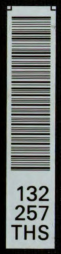


This is to certify that the

thesis entitled

The Relationship between Perceived Risk of Coronary Artery Disease and Osteoporosis to Frequency of Exercise in Menopausal Women

presented by

Carol L. Hill

has been accepted towards fulfillment
of the requirements for
Master of Science degree in Nursing

Marilyn L. Rothert
Major professor

Date June 30, 1997

THE RELATIONSHIP BETWEEN PERCEIVED RISK OF CORONARY DISEASE AND OSTEOPOROSIS TO FREQUENCY OF EXERCISE IN MENOPAUSAL WOMEN

By

Carol L. Hill

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE IN NURSING

College of Nursing

1997

ABSTRACT

THE RELATIONSHIP OF PERCEIVED RISK OF CORONARY HEART DISEASE AND OSTEOPOROSIS TO THE FREQUENCY OF EXERCISE IN MENOPAUSAL WOMEN

By

Carol L. Hill

With menopause, estrogen production begins to wane and eventually ceases. As estrogen production declines, women become at greater risk for Coronary Artery Disease and Osteoporosis. Exercise is a healthy behavior that has been effective in reducing the risks of Coronary Artery Disease (CAD) and Osteoporosis. This study used a convenience sample of 114 menopausal women to examine the relationship of perceived risk of CAD and Osteoporosis and the frequency of exercise. The Health Belief Model was used as the conceptual framework. Findings in this study revealed that the majority of this sample did not perceive themselves to be at a greater than 50 percent risk for CAD or Osteoporosis. Statistical analysis of the sample revealed that perceived risk of CAD or Osteoporosis was not a significant factor in the relationship of frequency of exercise in women of the sample. Although the results from this study reveal no significance in the relationship of CAD and Osteoporosis to the frequency of exercise in women, further research needs to be undertaken in this field to understand the concept of perceived risk and its relationship to healthy behaviors in women.

ACKNOWLEDGMENTS

Thank you to Dr. Marilyn Rothert, my committee chairperson, who not only gave freely of her time, despite an overwhelming schedule, but gave me continued support, encouragement, and appropriate feedback. Thank you to the members of my committee, Dr. Geraldine Talarczyk and Dr. Georgia Padonu for their time, support and encouragement.

Thank you to Jill Kroll, Ph.D., for her vast computer knowledge and skill. Thank you Ann and Evelyn for your friendship and tireless support.

Thank you to my sons, Tom for keeping me on track and Marc for his skill on the computer. Thanks to my co-workers for their continued encouragement and support.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

Figure Page

INTRODUCTION

As midlife approaches and a woman's childbearing years come to a close, estrogen production diminishes and the menopause occurs. Menopause is experienced universally, occurring naturally or artificially (i.e., surgical intervention). Decreased estrogen production results in an increased risk of heart disease, which includes acute myocardial infarction, and an increased risk for hip fracture from osteoporosis. Since 1950, heart disease has declined in men but risen in women (Das and Banka, 1992). Approximately 350,000 women die each year from heart disease which is more than from all the neoplastic (cancers) diseases combined (Das et al.; Gregory, 1993).

Osteoporosis is a major health problem in our society (Wark, 1993). It affects about one in four women over 65 years of age (Allen, 1993). Eighty percent of the one million fractures in women over fifty years of age and 90% of the fractures in women over sixty years of age are due to osteoporosis (Larson and Shannon, 1984).

As women enter the menopause, it is important that the client and health care provider are given the opportunity to discuss strategies to reduce or avoid these risks. As patient advocates and primary care providers, Advanced Practice Nurses (APN) promote health, wellness and the prevention of illness. Risk identification, risk reduction and risk

prevention are important factors in health and wellness. As promoters of health and a healthy lifestyle, APN's can aid in identifying patients at risk for illness.. The APN can use the Health Belief Model (HBM) (Rosenstock, 1990) as a framework to aid in determining the perception of risk, factors affecting the perception of risk and actions that could be taken to prevent the risks. This information would be useful in planning effective interventions to reduce those risks.

The benefits of exercise are well known and supported throughout literature. Aerobic exercise, such as jogging, walking and swimming, has been shown to improve cardiovascular status and aid in reducing lipids in the bloodstream, thereby reducing the risk of Coronary Artery Disease (Das and Banka, 1992; Harris, Caspersen, DeFriese, and Estes, 1989; Svendsen. Hassager & Christiansen, 1993). Weight training, walking, stair climbing and step aerobics, examples of weight bearing exercise, have shown benefits in increasing bone mass and bone density thereby reducing the risk of osteoporosis and in some instances, reducing the destructions of bone due to osteoporosis (Dalsky, 1987; Larson & Shannon, 1984; Lindsay, 1993). Therefore, a combination of aerobic and weight bearing exercise is beneficial in reducing those health risks related to menopause.

In 1990, Rothert, et al. studied women's decision making and self care related to menopause. In one part of the multifaceted questionnaire, the subjects were asked to rate their perceived risk of Coronary Artery Disease and fracture due to osteoporosis. In the year that followed, each subject recorded daily, on a monthly calendar, when they participated in any exercise.

The purpose of this study is to determine if there is a relationship between

perceived risk of developing Coronary Artery Disease and Osteoporosis and the frequency of exercise in menopausal women. As a patient advocate, the APN needs to be aware of the clients risks and risk perception in order to develop an individualized plan of care. This would enable both client and APN to work toward the goal of reducing those risks that have been identified.

RESEARCH QUESTIONS

The research questions for this study were: (1) Is there a relationship between perceived risk of developing Coronary Artery Disease and the frequency of self-reported exercise in menopausal women? (2) Is there a relationship between perceived risk of developing Osteoporosis and the frequency of self-reported exercise in menopausal women? (3) Does perceived risk of Coronary Artery Disease or perceived risk of Osteoporosis have the greater influence on frequency of exercise in menopausal women?

