicles were fewer or absent from the ovaries of the postmenopausal women. They concluded that the size of the follicular reserve was the major determinant of both the transition from regular menses to the perimenopause as well as to the menopause itself (see Appendix A).

With the decreased level of ovarian follicles in perimenopause, the secretion of estrogen is greatly diminished (Hee et al., 1993; Longcope et al., 1986; Shideler et al., 1989; and Trevoux et al., 1986) (Table 1). Perimenopausal women have low levels of estrogen and progesterone that are midway between the normal reproductive range and the postmenopausal range (Hee et al., 1993). Estradiol remains the major form of estrogen during perimenopause. There is a great deal of day to day fluctuation in this hormone level. During the postmenopausal period, the major source of estrogen comes from the peripheral conversion of estrone and testosterone. Compared to pre- and perimenopausal women, postmenopausal estrone levels are higher than estradiol levels (Greendale & Judd, 1993).

Further, with decreased ovarian follicles, the follicle stimulating hormone (FSH) level becomes elevated as a compensatory mechanism in the perimenopausal period and remains elevated within the range defined as postmenopausal (Longcope et al., 1986). Luteal hormone (LH) level can be

elevated or remain in the normal range (Cook, 1993).

The perimenopausal cycle can be ovulatory or anovulatory. The ovulatory cycle is characterized by a midcycle estrogen surge and subsequent luteal phase progesterone secretion that is lower than that found in the normal reproductive cycle, while the anovulatory cycle is characterized by a rise and fall in estrogen levels and no progesterone secretion (Upton, 1982).

Clinically, perimenopausal women usually have either a shorter or longer menstrual cycle compared to premenopausal women. Short cycles are accompanied by shorter follicular phases (6-10 days in length) and a normal duration of luteal phase. The longer menstrual cycles are usually anovulatory and last 40 to 60 days. Furthermore, the menstrual cycles in perimenopausal women are irregular and unpredictable and can have a duration varying from 20 to more than 60 days (Shermen, West, & Korenman, 1976).

Methodological issues, however, have to be considered when interpreting data. Gonadotrophins are secreted episodically, yet some studies obtained individual blood samples at isolated time points (Longcope et al., 1986). These samples could have been obtained anywhere during or after a secretory episode. Therefore, bias due to timing or frequency of sampling might have occurred. Additionally, some studies used small sample sizes. For example, Shideler et al. (1989) in their study used only two perimenopausal subjects; Hee et al. (1993) used three; and Richardson et al. (1987) used seven. Therefore, generalization of findings from these studies is difficult.

In summary, measuring the hormonal level may be a more objective way of defining menopausal status, but the cost and time frame for a doctoral study prohibited this approach for this study. In addition, menstrual cycle change during perimenopause closely reflects the hormonal change. Therefore, again, changes in menstrual patterns were used to define perimenopause in this study.

Clinical Aspects of Perimenopause

Age and Duration of Perimenopause

The onset and the duration of perimenopause have not been widely studied. Only three studies were found which dealt with the age at onset and the duration of the perimenopause (see Appendix B). In a survey of 6877 women aged 38 to 58 years, Magursky, Mesko, and Sokolik (1975) found that the age at onset of the perimenopause was approximately 47.5 years. In this study, the term climacteric was used to mean perimenopause. These investigators noted that onsets of perimenopause and menopause were related to menstrual disturbance and occupation. Women with more menstrual disturbances had their menopause about one year earlier than other women. Women who were manual workers and those in occupations other than housewives and agricultural workers had their menopause and onset of perimenopause at least a year earlier. Age at menarche and parity was not associated with the age at the onset of perimenopause.

Treloar (1981), in a study of 291 women who were followed from the time of menarche to natural menopause, found that the median age for the

onset of perimenopause was 45.5 years, with a range of 34 to 55 years. The duration of perimenopause was 4.8 years (median value) with a range of one to 10 years. He also found a long perimenopause usually began with a slow increase in cyclic variations which were linked to duration of perimenopause.

More than a decade later, McKinlay, Brambilla and Posner (1992) conducted a large and comprehensive prospective cohort study of 2500 mid-aged women. Their results were strikingly similar to Magursky and colleagues' study in 1975. McKinlay et al. found that the onset of perimenopause was 47.5 years and the duration was about 4 years. They noted that there were several factors such as smoking that affected the onset and duration of perimenopause. Smokers tended to have not only an earlier, but also a shorter perimenopause.

The discrepancies in age of inception of perimenopause noted in the above studies may be explained by the differing samples. Studies conducted by Magursky et al. (1975) and McKinlay et al. (1992) used women with more limited age ranges than Treloar's study (1981). Therefore, women with early perimenopause and menopause may not be represented in their samples. Conversely, Treloar's (1981) study may have included women with premature menopause.

In summary, age is an important factor in the onset of perimenopause. Most women will begin their perimenopause at about age 45 to 47 years. However, a few women may experience perimenopause as early as their late

30s and as late as their middle 50s. Perimenopause lasts one to ten years with an average of four years. In this study, women who have changes in their menstrual pattern and are aged 40 years and above are evaluated to exclude women who might experience premature menopause.

Symptoms of Perimenopause

A number of studies have reported on the incidence of symptoms reported by perimenopausal women (Seltzer, Benjamin & Doutsch, 1990; McKinlay et al., 1992; Holte, 1992; Dennerstein et al., 1993). A comparison of the findings of these studies is, however, limited by methodological issues. For example, some studies recruited women attending clinics as subjects (Seltzer et al., 1990) and others used nonclinical population samples (McKinlay et al., 1992). In addition, some studies failed to distinguish between perimenopausal and postmenopausal or between premenopausal and perimenopausal phases.

Menstrual changes

The first sign of perimenopause is a change in menstrual bleeding. The literature has consistently reported menstrual irregularity with either scanty or profuse bleeding during perimenopause (Bachmann, 1994b). It is believed that menstrual irregularity reflects marked fluctuations in levels of estrogen and progesterone or outright deficiency. Clinical studies of menopausal women have shown that approximately 90% of women will experience menstrual irregularity during perimenopausal years; only 10 to 12% of premenopausal

women will have sudden amenorrhea (McKinlay et al., 1992; Seltzer et al., 1990; Treloar et al., 1967). For example, a classic extensive longitudinal study of menstrual intervals throughout life by Treloar et al. (1967) found that beginning seven years before menopause, the incidence of short and long cycles dramatically increased and reached its peak about 4 years before menopause. During this time, the mean variability of menstrual intervals in individual women also increased. Further, Seltzer et al. (1990), in a chart review study of 500 perimenopausal patients reporting alterations in menstrual flow, found 86.7 % of perimenopausal women with irregular menstrual bleeding have oligomenorrhea, or abnormal menstrual periods (intervals of 36 to 90 days between periods) or hypomenorrhea (regular menses but decreased in amount); and 13.3% report menorrhagia, metrorraghia, and hypermenorrhea (see Table 1). However, caution has to be taken when interpreting this study because the study was retrospective and data were obtained by chart reviews of the clinical population. Thus, the incidence of menstrual problems may not be representative of the general population.

Abnormal bleeding can be disturbing, especially if it's heavy and unpredictable. McKinlay and colleagues (1992) indicated that irregular menstrual bleeding during perimenopause appears to be more worrisome to women than hot flashes, particularly if this irregular menstrual bleeding persists beyond a year or two. While clinical papers emphasize menstrual problems during perimenopause (Bachmann, 1994a), such menstrual problems did not

stand out as a significant symptom in research studies. This may reflect researchers' bias in the measurement of symptoms during perimenopause. Either menstrual problems were not included in the measurement tool or were not analyzed as separate symptoms. Consequently, menstrual problems may not have been evident because they were grouped into the "other" categories. In this study, prevalence of menstrual changes measured by several items and the effect of long term physical activity on menstrual changes were evaluated.

Table 1.
Examples of menstrual irregularity during perimenopause

Type of menstrual irregularity	Definition
Oligomenorrhea	Scanty or infrequent menstrual flow
Abnormal menstrual periods	Irregular menstrual flow
Hypomenorrhea	Deficient amount of menstrual flow but periods are regular
Menorrhagia	Excessive bleeding at the time of a menstrual period, either in number of days or amount of blood or both
Metrorrhagia	Bleeding from the uterus, esp. at any time other than during the menstrual period

Vasomotor symptoms

Although some years ago researchers believed that most menopausal symptoms started with the onset of menopause, current data suggest that vasomotor symptoms, psychosomatic symptoms and sexual problems may begin during the pre- and perimenopausal period. All studies reviewed, both cross-sectional and longitudinal, demonstrated a marked and significant

increase in vasomotor symptoms such as hot flashes and night sweats, during the perimenopausal period (Avis, Kaufert, Lock, McKinlay, & Vass, 1993; Ballinger, 1985; Dennerstein et al., 1993; Hunter, 1992; McKinlay et al., 1992) (see Appendix C); and all studies reviewed found a significant relationship between vasomotor symptoms and menopausal status (see Appendix D).

Hot flashes have been described by women as strong sensations of warmth, skin irritation, and perspiration that travel from the trunk toward the head before spontaneously disappearing. Hot flashes may be spontaneous, uncomfortable, and unpredictable, and may occur any time of the day or night. Episodes may last from seconds to minutes and occur frequently with varying intensity (Feldman et al., 1985). Hot flashes are often temporary but may last one to five years.

Estimates of prevalence of hot flashes in population studies ranged from 31-50% depending on the geographic region (Avis et al., 1993; Hunter, 1992; Jaszmann et al., 1969; McKinlay et al., 1992). Discrepancies in prevalence of vasomotor symptoms reported in epidemiologic surveys probably reflect inconsistencies in research methodologies. For example, the different methods of data collection may have influenced responses. A mailed questionnaire was used as a mode of data collection in Avis and colleagues' study (1993), while a combination of telephone interview and postal questionnaire methods were used in McKinlay and colleagues' study (1992). Interview as a method of data collection may increase the accuracy of data, yet interviewer-bias may also be

manifested.

Vasomotor symptoms are not unique to perimenopause; they occur throughout the reproductive years. However, the majority of studies (see Appendix C) reviewed found occurrence of vasomotor symptoms to peak during perimenopause. For example, MacKinlay and colleagues (1992) conducted probably the largest and most comprehensive prospective cohort study of middle-aged women, the Massachusetts Women's Health Study (MWHS). They studied 1178 women between the ages of 45 to 55 years. This prospective study consisted of six telephone contacts at nine-month intervals. They reported that hot flashes were experienced in only 10% of premenopausal women. This incidence rate increased slowly before the transition to perimenopause, then increased rapidly during perimenopause to a peak of about 50% during the last year of perimenopause (the year just after the cessation of menses). Then the rate began to decrease. At four years after the last menstrual period, the rate of hot flashes had declined to 20%.

Vasomotor symptoms have strong associations with other symptoms presumably associated with perimenopause such as cold sweats, insomnia, fatigue, nervousness, and depression (Utian, 1980). The majority of women who reported experiencing hot flashes also reported cold sweats. Insomnia was more likely to be reported by women who experienced hot flashes. This phenomenon may be due to sleep disturbance from frequent episodes of hot flashes and cold sweats during the night (Hunter, 1992; MacKinlay et al.,

1992).

Attempts have been made to identify the factors that might predict women experiencing vasomotor symptoms. Length of perimenopause was found to be related to the occurrence of vasomotor symptoms (McKinlay et al., 1992). Women with shorter or no perimenopause were less likely to have hot flashes than women with a longer perimenopause. The differences in percentage of incidence of vasomotor symptoms between women with average length of perimenopause and those with short or no perimenopause phase was 12%. Women with a longer perimenopause were also likely to have menstrual problems (McKinlay et al., 1992).

A history of premenstrual tension and/or having vasomotor symptoms when menstruating regularly before perimenopause has been correlated with vasomotor symptoms during perimenopause (Hunter, 1990). The author gave three explanations. First, there may be some type of hormonal pattern predisposing women to both kinds of symptoms. Second, vasomotor symptoms may be an illness behavior. Some people complain more about a whole host of symptoms because they are more preoccupied by bodily changes. Finally, women with a history of menstrual problems may develop learned reactions to reproductive changes.

In summary, consensus has been reached that there is a significant relationship between vasomotor symptoms and menopausal status. In this study, occurrence and distress associated with vasomotor symptoms and

impact of long term physical activity on vasomotor symptoms were examined.

Psychosomatic symptoms

Historically a variety of psychosomatic complaints, such as clinical depression, anxiety or irritability, depressed mood, feeling blue, fatigue, palpitations, headache, and insomnia have been attributed to perimenopause, since these symptoms seem slightly increased during this period (Holte, 1992). It has been reported that perimenopausal women had significantly higher levels of psychologic distress and more psychosomatic symptoms than pre- and postmenopausal women (Dennerstein et al., 1993; Stewart, Boydell, Derzko, and Marshall, 1992). For example, Stewart, Boydell, Derzko, and Marshall (1992), in a study of psychological distress in peri- and postmenopausal women (peri-, n = 113 and postmenopause, n = 146) attending a menopause clinic, found that perimenopausal women had significantly higher levels of psychologic distress. Furthermore, Dennerstein et al. (1993), in a study of 2000 women aged 45-55 years, found that premenopausal women were the least symptomatic and perimenopausal women the most symptomatic. Vasomotor symptoms and general psychosomatic symptoms were more frequent in the perimenopause.

Psychosomatic symptoms during the entire menopausal period include depression, fatigue, irritability, sleep disturbance, and mood change. In general, the incidence of psychosomatic symptoms is higher in perimenopausal than in premenopausal women, yet the degree of difference in incidence of

psychosomatic symptoms is much lower than that of vasomotor symptoms. Furthermore, whether the increase in psychosomatic symptoms during midlife is associated with perimenopause and menopause remains unanswered.

In the last decade, a number of cross-sectional studies of midlife women have been conducted to study the relationship between psychosomatic symptoms and menopausal status. The few conflicting results such as the relationship between menopausal status and depression may be explained by methodological problems, for example, the confounding effects of age, and the use of different lists of menopausal symptoms and different definitions of psychosomatic symptoms. In addition, strongly held beliefs and expectations regarding menopause are likely to influence women's responses to questionnaires if they are aware that menopause is being investigated.

In the past five years, several prospective studies have examined the relationship between psychosomatic symptoms and menopausal status (Holte, 1992; Hunter, 1990; McKinlay et al., 1992). Strengths of these studies include the use of the standard three-stage definition of menopausal status, and following women for several years so that the data represent the entire perimenopausal period.

Although the majority of the longitudinal studies did not find a significant relationship between psychosomatic symptoms, for example, depression, and menopausal status, one investigator (Hunter et al., 1986; Hunter, 1992) found that depression was significantly related to menopause. The conflicting results

may well be explained by the different definitions and measurements of depression used in various studies. While Hunter (1992) viewed depression as depressed mood and feeling blue, Kaufert et al. (1988) focused on measuring depressive symptoms more than mood change. Therefore, it seems likely that the use of different operational definitions of depression contributes to equivocal findings. There seems to be a trend that depressed mood is related to perimenopause, while depressive symptoms and clinical depression are not (Ballinger, 1990). In the current study, depressed mood and psychosomatic symptoms such as headache, nervousness, and their relationship to regular physical activity were evaluated.

Disturbances of sexuality

Although the disturbance of sexuality may be more of a problem for postmenopausal women, it may also occur in perimenopausal women. Depending on the demographics of the population studied, the definition used for sexual disturbance and on the particular sexual behavior reported, studies evaluating sexual function in midlife women found that the incidence of sexual disturbances ranged from 5 to 85% (Davidsen, 1985; Hallstrom, 1973; Hunter, 1992; Koster & Davidsen, 1993). The determinants of sexual behavior are thought to be complex and interrelated. According to Greendale and Judd (1993), sexual function is regulated by three general components: "the individual motivation (also called desire or libido), endocrine competence, and social-cultural beliefs" (p. 429).

Women attending clinics with perimenopausal complaints commonly report vaginal dryness and associated dyspareunia (Davidsen, 1985; Hunter, 1992). It is generally agreed that vaginal dryness is associated with low estrogen levels during perimenopause (Hunter, 1993). Vaginal dryness may affect sexual functioning and possibly lead to a decline in sexual enjoyment and interest. According to Bachmann (1994), during perimenopause, women often report a decrease in sexual desire and a diminished amount of vaginal lubrication with sexual arousal and coitus. Inadequate vaginal lubrication may lead to insertional dyspareunia. Similarly, Koster & Davidsen (1993) found that 30% of women experienced a decrease in sexual desire. Bachmann (1994) reported that there was a gradual decline in sexual arousal and a progressive decrease in coital frequency starting early in perimenopause.

A few available studies have found that decrease in sexual desire was not related to menopausal status (Hunter, 1992; Koster & Davidsen, 1993). In contrast, the change in sexual desire was highly correlated to previous and present subjective health status, former sexual activity, partner availability and social status, and women's subjective assessment of being perimenopausal. In the current study, the sexuality of perimenopausal women was examined.

In summary, many questions remain unanswered regarding the perimenopausal experience. It is significant to note that not all perimenopausal women experience symptoms around menopause. Therefore, it is important to identify factors that influence the occurrence and intensity of perimenopausal

symptoms. In the current study, the perimenopausal experience of long term physically active women was described. In addition, whether regular physical activity contributes to the improvement of perimenopausal experience was evaluated.

Concept of Physical Activity

Physical activity as a health related behavior has been widely used and studied. Viewed as a behavior, physical activity has been defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen, Powell, & Christenson, 1985). Exercise is a subtype of physical activity. It is planned, structured and repetitive. In the literature, physical activity and exercise has been used interchangeably. Regular moderate physical activity is an activity performed at least five times a week, at an intensity of 3-6 METs (work metabolic rate/resting metabolic rate-the equivalent of brisk walking at 3-4 mph for most healthy adults). Recent research suggested that it is a misperception of many people that to reap health benefits they must engage in vigorous, continuous exercise. Scientific evidence clearly demonstrated that regular moderate-intensity physical activity provides substantial health benefits. The current recommendation emphasizes the benefits of moderate-intensity physical activity and of physical activity that can be accumulated in relatively short bouts, such as five to 10 minutes of brisk walking. Existing evidence suggests that amount of activity is more important than the specific manner in which the activity is performed. The

health benefits of physical activity appear to accrue in approximate proportion to the total amount of activity performed, measured as either caloric expenditure or minutes of physical activity (Pate et al., 1995). Therefore, in this study, rather than measure the type of activities, the amount of activities performed were measured.

Physical activity has been demonstrated to have optimal protective effects against a number of chronic conditions, including stroke, coronary heart disease (CHD), diabetes, osteoporosis, colon cancer and even breast cancer risk (U.S. Congress, Office of Technology Assessment, 1992). Recently it was proposed that physical activity may be beneficial to menopausal symptoms (Gannon, 1988). Although the empirical support for advocating physical activity as a treatment alternative for menopausal symptoms is scarce, there are theoretical justifications which warrant its serious consideration and investigation.

Theoretical Speculations

The beneficial effects of physical activity on perimenopausal symptoms may be achieved through several pathways. Holders of the biomedical perspective on menopause believe that symptoms around menopause are caused by estrogen deficiency. However, recent research has posed serious threats to this belief since prepubertal girls and women with primary amenorrhea do not experience hot flashes (Rebar, 1987). In addition, past studies have not been able to find a significant correlation between hot flashes

and plasma levels of estrogen (Ballinger, 1987; Hunter, 1988; Maddock, 1978; Casper, Yen, & Wilkes, 1979). In contrast, the absence of hot flashes is notable in women with low estrogen levels. For example, Martin and colleagues (1993) found that elevated FSH and lowered levels of estrogen were shown in perimenopausal women without vasomotor symptoms. They concluded that lack of symptoms during the perimenopausal transition was not attributable to a difference in endocrinology.

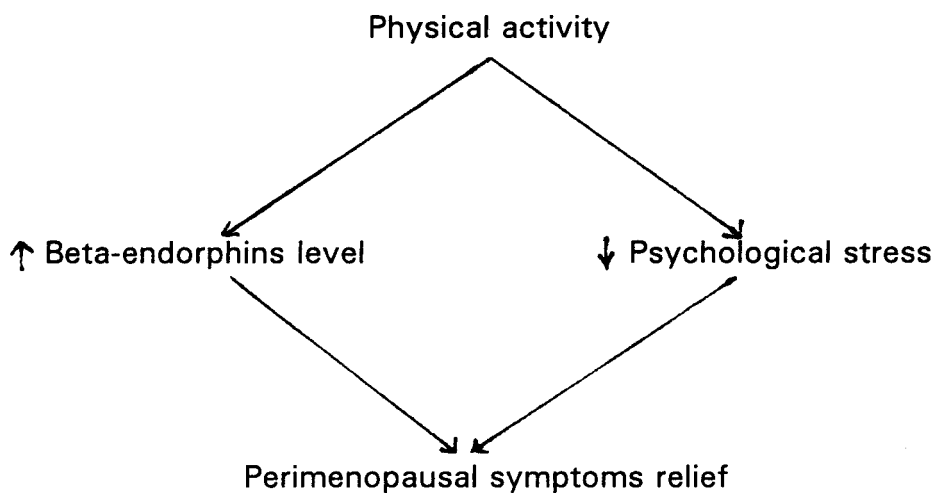
Currently, it is proposed that hot flashes are caused by thermoregulatory instability which is the result of a loss of ovarian function and the accompanying reduction in hypothalamic opioid tone (Greendale & Judd, 1993) (see Figure 2). Endogenous opioids regulate the major thermoregulatory nucleus and the release of GnRH (hypothalamic gonadotropin releasing hormone). In premenopausal women, adequate levels of ovarian steroids maintain the endorphin levels. However, with menopause and decreasing levels of estrogen and progesterone, endogenous opioids may decrease and cease to regulate GnRH and maintain thermal homeostasis. Evidence exists that there is a significant reduction in endorphin levels in menopausal women (Petraglia et al., 1985; Watts et al., 1985). Therefore, a possible mechanism of the effects of physical activity on perimenopausal symptoms is the release of endogenous opiates, specifically, beta-endorphins.

Regular physical activity has been demonstrated to increase central opioid activity, thus promoting thermal regulation. Research studies (McArthur,

1985) have indicated that levels of beta-endorphins are increased after exercise, similar to how estrogen influences vasomotor symptoms. Furthermore, people with higher levels of fitness have higher levels of base beta-endorphins than people with lower levels of fitness. Thus it is plausible that symptoms such as hot flashes can be minimized or alleviated by physical activity.

Figure 2.

Theoretical speculations of physical activity on
perimenopausal symptoms



The second view of perimenopausal symptoms is that there is a link between psychological stress and/or depression experienced before perimenopause and the subsequent reporting of vasomotor symptoms (Hunter, 1993). Hunter indicated that psychological symptoms can not be explained by hot flashes, however, women who are distressed or under stress might be more likely to develop vasomotor symptoms. This relationship has been demonstrated with both patients and the general population. Gath and colleagues (1987), in a cross-sectional survey of 500 middle-aged women, found a significant association between psychiatric symptoms and hot flashes. Hunter (1992), in a prospective study of 36 women, found women depressed before perimenopause to be more likely to develop hot flashes three years later when they entered perimenopause.

Ballinger and colleagues (1979) proposed that the impact of life stresses might actually lead to catecholamine and estrogen changes and hence vasomotor symptoms. This theory was examined in a study of 10 clinically depressed and 10 non-depressed menopausal women. They found that estrogen concentrations were lower in the depressed group. However, when depression was lifted using anti-depressive drugs, the estrogen levels increased.

Physical activity may be useful in alleviating the perimenopausal symptoms since physical activity can be stress-reducing. Physical activity as an effective means of symptom relief through stress reduction has been evaluated and proven in a variety of disorders (premenstrual disorder, tension

depression)(cite). In addition, menopausal symptoms seem to respond positively to stress reduction therapy. Studies (Germaine & Freedman, 1984; Stevenson & Delprato, 1983) have shown that stress reduction methods such as relaxation and self-control techniques are beneficial to hot flashes.

In summary, there are at least two possible pathways through which physical activity effects perimenopausal symptoms. This study tested the hypothesis that physical activity has a positive influence on perimenopausal symptoms.

Research Studies of Relationship between Physical Activity and Perimenopausal Symptoms

Physical activity as a treatment alternative for menopausal symptoms is not a new idea. It has been advocated by health professionals for decades. However, the majority of studies on physical activity as a therapeutic approach in midlife women have primarily assessed the effects on bone aging and cardiovascular degeneration, and rarely assessed for menopausal symptom management (Gannon, 1988). Several anecdotal accounts have been published which describe exercise as resulting in the alleviation of perimenopausal and menopausal symptoms. For example, Leven (1993), in a non-data based article, suggests that regular moderate exercise can have a positive effect on sexuality, although the relationship is not fully understood. Exercise may improve an individual's libido and overall sexual satisfaction.

A few empirical studies (Wallace, Lovell, Talano, Webb, & Hodson,

1982; Hammar, Berg, and Lindgren 1990; Wilbur, Dan, Hedricks, & Holm, 1992) in the literature have examined the relationship between physical activity and menopausal symptoms (see Appendix E). Wallace and colleagues (1982), in a study of pre- and postmenopausal women before and after an aerobic conditioning program, found that postmenopausal women experienced a reduction in vasomotor symptoms and that estrogen levels increased in both pre- and postmenopausal women after the conditioning program. The weakness of this study was that it evaluated the short-term effects of an exercise session or program without controlling subjects' prior fitness levels which would have an impact on the physiological, psychological, and behavioral effects of exercise. Small sample size may also undermine the study result.

Wilbur et al., (1992) in a study of 279 midlife women, found a significant positive relationship between occupational energy expenditure and vasomotor symptoms and general health. However, there was a negative correlation between leisure time physical activity (as measured by energy expenditure) and overall symptom reporting. The problem with this study was that it used women from the general population. These women may not have been physically active at all. Therefore, the sample may not have been adequate to test the relationship between physical activity and symptoms during perimenopause.

Hammar, Berg, and Lindgren (1990) investigated the relationship of frequency of moderate and severe hot flashes to physical exercise. A control

group of 1246 women aged 52 and 54 year old in Sweden was compared with a study group (n = 142). They found that moderate and severe psychosomatic symptoms of hot flashes and sweating were only half as common among the physically active postmenopausal women (21.5%) as in the control group (43.8%). The limitation of the study is that the levels of physical activity in the control group were not measured, therefore, some of the women in the control group may also have been physically active. In addition, this study did not measure the body mass index which may serve as a confounding variable, since adipose tissue, which converts adrenal androgens to estrogens, may alleviate menopausal symptoms, and consequently, women with a high body mass index may be less likely to have menopausal symptoms. Whether or not there was a true difference in body mass between the two study groups is not known. The current study controlled this confounding variable using a statistical method.

In summary, the effectiveness of physical activity on perimenopausal symptoms is promising but needed further empirical evaluation. Previous studies had not examined the possible benefits of long-term regular physical activity on the subsequent risk of occurrence of perimenopausal symptoms. The majority of physical activity research evaluates the level of current physical exercise or a short term exercise session. Gannon (1988) indicated that even if a hormone is found to increase from pre to postexercise, it does not necessarily indicate that the basal level of such a hormone will respond in the

same manner to a regular physical activity pattern or exercise program. In addition, a history of recent physical activity is closely related to overall general health (Shinton & Sagar, 1993). Thus the relation between perimenopausal symptoms and recent exercise can be confounded by illnesses. A regular physical activity pattern was examined in this study in order to minimize this threat to design validity.

Further, research in the past has suggested that the strenuous exercise required of professional athletes may lead to a reduction of estrogen levels in normally menstruating women (Gannon, 1988). In order for the results of this study to be of practical import and realistic for most women, physical activity of moderate to vigorous intensity was studied. Therefore, the proposed study evaluate the influence of long term, regular, moderate and vigorous intensity physical activity on perimenopausal symptoms.

Demographic Influences

Demographic factors such as social class, years of education, employment status, marital status and social network have been the focus of a number of studies with interesting and disparate findings. Wasti, Robinson, Akhtar, Khan, and Badaruddin (1993), in a study of 650 women with natural menopause, found that women from a higher socioeconomic status reported more depressed moods than middle class women and those who lived in slums. The authors explained that perhaps the middle and lower class individuals overlooked minor symptoms when faced with major socioeconomic problems.

In contrast, British studies have found that working class women generally report more symptoms than middle class women during perimenopause (Bebbington, Hurry, & Tennant, 1981; Hunter, 1992). Holte and Mikkelsen (1991) reported that women's depressed moods were more common among those who had lower monthly incomes.

Years of education in middle aged women have been demonstrated to be inversely correlated with symptoms during perimenopause (McKinlay, McKinlay, & Brambilla, 1987; Dennerstein et al., 1993). For example, Dennerstein et al. (1993), in a study of 2000 women between 45 and 55 years, found, with increasing years of education, women reported fewer psychological symptoms, better self-rated health, using fewer non-prescription medications, the absence of chronic health conditions, a low level of interpersonal stress, the absence of premenstrual complaints, not currently smoking, and had positive attitudes toward aging and menopause.

Unemployment has also been shown to contribute to the incidence of symptoms during menopause (Hunter, 1992). Midlife women who work (i.e., have a paying job) are more likely to be fired, laid off or leave voluntarily when compared to men. Crowley (1991) suggests that people who lose their jobs often experience a type of grief reaction followed by depression. Furthermore, older workers who are laid off are unattractive to subsequent employers, being close to the end of their working lives (Crowley, 1991). Perhaps lack of job security and difficulty in employment are also factors noted in the greater

incidence of depression in menopause.

Similarly, Roy (1987) indicated that women who lack any form of full or part-time employment outside the home are more likely to suffer depression in the presence of stressful life events or difficulty. Jennings and colleagues (1984), in their cross-sectional study, found that while unemployed women were the least healthy, full-time homemakers reported worse emotional health than employed women. Perhaps lack of financial independence is also an important factor in the occurrence of depression in menopause.

In addition, recent studies have found that menopausal women who are divorced, widowed or separated are more likely to be depressed, followed by married women, with single women having the fewest problems (Hunter, 1990; McKinlay, McKinlay, & Brambilla, 1987). In general, studies of marital, employment and socio-economic status have produced mixed results, probably because these variables interact in complex ways. For example, in the Massachusetts study (McKinlay et al., 1987), there was an interaction between years of education and marital status, with the less educated women who were divorced or separated being most prone to depressed moods. Therefore, the interactions among psychosocial variables need to be considered. In this study, data on demographic variables were collected and analyzed as covariates.

Levels of estrogen have been related to the percentage of body fat since adipose tissue is one source of estrogen. In order to investigate the relationship between physical activity and perimenopausal symptoms, the

percent of body fat should be taken into consideration. In this study, body mass index was used to estimate the percentage of body fat.

The Aims of the Study

The aims of the study were:

1. a. To describe the frequency of symptoms in perimenopausal women.
- b. To describe the distress of symptoms in perimenopausal women.
2. a. To evaluate the effect of current physical activity on the frequency of perimenopausal symptoms.
- b. To evaluate the effect of current physical activity on the distress of perimenopausal symptoms.
3. a. To evaluate the effect of long term physical activity on the frequency of perimenopausal symptoms.
- b. To evaluate the effect of long term physical activity on the distress of perimenopausal symptoms.

Operational Definitions

1. Perimenopause:
is defined as experiencing changes in menstrual pattern such as irregular menstruation or no menstruation for 3 to 11 months.
2. Physical activity:
is any bodily movement produced by skeletal muscles that results in energy expenditure.

3. Exercise:

is a subset of physical activity defined as planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness

4. Moderate physical activity:

is an activity performed at an intensity of 3 to 6 METs (work metabolic rate/resting metabolic rate)-the equivalent of brisk walking at 3 to 4 mph for most healthy adults. Examples include briskly walking (3-4 mph); cycling for pleasure or transportation (<10 mph), moderate effort swimming, general calisthenics, table tennis, golf (pulling cart or carrying clubs), fishing (standing/casting), leisurely canoeing (2.0-3.9 mph), painting (home repair), mowing lawn (power mower).

5. Vigorous physical activity:

is an activity performed at an intensity of 6 or more METs. Examples include briskly walking uphill or with a load, fast or racing cycling (> 10 mph), fast treading or crawl swimming, stair ergometer, ski machine conditioning exercise, singles tennis, racketball, fishing in stream, rapidly canoeing (> 4 mph), moving furniture, mowing lawn (hand mower).

6. Currently active:

individuals who accumulate 150 minutes or more of moderate to vigorous-intensity physical activity per week during the past month.

7. Currently relatively active:

individuals who accumulate 30-149 minutes of moderate to vigorous-intensity physical activity per week during the past month.

8. Currently inactive:

individuals who do none or less than 30 minutes of moderate and vigorous physical activity per week during the past month.

9. Long-term active:

individuals who accumulate 150 minutes or more of moderate to vigorous physical activity per week over the past 10 years

10. Long-term inactive:

individuals who do none or less than 30 minutes of moderate to vigorous physical activity per week over the past 5 years.

11. Long-term relatively active:

individuals who were not belonging to either long-term inactive or long-term active group.

CHAPTER III

METHODS

Sample

The sample consisted of perimenopausal women who were participants in Women Take Heart, a community-based study evaluating women's risk of coronary heart disease. Using the power analysis model, to detect an R² of at least 15% with 7 predictor variables (physical activity, age, years of education, employment status, marital status, social class and BMI) (beta = .20; power = .80; alpha = .05), a minimum of 88 women were necessary for the study.

Selection Criteria

Subjects included women who were perimenopausal and aged 40 and above. Perimenopause was defined as experiencing changes in menstrual pattern which includes menstrual irregularity or no menstruation for three to 11 months. Using only the perimenopausal women as subjects, it was possible to separate the effect of physical activity from that of menopausal status on symptoms associated with perimenopause. Potential subjects were excluded from the study if they: had a history of hysterectomy and/or bilateral oophorectomy; were currently pregnant; were currently or previously on hormone replacement therapy; have been on oral contraceptives within the past five years. Professional athletes were also excluded from the study since

intense training, or overtraining, consistently results in increased mood disturbance (Raglin, 1990). In addition, intense training may result in amenorrhea.

Design

The design was a cross-sectional, correlational, one factor design with three levels for the factor. The factor was the levels of physical activity. Three groups of women were studied: inactive, relatively active, and active. The dependent variables included perimenopausal symptoms and four subscales of the Women's Health Assessment Scale (menstrual change, vasomotor symptoms, psychosomatic symptoms, and sexual health). The independent variable was the amount of physical activity (level = 3). Covariates included age, years of education, employment status, marital status, social class and body mass index.

Measurements

Menopausal Symptoms

The Women's Health Assessment Scale (see Appendix F) was developed from two sources: The Women's Health Questionnaire (Hunter, 1986) and the 21-item Kaufert and Syrotuik Symptoms Index (Kaufert et al., 1988). The Women's Health Questionnaire consists of nine subscales and 35 items to assess the following areas: somatic (7 items), depressed mood (7 items), cognitive difficulties (3 items), anxiety/fears (4 items), sexual functioning (3 items), vasomotor symptoms (2 items), sleep problems (3 items), menstrual

problems (4 items), and attractiveness (2 items). Frequency of the symptoms over the past several months was scored on a four-point scale as 0 = "no, not at all; 1 = "No, not much"; 2 = "yes, sometimes"; or 3 = "yes, definitely". The concurrent validity of the questionnaire was reported to be .80 and test-retest reliability was .86 (Hunter, 1986). The strengths of the questionnaire include that it measured 1) depressed mood which is more menopause-related than clinical depression; and 2) the sexual health of perimenopausal women.