STUDY RELEVANCE

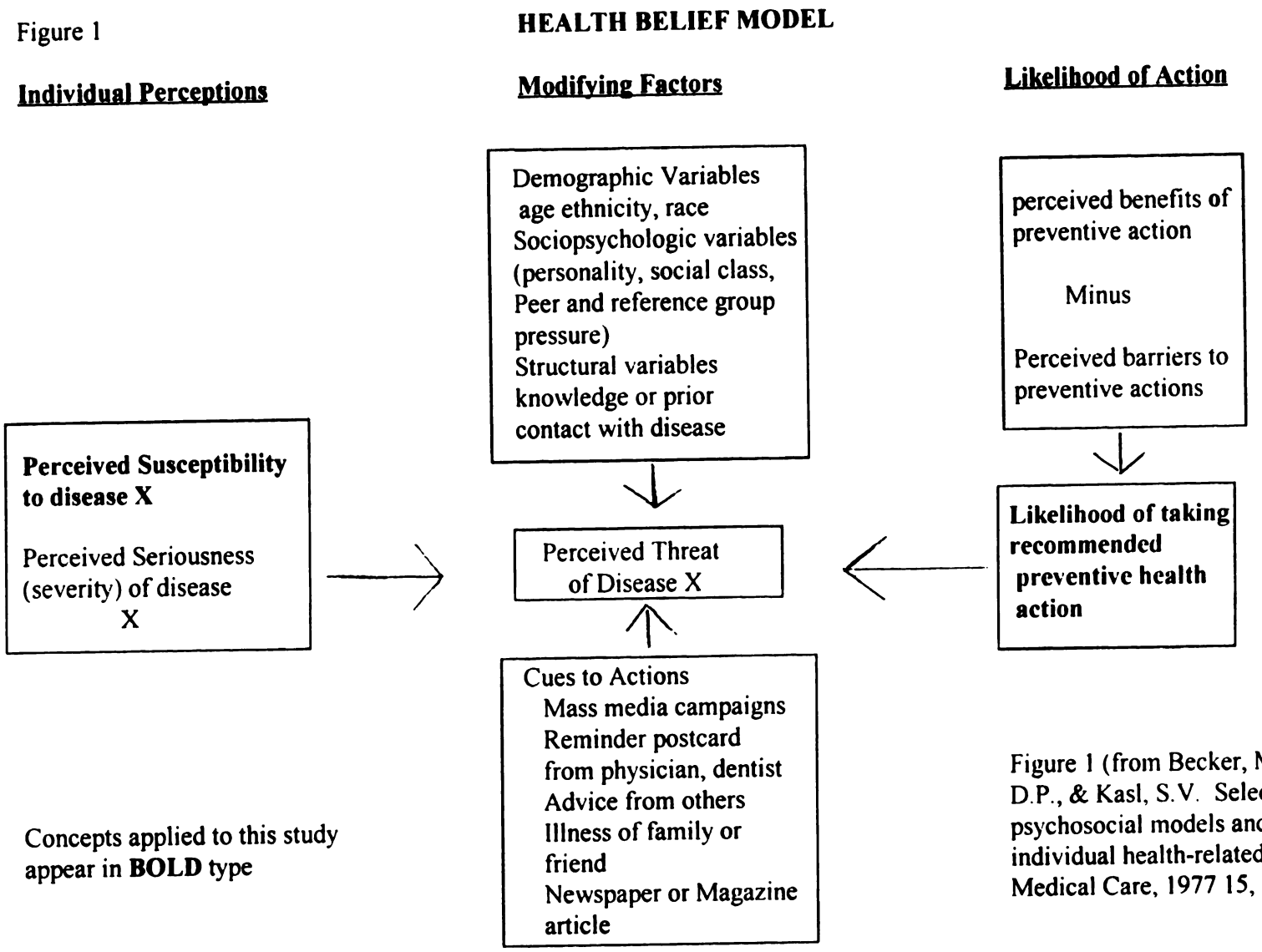
The findings of this study would provide the APN with a stronger understanding of the importance of risk identification and risk perception in clients. Through the identification of these risks, the APN can encourage healthy behaviors. This study has the potential of lending support to the use of the Health Belief Model as a framework for understanding behavior. It may also help in understanding those factors that may influence individual's behaviors and those factors that can be modified to prevent or reduce those risks.

THEORETICAL FRAMEWORK

The Health Belief Model, as shown in Figure 1, developed by Hochbaum in the 1950's and expanded by Rosenstock and Becker in the 1970's (Rosenstock, 1990), will serve as the theoretical framework for this study. The Health Belief Model (HBM) examines the variables of perceived susceptibility, perceived severity, perceived benefits, and perceived barriers as they relate to health and health care. Perceived susceptibility is defined as one's subjective perception of the risk of contracting a health condition. Perceived severity is defined as one's beliefs concerning the seriousness of contacting an illness or leaving it untreated. Perceived benefits are the positive results of those actions taken in preventing or treating a condition. Perceived barriers are potentially negative aspects of particular health actions of those engaging in appropriate care. In general, it is believed that individuals will take action to ward off, to screen from, or to control ill-health conditions if they regard themselves as susceptible to the risk, if they believe there are serious consequences, if they believe a certain course of action would be beneficial, if reduction of either susceptibility or severity will be beneficial and if they believe the expected barriers to initiation the action are outweighed by the benefits (Rosenstock).

The principles of the HBM will be applied to this study as it examines the concept of risk perception (perceived susceptibility) and the engaging in exercise (perceived benefit) to reduce those risks. In Figure 1, Individual Perception (in this study), of the risk of CAD and Osteoporosis, is the individuals' perceived susceptibility to those diseases. Other concepts of the model include modifying factors, i.e., age, sex,

Figure 1



Concepts applied to this study appear in **BOLD** type

Figure 1 (from Becker, M.H., Haefner, D.P., & Kasl, S.V. Selected psychosocial models and correlates of individual health-related behavior. Medical Care, 1977 15, 27-46.)

personality, knowledge of disease etc., and cues to action. While these concepts are important to the HBM, this study does not address them. The probability or likelihood of engaging in exercise, the recommended preventive health action, is influenced by the perceived benefits minus the perceived barriers. Perceived benefits and perceived barriers, although important, are not a part of this study. In recognizing women at risk and helping them to identify and remove barriers to preventive health actions, the APN in primary care can use the concepts of the HBM to understand human behavior and develop individual strategies to promote wellness and better health.

REVIEW OF LITERATURE

Coronary Artery Disease in Women

Until recently, most studies of heart disease included only male subjects for data collection, therefore results cannot be generalized to the female population. Researched literature on CAD in women is limited by this fact. This alone implies that more research studies of CAD in women are needed.

Amsterdam, Eliot, and Stampfer (1993), state that risk factors, (hypertension, smoking, obesity, diabetes), affect both sexes equally. However, women have an advantage over men which decreases after menopause due to diminished endogenous estrogen.

In a study by Corrso, Becker, Ockene and Hamilton (1990), coronary heart disease was found to be the leading cause of death among women, accounting for 28% of all deaths in women. The Framingham study also showed a two-fold increase in CAD among post menopausal women. This study further stated the risk of CAD increased

with the age of onset of menopause. Cardiovascular disease becomes a major cause of mortality and morbidity in women after the age of 55.

Das and Banka (1992) state that since 1950, the incidence of CAD has declined in men but risen in women. They further state the risk factors for CAD in women include smoking, hypertension, obesity, family history, and the menopausal state. Evidence suggests that estrogen protects against CAD. Endogenous and exogenous estrogen increase high density lipids (HDL) and lower low density lipids (LDL) and the total cholesterol levels. The researchers also state the ratio of total cholesterol to HDL has emerged as a good predictor of CAD in women.

Gregory (1993) states that although women fear cancer the most, coronary heart disease kills as many women as all forms of malignancy. Women exhibit signs of coronary heart disease 10 years later than men but after menopause morbidity and mortality rates of women eventually approach those of men. In the study Gregory found that CAD accounted for 250,000 deaths for women and deaths from all cancer amounted to 225,000. Although the numbers are close, coronary heart disease presents an even higher danger for women than that of cancer.

According to Jackson (1994), CAD is the most common cause of death in many countries including Britain and the United States. The incidence increases with age and rises sharply after menopause. Jackson has observed women have more severe infarcts, being older at presentation and therefore more likely to have significant CAD which increases mortality

In a prospective cohort study of 5,209 women, Kanmel and Wilson (1995)

carefully documented the onset of menopause in women. The study noted a quadrupled risk of CAD existed for menopausal women as compared to premenopausal women. Following the onset of menopause, the severity of coronary heart disease increased, shifting from angina to an increased occurrence of acute myocardial infarction and sudden death. They estimate 50% of women in the United States will die of atherosclerosis related disease. The researchers also found that disability due to heart disease in persons more than 65 years of age is increased.

Risk factors of CAD in women include menopause (Rich-Edwards, Manson, Hennekens & Buring, 1995). As CAD increases in the middle years, Rich-Edwards et al. speculated that menopause marks the end of the protective effect afforded by the ovarian hormones on CAD. They note that women with bilateral oophorectomy (and no hormone replacement therapy) have a 2.2 times higher risk of CAD than the premenopausal women of the same age.

Svendsen et al. (1993) and Rosenberg (1993), note the increased risk of coronary heart disease in postmenopausal women. Rosenberg claims that the protective effect of estrogen is through its favorable effect on serum lipids. Svendsen et al. recommends exercise to decrease cholesterol and lipid levels thereby decreasing the CAD risk for women

These studies support the evidence of CAD in women. They also support the previous findings that the risk of CAD increases with the menopausal state and advancing years. It is also noteworthy that few studies found in the researched literature, are devoted solely to women and Coronary Artery Studies

.Osteoporosis

Osteoporosis is defined as a loss of bone mass (Allen, 1992; Bond, 1991; Gambert, Schultz, and Hamdy, 1995). Bond classifies osteoporosis into two types. Type I occurs in females, usually Caucasians, during the first few years after natural or induced (surgical) menopause. Type II occurs in the elderly population aged 75 and older. Type II affects 75% of women and 25% of men in that age group. One of every four women older than 45 years has progressive loss of bone mass resulting in fractures.

Osteoporosis is a major health problem. Wark (1993) estimates that in the United States, 24 million people are affected. Gambert et al. (1995) describe osteoporosis as a significant and growing problem in the elderly populations. By the age of 65, 50% percent of women have a decreased amount of bone mineral content below the fracture threshold. Of the one million fractures which occur each year, 80% occur in women over 50 years of age and 90% occur in women over 60 years of age (Larson and Shannon 1984). Lindsay (1993) states osteoporotic fractures mainly affect the spine, hip and distal radius. In the United States alone, the financial cost is approximately 10 billion dollars per year (Wark). Fifty percent of hip fractures result in a permanent loss of independence. The cost plus its disabling effects make osteoporosis a major health threat.