The 21-item Kaufert and Syrotuik Symptoms Index assesses four areas: vasomotor (2 items), genitourinary (3 items), psychologic (6 items), and general health symptoms (10 items) (Kaufert & Syrotuik, 1981). Frequency of the symptoms over the past several months is scored on a three-point scale as 0 = "never"; 1 = "sometimes"; or 2 = "often". The questionnaire has been used in a number of previous studies of midlife women (Kaufert, 1988; Wilbur et al., 1992). Wilbur et al. (1992) found that the questionnaire was reliable and the six nervous symptoms were positively related to the Center for Epidemiological Studies' Depression Scale.

In summary, although The Women's Health Questionnaire (Hunter, 1986) and the 21-item Kaufert and Syrotuik Symptoms Index are reliable tools to measure menopausal symptoms; however, they lack two important components which are critical for perimenopausal women. First, they do not measure to what degree perimenopausal symptoms upset or distressed midlife women. Second, they do not measure menstrual problems that perimenopausal

women may experience. Therefore, the Women's Health Assessment Scale which does address these areas was developed for this study.

When developing the Women's Health Assessment Scale, items from the Women's Health Questionnaire and the 21-item Kaufert and Syrotuik Symptoms Index (Kaufert et al., 1988) were compiled. When items from those two instruments were similar, one was selected. In addition, five items concerning the menstruating problems which frequently occurred during perimenopause were added to the questionnaire. The final questionnaire, the Women's Health Assessment Scale, consists of 47 items. In relation to the symptom aspect of the new tool, both frequency and degree of distress or bothersomeness were rated. Frequency of the symptoms over the past several months was scored on a five-point scale as 0 = "never", 1 = "rarely", 2 = "sometimes", 3 = "often", or 4 = "always". Degree of bothersomeness or distress of symptoms was also scored on a five-point scale as 0 = "not at all", 1 = "a little", 2 = "moderately", 3 = "quite a bit", or 4 = "extremely". Scores were averaged for each dimension separately. The sum of scores on all items for each dimension was used to indicate the total perimenopausal symptom frequency and distress scores. The score on items of each subscale were summed to indicate total subscale scores. Face and content validity of Women's Health Assessment Scale were established for the modified tool by a panel of five experts. Cronbach's alpha was used to determine internal consistency. The strengths of the Women's Health Assessment scale included

that it contains the measurements of 1) frequency and degree of bothersomeness or distress of perimenopausal symptoms and 2) occurrence of menstrual symptoms. Therefore, it is more applicable to perimenopausal women.

Physical Activity

A Physical Activity Questionnaire (see Appendix F) was developed based on the physical activity questionnaire in Sturgeon and colleague's study (Sturgeon et al., 1993). The Physical Activity Questionnaire consisted of two dimensions: current and long-term physical activity. Items estimating activity level on each of two aspects: moderate and vigorous activity were included. Current activity measured the amount of moderate to vigorous activity during the past month. Long-term activity measured the regular activity pattern which included the dose and duration of activity. Scores were averaged for each dimension separately to give subscale measures of moderate and vigorous physical activity. The long-term averages on each dimension were summed to indicate total regular physical activity.

American Heart Association Physical Activity Questionnaire (AHAPAQ) measures physical activity pattern on a 5-point scale with 0 = inactive and 4 = highly active. AHAPAQ was used to evaluate the construct validity of the Physical Activity Questionnaire for this study.

Demographic Variables

Demographic variables including age, years of education, employment

status, marital status, and BMI were measured using a data collection tool addressing demographic information and health history (see Appendix F).

Procedure

After receiving Institutional Review Board approval (see Appendix G), a pilot study was conducted before the actual study began to evaluate the reliability of the tools. Seventy-two nursing faculty and staff were contacted in order to obtain the pilot sample of 22. A cover letter (Appendix J) explaining the purpose of the study and a survey packet, which included questionnaires and a stamped and addressed envelope for returning the questionnaires, were mailed to all potential subjects. In the cover letter, women were asked to participate in the study and informed that their consent to be subjects would be indicated by their completion and return of the questionnaire.

Twenty-two completed questionnaires were returned. The age of the subjects ranged from 41 to 55 years, with a mean age of 48.2 years ($sd = 3.8$). Twenty (91%) subjects were white, one Black (4.5%) and one Hispanic (4.5%). The subjects weighed an average of 169 pounds ($sd = 33.3$; range = 127 to 238 pounds). All subjects were undergoing perimenopause.

Content validity of the questionnaires were evaluated by five content specialists (three menopause researchers, one exercise expert and one tool development expert). A few item-modifications were made before the pilot study.

The reliability of the tool was determined based on internal consistency.

Cronbach's alpha for both dimensions of the Women's Health Assessment Scale met the accepted standard of .70 indicating the homogeneity reliability of the scale (the Cronbach alpha was .94 for symptom frequency and .91 for symptom distress. There were 47 items in each dimension.

Cronbach alpha for the physical activity questionnaire (Cronbach alpha = .61 and number of items = 10) did not meet the standard for homogeneity reliability evaluation which may be explained by the small number of items on the tool. Multicollinearity was not found to be a problem as indicated by few inter-item correlations greater than .70.

Based on the results of the pilot study, no changes were made to the WHA questionnaire. Four items describing the type of activity were added to the physical activity questionnaire.

After the reliabilities of the tools were established, database for the Women Take Heart program was used to obtain the names, phone numbers, and addresses of the perimenopausal women. Then, a cover letter (Appendix H) explaining the purpose of the study and a survey packet, which included questionnaires and a stamped and addressed envelope for returning the questionnaires, was mailed to all potential subjects. In the cover letter, women were asked to participate in the study and informed that their consent to be subjects would be indicated by their completion and return of the questionnaire. Three weeks after the initial mailing, if no response was received, follow-up telephone calls were made. A second mailing was made to potential subjects

who: 1) were reached by telephone and indicated they were willing to participate, but either never received the first questionnaire packet or mislaid it, and 2) were not successfully reached by telephone. Twenty percent of the perimenopausal women who did complete and return their questionnaires, were requested to complete the same questionnaire two weeks later for the purpose of test-retest reliability analysis (see Appendix I). A total of 35 women were retested.

Data Analysis

Data analysis techniques specific to each research question of the study are listed below. Internal consistency for each tool was determined by Cronbach alpha. The significance level was set at $p < 0.05$.

AIM 1. To describe the frequency and associated distress of symptoms in perimenopausal women.

Descriptive statistics were used to describe demographic information and the frequency and degree of distress or bothersomeness of perimenopausal symptoms.

AIM 2. To evaluate the influence of current physical activity on the frequency and distress of perimenopausal symptoms.

To accomplish this aim, two steps were used. First, perimenopausal symptoms (total score for each dimension) were used as a single dependent variable and an ANCOVA with covariates were performed. Second, MANCOVA with covariates was used to detect differences on four subscales in three

different groups.

Before the ANCOVA was used, the statistical assumptions were checked before any test. For ANCOVA procedure, as a first step, a check was made to determine if significant interactions between each of the covariates and the independent variable on perimenopausal symptoms (total score for each dimension). All covariates, and significant interaction terms were entered in the analysis. If a significant F-test for any of the covariates was found it would indicate a significant effect for that particular term on perimenopausal symptoms. The terms in each covariance model were trimmed to eliminate non-significant elements.

When applying the MANCOVA model, significant interactions between each of the covariates and the independent variable on each dimension of perimenopausal symptoms were also examined. Assuming equal slopes of a given covariate on perimenopausal symptoms in each of the cells of the design, a more complex analysis of covariance was undertaken as appropriate. All covariates, and significant interaction terms were entered in the analysis. Similar to ANCOVA, a significant F-test for any of the covariates would indicate a significant effect for that particular term on perimenopausal symptoms. The terms in each covariance model will be trimmed to eliminate non-significant elements.

AIM 3. To evaluate the effect of long-term physical activity level on the frequency and distress of perimenopausal symptoms

Analysis methods used in AIM 2 were used for this aim.

Potential Risks

To protect individuals from the threat of loss of confidentiality, code numbers were assigned to each subject. Only the study code number appeared on the questionnaires and records. A master list of names, addresses, and code numbers was maintained in the event that follow-up was needed. But this list was available only to the investigator and will be destroyed when the study was completed. There were no any other known risks involved in this study except the time and inconvenience required for completion of the questionnaires.

Limitations of the Study

1. This study was limited by its cross-sectional design since long-term recall was involved, the study results might be limited by recall bias.
2. There were no objective measures used in this study. It relied on the self-report of the women subjects. The use of only self-report data to examine physical activity behaviors and symptoms may present some threat to internal validity. Each individual's perception may play a role in her response to the questionnaire. There was the possibility that some respondents reported their behaviors more as they think it should have been rather than as it was.

CHAPTER IV

RESULTS

Profile of the Sample

Of the 840 questionnaires distributed to women aged 40 to 55 years, 424 were returned, with a response rate of 51%. When women who participated in the pilot study were included, 35.7% ($n=159$) were premenopausal, 5.8% ($n=26$) postmenopausal, 10.5% ($n=47$) were taking hormones or oral contraceptives. This left 214 usable responses. To ensure complete data, women were contacted by phone to complete unanswered questions and to verify responses when necessary. Therefore, missing data were minimal. For Women's Health Assessment Scale, serial means were used for the missing data points. For the Physical Activity Questionnaire, subjects with missing data were deleted analysis by analysis.

The report of the results are divided into two sections: psychometric analysis of instruments and findings relative to research questions.

Psychometric Analysis of Instruments

The total sample ($n=214$) was used to establish internal consistency reliabilities on the instruments. Measurements of internal consistency reliability were made on all of the instruments in this study. Cronbach alphas were computed for each subscale within the instruments. The test-retest method

was used to determine the stability reliability (repeatability) of the instruments.

Women's Health Assessment Scale (WHAS)

Symptom frequency dimension of WHAS

The items measuring symptom frequency on the WHAS scale were analyzed for internal consistency reliability. The Cronbach alpha for the symptom frequency (47 items) for the entire sample was .91. The internal consistency reliabilities for the subscales for the entire samples are presented in Table 2. It should be noted that an extremely high alpha coefficient is not necessarily desirable since this would indicate that items are too similar and thus, redundant (Cattell, 1978).

To assess the possibility of redundancy, the inter-item correlations were analyzed. There were only a few correlations greater than .70 indicating redundancy is less likely a problem. The high Cronbach alphas for total scale and psychosomatic scale may be explained by the greater number of items in those scales.

The homogeneity reliability was also analyzed by correlating subscale scores with the total scale score (Hinshaw and Atwood, 1982). All the subscales were significantly correlated with the total scale (all P values $< .00$; $r = .31$ to $.97$) indicating the contributions of the subscales to the total scale (see Table 3). The psychosomatic subscale contributed the most while the vasomotor symptoms did the least to the total scale.

The subscale scores were further correlated with each other to

investigate possible overlap between the subscales. The correlation coefficients ranged from low to moderate ($r = .07$ to $.38$) (see Table 4). The highest correlation coefficients were between psychosomatic symptoms and sexual health.

Table 2.
Homogeneity reliability: WHAS
($n = 214$)

Scale/subscale	Cronbach's alpha	No of items
Symptom Frequency		
total score	0.91	47
vasomotor symptoms	0.49	2
psychosomatic symptoms	0.92	36
menstrual problems	0.19	5
sexual health	0.75	4
Symptom Distress		
total score	0.92	47
vasomotor symptoms	0.55	2
psychosomatic symptoms	0.92	36
menstrual problems	0.58	5
sexual health	0.76	4

Table 3.
Correlations between subscale scores and total scale score of symptom frequencies of WHAS (n = 214)

scale	correlation coefficient (r)	P value
Total score and vasomotor symptoms score	0.30	.000
Total score and psychosomatic score	0.97	.000
Total score and menstrual problems	0.45	.000
Total score and sexual health	0.55	.000

Table 4.
Correlation matrix of symptom frequency dimension of WHAS

Subscale	Vasomotor symptoms (r)	Psychosomatic symptoms (r)	Menstrual problems (r)	Sexual health (r)
Vasomotor symptoms	1			
Psychosomatic symptoms	0.22; 0.00	1		
Menstrual problems	0.07; 0.16	0.35; 0.00	1	
Sexual health	0.19; 0.00	0.40; 0.00	0.26; 0.00	1

Stability reliability was used to examine the extent to which WHAS yields similar results with the sample over time. The test-retest method was used to determine the stability reliability (repeatability) of the instrument. Thirty-five women were retested after two weeks. Spearman's correlation coefficients of the test-retest data indicated that the instrument was reliable (total score: $r=0.85$, $p=.000$; vasomotor symptoms: $r=0.86$ $p=.000$; psychosomatic symptoms: $r=0.83$, $p=.000$; menstrual problem: $r=0.76$, $p=.000$; and sexual health: $r=0.91$, $p=.000$) (see Table 5). All correlations obtained were significant at .05. Sexual health was the most stable subscale. Stability reliability of the instrument was therefore supported by these results.

Symptom distress dimension of WHAS

The same methods were used to analyze the internal consistency and repeatability of the symptom distress dimension of the scale. The Cronbach alpha for the symptom distress dimension (47 items) was .92. which meets the acceptable standard of .70 cited by Nunnally (1978), therefore, demonstrating support for homogeneity reliability of this dimension. The correlation coefficients of subscale scores and total scale scores ranged from moderate to high (.38 to .98) which further supports the homogeneity reliability of this dimension (see Table 6).

The symptom distress dimension of WHAS exhibited no overlapping between subscales, as the correlations between subscales ranged from low to moderate ($r=.10$ - $.42$) (see Table 7). The highest correlation coefficients were

between menstrual symptoms and psychosomatic symptoms.

Table 5.
Stability reliability of WHAS
(n = 35)

Scale/subscale	Correlation (r)
Symptom frequency	
Total score	0.85 *
vasomotor symptoms	0.86 *
psychosomatic symptoms	0.83 *
menstrual problems	0.76 *
sexual health	0.91 *
Symptom distress	
total score	0.80 *
vasomotor symptoms	0.83 *
psychosomatic symptoms	0.81 *
menstrual problems	0.88 *
sexual health	0.91 *

* $p < 0.001$

Table 6.
Correlations between subscale scores and total scale score of symptom distress of WHAS (n = 214)

Scale	correlation coefficient (r)	P value
Total score and vasomotor symptoms score	0.38	.000
Total score and psychosomatic score	0.98	.000
Total score and menstrual problems	0.53	.000
Total score and sexual health	0.53	.000

Table 7.
Correlation matrix of symptom distress dimension of WHAS

Subscale	Vasomotor symptoms (r; p)	Psychosomatic symptoms (r; p)	Menstrual problems (r; p)	Sexual health (r; p)
Vasomotor symptoms	1			
Psychosomatic symptoms	0.32; 0.00	1		
Menstrual problems	0.10; 0.67	0.42; 0.00	1	
Sexual health	0.20; 0.00	0.42; 0.00	0.23; 0.00	1

The stability reliability of the scale was supported by high correlations between test and retest data. All correlations were significant at .05 level (total score: $r=0.80$, $p=0.000$; vasomotor symptoms: $r=0.83$, $p=0.000$; psychosomatic symptoms: $r=0.81$, $p=0.000$; sexual problems: $r=0.88$, $p=0.000$, and sexual health: $r=0.91$, $p=0.000$) (see Table 5). Again, the sexual health was the most stable subscale.

Physical Activity Questionnaire (PAQ)

The items measuring physical activity, both current and long-term, were included in the analysis of internal consistency reliability (only items with same levels of measurement were included; $n=4$). The Cronbach alpha was 0.79.

The correlations between total score of physical activity questionnaire and current and long-term score were high (.95 and .95, respectively) further supporting the homogeneity reliability of the scale. The current and long-term physical activity were also highly correlated ($r=0.81$; $p=.00$) indicating that the current physical activity may be reflecting a long-term physical activity pattern. It was possible that women who were currently active have also been long-term active.

The stability reliability of the physical activity scales are presented in Table 8. All correlations obtained were significant at .05. Stability reliability of the instrument was therefore supported by these results. It is interesting to note that long-term activity was more stable than current activity and also more stable than American Heart Association Physical Activity Questionnaire. For

both current and long-term activity, vigorous activity was more stable than moderate activity.

Table 8.
Stability reliability of Physical Activity Questionnaire
(n = 35)

Scale/subscale	Correlation (r)
Current physical activity	
Total score	0.79*
vigorous PA	0.81*
moderate PA	0.60*
Long-term physical activity	
total score	0.92*
vigorous PA	0.85*
moderate PA	0.73*
American Health PAQ	0.82*

* $p < 0.001$

Validity of the Physical Activity Questionnaire was evaluated by its correlation with the AHAPAQ. The correlations for total scale and each dimension were all significant at 0.001 level (see Table 9) indicating the construct validity of the scale.

Table 9 .
The correlation between the Physical Activity Questionnaire and the
American Heart Association Physical Activity Questionnaire

Questionnaires	Correlation coefficient
AHAPAQ and current physical activity	
total score	0.66*
vigorous PA	0.61*
moderate PA	0.46*
AHAPAQ and long-term Physical activity	
total score	0.56*
vigorous PA	0.55*
moderate PA	0.40*

* All Ps < 0.05

Study Aims

Data were analyzed to describe the frequency and distress resulting from symptoms in perimenopausal women. The data were further analyzed to evaluate the effect of physical activity on perimenopausal symptoms. The statistical significance level for all analyses was set at .05.