Osteoporosis is a result of multiple factors including age, decreased levels of estrogen and progesterone (Wark, 1993). Allen (1993) states an estrogen deficiency is a significant factor in the development of osteoporosis. Gambert et al. (1995) state osteoporosis affects post menopausal women most frequently and a link clearly exists

between estrogen deficiency and accelerated bone loss. Bellatoni (1996) states the risk factors associated with osteoporosis include cardiovascular and thyroid medication, smoking, calcium deficient diet, sedentary lifestyle, family history, and hypogonadal state, especially menopause.

The "treatment" of osteoporosis should begin with prevention (Bellatoni, 1996; Lindsay, Marcus and Recker, 1996). A team approach, which combines medical, nutritional and physical therapies, is beneficial. Preventive measures that maintain bone mass throughout life are preferred over the treatment of established disease (Gambert et al. 1996). Exercise, especially weight bearing exercise, is one of the treatments recommended. Lindsay et al. state all women are candidates for treatment and weight bearing exercise, especially walking for 30 minutes three times a week. The skeleton is designed to accommodate the burden it regularly receives. Regular stress, (in the form of exercise), conserves bone, helps maintain flexibility, enhances muscle strength and aids in preventing falls.

This review of the literature clearly states the relationship of osteoporosis to menopause. It also supports the deleterious effects of osteoporosis in terms of health, health care costs, and personal loss to individuals. It justifies the identification of those at risk and educational interventions as preventive strategies.

Exercise

The benefits of exercise are well known and well documented in the literature. Exercise has a positive effect in weight reduction, lowering of blood pressure and decreasing serum lipids. It also aids in developing muscle strength (including cardiac

muscle), bone mass, and flexibility. Exercise is a behavior that will benefit a person's health, both physical and mental.

Exercise and Coronary Artery Disease

Harris et al. (1989), in an evaluation of literature, reported that physical activity is associated with prevention and control of various medical conditions, including CAD and osteoporosis. Since coronary heart disease is the leading cause of mortality and morbidity, the prevention of coronary heart disease is of major health importance.

Rich-Edwards et al. (1995), in a review of previously conducted studies of the relationship of exercise to CAD in women, found that women who are physically active have a 60 to 75% lower risk of coronary heart disease than women who are inactive. Das and Banka (1992) state that exercise may modify risk factors of CAD, especially in obese women.

In a study by Svendsen et al. (1993), on healthy overweight post menopausal women, it was noted that both anaerobic and aerobic exercise had a profound decrease in all risk factors for cardiovascular disease. The mean reduction in this study was 33% decrease overall in all risk factors (i.e., weight, cholesterol, LDL, HDL, blood pressure).

Few studies exist that examine the relationship of exercise and CAD in women. These reviewed here specifically addressed this issue and add evidence to the benefit of exercise in reducing the risk of CAD in women.

Exercise and Osteoporosis

Studies reviewed advocate exercise to reduce the risk of osteoporosis in women. Ali and Bennet (1992) studied 91 women, 54-83 years of age, with respect to knowledge

and healthy behavior. The findings revealed that increased knowledge led to increased participation in healthy behaviors. Women can increase bone mass and reduce the risk of osteoporosis in the third and fourth decades of life if they exercise regularly, take a calcium supplement, restrict alcohol intake and avoid cigarettes. Activity was found to increase bone mineral density. Another study by Prince et al. (1991) examined 120 post menopausal women. The subjects were enrolled in a double blind, randomized study comparing the effects of an exercise regimen, exercise plus dietary calcium, and exercise plus continuous estrogen and progesterone replacement. Results after the 12-week period clearly showed an effect in slowing or stopping bone lose with exercise and either a calcium supplement or hormone replacement therapy. The study also showed that exercise alone can be effective in preventing bone loss.

In a review of exercise studies, Dalsky (1987) states preliminary evidence suggests that exercise may help to maintain and possibly increase bone mineral content during the aging process. Exercise prescription should consist of weight bearing exercise and need not be vigorous if done for extended periods of time. Bloomfield, Williams; Lamb and Jackson (1993), followed fourteen Caucasian post menopausal women. The group was split in half with seven of the women participating in an exercise program and the remaining seven serving as a control group. The exercise group participated in planned exercise which consisted of calisthenic exercise and stationery cycling over an eight-month period. The major finding of the study was the significant increase in bone mineral density of the lumbar spine in the group which participated in the exercise program. These results indicate that non weight bearing exercise (i.e., cycling) may be

effective in the prevention of post menopausal bone loss in the lumbar spine. In a study of 146 women, 52-67 years of age, Preisinger, Alacamlioglu, Plis, Saradeth and Schneider (1995) evaluated the efficacy of therapeutic exercise. The women were divided into two groups. Eight-two women participated in an exercise program while the remaining 64 women served as a control group. Results obtained showed significantly less bone regression in the women who exercised regularly. Presinger et al. concluded that regular appropriate exercise in elderly women may aid in the prevention of osteoporosis. Wark (1993), in a review of literature, states that studies indicate regular, moderate, weight bearing exercise is beneficial to the skeleton as it is to other organ systems. Frequent (three times a week) exercise retains bone mass, maintains flexibility, balance and muscle strength and provides an additional method for preventing and treating osteoporosis (Recker, 1993; Skolnik, 1990; Wolman, 1994; Young, Formica, Szmukler, and Seeman, 1994)

The American College of Sports Medicine (ACSM) (Drinkwater, Grimston, Raab-Cullen, & Snow-Harte 1995) pronounced their stand on osteoporosis and exercise. The decrease in cortical bone mass appears normal until menopause. Epidemiological studies indicate a change of approximately minus 7% in lumbar bone density and minus 16% in the hip bone density at age 50. Any combination of factors (diet, exercise) that can maintain or increase bone density during these years may reduce the risk of fracture in the future. Menopause is a time during which bone loss is accelerated as endogenous levels of gonadal hormones, estrogen and progesterone, decrease markedly. Although exercise is important, the ACSM recommends hormone replacement therapy in addition

to physical activity in the prevention of bone loss in menopausal women.