The results are presented in the following order: sample characteristics, the frequency and distress of perimenopausal symptoms, the effect of current physical activity on perimenopause, the effect of long-term physical activity on perimenopause and the relationships of quality of life to perimenopausal symptoms.

Sample Characteristics

The sample consisted of a total of 214 women, 40-55 years of age, all of whom were undergoing perimenopause. White women were predominant in the study, compared to other ethnic groups (89.7%, n = 192; 10.3%, n = 22 respectively). The mean age of the sample was 47 yrs (sd = 3.0). One hundred and fifty six women (72.9%) were married, four separated (1.9%), six widowed (2.8%), and twenty-one (9.8%) never married and twenty-six (12.1%) divorced. The majority of women received (97%; n = 206) high school or higher education. About 88% of the women (n = 188) were employed; 12% (n = 26) were not working at the time of the study. Demographic characteristics based on current levels of physical activity are detailed in Table 10.

Aim 1. Frequency and Distress of Perimenopausal Symptoms

Prevalence

Hot flashes which are generally considered as one of the most common perimenopausal symptoms occurred in 45.8% of the women with 37.3% reporting the hot flashes as distressful. However, only 13% of the subjects reported experiencing hot flashes often or always and only 14% reported that hot flushes were quite a bit or extremely distressful. Hot flashes were not the most frequent or distressful symptom reported. The most frequently occurring symptoms were reported to be irregular menstrual flow (86.4%), lack of energy (74.6%), forgetfulness (67%), irritability (64.8%), stiff joints (62.1%),

Table 10.
Demographic characteristics of the sample
(N = 214)

Variable	Group		
	Inactive (n = 59)	Relatively active (n = 69)	Active (n = 68)
Age (yrs) mean (sd)	47.17 (3.3)	47 (2.6)	46.72 (3.3)
Height (inch) mean (sd)	64.46 (2.2)	64.8 (2.6)	64.79 (2.5)
Weight (kg) mean (sd)	183.95 (49.6)	159.42 (36.1)	156.06 (36.8)
Race (%)			
White	82.8	91.3	94.1
Non-white	17.2	8.6	5.8
Education (yrs)			
< 13	32.8	18.8	23.5
13-16	46.6	49.2	51.4
> 16	20.7	31.9	25.0
Marital status (%)			
Never married	8.6	11.6	11.8
Married	77.6	71.0	70.6
Separated	3.4	0.0	0.0
Divorced	6.9	14.5	16.2
Widowed	3.4	2.9	1.5
Job Status (%)			
Working	93.2	89.9	82.4
Not working	06.8	10.1	17.6
Income			
< \$20,000	86.2	1.5	4.7
\$20,000-100,000	13.7	84.9	83.6
> 100,000	0	13.6	12.5

difficulty concentrating (58%), bloated stomach (57%), decreased sexual desire (57%), breast tenderness (56%), and excessive bleeding (54%). The symptoms reported to be most distressful were irritability (54.8%), lack of energy (61.4%), forgetfulness (60%), pain and stiffness of joints (51%), headache (53%), difficulty concentrating (53%), bloated stomach (51%), irregular menstrual flow (69.4%) and excessive bleeding (50%).

Overall scores and subscale scores

WHAS measures the frequency and distress of perimenopausal symptoms. The symptom frequency scores were computed by dividing the frequency scores for the total scale and for each subscale by number of items. The possible range of scores for this method of computation was 0-4. The mean overall frequency score for all symptoms for the sample was 1.11 (sd=0.47; range=0.11-2.49) indicating that the perimenopausal women experienced symptoms rarely to sometimes. Mean frequency scores for the four subscales were as follows: Vasomotor symptoms, 0.89 (sd=0.78; range=0-4); psychosomatic symptoms, 1.13 (sd=0.55; range=0.03-2.78); menstrual problems, 1.26 (sd=0.56; range=0-2.8), and sexual health, 0.97 (sd=0.84; range=0-3.5). Thus, overall, the perimenopausal symptoms occurred rarely to sometimes and the menstrual symptoms occurred more frequently than other types of symptoms.

The five most frequently reported symptoms on a 0-4 scale were: 1) irregular menstrual flow (mean=2.08 on a 0-4 scale, sd=1.21), 2) lack of

energy (mean = 1.98; sd = 1.12), 3) irritability (mean = 1.82; sd = 1.00), 4) stiff of joints (mean = 1.79; sd = 1.25) and 5) forgetfulness (mean = 1.77; sd = 1.04). The five least reported symptoms were 1) anxiety leaving the house alone (mean = 0.23; sd = 0.59), 2) loss of appetite (mean = 0.30; sd = 0.64), 3) bladder infection (mean = 0.32; sd = 0.68), 4) persistent cough (mean = 0.41; sd = 0.85) and 5) bleeding from the uterus at any time other than during the menstrual period (mean = 0.43; sd = 0.74).

Using the same method, symptom distress was computed by dividing the distress scores for the total scale and for each subscale by number of items. Again, the possible range of scores was 0-4. The mean overall distress score for the sample was 1.07 (sd = 0.57; range = 0-4) indicating, on average, menopausal symptoms were a little stressful. Mean distress scores for the four subscales were as follows: Vasomotor symptoms, 0.84 (sd = 0.87; range = 0-4); psychosomatic symptoms, 1.12 (sd = 0.63; range = 0.03-3.03); menstrual problems, 0.95 (sd = 0.71; range = 0-3.2), and sexual health, 0.92 (sd = 0.93; range = 0-4). Thus, all perimenopausal symptoms were a little distressful and psychosomatic symptoms were more stressful than the other types of symptoms.

The five most distressful symptoms were: 1) lack of energy (mean = 1.94 on a 0-4 scale, sd = 1.33), 2) irritability (mean = 1.82; sd = 1.24), 3) forgetfulness (mean = 1.81; sd = 1.30), 4) headache (mean = 1.66; sd = 1.33) and 5) excessive bleeding (mean = 1.64; sd = 1.50). The five least reported

symptoms were 1) loss of appetite (mean = 0.16; sd = 0.46), 2) anxiety leaving the house alone (mean = 0.22; sd = 0.66), 3) persistent cough (mean = 0.36; sd = 0.88), 4) deficient amount of menstrual flow with regular periods (mean = 0.42; sd = 0.86), and 5) bladder infection (mean = 0.45; sd = 1.01).

Overview of the Effect of Physical Activity on Perimenopausal Symptoms

Descriptive data for physical activity are shown in table 11. About one third of women (34.7%, n = 68) were currently active and one third were physically inactive (30.1%, n = 59). A quarter of women were performing vigorous physical activity at least 60 minutes a week. However, only 13.6% (n = 29) had been active for 10 years or more and about 48.1% had been inactive for many years.

Table 11.
Descriptive data of physical activity

Groups	N	%
Currently inactive	59	30.1
Currently relatively active	69	35.2
Currently active	68	34.7
Long-term inactive	103	48.1
Long-term relatively active	59	27.6
Long-term active	29	13.6

Prior to examining the effect of physical activity on perimenopausal symptoms, the similarities and differences among three groups based on the current physical activity for demographical variables were evaluated. Using

nonparametric tests for three independent samples, no significant differences were found between the groups for race, working status, marital status, and income. Using one-way analysis of variance, no significant differences were found between groups for age. However, there was a significant difference between groups for body mass index ($f = 10.05$; $p = 0.0001$). Using Turkey's Honestly Significant Difference (HSD) test to further analyze the locations of the differences, it was found that the inactive group had a significantly higher body mass index than the relatively active and the active group. There was no significant difference in body mass index (BMI) between the relatively active and active group. Therefore, BMI was used as a covariant in the analyses.

The influence of physical activity on frequencies of perimenopausal symptoms were examined using ANCOVA for total score and MANCOVA for subscales. Tukey's HSD tests were used for group comparisons. BMI was not a significant covariate for any of the analyses.

Aim 2. Effect of Current Physical Activity on Perimenopausal Symptoms

Women were grouped into inactive, relatively active, and active based on their levels of current physical activity. Group membership was determined according to the following: inactive < 30 minute of total current activity in a week; relatively active: 30-149 minutes of total current activity in a week; and active: = or > 150 minutes of total current physical activity in a week. The descriptive data are shown in Table 12. The inactive group consistently had the highest means among the three groups on both the frequency and distress

dimensions and all subscales of perimenopausal symptom subscales.

The tests of significance are shown in Table 13. There were significant differences among groups in frequency and distress of overall perimenopausal symptoms ($f = 8.86$, $p = 0.00$; $f = 6.25$; $p = 0.00$ respectively). The relatively active and the active groups had significantly less overall frequency of symptoms and distress related to symptoms than the inactive group. However, the effect of physical activity seems not to be dose-dependent. The active group experienced more symptoms and distress than relatively active group.

The significant multivariate differences were found only in symptom frequency ($F = 2.33$; $p = 0.02$) not in symptom distress subscale (see Table 14). However, univariate tests demonstrated that the differences existed in psychosomatic symptoms and sexual health for both the frequency ($f = 8.05$, $p = 0.00$; $f = 3.42$, $p = 0.03$ respectively) and distress ($f = 5.80$, $p = 0.00$; $f = 3.74$, $p = 0.03$ respectively) aspects of perimenopausal symptoms (see Table 15). The inactive group experienced more psychosomatic and sexual symptoms and also rated psychosomatic and sexual symptoms as more distressful than the relatively active and active groups. Again the relatively active group experienced fewer symptoms and less distress than active group. No significant differences were found among groups in frequency and distress of vasomotor symptoms and menstrual problems.

Table 12.
Descriptive data for perimenopausal symptoms based on levels of
current physical activity

Scale/subscale	Group	Sample size	Mean	SD
Symptom frequency				
total score	inactive	59	1.29	0.45
	relatively active	69	0.95	0.44
	active	68	1.16	0.51
vasomotor	inactive	59	1.01	0.80
	relatively active	69	0.76	0.73
	active	68	0.93	0.80
psychosomatic	inactive	59	1.32	0.50
	relatively active	69	0.94	0.49
	active	68	1.17	0.58
menstrual problem	inactive	59	1.36	0.55
	relatively active	69	1.17	0.58
	active	68	1.26	0.52
sexual health	inactive	59	1.16	0.81
	relatively active	69	0.77	0.73
	active	68	1.08	0.96
Symptom distress				
total score	inactive	59	1.24	0.54
	relatively active	69	0.89	0.50
	active	68	1.09	0.61
vasomotor	inactive	59	0.94	0.85
	relatively active	69	0.76	0.85
	active	68	0.84	0.91
psychosomatic	inactive	59	1.30	0.61
	relatively active	69	0.93	0.57
	active	68	1.13	0.65
menstrual problem	inactive	59	1.07	0.72
	relatively active	69	0.87	0.65
	active	68	0.98	0.69
sexual health	inactive	59	1.09	0.98
	relatively active	69	0.69	0.76
	active	68	1.07	1.07

Table 13.
ANOVA for perimenopausal symptoms based on levels of current physical activity

Symptom frequency /distress	Source of Variance	DF	SS	MS	F-ratio	P
Symptom frequency	between groups	2	3.86	1.93	8.86	0.00*
	within groups	193	42.07	0.22		
	total	195	45.93			
Symptom distress	between groups	2	3.82	1.91	6.25	0.00*
	within groups	193	58.95	0.31		
	total	195	62.77			

Table 14.
Multivariate tests of significance for subscales of perimenopausal symptoms based on current physical activity

Symptom frequency /distress	DF	Wilks Lambda	F	P
Symptom frequency (with four subscales)	8, 380	0.91	2.33	0.02*
Symptom distress (with four subscale)	8, 380	0.93	1.79	0.07

Table 15.

Univariate tests for subscales of perimenopausal symptoms based on levels of current physical activity

Symptom frequency /distress	DF	SS	MS	F-ratio	P
Symptom frequency					
vasomotor	(2,193)	2.07	1.03	1.72	0.18
psychosomatic	(2,193)	4.45	2.22	8.05	0.00*
menstrual	(2,193)	1.10	0.55	1.82	0.17
sexual health	(2,193)	4.87	2.43	3.42	0.03*
Symptom distress					
vasomotor	(2,193)	1.04	0.52	0.69	0.51
psychosomatic	(2,193)	4.32	2.16	5.80	0.00*
menstrual	(2,193)	1.21	0.61	1.29	0.28
sexual health	(2,193)	6.61	3.31	3.74	0.03*

AIM 3. Effect of Long-term Physical Activity on Perimenopausal Symptoms

Women were divided into three groups based on the levels of long-term physical activity. Rules for group membership included: inactive: < 30 minutes of physical activity a week for the past five years; active: > 150 minutes of activity a week for the past 10 or more years; and relatively active: women not belonging to either group. Descriptive data are shown in Table 16. The inactive group consistently had the highest means among the three groups on both the frequency and distress dimensions and all subscales of perimenopausal symptoms. The ANOVA tests for differences among groups on overall symptom frequency and distress are shown in Table 17. No significant differences were found. The multivariate tests of significance are shown in Table 18. There was a significant difference among the means of subscales of symptom occurrence ($f = 1.98$; $p = 0.04$), but not that of symptom distress. Univariate tests demonstrated that the differences existed in psychosomatic symptoms ($f = 3.24$, $p = 0.04$) (see Table 19). The inactive group experienced more psychosomatic symptoms than the relatively active and active groups. Again, the effect of physical activity seems not to be dose-dependent. The relatively active group experienced fewer psychosomatic symptoms than the active group. There were no significant differences among groups in vasomotor, menstrual, and sexual problems.

Table 16.
Descriptive data for perimenopausal symptoms based on levels of long-term physical activity

Scale/subscale	Group	Sample size	Mean	SD
Symptom frequency				
total score	inactive	103	1.21	0.49
	relatively active	59	1.03	0.50
	active	29	1.13	0.48
vasomotor	inactive	103	0.88	0.78
	relatively active	59	0.88	0.82
	active	29	1.17	0.74
psychosomatic	inactive	103	1.24	0.55
	relatively active	59	1.01	0.55
	active	29	1.13	0.56
menstrual problem	inactive	103	1.28	0.58
	relatively active	59	1.19	0.56
	active	29	1.37	0.53
sexual health	inactive	103	0.95	0.77
	relatively active	59	1.02	0.92
	active	29	0.90	0.90
Symptom distress				
total score	inactive	103	1.15	0.59
	relatively active	59	1.00	0.58
	active	29	1.07	0.57
vasomotor	inactive	103	0.83	0.86
	relatively active	59	0.85	0.90
	active	29	1.05	0.91
psychosomatic	inactive	103	1.22	0.65
	relatively active	59	1.01	0.60
	active	29	1.10	0.63
menstrual problem	inactive	103	0.95	0.71
	relatively active	59	0.95	0.68
	active	29	1.05	0.73
sexual health	inactive	103	0.90	0.92
	relatively active	59	1.02	1.02
	active	29	0.84	0.92

Table 17.

ANOVA for perimenopausal symptoms based on levels of long-term physical activity

Symptom frequency /distress	Source of Variance	DF	SS	MS	F-ratio	P
Symptom frequency	between groups	2	1.17	0.58	2.42	0.09
	within groups	188	45.22	0.24		
	total	188	46.39			
Symptom distress	between groups	2	0.88	0.44	1.33	0.27
	within groups	188	62.22	0.33		
	total	188	63.10			

Table 18.

Multivariate tests of significance for subscales of perimenopausal symptoms based on levels of long-term physical activity

Symptom frequency /distress	DF	Wilks Lambda	F	P
Symptom frequency (with four subscales)	8	0.92	1.98	0.04*
Symptom distress (with four subscale)	8	0.96	0.95	0.46

Table 19.
Univariate tests of significance for subscales of perimenopausal symptoms based on levels of long-term physical activity

Symptom frequency /distress	DF	SS	MS	F-ratio	P
Symptom frequency					
vasomotor	(2,182)	2.02	1.01	1.63	0.20
psychosomatic	(2,182)	1.95	0.98	3.24	0.04*
menstrual	(2,182)	0.72	0.36	1.13	0.33
sexual health	(2,182)	0.39	0.19	0.27	0.76
Symptom distress					
vasomotor	(2,182)	1.00	0.50	0.63	0.53
psychosomatic	(2,182)	0.75	0.37	0.96	0.39
menstrual	(2,182)	0.31	0.15	0.30	0.74
sexual health	(2,182)	0.81	0.40	0.45	0.64

Additional Findings

The relationships between perimenopausal symptoms and quality of life variables were also analyzed.

The relationship between perimenopausal symptoms and overall quality of life

All aspects of perimenopausal symptoms except frequency of vasomotor symptoms were significantly correlated with quality of life (see table 20). Multiple regression was used to identify aspects of symptoms which were predictable of women's quality of life during perimenopause. It was found that the frequency of psychosomatic symptoms was the single significant symptom subscale predicting quality of life. The fewer psychosomatic symptoms a woman experienced, the better her quality of life during perimenopause. The frequency of psychosomatic symptoms as a single factor accounted for 32% of variance (see Table 21).

Comparison in quality of life before and during perimenopause

The quality of life during perimenopause was compared with the quality of life before perimenopause, using Wilcoxon matched pairs signed-ranks test. Women had significantly decreased quality of life during perimenopause ($z = -6.97$; $p = 0.00$).

Table 20.

The correlations between perimenopausal symptoms and overall quality of life

Scale/subscale	Quality of Life (r; p)
Symptom frequency	
total score	-0.55; 0.00*
vasomotor symptoms	-0.07; 0.15
psychosomatic symptoms	-0.55; 0.00*
menstrual problems	-0.20; 0.00*
sexual health	-0.30; 0.00*
Symptom distress	
total score	-0.54; 0.00*
vasomotor symptoms	-0.14; 0.02*
psychosomatic symptoms	-0.54; 0.00*
menstrual problems	-0.21; 0.00*
sexual health	-0.31; 0.00*

* P < .05

Table 21.
Multiple regression of quality of life on perimenopausal symptoms

Perimenopausal symptoms	BETA	T	P
Symptom frequency			
vasomotor symptoms	0.06	0.53	0.60
psychosomatic symptoms	-0.55	-9.63	0.00*
menstrual problems	-0.02	-0.19	0.85
sexual health	0.01	0.06	0.95
Symptom distress			
vasomotor symptoms	-0.00	-0.02	0.99
psychosomatic symptoms	-0.13	-0.76	0.45
menstrual problems	0.04	0.52	0.60
sexual health	-0.11	0.71	0.48

* $P < .05$

$R^2 = 32\%$

Model: $f = 12.06$; $p = 0.00$

Summary of Findings

The following summarizes the important findings of the influence of physical activity on perimenopausal symptoms in 214 perimenopausal women:

1. The Women's Health Assessment Scale and the Physical Activity Questionnaires were reliable instruments for measuring perimenopausal symptoms and physical activity respectively.
2. Mean age of perimenopause was 47 years.
3. More than two-thirds of perimenopausal women experienced hot flashes. However, only 13.5% experienced the symptom often or all the time and only about 14% reported that the symptom was quite a bit or extremely distressful.
4. The most frequent and distressful symptoms were psychosomatic such as irritability, lack of energy, forgetfulness, stiff joints, and menstrual problems such as irregular menstruation and excessive bleeding.
5. About one third of women were currently active, one third relatively active and one third inactive. Only about 15.2% of the women had been active for 10 years or more, and more than one half of the women were inactive for over 10 years.
6. Total amount of weekly physical activity had significant effects on both dimensions of perimenopausal symptoms. Relatively active and active women had significantly fewer total symptoms, psychosomatic and

sexual symptoms than the inactive group. They also experienced less distress for psychosomatic and sexual symptoms than the inactive group. However, the effect of physical activity was not dose dependent because the relatively active group experienced fewer symptoms and less distress and the active group.

7. Long-term physical activity had significant effects on psychosomatic symptoms. The relatively active and active group had significantly fewer psychosomatic symptoms than the inactive group. Again, the effect of physical activity was not dose dependent. The relatively active group experienced few psychosomatic symptoms than active group.
8. Frequency of psychosomatic symptoms was the single significant subscale predicting quality of life during perimenopause. This single factor accounted for 32% of the variance.
9. Quality of life was lower during perimenopausal versus premenopausal period.

CHAPTER V

DISCUSSION

The primary aim in this chapter is to discuss the findings in two major areas: measurement statistics and the findings related to the study aims. Recommendations for future research and implications for nursing care are also discussed.

Measurement Statistics of the WHAS and PAQ

WHAS

Homogeneity reliability is a measurement of the degree to which items on the tool are measuring the same attribute. Cronbach's alpha for both dimensions of Women's Health Assessment Scale (WHAS) met the accepted standard of greater than 0.70, supporting the homogeneity reliability of the scale. Two subscales, psychosomatic and sexual health, for both dimensions, also met the standard.

The low Cronbach's alpha for vasomotor symptoms may be explained by the small number of items (items = 2) since the size of the alpha coefficient is based on both the average correlation among items and the number of the items in the tool. However, the vasomotor subscale did meet the recommendation given by Helmstadter (1964) that alpha coefficient of 0.50 was sufficient for group comparison.

It was not surprising that menstrual subscale did not meet the homogeneity reliability standard because some items composing the subscale were mutually exclusive. For example, if a woman experienced scant menstruation, she would not experience excessive bleeding.

The subscales of WHAS were significantly correlated with the total scale for both dimensions, frequency and distress, further supporting the homogeneity reliability of the scale. The low inter-subscale correlations indicated that the subscales measured differing dimensions and were not redundant.

Stability reliability examines the extent to which the instrument yields similar results with same sample over time. The WHAS proved stable as shown by the high correlations between test and retest scores for both dimensions and all subscales of the tool.

PAQ

Homogeneity reliability of the Physical Activity Questionnaire was supported by adequate alpha coefficients and substantial correlations between the subscales, the current and long-term activity, and total scale. However, the inter-subscale correlation was also high which may indicate redundancy between subscales or that current physical activity is a reflection of long-term physical activity patterns.

Stability reliability of the physical activity questionnaire was well supported by the strong correlations between test and retest scores. The

significant correlation between the Physical Activity Questionnaire and the American Heart Association questionnaire established the construct validity of the physical activity questionnaire.

In summary, homogeneity reliability coefficients and stability coefficients of the WHAS and physical activity questionnaire achieved satisfactory standards for reliability. Content validity of the WHAS was adequately documented and the construct validity of physical activity was established by these data. WHAS fills a void in the instrumentation available for assessing perimenopausal symptoms. Future research should focus on replication of the psychometric procedures using a larger sample size.

Study Aims

This study was designed to examine the influence of physical activity on perimenopausal symptoms. The main results are compared with the findings of other recent studies.

Before attempting to interpret the results of frequency and distress of perimenopausal symptoms, several important related points should be noted. First, the data consisted of self-reported symptoms which were specified in the questionnaire but which may have been subject to varying interpretation by the respondents. Second, although an opportunity was provided for respondents to list further symptoms, this opportunity was seldom taken. Thus, reporting was effectively restricted to those symptoms specified in the questionnaire. This method of data gathering might lead to over-reporting of the specified set

of symptoms and under-reporting of others, thus creating bias in the results. Third, in this study, the frequency and distress of each symptom category was the average rating of each symptom's frequency and distress on a 5 point scale, ie, from never to always, thus the averages of symptoms in this study may be artificially high.

Aim 1. Frequency and Distress of Perimenopausal Symptoms

The overall level of symptoms in this group of women as detected by the WHAS is comparable with that already noted in studies of women of this age group in the general population. In this study of apparently healthy women, the mean overall frequency and the mean overall distress score of perimenopausal symptoms were 1.11 and 1.07 (ranges, 0 to 4), respectively, suggesting that symptoms occurred rarely to sometimes and were a little stressful. This finding is in agreement with other community-based studies in North America showing that perimenopause was not a major subjective health problem in midlife women (Avis, McKinlay, 1991; Kaufert, Gilbert, and Hassard, 1988; Matthews et al., 1990; McKinlay et al., 1991).

Perimenopausal women do experience symptoms and these symptoms do seem distressful in a small percentage of women. In this study, it was found that the most prevalent symptom was menstrual irregularity. This result was expected because menstrual irregularity is a symbol of entering into the perimenopausal stage of menopause. Besides menstrual problems, psychosomatic symptoms occurred more frequently than sexual and vasomotor

symptoms. Vasomotor symptoms were the least frequently experienced symptoms among the four groups of symptoms. The most distressful symptoms were psychosomatic symptoms and the least distressful symptoms were vasomotor symptoms. This finding does not support contemporary health care view which stresses that women often seek help for vasomotor symptoms such as hot flashes. It is possible that some women with vasomotor symptoms may have been excluded from this study due to treatment with hormone replacement therapy.

No previous studies have reported the occurrence and distress of perimenopausal symptoms using a 5-point scale. So it is impossible to compare the means of frequency and distress of perimenopausal symptoms in this study to that of others. It is possible, however, to compare the frequency and distress of perimenopausal symptoms in physically active to inactive women within the present sample. Physically active women experienced fewer overall symptoms and less distress. When each symptom subscale (vasomotor, psychosomatic, menstrual and sexual health) was broken down into its component symptoms, comparisons were made with the findings of other studies.

Vasomotor symptoms

The prevalence of the occurrence of hot flashes was 45.8%, which is comparable with majority of the previous studies in western countries (Mckinlay et al., 1992; Jaszman et al., 1969; Hunter, 1992; Koster & Davidsen, 1993)

(see Table 3). However, this prevalence is still higher than that reported for Australian (Dennerstein et al., 1993) and Canadian women (Kaufert et al., 1992) (see Table 3).

The distress associated with vasomotor symptoms has been often ignored by other investigators. In this study, it was found that only 14% of perimenopausal women reported that hot flashes were quite a bit or extremely distressful. For most women hot flashes were in fact relatively easy to cope with, probably because they are characteristically short-lived (duration approximately 3 minutes) and occurred infrequently in most women. Many women were bothered more by the psychosomatic complaints for which they often did not have an explanation, and for which they sought medical care. This finding is in agreement with findings reported by Oldenhave et al. (1993) and Boulet et al. (1994). In their studies, it was found that women suffering from psychosomatic complaints were more likely to have consulted their physicians than women suffering from hot flashes and night sweating.

Menstrual problems

The prevalence of menstrual irregularity (86.4%), the most common symptom in perimenopausal women, was consistent with previous studies by McKinlay, Brambilla, and Posner (1992), Seltzer et al. (1990), and Treloar et al. (1967). They found that approximately 90% of women experienced menstrual irregularity during perimenopausal years, and that only 10-12% of premenopausal women will have sudden amenorrhea.

Menstrual problems were the second most distressful perimenopausal symptom. This finding is consistent with the view of McKinlay et al. (1992) who indicated that abnormal bleeding can be disturbing, especially if it is heavy and unpredictable. These investigators further indicated that irregular menstrual bleeding during perimenopause appears to be more worrisome to women than hot flashes, particularly if this irregular menstrual bleeding persists beyond a year or two.

Psychosomatic symptoms

The most frequently experienced psychosomatic symptoms in perimenopausal women in this study included irritability (64.8%), forgetfulness (67%), lack of energy (74.6%), stiff joints (62.1%), and headache (54.2%). In comparison with those reporting vasomotor complaints, the percentage of women experiencing psychosomatic complaints were relatively high. This finding is in agreement with previous studies (Dennerstein et al., 1993; Greene, 1976; Kaufert, Syrotuik, 1981; Mikkelsen, Holte, 1982; Oldenhave et al., 1993; Holte, 1992; and Boulet, et al., 1994) (see Table 3). The high percentages of women reporting psychosomatic symptoms might be an indicator of general distress experienced around the perimenopausal years, such as the realization that one is aging. When these symptoms are viewed as individual symptoms, irritability, lack of energy and headache are consistently among the top five symptoms reported across studies (Dennerstein et al., 1993; Jaszmann, Van Lith, and Zaat, 1969). The present findings, combined

with earlier observations in different countries, suggest that perimenopause is mainly associated with psychosomatic symptoms, such as irritability, forgetfulness, lack of energy, stiff joints, and headache.

No previous studies were found which used rating scales to measure the distress of psychosomatic complaints. This study found that the psychosomatic symptoms were most distressful in perimenopausal women. As discussed previously, many women were bothered more by the psychosomatic complaints for which they often did not have an explanation and for which they sought medical care. This is in agreement with the findings reported by Oldenhave et al. (1993) in the Netherlands and by Boulet et al. (1994) in seven South-East Asian countries. According to a National Ambulatory Medical Care Survey (NAMCS) in 1989, symptoms such as headache, neck, shoulder and back discomfort, depression, dizziness, anxiety and nervousness, and particularly tiredness, exhaustion and fatigue, were ranked in the top 36 reasons of 60 reasons for visiting physicians mentioned by women patients, aged 45 to 64 years. This indirectly suggests that psychosomatic problems among this age group are more distressful than vasomotor symptoms.

Sexual health

In this study, the prevalence of sexual problems were: decrease in sexual desire 57%, vaginal dryness, 53.3%, dissatisfaction, 37.9%, and painful intercourse, 27.6%. Yet these women did not rank these sexual problems as highly as other perimenopausal symptoms. This is consistent with previous

studies or commentaries (Bachman, et al., 1985; Channon and Ballinger, 1986; Hunter, Battersby, and Whitehead, 1986) (see table 3).

The distress associated with sexual problems has seldom been studied. This study found sexual problems were less stressful than psychosomatic and menstrual complaints, but more stressful than vasomotor symptoms. Sexual problems maybe overshadowed by other symptoms such as mood swings and menstrual irregularity. The beliefs that sexual decline and dysfunction in perimenopausal women are the natural consequences of aging and hormonal decline, and that women who maintain interest in sexual activity at levels exhibited during their 20s and 30s did not seem to influence the responses from the present sample.

Aim 2. Effect of Current Physical Activity on Perimenopausal Symptoms

Regular physical activity has long been regarded as an important component of a healthy lifestyle. This impression has been reinforced by new scientific evidence that physical activity prevents or reduces the incidence of cardiovascular disease, obesity, osteoporosis, anxiety and depression (Pate, et al., 1995). There is beginning evidence that physical activity may be an important contributor to perimenopausal symptom prevention and management. Therefore, this study was designed to examine the effect of physical activity on perimenopausal symptoms.

Effect of current physical activity on vasomotor symptoms

The findings from the present study did not support the notion that

physical activity ameliorates vasomotor symptoms. This is consistent with two previous studies. Wilbur et al. (1992) in a study of 279 midlife women found that physical activity measured by energy expenditure did not effect the occurrence of vasomotor symptoms. Guthrie et al. (1995) in a community study of 2000 women also found that the level of physical activity had no significant effect on women's experience of troubling symptoms, such as vasomotor symptoms. Thus the present study in combination with Wilbur et al. and Guthrie et al. seem not to support physical activity as an alternative to estrogen replacement therapy for vasomotor symptoms.

However, in contrast to these findings, Wallace et al. (1982) found that short-term exercise reduced vasomotor symptoms in menopausal women. They tested pre- and postmenopausal women before and after an aerobic conditioning program. Fifty-five percent of the postmenopausal women reported a decrease in severity of hot flashes and both groups showed a significant increase in levels of estrogen. Similar to findings of Wallace et al., Hammar et al. (1990) in a study of 1246 women found that hot flashes and sweating were only half as common in postmenopausal women who took part in organized physical exercise as compared to the control group.

The differing findings between the present study and those demonstrating that exercise can help vasomotor symptoms can be explained by several factors. First, the studies by Wallace et al. and Hammar et al. used different study populations than the present study; while Wallace et al. and

Hammar et al. used postmenopausal women, the present study used perimenopausal women as subjects. The postmenopausal women's responses to exercise may be different from those of the perimenopausal women. For example, Wallace and colleagues found that exercise which relieves symptoms for postmenopausal women was not useful for peri- and premenopausal women.

The second explanation for the discrepancies in findings is that it may require higher levels of physical activity to relieve vasomotor symptoms. It should be noted that the levels of activity in the studies by Wallace et al. and Hammar et al. could have been higher than the physical activity levels in the present study. This may also be true of the studies by Wilbur et al. and Guthrie et al. The present study also showed a trend that women with higher levels of vigorous activity experienced fewer vasomotor symptoms and less distress. However, this difference did not reach statistical significance level. So it is possible that the level of vigorous activity practiced by women in the present study as well as those in the studies by Wilbur et al. and Guthrie et al. was not high enough to have a significant effect on vasomotor symptoms.

The present study not seem to support the view that changed central noradrenergic and opioid activity cause hot flashes (Schurz et al., 1988; Shoupe and Lobo, 1987; Sturdee and Brincat, 1988; Tepper et al., 1987). Experts suggest that there are several indications of changes in both noradrenergic and opioid neuron activities during perimenopause (Shoupe and

Lobo, 1987; Sturdee and Brincat, 1988); and that β -endorphin has been shown to increase after estrogen supplementation (Shoupe and Lobo, 1987). If low opioid activity is involved in the mechanisms that elicit the hot flashes, then regular physical activity, which is known to increase central opioid activity (Cumming and Wheeler, 1987), should diminish the risk of hot flashes. However, in this study, the occurrence and severity of the vasomotor symptoms was the same for physically active women as for inactive women. Again, the possible explanations include that the dose of physical activity was not high enough to increase the central opioid activity. Another possible explanation might be that the active women had less adipose tissues. Adipose tissue converts adrenal androgens to estrogens, which may alleviate perimenopausal symptoms. In this study, levels of physical activity were significantly correlated with body mass index, which suggest that physically active women had less body fat.

Effect of current physical activity on psychosomatic symptoms

The present study demonstrated for the first time that moderate amounts of physical activity may significantly decrease the occurrence and distress of psychosomatic symptoms. The groups who participated in physical activity had fewer symptoms than the group who were inactive. The potential beneficial effect of physical activity on psychosomatic symptoms is consistent with previous studies of physical activity on mortality of cardiovascular diseases. Pate et al. (1995) in reviewing several studies of physical activity on

the relative risk of cardiovascular mortality concluded that the health benefits of physical activity appear to accrue in approximate proportion to the total amount of activity performed, measured as either caloric expenditure or minutes of physical activity (Blair et al., 1989; Ekelund et al., 1988; Leon et al., 1987; Morris, et al., 1990; Paffenbarger et al., 1993; Sandvik et al., 1993).

This finding is also consistent with a number of other studies of physical activity in menopausal women. Wilbur et al. (1990) found significant negative correlations between leisure time physical activity and nervous (tiredness, irritability, headache, nervous tension, trouble sleeping and depression) and general symptoms (joint pain, backache, diarrhea, upset stomach, cough, et al.) in pre-, peri-, and postmenopausal women. Collins and Landgren (1995) found that in a Swedish population-based sample of perimenopausal women, negative mood was associated with a lack of exercise.