The literature supports exercise as a means of treatment and prevention of osteoporosis in women. It also favors exercise for reducing risk factors in CAD and improving cardiovascular fitness. As presented here, the literature has many references to osteoporosis, its risks and treatments, but notably few references to women and CAD, its risks and treatments.

Perceived Risk

While risk factors are readily identified in reviewing literature related to CAD and Osteoporosis, the researchers have not addressed perceived risk. Studies related to perceived risk can be found in Psycho-social literature but those reviewed are not specific to women.

Mullett, Duquesnoy, Raiff, Fahrasmane, and Namar (1993) reviewed the factors that contribute to risk perception. These included the ideas of fatality, catastrophe and man's lack of control, knowledge, which relates to knowledge of risk and immediacy of risk, number of people exposed and the evaluative factor that included the morality of the issue and its effects of society. In this study the authors determined that dread and the evaluative factors were better predictors of risk perception.

Stasson and Fishbein (1990) investigated perceived risk and preventive action. In their study of perceived driving risk and intention to wear seatbelts, they determined that although perceived risk did indeed influence the use of seatbelts, it had an indirect effect. Other factors (i.e., peer pressure) provided a greater influence in the use of sealbelts in

this study. The authors concluded that even an indirect effect has a significant influence on behavior.

In a study to test the HBM to promote the use of bicycle helmets, the combined concepts of perceived susceptibility and perceived seriousness were found to compose the construct of perceived threat. This construct, along with cues to action, directly affected the use of bicycle helmets (Witte, Stokols, Ituarte, and Schneider, 1993). Again this proves that people do respond to the indirect effects of perceived risk on human behavior.

Janz and Becker (1984) did a comprehensive review of the HBM using 29 HBM-related investigations over a ten year period. The results of this review found that perceived susceptibility is an important factor in understanding preventive health behavior. The authors also noted that perceived severity is less likely to influence preventive health behavior.

These few studies strengthen evidence that perceived risk or subjective probability is a determinant of health behavior. However, none of these studies examine the concepts of CAD, Osteoporosis, perceived risk and exercise in women. This study examines those concepts and their relationship to healthy behavior of exercise in menopausal women.

METHOD

Parent Study

The parent study, "Women's Judgements of Estrogen Replacement Therapy", was conducted by a team of researches with Dr. Marilyn Rothert as principal investigator (1990) (Appendix A). The study tested a "decision support intervention" to help women make informed decisions regarding the use of Hormone Replacement Therapy (HRT) as they begin to experience menopause. Using an experimental design, subjects were randomly assigned to one of three groups. The first group received written information relative to menopause, HRT, and communication strategies for use with their health care provider. The second group received the same written information as Group I using a lecture/discussion format over three sessions. The third group was given information identical to that given to Group II, plus a decision-support intervention with participants using the data in their own personal risk profile and determining the likelihood of their own health outcomes.

The participants were recruited from the mid-Michigan area through the newspaper and interviews on radio and television to present the study and request participants. Subjects were primarily Caucasian (94%), employed full time (62.3%), college-educated (49%), and with a household income of over $50,000 per year (55.5%) (Table 1). Data were collected over a 12 month period. Data were obtained on decisional conflict, knowledge, satisfaction with the decision, adherence calendar, satisfaction with the health care provider and self efficacy in interaction with the health care system

Table 1

Sociodemographic Characteristics of Parent Study
(N = 252)

Characteristic	n	%
Age (years)		
40-45	95	37.7
46-50	115	45.6
51-55	34	13.5
56-60	6	2.4
61-65	2	0.8
Race		
African-American	9	3.6
Hispanic	4	1.6
American Indian	1	0.4
White	237	94.0
Other	1	0.4
Marital Status		
Married	166	65.9
Divorced	65	25.8
Single	17	6.7
Widowed	3	1.2
Separated	1	0.4
Employment Status		
Full-time	157	62.3
Part-time	49	19.4
Retired	12	4.8
Not employed	28	11.1
Other	6	2.4
Income		
< $14,000	10	4.0
$15,000-$29,000	32	12.7
$30,000-$49,999	69	27.4
$50,000-$99,999	117	46.0
$100,000-$200,000	22	8.7
>$200,000	2	0.8

Table 1 (continued)

Characteristic	n	&
Education		
<12 years	2	0.8
High School Graduate	24	9.5
>12 years	65	25.8
Technical/Community College	33	13.1
Bachelors Degree	60	23.8
Masters Degree	42	16.7
PhD/Professional Degree	21	8.3
Missing	5	0.2

The data were collected at four times during the study; Time 1: pre-intervention; Time 2: post intervention- 3 weeks later; Time 3: six months later; and Time 4: - twelve months later.

The convenience sample consisted of 379 women aged 40 to 60 years of age with the mean age of 50. The age 40 is a common age indicator for mid-life issues and is expected to include the age at which women confront the issues of menopause. The researchers made no attempt to exclude women due to menopausal status, hysterectomy or current medication regime.

Of the 379 women who registered for the study, 300 attended the first session. Eighty-four percent (n = 252) of the women who attended the original session returned to complete the questionnaires. Of these 252, 81%, (n= 203) completed follow up questionnaires at 6 months. At 12 months, 99% of the 203 questionnaires (n= 201) were completed.

Perceived risk (subjective probability) was measured pre and post intervention, at six months and at twelve months. The subjects recorded exercise data daily on a monthly calendar. The calendar was turned in each month over the 12-month period of the study. The data were collected in a classroom setting at a large Midwestern university campus. At the three different classrooms sites, two members of the research team were present to offer consistent instruction to the participants.