However, the findings of the present study are inconsistent with one recent study. Guthrie et al. (1995), in a random selected community cohort of 2000 Australian women, found that there were no significant associations between levels of physical activity, psychological well-being and women's experience of symptoms during the natural menopause transition. The discrepancies between the two studies may be explained by the measurement of physical activity. In the present study, physical activity was measured as the total amount of moderate and vigorous activity. In contrast, Guthrie et al (1995) measured physical activity as daily energy expenditure using the

Minnesota Physical Activity Questionnaire which includes light, moderate, and vigorous activity. Including the light activity may dilute the effect of moderate and vigorous activity on perimenopausal symptoms, because light activity has been shown to have no beneficial effects on health.

Although it appears that there is amelioration of psychosomatic symptoms with more physical activity, there is no clear physiological explanation for these findings. Fremont and Craighead (1987) suggested that physical activity may produce increased levels of endorphins which influence mood. Raised endorphin levels have been associated with significant reduction in depression (Gerner et al., 1980). However, Farrell et al. (1987) found that endorphins activated by physical activity had no effect on mood alterations.

Psychological explanations for psychosomatic symptom relief after physical activity have been the subject of several reviews (Coverley-Veale, 1987; Gleser & Mendelberg, 1990; Kirkcaldy & Shephard 1990). Cognitive-behavioral theory proposes that cognitive distortions and repeated intrusive thoughts are major components of psychosomatic symptoms (Beck, 1987). Physical activity may act as a distraction from intrusive thoughts, and allow positive thoughts to surface, decreasing depression in the short-term. Another possible explanation is that physical activity improves body image and self-efficacy which impacts on self-concept and self-esteem. The increased social contact offered by physical activity groups may be particularly relevant. However, much of this remains speculative. Thus, so far we can only report

that physical activity can alleviate psychosomatic symptoms.

Although physical activity is beneficial to psychosomatic symptoms, the effect is not dose dependent. The relatively active group experienced fewer psychosomatic symptoms and distress than the active group. The non-linear relationship may be due to the rigid classification of levels of physical activity. It is also possible that some active women may have underreported their activity and being classified into the relative active group. Further study is needed to identify the adequate dose of physical activity for psychosomatic symptoms.

Effect of current physical activity on sexual symptoms

Another significant finding of this study was the negative relationship between levels of physical activity and occurrence and distress of sexual symptoms. Sexual health for perimenopausal women has not been well studied. Collins and Landgren (1995) found that in a Swedish population-based sample of perimenopausal women, occurrence of perimenopausal symptoms including reduced sexual interest was related to lack of exercise. However, no separate analysis for sexual health was done.

It is not clear how physical activity influences sexual health. A study of sexual behavior in exercising men indicated that sexual health was related to the level of physical fitness (White, Case, McWhirter, & Mattison, 1990). Physical activity can improve physical fitness, thus, help improve sexual health. Other data suggest that orgasmic pleasure may increase with increased skeletal

muscle tone resulting from physical activity (Mandell, 1979). Another explanation may be that physical activity increases women's perceived physical attractiveness and, consequently, enhanced sexual health (Holmes, Chamberlin, & Young, 1994).

Effect of current physical activity on menstrual problems

Menstrual problems during perimenopause have not been well studied. In this study, no significant differences were found between the menstrual problems reported by physically active and inactive women.

Previous research has shown that menstrual irregularity such as oligomenorrhea or secondary amenorrhea is an infrequent but possible consequence of strenuous exercise programs in menstruating women and is frequently used as an argument against women engaging in strenuous exercise (Bullen et al., 1985; Gannon, 1988). Russell et al. (1984) reported that six swimmers who were training intensively up to five hours per day, five days per week developed oligomenorrhea; however, all six resumed normal menses when training was reduced. This suggests that exercise-induced menstrual changes may be temporary. In attempting to clarify the cause of menstrual irregularity in athletes, Shangold, Gatz, and Thysen (1981) have pointed out the necessity of separating the effects of exercise per se, from the effects of the physical stress of training and the emotional stress of competing. Schwarz et al. (1981) found that amenorrheic runners associated more stress with their running than did normally menstruating runners. In the present study, no

relationship was found between physical activity and menstrual symptoms. One explanation is that the physical activities of this group of women were not strenuous enough to cause menstrual dysfunction, and without competition, no emotional stress was involved. Thus, it may be concluded that physical activity has a variety of beneficial effects and is not associated with potentially harmful menstrual changes, particularly in moderate doses.

AIM 3. Effect of Long-term Physical Activity on Perimenopausal Symptoms

Long-term physical activity is defined by two independent factors-- weekly amount of physical activity and years of activity performed. Both long-term and current physical activity were related to perimenopausal symptoms in the same way. It is possible that women who are active currently have also been active long-term. Total years of physical activity had significant effect on perimenopausal symptoms. Women with 10 or more years of moderate and /or vigorous activity had significantly less total, psychosomatic and sexual symptoms than those with less than 10 years of physical activity. This finding further supports the view that long-term physical activity is beneficial to perimenopausal health. This finding supports the view that physical activity of lifelong continuation is as important, if not more important than recent or short term physical activity (Shinton and Sagar, 1993)

Additional Findings

Women experience decreased quality of life during perimenopause compared to premenopausal stage. This finding is expected because women

are generally experiencing more symptoms during peri- than premenopausal period. Experience of symptoms such as hot flashes and forgetfulness and the distress caused by them would decrease the quality of life during perimenopause.

All aspects of perimenopausal symptoms except occurrence of vasomotor symptoms are significantly correlated with quality of life. However, using multiple regression analysis, it was found that psychosomatic symptoms were the single significant symptom category among the four subscales predicting quality of life. The occurrence of psychosomatic symptoms as a single factor accounted for 32% of the variance. This indirectly suggests that psychosomatic symptoms are important determinants to quality of life in perimenopausal women.

Finally, the more active the woman, the better quality of life. This can be explained by the fact that physical activity reduces psychosomatic symptoms, the most prevalent and distressful symptoms, among the perimenopausal women which lead to better quality of life.

Conclusions, Implications and Limitations

In conclusion, perimenopausal symptoms were reported to occur rarely to sometimes and, for the majority of women, symptoms were a little distressful in a community-based population. Among these symptoms, menstrual problems, such as excessive bleeding, were most prevalent, followed by psychosomatic, sexual, and vasomotor symptoms. However, the

psychosomatic symptoms, such as lack of energy, forgetfulness, irritability, were the most distressful, compared to menstrual, sexual, and vasomotor symptoms. Vasomotor symptoms were the least frequently experienced and least distressful symptoms among four group of symptoms. This seems contradictory to contemporary health care view that women often seek help for vasomotor symptoms. It is possible that some women with vasomotor symptoms may have been excluded from this study due to treatment with hormone replacement.

The findings from this study suggest that physical activity is beneficial to psychosomatic symptoms. Although the effect is not dose dependent, both relatively active and active group had fewer psychosomatic symptoms than inactive. No relationships were found between vasomotor symptoms and the amount of physical activity, thus these findings do not support the use of physical activity as an alternative to hormone replacement therapy for vasomotor symptoms. This is of practical and consistent with public health value for perimenopausal women, for whom the issue of moderate physical activity is of greater interest. Long-term physical activity was also beneficial to psychosomatic symptoms.

All perimenopausal symptoms except occurrence of vasomotor symptoms were significantly correlated with quality of life. The frequency of psychosomatic symptoms was the single significant symptom category predicting quality of life in perimenopausal women.

One third of this group of perimenopausal women was inactive, which suggests that more efforts are needed to change this sedentary population into an active one. African American and other ethnic minority women were less active than white Americans, and women who were widowed, separated, or divorced tended to have less long-term vigorous physical activity, and working women reported physical activity. Special efforts will be required to target these populations in which physical inactivity is particularly prevalent.

The present results provide systematic evidence of a relationship between physical activity and some perimenopausal symptoms. This study therefore increases basic knowledge of perimenopausal symptoms and physical activity by identifying the relationships between the two factors. This conclusion is likely to be welcome news, especially for those women who wish to reduce some perimenopausal symptoms using nonpharmacological methods. It can also increase the confidence of those women who want to change from a sedentary to an active life style, in efforts to reduce risk of bone loss and cardiovascular disease.

Unique educational opportunities exist when women can be informed of practical methods to reduce psychosomatic symptoms which were the most prevalent and most distressful to women in this study. With the information gained here, nursing interventions to promote physical activity can be tailored to reduce some perimenopausal symptoms. Information from this study can also lend an awareness of, and appreciation for, the relationship between

perimenopausal symptoms and physical activity.

However, conclusions must be qualified in recognition of the study's limitations. Only 214 perimenopausal were investigated. In addition, some candidates in the available pool were excluded for the reasons given in Methods, thus further limiting generalizations. The differences between the respondents and non-respondents may have influenced our results, as the respondents had a higher level of education, which probably influenced their levels of physical activity. Lack of participation in recreational physical activity was more common in less well educated women. An improved techniques of data collection are needed to obtain higher responds rate.

Future Research Recommendations

This study was designed to examine the frequency and distress associated with symptoms experienced by perimenopausal women, and their relationship to physical activity using a cross-sectional design. Four groups of symptoms were experienced by perimenopausal women. Further research is needed to identify the relationship between these symptoms and menopausal status over time, from pre- to postmenopausal periods. A longitudinal design will help gain an understanding of how these symptoms behave over time. This would also provide opportunity to examine hormonal changes.

Associations between the amount of physical activity and two dimensions of psychosomatic and sexual symptoms in perimenopausal women were also noted, however there was no compelling evidence to support a

conclusion that physical activity was causally related to enhanced psychosomatic and sexual health in these women. A well-controlled, longitudinal study is needed to clarify the causal relationships between physical activity and perimenopausal symptoms.

Further study should investigate whether the relationships between physical activity and perimenopausal symptoms is also true in postmenopausal women. There is also a need to further clarify the relationships between physical activity and vasomotor symptoms. Women who participate in exercise programs may be used to study these relationships, offering a clearer understanding of the importance/nonimportance of physical activity and its influence on vasomotor symptoms during the transition into menopause.

APPENDIX A.
HORMONAL ASPECT OF PERIMENOPAUSE

APPENDIX A.
HORMONAL ASPECT OF PERIMENOPAUSE

Author/ Title	Sample	Variables/ Instruments	Findings
Longcope, Franz, Morello, Baker, & Johnston, (1986). Steroid and gonadotropin levels in women during the perimenopausal years.	n = 88; aged 45-58 yrs	blood samples were obtained every 1-2 month and analyzed for estrogens, androgens and gonadotropin using radioimmunoassay techniques	There is a gradual decline in ovarian estrogen secretion during the perimenopause. In most women, this gradual decline is not associated with episodes of vaginal bleeding, despite levels of estrogens which are capable of endometrial stimulation. There is a significant inverse correlation between estrogen and FSH concentrations.
Trevoux, Brux, Castanier, Nahoul, Soule, & Scholler (1986). Endometrium and plasma hormone profile in the perimenopause and postmenopause	n = 483; Longitudinal study over a period of 13 years	Endometrial histology and plasma levels of Follicle Stimulating Hormone (FSH), Lutealizing Hormone (LH), Estradiol (E2), Estrone (E1) and Progesterone (P).	From Year-6 to year-3, gonadotrophin levels increased gradually while those of E2 remained normal, with peaks in some cases. Mean plasma P levels were within the normal range until year-3, but they then decreased progressively. From Year-3 to year + 1 there was a concomitant rise in gonadotrophin as the E2 and P levels decreased. However, at the start of definitive amenorrhea, the mean E2 and P levels fluctuated between 60 and 100 pg/ml and between 2 and 3 ng/ml, respectively. The endometrium was proliferative rather than atrophic. From year + 1 to year + 7, gonadotrophin reached a plateau at high levels while those of E2 continued to fall, reaching very low values at year + 4, after which they reached a plateau. P levels were at the detection limit of the technique.

APPENDIX A (cont.)

<p>Richardson, Senikas, & Nelson, (1987). Follicular depletion during the menopausal transition: evidence for accelerated loss and ultimate exhaustion.</p>	<p>n = 17 women aged 45-55 yrs. (pre = 6, peri = 7, post = 4).</p>	<p>Follicle numbers in one ovary from each woman.</p>	<p>The mean number of primordial follicles in the ovaries of premenopausal women was 10-fold higher than that in perimenopausal women. Follicles were absent in postmenopausal women. It was concluded that declining follicular reserve was the immediate cause of perimenopause.</p>
<p>Shideler, DeVane, Kalra, Benirschke, & Lasley, (1989). Ovarian-pituitary hormone interactions during the perimenopause</p>	<p>n = 5; women aged 42-47 yrs (pre = 3; peri = 2).</p>	<p>1. Daily urine and random blood samples collected for 3 or 4 consecutive cycles. 2. Estrone measured by urine. 3. LH, FSH, P, E1, E2 measured using serum samples.</p>	<p>There are some forms of menstrual variability at the time of the perimenopause associated with lowered early follicular phase estrogen levels. Reduced negative feedback and subsequently increased gonadotrophin levels may have stimulated estrogen production which may have suppressed gonadotrophin secretion and lowered estrogen excretion.</p>

APPENDIX A (cont.)

<p>Hee, MacNaughton, Bangah, & Burger, (1993). Perimenopausal patterns of gonadotrophin, immunoreactive inhibin, oestradiol and Progesterone</p>	<p>n = 10 (pre = 7 aged 34-44; peri = 3 aged 45-46).</p>	<p>Radioimmunoassay of serum FSH, LH, E2, P.</p>	<p>Perimenopausal women have lower levels of E2 and P than premenopausal women but higher levels of E2 and P than postmenopausal women.</p>
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APPENDIX B.
AGE AND THE DURATION OF PERIMENOPAUSE

APPENDIX B.
AGE AND THE DURATION OF PERIMENOPAUSE

Author/year	Sample	Design	Variables/ instruments	Findings	Comments
Magursky, Mesko, & Sokolik, 1975	6877 women aged 38-58 yrs.	Cross- sectional survey	Age of menopause, age and duration of perimenopause and factors influence onset and duration of perimenopause measured by self- constructed questionnaire that consisted of 25 questions.	The mean age at the menopause was 51 yrs. The mean age at the onset of the perimenopause was 47.6 yrs. Women with menstrual disturbances had their menopause about 1 yr earlier. Age at menarche and parity had no effect on the age at the onset of perimenopause. Women working in agriculture and house-wives had their menopause a little later than mean age of the sample, whereas manual workers and those in other occupational categories had their menopause and onset of the perimenopause about 1 year earlier.	Retrospective

APPENDIX B (cont.)

<p>Treloar, 1981</p>	<p>n = 291 women</p>	<p>All women were followed from the time of menarche to menopause.</p>	<p>Menstrual history measured by self-constructed questionnaire.</p>	<p>The age for the onset of perimenopause was 45.5 years, with a range of 34 to 55 yrs. The duration of perimenopause was 4.8 yrs with a range of 1 to 10 years. The cyclic variability may be indicative of duration of the perimenopause.</p>	
<p>McKinlay, Brambilla, & Posner, 1992</p>	<p>N = 1178 premenopausal women, aged 45-55 yrs.</p>	<p>Longitudinal study. Women were followed for 5 yrs by telephone interviews with 9-month intervals.</p>	<p>Menopausal status, demographics, and a list of 22 signs/symptoms</p>	<p>The median age at inception of perimenopause is 47.5 yrs and the duration is about four years. Smokers tend to have an earlier and a shorter perimenopause. Only the vasomotor symptoms are related to menopausal status.</p>	<p>No psychometric parameters reported on tools used.</p>

APPENDIX C.

PREVALENCE OF SYMPTOMS DURING PERIMENOPAUSE (%)

APPENDIX C.
PREVALENCE OF SYMPTOMS DURING PERIMENOPAUSE (%)

Author/year	Menopausal status	Vasomotor	Depression	Fatigue	Irritability	Sleep disturbance	Sexual disturbance	Mood change
Jaszmann et al. (1969)	pre peri post	17 40 35		46 55 <50	35 15	20 40 30		
McKinlay et al. (1992)	pre peri post	10 50 20						
Hunter (1992)	pre peri & post	24 45	13 21			27 40	27 40	
Matthew et al. (1992)	pre peri & post	6 43	19 9			7 14		
Kaufert et al. (1992)	pre peri post	26 26 26						
Avis et al. (1993)	pre peri post	14 37 33	29 38 34					

APPENDIX C (cont.)

Koster & Davidsen (1993)	pre	31	12	21				33
	peri	46	21	30				34
	post	68	16	26				32
Dennerstein et al. (1993)	pre	10	25	38	32	24		
	peri	31	33	46	41	35		
	post	39	29	38	40	41		
Shaver & Paulsen (1994)	pre					43		
	peri					53		
	post					64		

Note: Empty box = Observations not made or reported.

APPENDIX D.

**THE RELATIONSHIP BETWEEN MENOPAUSAL STATUS AND SYMPTOMS REPORTED
DURING MIDLIFE**

APPENDIX D.
THE RELATIONSHIP BETWEEN MENOPAUSAL STATUS AND SYMPTOMS REPORTED DURING MIDLIFE

Author/year	Sample	Design	Variables/ instruments	Findings	Comments
McKinlay et al., 1992	N = 1178 women, aged 45-55 yrs.	Longitudinal study. Women were followed for 5 yrs. by telephone interview with 9-month intervals.	Menopausal status, demographics, and a list of 22 signs/symptoms	The median age at inception of perimenopause is 47.5 yrs and the duration is about four years. Smokers tend to have an earlier and a shorter perimenopause. Only the vasomotor symptoms are related to menopausal status. The relationship between perimenopause and symptoms reporting seems to be transitory, with reported rates showing an increase in the perimenopause and a compensatory decrease in the postmenopause. Women with longer perimenopause have more symptoms.	No psychometric parameters reported on tool measuring symptoms used.