Design

This was a secondary analysis of date from the "Women's Judgements of Estrogen Replacement Therapy. This correlational study examined the relationship between perceived risk of CAD and osteoporosis and frequency of exercise in menopausal women.

DESCRIPTION OF PRESENT STUDY

Operational Definitions of Variables and Instrumentation

In this study researchers used one subjective probability measure from the sociodemographic and health history questionnaire and one self-report measure were used from the research developed by Rothert et al. (in press). The subjective probability measure asked each participant to rate her perceived risk of attaining osteoporosis and coronary artery disease. The self-report measure consisted of a monthly calendar on which each participant logged the activities she participated in each day (i.e., planned exercise, hormone replacement therapy, and calcium). Participants returned each calendar monthly to decrease the probability of error in recall of logged activities.

PERCEIVED RISK

Ost (1995) defines perceived risk as a function of information, knowledge, values and perception. Pender (1987) describes perceived risk as an individual's estimated probability that they will encounter a specific health problem. This author defines perceived risk as an awareness of the possibility of loss or injury due to certain factors that may or may not be controlled by the individual.

PERCEIVED RISK OF CORONARY ARTERY DISEASE

Coronary Artery Disease (CAD) is defined as a group of diseases that affect the health of the coronary arteries. These include but are not limited to angina and Acute Myocardial Infarction.

Perceived risk of CAD was measured using the subjective probability measure contained in the health background information of the parent study. Item 28 of the Health Background Information asked: On a scale of less than 1% to 100%, how likely DO YOU THINK YOU are to get heart disease? Subjects were asked to rate their perception using a scale of 1-10. Each number corresponded to a percentage of chance:

1 = 10% or less	5 = 41% to 50%	9 = 81% to 90%
2 = 11% to 20%	6 = 51% to 60%	10 = 91% to 100%
3 = 21% to 30%	7 = 61% to 70%	
4 = 31% to 40%	8= 71% to 80%	

PERCEIVED RISK OF FRACTURE DUE TO OSTEOPOROSIS

Bond (1991) defines osteoporosis as an accelerated loss of bone mass. Larson and Shannon (1984) define osteoporosis as an imbalance between bone formation and bone resorption which results in an increase risk of fracture.

Perceived risk of fracture due to osteoporosis was assessed using the subjective probability measure from the health background information. Item 27 from the Health Background Information asked: On a scale of less than 1% to 100%, how likely DO YOU THINK YOU are to sustain a fracture due to osteoporosis? Each subject was asked to rate their perception on a scale of 1 to 10. Each number corresponded to a percentage of chance:

1 = 10% or less	5 = 41% to 50%	9 = 81% to 90%
2 = 11% to 20%	6 = 51% to 60%	10 = 91% to 100%
3 = 21% to 30%	7 = 61% to 70%	
4 = 31% to 40%	8= 71% to 80%	

EXERCISE

This author defines exercise as engaging in physical activity for health. That purpose being to improve the cardiovascular and pulmonary status through aerobic exercise and to improve bone mass, balance and coordination through weight bearing exercise.

Each subject agreed to keep a record of her daily exercise activity on a monthly calendar for 12 months. Researchers logged the information from the calendars into a data base. From these data, the frequency of exercise for each participant was determined by averaging the data for Time 4 from the 9th through the 12th month of the study.

Data Collection Procedure

Risk perception for CAD and Osteoporosis was assessed at Time 4. The mean frequency of exercise from the 9th through the 12th month was used in the analysis.

Data Analysis

Data analysis was conducted using SPSS computer software. The relationship between perceived risk of coronary artery disease and osteoporosis and the averaged frequency of exercise was analyzed using Pearson's correlation coefficient. A Linear Regression model was used to determine whether perceived risk of CAD or perceived risk of osteoporosis was a better predictor of exercise.

Protection of Human Subjects

The individual rights of subjects were protected according to the University Committee on Research Involving Human Subjects (UCRIHS) guidelines. Confidentiality was protected by giving an identification code number to each participant in the study. Each person signed a consent form prior to participation in the study. All responses throughout the study remained confidential. Data results were collectively reported. Application for approval to conduct this secondary analysis was made prior to analysis of the data.

RESULTS

In this section a comparison of demographic characteristics between the parent study and the study sample will be presented. The statistical results of the analysis are presented for each research question.

Description of the Study Sample

One hundred fourteen women completed calendar data that included the daily logging of exercise. These 114 women comprised the study sample. Sociodemographic characteristics of this sample, shown in Table 2, were as follows: 72% (n = 83) were

between 40 and 50 years of age with 42% (n = 48) between 46 and 50 years old. Most women in the study sample were Caucasian (96.4%), married (68%), employed full time (65%), held a Bachelors or higher degree (53%), and had a household income of more than $50,000 annually (54%) In comparing the study sample with the parent study, both were fairly homogenous with little variation among the subjects..

Of the 114 women in the sample 68% (n = 77), rated themselves 50% or less, likely to be at risk for Coronary Artery Disease. The mean value was 4.3 (corresponding to a 31% to 40% chance of risk) with a standard deviation of 2.65 (Table 3).

In rating their risk of fracture due to osteoporosis, 86% (n = 98) of the participants believed that they were less than 50% likely to sustain a fracture due to Osteoporosis. The mean value was 3.3, (corresponding to 21% to 30% at risk), with a standard deviation of 2.1 (Table 4).

The subjects in the study logged their exercise activity on a calendar every day. The frequency of exercise for each participant was averaged from the 9th month through the 12th month. The average exercise for the group is shown in Table 5. The mean value was 3.5 corresponding to exercise frequency of 8 to 11 times per month. Assuming this was distributed across the month, the average exercise was 2 or 3 times per week. The standard deviation was 2.07.