APPENDIX D (cont.)

<p>Matthew et al., 1990</p>	<p>n = 541 initially premenopausal women aged 42-50 yrs. After 3 years of follow-up, pre = 101 and post = 69.</p>	<p>1. Longitudinal design. 2. All women were followed for 3 yrs. 3. Premenopausal women (n = 101) were evaluated at baseline and 3 yrs later; postmenopausal women were evaluated at baseline and within three months after their diagnosis of postmenopause.</p>	<p>1. Menopausal status. 2. Physical and psychological symptoms experienced during the previous 2 weeks measured by a standard checklist of 27 symptoms (Neugarten & Kraines, 1964); psychosocial factors measured by inventory containing standardized personality tests of psychological factors.</p>	<p>Vasomotor symptoms were significantly correlated with menopausal status. There were few changes in psychological characteristics.</p>	<p>Sample size was relatively small compared with the complex analyses (Total of nine scales were used to measure the psychosocial status).</p>
<p>Kaufert et al., 1988</p>	<p>n = 477 initially premenopausal women aged 45-55 yrs</p>	<p>Longitudinal design. All women were interviewed 6 times over a 3-yr period.</p>	<p>1. Menopausal status. 2. Symptoms measured by a checklist of physical, menopausal, and psychological symptoms.</p>	<p>There was a significant relationship between vasomotor symptoms and menopausal status; there was no significant relationship between psychological symptoms and menopausal status.</p>	<p>No psychometric data reported on the tool measuring symptoms.</p>

APPENDIX D (cont.)

<p>Hunter, 1990</p>	<p>n = 36 premenopausal women aged 45 to 55 yrs</p>	<p>Prospective and longitudinal design. Women were interviewed at baseline and 3 years later</p>	<p>1. Menopausal status 2. Women's Health Questionnaire (WHQ) (total of 28 items)</p>	<p>Vasomotor symptoms and depressed mood were significantly correlated with menopausal status; other psychological and sexual symptoms were not.</p>	<p>Small sample size.</p>
<p>Jaszmann et al. 1969</p>	<p>n = 2906 women (pre = 999; peri = 804; post = 1103)</p>	<p>Cross-sectional survey (postal questionnaire)</p>	<p>1. Menopausal status. 2. Symptoms measured by Blatt Menopausal Index.</p>	<p>All kinds of symptoms were more prevalent in peri- and postmenopausal women. Premenopausal women have significantly less vasomotor symptoms.</p>	<p>Premature menopausal women were included in their sample which limited the generalization of the study results.</p>
<p>Holte & Mikkelsen, 1991</p>	<p>n = 2349 women aged 45-55 yrs were surveyed. n = 1686 women (pre = 765, peri = 88, post = 833) used in analysis.</p>	<p>cross-sectional survey (postal questionnaire)</p>	<p>1. Menopausal status. 2. Symptom checklist composed of 24 items</p>	<p>Vasomotor complaints and vaginal dryness were the only variables significantly related to menopausal development.</p>	<p>The reliability and validity of the tools used were not reported.</p>

APPENDIX D (cont.)

<p>VanHall et al., 1994</p>	<p>n = 8679 women and men aged 25-74. (women = 4426, men = 4253).</p>	<p>Cross-sectional design. Personal health interview. Subjects were divided into 6 groups according to their ages rather than menopausal status.</p>	<p>1. Menopausal status. 2. Questions related to a variety of complaints experienced during the past two weeks. 3. Psychosomatic symptoms measured by General Health Questionnaires (GHQ) and Biographic Problem List (BIOPRO) were also delivered.</p>	<p>Except for excessive perspiration, none of the other complaints usually attributed to menopause increased more in women than in men during the perimenopausal period. It was concluded that psychosomatic complaints usually attributed to the climacteric are neither gender nor age specific and that, therefore, a hormonal cause for these complaints seems unlikely.</p>	<p>Standardized three stage definitions were not utilized. Women were divided into groups according to their age instead of menopausal status</p>
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APPENDIX D (cont.)

<p>Koster & Davidsen, 1993.</p>	<p>n = 597 women aged 51 years. (pre = 47, peri = 91, post = 129, hormone group = 125, surgical menopause = 84)</p>	<p>Cross-sectional and retrospective for past 4 years. Postal questionnaire</p>	<p>1. Menopausal status. 2. symptoms related to menopause. 3. significant life events</p>	<p>Prevalence of hot flashes, moodiness and fatigue were significantly associated with menopause status. However, fatigue, moodiness and depression were more strongly associated with socioeconomic variables than menopause status. Sexual desire was not correlated with menopausal status.</p>	<p>1. Bias due to retrospectivity for four years. 2. Relatively small sample of natural menopausal women. 3. Questionnaires were constructed by the researchers. The reliability and validity of tools were unknown.</p>
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APPENDIX D (cont.)

<p>Shaver & Paulsen, 1993</p>	<p>n = 135 women aged 37-59 yrs. (pre and good sleep (GS) = 30, pre and poor sleep(PS) = 23, peri and GS = 20, peri and PS = 23, post and GS = 14, post and PS = 25).</p>	<p>Cross-sectional design. Sleep quality and psychological stress were compared in two groups of menopausal women (divided by the presence of the sleep disturbance)</p>	<p>1. Menopausal status 2. Self-reported sleep quality using a 4-point scale in a daily health diary. 3. Objective sleep pattern measured by the time to fall asleep from lights out to each stage of sleep and percent of time spent in each sleep stage and three summary indexes. 4. Psychological stress was measured by Symptoms Checklist 90 (Derogatis, 1977)</p>	<p>More than one-third of the midlife women reported poor sleep quality. But menopausal status and perceived sleep quality were not statistically related. Women with poor sleep reported higher levels of psychological distress and somatic symptoms than women reporting good sleep.</p>	
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APPENDIX D (cont.)

<p>Avis et al., 1993</p>	<p>Three groups of women from different cultures were studied. Samples included 8050 U.S. women aged 45-55 yrs, 1326 Canadian women aged 40-59 yrs, and 1316 Japanese women aged 45-55 yrs</p>	<p>Cross-sectional survey using mailed questionnaire</p>	<p>1. Menopausal status. 2. Symptoms measured by a questionnaire (adapted from Kaufert & Syrotuik, 1981) consisted of 16 symptoms. 3. Medication use measured by self-constructed questions</p>	<p>1. Women in the US are likely to begin experiencing menopause at an earlier age than Japanese or Canadian women. This may be due to the effect of smoking on age of menopause. 2. Japanese women, compared with Northern American women, report generally lower rates of a wide range of symptoms and commensurately low rates of medication use. 3. For the symptoms and medications considered, there is no or only a weak association between reported use and menopause status in Japanese women. 4. The association between menopause status and symptom or medication reporting was quite variable.</p>	<p>Confounding variables (such as lifestyle and genetic factors) may influence the comparability of the study result.</p>
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APPENDIX D (cont.)

<p>Hunter et al., 1986.</p>	<p>n = 682 women aged 45-65 (pre = 124, peri = 177, and post = 380).</p>	<p>Cross-sectional survey using postal questionnaire.</p>	<p>1. Menopausal status. 2. Symptoms measured by Women's Health Questionnaire. 3. Social factors and general health measured by Pilowsky Hypochondriasis Questionnaire (1967)</p>	<p>Vasomotor symptoms, depressed mood, and sexual difficulties were best predicted solely by menopausal status while other psychosomatic symptoms were more clearly associated with psychosocial factors.</p>	
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APPENDIX E.

**THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND SYMPTOMS
REPORTING IN MIDLIFE**

APPENDIX E.
THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND SYMPTOMS REPORTING IN MIDLIFE

Author/year	Sample	Design	Variables/ instruments	Findings	Comments
Wilbur et al., 1992	n = 279 women aged 37 to 64 yrs	The original study was a longitudinal. This report only concerned the results from a cross-sectional data.	1. Menopausal status. 2. A 12- month energy expenditure measured by self- report questionnaire. 3. Symptoms measured by the 21-item Kaufert and Syrotuik Symptoms Index.	Perimenopausal women had the highest scores on symptoms than pre, post, and surgical menopausal women. Premenopausal group had the lowest scores for vasomotor symptoms. There was a significant positive relationship between occupational energy expenditure and vasomotor symptoms and general health. However, there was a negative correlation between leisure time energy expenditure and overall symptoms reporting.	

APPENDIX E (cont.)

<p>Wallace et al., 1982</p>	<p>n = 11 women, mean age of pre = 43 yrs, and mean age of post = 53.7 yrs</p>	<p>Longitudinal design</p>	<p>1. Menopausal status. 2. Estrone (E1), Estradiol (E2) & androgens measured by radioimmunoassay.</p>	<p>Both pre- and postmenopausal women significantly increased level of E2. The E1 and E2 profile in postmenopausal women changed to premenopausal level. Severity of flashing changed in 55% of postmenopausal women. Exercise therapy appears to change symptoms during postmenopausal period</p>	<p>Sample size was too small for adequate analyses. It was not clear how many women were premenopausal and how many were postmenopausal. In addition, it is not clear what kind of exercise program was applied to midlife women. Perimenopausal women as a group were not studied.</p>
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APPENDIX F.
QUESTIONNAIRE BOOKLET

APPENDIX F.
QUESTIONNAIRE BOOKLET

ID _____
Date _____

A Study of Women's Health

Suling Li, MSN, RN
PhD Candidate

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DEMOGRAPHIC QUESTIONNAIRE

1. What is your social security number _____

2. What is your current age? _____(yrs)

3. What is your race (Please circle only one)

- Caucasian 1
 Black 2
 Hispanic 3
 Asian 4
 American Indian/Alaskan Native . . . 5
 Pacific Islander 6
 Other (specify) 7

4. What is your height? _____feet _____inches

5. How much do you weigh _____(lbs)

6. How many years of school have you completed so far?

- Less than 7th grade 1
 7 thru 9th grade 2
 Partial high school
 (10-11th grade) 3
 High school grad 4
 Partial college 5
 College grad 6
 Grad/Prof training 7

7. Are you currently working at a job for pay?

No 0

Yes 1

7a: If yes, do you work full time or part time?

Full time 1

Part time 2

7b: If you are working, what is your occupation

8. What is your current marital status? (Please circle only one)

Never married 1

Married 2

Married but separated 3

Divorced 4

Widowed 5

Other (Please specify) _____

9. Which socio-economic level do you feel you belong to at the present time?

Lower 1

Middle 2

Upper 3

10. What was your household income, before taxes last year?

less than \$5,000 1

\$5,000 to \$19,999 2

\$20,000 to \$39,999 3

\$40,000 to \$59,999 4

\$60,000 to \$79,999 5

\$80,000 to \$99,999 6

\$100,000 or more 7

WOMEN'S HEALTH ASSESSMENT

This questionnaire is about the body changes and symptoms occurring during midlife and associated with perimenopause/menopause. This questionnaire asks what perimenopausal/menopausal symptoms you are currently experiencing or have experienced during the past year and how bothersome they are to you.

NOTE: THIS QUESTIONNAIRE IS NOT ABOUT SYMPTOMS RELATED TO ANY CHRONIC CONDITIONS YOU MAY HAVE (For example, chronic backaches, chronic asthma).

DIRECTIONS: The left column lists a variety of symptoms. Please read each symptom carefully and rate the frequency of the symptom in the middle column (Part A),

- 0 = never had,
- 1 = rarely,
- 2 = sometimes,
- 3 = often,
- 4 = always

and then how bothersome in the right column (Part B),

- 0 = not at all,
- 1 = a little,
- 2 = moderately,
- 3 = quite a bit,
- 4 = extremely.

Complete both columns before going on to the next symptom. If you never experience the symptom, you only need to complete Part A.

EXAMPLE: Ms. Smith (47 years old) has experienced DIZZY SPELLS sometimes which are quite bothersome and COLD SWEATS rarely which are not bothersome at all, but she has never experienced HOT FLASHES during the past year.

Symptom	Part A	Part B
	Have you experienced this symptom during PERIMENOPAUSE (around menopause)? 0 = never had, 1 = rarely, 2 = sometimes, 3 = often, 4 = always	If you have experienced this symptom during PERIMENOPAUSE, how bothersome was it? 0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely.
1. hot flashes	0 1 2 3 4	0 1 2 3 4
2. cold sweats	0 1 2 3 4	0 1 2 3 4
3. dizzy spells	0 1 2 3 4	0 1 2 3 4

Symptom	Part A Have you experienced this symptom during PERIMENOPAUSE (around menopause)? 0 = never had, 1 = rarely, 2 = sometimes, 3 = often, 4 = always	Part B If you have experienced this symptom during PERIMENOPAUSE, how bothersome was it? 0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely.
1. hot flashes/flushes	0 1 2 3 4	0 1 2 3 4
2. cold sweats	0 1 2 3 4	0 1 2 3 4
3. dizzy spells	0 1 2 3 4	0 1 2 3 4
4. lack of energy	0 1 2 3 4	0 1 2 3 4
5. diarrhea or constipation	0 1 2 3 4	0 1 2 3 4
6. irritability	0 1 2 3 4	0 1 2 3 4
7. persistent cough	0 1 2 3 4	0 1 2 3 4
8. restlessness	0 1 2 3 4	0 1 2 3 4
9. backaches	0 1 2 3 4	0 1 2 3 4
10. nervous tension	0 1 2 3 4	0 1 2 3 4
11. aches and stiffness in joints	0 1 2 3 4	0 1 2 3 4
12. upset stomach	0 1 2 3 4	0 1 2 3 4
13. headaches	0 1 2 3 4	0 1 2 3 4
14. rapid heart beat	0 1 2 3 4	0 1 2 3 4
15. shortness of breath	0 1 2 3 4	0 1 2 3 4
16. early morning wakening	0 1 2 3 4	0 1 2 3 4

Symptom	Part A Have you experienced this symptom during PERIMENOPAUSE (around menopause)? 0 = never had, 1 = rarely, 2 = sometimes, 3 = often, 4 = always	Part B If you have experienced this symptom during PERIMENOPAUSE, how bothersome was it? 0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely.
17. sore throat or cold	0 1 2 3 4	0 1 2 3 4
18. "pins and needles" in hands or feet	0 1 2 3 4	0 1 2 3 4
19. leaking of urine when laughing or coughing	0 1 2 3 4	0 1 2 3 4
20. loss of appetite	0 1 2 3 4	0 1 2 3 4
21. fluid retention	0 1 2 3 4	0 1 2 3 4
22. forgetfulness	0 1 2 3 4	0 1 2 3 4
23. difficulty concentrating	0 1 2 3 4	0 1 2 3 4
24. bladder infection	0 1 2 3 4	0 1 2 3 4
25. loss of interest in things	0 1 2 3 4	0 1 2 3 4
26. lack of enjoyment	0 1 2 3 4	0 1 2 3 4
27. miserable and sad	0 1 2 3 4	0 1 2 3 4
28. decreased feelings of well-being	0 1 2 3 4	0 1 2 3 4
29. life not worth living	0 1 2 3 4	0 1 2 3 4
30. frightened /panicky feelings	0 1 2 3 4	0 1 2 3 4

Symptom	Part A Have you experienced this symptom during PERIMENOPAUSE (around menopause)? 0 = never had, 1 = rarely, 2 = sometimes, 3 = often, 4 = always	Part B If you have experienced this symptom during PERIMENOPAUSE, how bothersome was it? 0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely.
31. anxiety leaving house alone	0 1 2 3 4	0 1 2 3 4
32. difficulty falling asleep	0 1 2 3 4	0 1 2 3 4
33. breast tenderness	0 1 2 3 4	0 1 2 3 4
34. bloated stomach	0 1 2 3 4	0 1 2 3 4
35. abdominal cramps	0 1 2 3 4	0 1 2 3 4
36. feeling unattractive	0 1 2 3 4	0 1 2 3 4
37. clumsiness	0 1 2 3 4	0 1 2 3 4
38. not lively or excited	0 1 2 3 4	0 1 2 3 4
39. scanty or infrequent menstrual flow	0 1 2 3 4	0 1 2 3 4
40. irregular menstrual flow	0 1 2 3 4	0 1 2 3 4
41. deficient amount of menstrual flow but periods are regular	0 1 2 3 4	0 1 2 3 4
42. excessive bleeding at the time of a menstrual period, either in number of days or amount of blood or both	0 1 2 3 4	0 1 2 3 4

Symptom	Part A Have you experienced this symptom during PERIMENOPAUSE (around menopause)? 0 = never had, 1 = rarely, 2 = sometimes, 3 = often, 4 = always	Part B If you have experienced this symptom during PERIMENOPAUSE, how bothersome was it? 0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely.
43. bleeding from the uterus at any time other than during the menstrual period	0 1 2 3 4	0 1 2 3 4
44. vaginal dryness	0 1 2 3 4	0 1 2 3 4
45. decrease in sexual desire/interest	0 1 2 3 4	0 1 2 3 4
46. painful intercourse (if you are not sexually active, please skip this row)	0 1 2 3 4	0 1 2 3 4
47. dissatisfaction with sexual relationship (if you are not sexually active, please skip this row)	0 1 2 3 4	0 1 2 3 4
48. other (specify):	0 1 2 3 4	0 1 2 3 4
49. other (specify):	0 1 2 3 4	0 1 2 3 4

LONG-TERM PHYSICAL ACTIVITY QUESTIONNAIRE

DIRECTIONS: Please circle the number or mark the appropriate box to answer each question. In some instances it will be necessary to fill in blanks with further information.

- P1. DURING THE PAST YEAR, HOW OFTEN DID YOU PARTICIPATE IN VIGOROUS PHYSICAL ACTIVITIES such as, dance, basketball, gymnastics, running, aerobics, or field hockey, briskly walking uphill or with a load, fast or racing cycling (>10 mph), fast treading or crawl swimming, stair ergometer, ski machine conditioning exercise, single tennis, racketball, fishing in stream, rapidly canoeing (>4 mph), moving furniture, mowing lawn (hand mower)? (PLEASE CIRCLE ONLY ONE CHOICE WHICH BEST DESCRIBES YOUR ACTIVITY STYLE)

daily 1
 4-6 times per week 2
 2-3 times per week 3
 one time per week 4
 1-3 times per month 5
 never 6

If you practice any VIGOROUS activity, ON AVERAGE, state how many minutes do you do VIGOROUS activity on a single time? (___)

- P2. If you have practiced the VIGOROUS physical activity style you described above for more than one year, then specifically state how many years? (_____) YEARS

Please describe your VIGOROUS activities:

- P3. DURING THE PAST YEAR, HOW OFTEN DID YOU PARTICIPATE IN MODERATE PHYSICAL ACTIVITIES such as briskly walking (3-4 mph); Cycling for pleasure or transportation (< 10 mph), moderate effort swimming, general calisthenics, table tennis, golf (pulling cart or carrying clubs), fishing (standing/casting), leisurely canoeing (2.0-3.9 mph), painting (home repair), mowing lawn (power mower), volleyball, softball, or working at a job that involved active cleaning such as scrubbing floors and vacuuming? (PLEASE CIRCLE ONLY ONE CHOICE WHICH BEST DESCRIBES YOUR ACTIVITY STYLE)

daily 1
 4-6 times per week 2
 2-3 times per week 3
 one time per week 4
 1-3 times per month 5
 never 6

If you practice any MODERATE activity, ON AVERAGE, state how many minutes do you do MODERATE activity on a single time? (___)

- P4. If you have practiced the MODERATE physical activity style you described above for more than one year, then specifically state how many years? (_____) YEARS

Please describe your MODERATE activities:

CURRENT PHYSICAL ACTIVITY QUESTIONNAIRE

DIRECTIONS: Please circle the number or mark the appropriate box to answer each question. In some instances it will be necessary to fill in blanks with further information.

- P1. DURING A TYPICAL WEEK IN THE LAST MONTH, HOW OFTEN DID YOU PARTICIPATE IN VIGOROUS PHYSICAL ACTIVITIES such as, dance, basketball, gymnastics, running, aerobics, or field hockey, briskly walking uphill or with a load, fast or racing cycling (> 10 mph), fast treading or crawl swimming, stair ergometer, ski machine conditioning exercise, single tennis, racketball, fishing in stream, rapidly canoeing (>4 mph), moving furniture, mowing lawn (hand mower)? (PLEASE CIRCLE ONLY ONE CHOICE WHICH BEST DESCRIBES YOUR CURRENT ACTIVITY STYLE)

daily	1
4-6 times per week	2
2-3 times per week	3
one time per week	4
1-3 times per month	5
never	6

If you practice any VIGOROUS activity, ON AVERAGE, state how many minutes do you do VIGOROUS activity on a single time? (___)

Please describe your VIGOROUS activities:

- P2. DURING A TYPICAL WEEK IN THE LAST MONTH, HOW OFTEN DID YOU PARTICIPATE IN MODERATE PHYSICAL ACTIVITIES such as briskly walking (3-4 mph); Cycling for pleasure or transportation (< 10 mph), moderate effort swimming, general calisthenics, table tennis, golf (pulling cart or carrying clubs), fishing (standing/casting), leisurely canoeing (2.0-3.9 mph), painting (home repair), mowing lawn (power mower), volleyball, softball, or working at a job that involved active cleaning such as scrubbing floors and vacuuming? (PLEASE CIRCLE ONLY ONE CHOICE WHICH BEST DESCRIBES YOUR CURRENT ACTIVITY STYLE)

daily	1
4-6 times per week	2
2-3 times per week	3
one time per week	4
1-3 times per month	5
never	6

If you practice any MODERATE activity, ON AVERAGE, state how many minutes do you do MODERATE activity on a single time? (___)

Please describe your MODERATE activities:

AMERICAN HEART ASSOCIATION PHYSICAL ACTIVITY QUESTIONNAIRE
1995

Choose the column (A, B or C) that best describes your usual level of physical activity. Rate your activity level:

- Column A 1
- Between Column A and ~~B~~
- Column B 3
- Between Column B and ~~C~~
- Column C 5

<p style="text-align: center;">A HIGHLY ACTIVE</p>	<p style="text-align: center;">B MODERATELY ACTIVE</p>	<p style="text-align: center;">C INACTIVE</p>
<p>My job requires very hard physical labor (such as digging or loading heavy objects) at least four hours a day</p> <p style="text-align: center;">OR</p> <p>I do vigorous activities (jogging, cycling, swimming, etc.) at least three times per week for 30-60 minutes or more</p> <p style="text-align: center;">OR</p> <p>I do at least one hour of moderate activity such as brisk walking at least four days a week</p>	<p>My job requires that I walk, lift, carry or do other moderately hard work for several hours per day (day care worker, stock clerk or busboy/waitress)</p> <p style="text-align: center;">OR</p> <p>I spend much of my leisure time doing moderate activities (dancing, gardening, walking or housework)</p>	<p>My job requires that I sit at a desk most of the day</p> <p style="text-align: center;">AND</p> <p>much of my leisure time is spent in sedentary activities (watching TV, reading, etc.)</p> <p style="text-align: center;">AND</p> <p>I seldom work up a sweat and I cannot walk fast without having to stop to catch my breath</p>

HEALTH HISTORY

The following questions are about your menstrual history:

1. How old were you when you had your first menstrual period?

_____ (Age)

2. At what age, did your menstrual periods become regular, that is, you could usually predict about when they would start?

_____ (Age)

_____ Never became regular

3. Did your periods become regular naturally, or because of taking birth control pills, or in some other way?

- Naturally 1
- Birth control pill 2
- Some other way 3

4. Please check the one response that best describes your menstrual cycles over the past 12 months:

- 1). I menstruated over the past 12 months, and my periods were regular, for me
- 2). I was pregnant or breastfeeding during the past 12 months, and my periods were infrequent or absent
- 3). I menstruated over the past 12 months, but my periods were irregular, or infrequent, or different, for me
- 4). I did not menstruate over the past 3-11 months.
- 5). I did not menstruate over the past 12 months because I have gone through a natural, or non-surgical menopause and therefore I no longer menstruate.
- 6). I did not menstruate over the past 12 months because I have had my uterus and/or both ovaries removed, therefore, I no longer menstruate

5. In general, are or were, you able to predict, within a few days, when your next period would begin? That is, were your menstrual periods regular?

- I don't know; I never paid attention to my period 8
- No, they were not generally regular 0
- Yes, they were generally regular 1

5a. If yes, how often, on the average, did or do your menstrual periods come?
 Every _____ days

6. Was there any time in your life when there were more than 40 days between the beginning of one period and the beginning of the next, or when your periods stopped for at least six months (not including when you were pregnant or breastfeeding)?

No 0
 Yes 1

7. Have you ever had premenstrual syndrome?

No 0
 Yes 1
 Don't know 2

8. Circle any of the members of your family listed below who ever suffered from perimenopausal symptoms and describe their symptoms if you can?

No one 0
 Your mother 1
 Your sister 2
 Your mother's mother 3
 Your father's mother 4
 Your mother's sisters 5
 Your father's sisters 6

Please describe

9. Have you ever been pregnant?

No 0
 yes 1

a. If yes, circle the number that represents the outcomes of each pregnancy and include the number of times each occurred:

1=live birth # _____
 2=induced abortion # _____
 3=miscarriage or spontaneous abortion # _____

4=stillbirth # _____
 5=ectopic tubal pregnancy # _____
 6=other (specify) _____ # _____

10. Have you ever taken oral contraceptives, or birth control pills for reasons other than regulating your period?

No 0
 Yes 1

The following questions are about your medical history:

11. Have you ever been told by a nurse or a doctor that you had any of the following conditions? Circle each one you have had or currently have.

- 1) Drinking problem or alcoholism
- 2) Angina/Chest pain
- 3) Heart Attack
- 4) High blood pressure/hypertension
- 5) Stroke
- 6) Tuberculosis
- 7) Chronic bronchitis or emphysema
- 8) Allergy
- 9) Stomach ulcers
- 10) Chronic colitis/Crohn's disease
- 11) Diabetes
- 12) Kidney or renal disease
- 13) Bladder problems

- 14) Liver disease/hepatitis
 - 15) Arthritis
 - 16) Osteoporosis
 - 17) Polycystic ovaries
 - 18) Anorexia Nervosa
 - 19) Infertility
 - 20) Endometriosis
 - 21) Abnormal pap smear
 - 22) Cancer
 - 23) Thyroid disease
 - 24) Other-specify
-
-

The following questions are about any medications you are taking now:

12. Have you taken any of the following pills within the past year?

- a. Beta Carotene Yes No
- b. Vitamin A Yes No
- c. Vitamin B Yes No
- d. Vitamin C Yes No
- e. Vitamin E Yes No
- f. Iron Yes No
- g. Multivitamins Yes No

If you have taken any of the following within the past year, please list the name, the dose and the frequency of each medication below and the date that you last took the medication.

13. Please list any prescribed medications you regularly take:

14. Please list any over the counter medications you routinely take:

15. Please list any medications you have ever taken to relieve perimenopausal symptoms (For example, Rejuvex):

The last question is about your smoking history:

16. Which one of the following best describes you:

- Never smoked 0
- Never smoked but live with a smoker 1
- Have smoked for six month or longer but quit 2
- Currently smoke 3

If you have ever smoked or are currently smoking, how many years have you smoked _____(yrs), and how many packages do/did you smoke a day _____(pack/day).

You did it !
Congratulations!

We appreciate all the time and thought you put into
answering these questions.

Please check that you didn't leave any questions
blank

Return this booklet in the attached self-addressed
stamped envelope as soon as possible

APPENDIX G.
IRB APPROVAL

APPENDIX G.

IRB APPROVAL

LOYOLA UNIVERSITY INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF
HUMAN SUBJECTS-MEDICAL CENTER

Li, Suling

LU NUMBER: 7424.00

The influence of regular physical activity on perimenopause.

Dear Investigator:

Attached is the full approval for your research project.

The date of full approval is 12/11/95.

This approval expires on 12/10/96 which is the date of the first scheduled periodic review of a research activity.

The frequency of review of this research project will be 12 months.

You are approved to enroll 88 participants in your research project.
IF YOU WISH TO EXCEED THIS NUMBER YOU MUST PROVIDE WRITTEN JUSTIFICATION AND
SEEK THE PRIOR APPROVAL OF THE BOARD.

Please note that the Loyola Institutional Review Board for the Protection of Human Subjects is appropriately constituted and has been granted Multiple Projects Assurance Number M-1387 (effective 05/01/94 to 04/30/99).

Attached are an amendment report form, an adverse protocol reaction form, a temporary protocol closure notice, request to resume protocol activity after temporary closure and a permanent closure form. These forms are to be used when reporting actions to the IRB. The blank forms may be xeroxed and used for subsequent amendments, adverse protocol reactions and temporary closure notification for THIS PROJECT ONLY.

Thank you.

APPENDIX G (cont.)

YOLA UNIVERSITY INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN
HUMAN SUBJECTS (MEDICAL CENTER)

PROTOCOL AMENDMENTS/REVISIONS
REQUIRING IRB ACTION

NOTIFICATION OF FULL APPROVAL OF AMENDMENT

LU NUMBER: 7424.00 INVESTIGATOR: Li , Suling

AMEND 1 : See PI letter dated 12/13/95.

Further considerations now suggest that 500 women will be needed
to achieve statistical significance.

1. DATE OF REVIEW: 12/20/95
2. SUBSTANTIVE (SUBS) OR ADMINISTRATIVE (ADMIN) CHANGE: ADMIN
3. EXPEDITED (ER) OR FULL BOARD (FB) REVIEW: FB
4. EFFECT OF AMENDMENT ON RISK TO THE PATIENT
(INcrease, DEcrease, NoChange): NC
5. CHANGES NECESSARY TO THE INFORMED CONSENT DOCUMENT (Y/N): N
[12/20/95- 7424112095]
6. WILL THE BOARD REQUIRE THAT PAST OR CURRENT PARTICIPANTS BE APPRISED
OF THE NEW INFORMATION (Y/N): N

COMMENTS: None.

ACTION (APPROve, Conditional Approval, Table, DISapprove): APP

IF PREVIOUSLY TABLED:

DATE OF REREVIEW:

ACTION OF REREVIEW:

Kenneth C. Micetich

----- DATE OF APPROVAL: 12/20/95

KENNETH CRAIG MICETICH, M.D.
CHAIRMAN, INSTITUTIONAL REVIEW BOARD (MEDICAL CENTER)

APPENDIX H.
COVER LETTER

APPENDIX H.
COVER LETTER

Date

Subject's Name
Street Address
City, State Zip code

Dear Ms.

In 1992, you participated in the Women Take Heart Study at St. James Medical Center, Chicago Heights. I am presently a doctoral student at Loyola University Medical Center and am now working with Dr. Al-Hani, the principal investigator, and Dr. Holm, a member of the medical advisory committee for Women Take Heart, to extend the study by examining the relationships between physical activity and health during perimenopause/menopause.

Perimenopause, the period before and after menopause, is a time when women experience changes in their menstruation pattern, for example, having a longer or shorter interval between periods or excessive or scanty bleeding, or no period for three to eleven months. Many women find the symptoms associated with these changes to be bothersome or distressing. We believe it is important to study what can be done to relieve or prevent distressful symptoms. Therefore, we would like to invite you to participate. If you agree, please complete the enclosed questionnaires which should take approximately 25 minutes.

This research project is also part of the requirement for my Ph.D. degree in the Graduate School of Nursing, Loyola University of Chicago. Dr. Al-Hani and Dr. Holm are on my research committee.

Your participation is voluntary. All responses and identifying information will be kept strictly confidential. Your completion and return of the questionnaires will be an indication of your consent and willingness to participate in this study. Some of the participants will be asked to complete the questionnaires again at a later date.

The completed questionnaire can be faxed to me at (708) 327-9183, or you can mail it to me at Loyola University Medical Center, 2160 South First Avenue, Maywood, Illinois, 60153.

APPENDIX H (cont.)

If you have any questions, I can be reached at (708) 216-9577 on most week days between 9AM to 5PM, Chicago time or leave a message on my voice mail (708) 327-9173. Dr. Holm, the supervising nurse scientist for this project can be reached at (708) 216-3831 at the Department of Medical-Surgical Nursing at Loyola University Medical Center.

If you have any questions concerning your rights as a research participant, please contact Kenneth C. Micetich, M.D., Chairman, Institutional Review Board for the Protection of Human Subjects, Loyola University Medical Center, 708-216-4608.

We sincerely appreciate your participation in this study. The information we learn will help us to provide better care to our midlife women who are going through perimenopause/menopause.

Thank you for your time

Sincerely,

Suling Li RN MSN
Ph.D candidate

cc: Dr. Al-Hani
Dr. Holm

APPENDIX I.
RETEST COVER LETTER

APPENDIX I.

RETEST COVER LETTER

Subject's Name
Street Address
City, State Zip code

Dear Ms.

Thank you for completing the questionnaire for the Women's Health study. As directed by my research committee (Dr. Al-Hani and Dr. Holm), it is necessary to have you complete the same questionnaire again to assess consistency of women's responses.

Please complete the enclosed questionnaire and return it to me in the addressed, stamped envelope within two weeks. Again, your participation is voluntary. If you have any questions, please do not hesitate to call. I can be reached at (708) 216-9101 on most week days between 9AM to 5PM, Chicago time or leave a message on my voice mail (708) 327-9173. Dr. Holm, the supervising nurse scientist for this project can be reached at (708) 216-3831 at the Department of Medical-Surgical Nursing at Loyola University Medical Center.

Thank you for your time

Sincerely

Suling Li RN MSN
Ph.D candidate

cc: Dr. Al-Hani
Dr. Holm

APPENDIX J
PILOT COVER LETTER

APPENDIX J

PILOT COVER LETTER

Date

Subject's Name
Street Address
City, State Zip code

Dear Ms.

When women reach a certain age, they go through a time when they experience changes in their menstruation pattern, for example, having a longer or shorter interval between periods or excessive or scanty bleeding. Many women find the symptoms associated with these changes to be bothersome or distressing. I believe it is important to study what can be done to relieve or prevent distressful symptoms. Therefore, if you are: experiencing changes in your menstrual pattern; aged 40 and above; not on hormone replacement therapy or oral contraceptives within the past five years; and have no history of hysterectomy or bilateral oophorectomy, I invite you to participate in a study of how regular physical activity affects this time of transition. Taking part in the study involves filling out a questionnaire booklet which takes about 20 minutes. The booklet includes a Women's Health Assessment Scale, Physical Activity Questionnaire, a Health History and a Demographic Questionnaire.

You will find the booklet enclosed with this letter. If you agree to participate in this study, please answer all of the questions to the best of your ability. Your name is not needed anywhere on the booklet, so your answers will be confidential. If you have any questions, please call me at (708) 327-9173 or (708) 216-9101.

I would appreciate it if you could return the questionnaire booklet within two weeks after receiving it. The completed booklet can be mailed to me at Loyola University Chicago, Medical Center, School of Nursing, Building 105, Room 2840.

I sincerely appreciate your participation in this study. The information I learn will help us to provide better care to our midlife women who are going through perimenopause/menopause.

Sincerely

Suling Li, RN, MSN
PhD Candidate
School of Nursing
Bldg 105 - RM 2840
LUMC

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DISSERTATION APPROVAL SHEET

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