Table 2

Sociodemographic Characteristics of Present Study

(N = 114)

Characteristic	n	%
Age (years)		
40-45	35	30.0
46-50	48	42.0
51-55	27	27.0
56-60	2	0.5
61-65	2	0.5
Race		
African-American	2	2.0
Hispanic	1	0.8
American Indian	1	0.8
White	110	96.4
Marital Status		
Married	78	68.0
Divorced	27	24.0
Single	8	7.0
Widowed	1	0.8
Employment Status		
Full-time	74	65.0
Part-time	24	21.0
Retired	7	6.0
Not employed	9	8.0
Income		
< $14,000	5	4.0
$15,000-$29,000	12	10.5
$30,000-$49,999	32	28.0
$50,000-$99,999	53	46.5
$100,000-$200,000	10	8.0
>$200,000	2	1.0

Table 2 (continued)

Characteristic	n	%
Education		
High School Graduate	9	8.0
> 12 years	30	26.0
Technical/Community College	14	13.0
Bachelors Degree	31	27.0
Masters Degree	21	18.0
PhD/Professional Degree	9	8.0

Table 3

Subject Rating of Perceived Risk of CAD
(N = 114) Mean = 4.3 S.D. = 2.65

Value	n	%
10% or less	18	15.9
11 to 20%	17	15.0
21 to 30%	19	16.8
31 to 40%	7	6.2
41 to 50%	16	14.2
51 to 60%	9	8.0
61 to 70%	6	5.3
71 to 80%	14	12.4
81 to 90%	3	2.7
91 to 100%	4	3.5

Table 4

Subject Rating of Perceived Risk of Osteoporosis
(N = 114) Mean = 3.3 S.D. = 2.1

Value	n	%
10% or less	30	26.3
11 to 20%	15	13.2
21 to 30%	22	16.8
31 to 40%	8	7.0
41 to 50%	23	20.2
51 to 60%	7	6.1
61 to 70%	3	2.6
71 to 80%	4	3.5
81 to 90%	1	0.9
91 to 100%	1	0.9

Table 5

Exercise Average Month 9 through Month 12
(N = 114) Mean = 3.5 S.D. = 3.1

Value	n	%
less than 4 times a month	11	9.4
4 to 7 times a month	25	21.4
8 to 11 times a month	21	20.5
12 to 15 times a month	18	15.4
16 to 19 times a month	12	10.2
20 to 23 times a month	4	3.4
24 to 27 times a month	5	4.3
over 28 times a month	18	15.4

Data Analysis by Research Question

The purpose of this research study is to investigate the questions related to perceived risk of coronary artery disease, osteoporosis and frequency of exercise in menopausal women. The first question was: Is there a relationship between perceived risk of CAD and exercise frequency in menopausal women? Perceived risk of CAD was assessed in item 28 of the health background questionnaire, which asked how likely the subject thought they were to get heart disease. On the average the subjects rated themselves as less than 45% likely to acquire CAD. The majority of the participants did not perceive themselves to be at greater than 50% risk for CAD. Pearson's Correlation, $r = -.0456$, ($p = .316$), revealed that a relationship does not exist between perceived risk of CAD and exercise frequency of women in this sample.

The second question, similar to the first, asked: Is there a relationship between perceived risk of osteoporosis and frequency of exercise in menopausal women? This too was assessed in the health background questionnaire, item 27. The subjects rated their probability of sustaining a fracture due to osteoporosis. Again the majority did not perceive themselves to be over 50% at risk for osteoporosis. Pearson's Correlation of perceived risk of sustaining a fracture due to osteoporosis and frequency of exercise revealed $r = .031$, ($p = .371$). Therefore, in this study sample there is no relationship between perceived risk of fracture due to osteoporosis and frequency of exercise.

Question 3 asked if the perceived risk of CAD or the perceived risk of osteoporosis was a greater influence on the frequency of exercise. Since neither variable was significantly correlated with frequency of exercise, this question was not analyzed further.

DISCUSSION

Findings of this study are presented in this section. First, the research questions are discussed. Second, the implications of this study in relation to the APN and primary care are reviewed. Lastly, limitations of this study are presented along with suggestions for continued research.

The findings of this study can serve as a beginning point in helping women, as they approach menopause, to identify risks and methods to reduce or eliminate these risks. These results will aid the APN to be aware of useful information to be shared with clients to promote health and wellness.

Research Questions

Perceived Risk of CAD and Frequency of Exercise

No relationship exists between perceived risk of CAD and frequency of exercise in women of this sample. However, it is interesting to note the variability of perceived risk of CAD in the sample (Table 3). Nearly half, 47% (n = 54) perceived their risk of CAD below 30%. Only 31.6% (n = 36) of the subjects rated themselves as greater than 50% at risk for CAD. Even though the subjects rating of risk was lower than expected, the majority of the sample exercised at least 8 to 11 times per month.

Perceived risk of CAD reported in the sample is not congruent with actual risk

identified in the literature. Articles discussing women and CAD state that as women reach menopause, the risk of developing heart disease increases as estrogen production decreases. According to Kanmel et al. (1993), the onset of menopause in women quadruples the risk of a coronary event compared with women of the same age who remained premenopausal. Rich-Edwards et al. (1995) state that after the age of 60 coronary heart disease is the primary cause of death among women. Gregory (1993) states that CAD manifests itself ten years later in women than in men, but after menopause, morbidity and mortality eventually equal that of men.

To reduce the risk of CAD, the literature recommends exercise (Svendsen et al. 1993; Eaton, LaPance, Garber, Assaf, Lasater & Carleton, 1995). Aerobic exercise is advised to minimize CAD risk at least 2 to 3 times per week. Noting the average frequency of exercise among women in this study, (Table 5) these subjects met or exceed that recommended.

Perceived Risk of Osteoporosis and Frequency of Exercise

Similarly, there was no relationship between perceived risk of fracture due to osteoporosis and frequency of exercise. There is less variability in the frequency distribution of perceived risk osteoporosis than noted with perceived risk of CAD. The most frequently reported value, or mode was 1, (n = 30), which corresponds to a perceived risk of 10% or less likely to sustain a fracture due to osteoporosis (Table 3). Evidently the majority of subjects in this sample did not perceive themselves as a high risk for fracture due to osteoporosis. Notably the women in the study sample exercised 2 to 3 times or more per week. This amount of exercise meets or exceeds that

recommended in the literature. Dalsky (1987), Wark (1993), and Recker (1993), advocate exercise to reduce the risk of osteoporosis. Weight-bearing exercise performed three times a week is necessary to lessen the risk of this disease. As shown in table 5, the women in this study were highly motivated to exercise..

The finding that most subjects underestimated the risk for fracture is not consistent with findings in the literature. After menopause, osteoporosis is a major threat to women's health. As estrogen decreases with menopause, osteoporosis begins to affect the bones by lessening the bone mass (Bond, 1991; Gambert et al. 1995; Lindsay et al. 1995; Sombert & Gomez. 1992). Fractures occur especially in the hip and vertebral column (Larson, 1984; Wark, 1993). These types of fracture increase health care costs as well as deprive their victims of independence (Wark, 1993).

Noting the sample's underestimation of perception of risk of CAD and likelihood to sustain a fracture from osteoporosis compared with actual risk identified in the literature, raises three questions. Why is there a wide range of variability in perception of risk of CAD? Why is there, to a lesser degree, variability in perception of risk of fracture due to osteoporosis? Lastly, why did the majority rate themselves as less than 50% at risk for CAD and fracture from osteoporosis? The answer to these questions is beyond the scope of this investigation. However, one could speculate that since the majority of the sample were under 50 years of age, they were not experiencing menopause. Another reason may be that fact that the group was highly motivated to exercise and through exercise they were reducing their risk for these diseases.

Perceived risk and the Health Belief Model

Although the women in this study did underestimate their perceived risk for CAD and fracture due to osteoporosis, compared with actual risk, they were highly motivated to exercise. If one considers only these findings, this study did not add support to the HBM. However, all concepts of the model were not considered (i.e., modifying factors, cues to action). One can assume other factors were more influential on exercise behavior of this sample than that of perception of risk. Langlie (1977), in applying concepts of the HBM, studied a group of adults perceived vulnerability in relation to personal health behaviors. She noted that low, rather than high levels of perceived vulnerability, were associated with appropriate personal health behaviors. Langlie reasoned that this inverse relationship may have been due to the fact that participants in her study were already performing personal health behaviors.

Other concepts to consider in using the HBM include perceived severity, modifying factors, (i.e., age, race, knowledge or prior contact to disease), cues to actions, (i.e., media exposure, illness of family or friend), and perceived benefits and barriers to preventive health behaviors. These concepts were not examined in the parent study. In considering the study by Langlie (1977), the present study also presents an inverse relationship to perceived risk and personal health behavior, as the subjects rated themselves at lower risk but were exercising at least 2 to 3 times per week.

Implications for Advanced Nursing Practice and Primary Care

As increasing numbers of women reach the menopause, it is important that the APN is prepared to offer comprehensive health care. Promoting health and wellness,

while preventing disease are primary goals for the APN. The results of this study provide information to help the APN attain these goals.

The findings in this study reveal an underestimate of perceived risk of CAD and fracture due to osteoporosis compared with actual risk of identified in the literature. As a clinician, the APN has the ability to assess the clients actual health risk as well as perceived risks. Developing a risk assessment for the menopausal women would be advantageous in providing quality health care.

As an educator, the APN helps women by teaching facts about menopause, clearing any misunderstanding of this natural process. The APN aids the menopausal client identify factors that can be modified. Through this, the APN can promote healthy behaviors and encourage life style changes that need to be undertaken. Also as an educator, the APN has the responsibility to inform all female clients regardless of age, about risks related to menopause.

As a client advocate and counselor, the APN helps the client in mutually constructing a plan of care that is tailored to individual needs. The APN can identify motivating factors to encourage the client to maintain the plan of care.

As a consultant, the APN can educate others in the community and health care field on the risks of menopause, as well as the why and how of risk prevention. The APN can share her/his experience by developing workshops and writing articles on the subject of menopause.

Of equal importance is the APN's' role of research. He/she is in an ideal position to conduct research related to risk perception and healthy behaviors (exercise). This

would obviously lend support to existing literature, the theoretical framework, and standards of practice.

Another finding in this study is the lack of studies of women with CAD. This fact should be an impetus for the APN to educate clients about risks for CAD in relationship to menopause. It should also encourage the APN to participate in research thereby adding quality information to the present body of knowledge. Continued research in this area would not only advance nursing practice but also enhance positive outcomes for all women.

Limitations Due to Secondary Analysis

Since the focus of the parent study was "decision making" and not perceived risk of CAD and osteoporosis in relation to exercise, the findings of the present study are limited. The study utilized a convenient, or non-probability sampling method. The resulting sample was fairly homogeneous which is often the case with such sampling techniques. The sociodemographic characteristics of the subjects in the sample were very similar. Most were Caucasian, middle to upper-middle class, with a college education.

These characteristics could be considered unique and, therefore only generalizable to a similar population and not to the general public. One could ask whether women from a lower socio-economic group, with lesser education and a different ethnic background would have responded similarly to the questions. None-the-less, findings from this study will generate other questions and ideas for further research.

Another limiting factor is in secondary analysis itself. The original (parent) study focused on decision making and not perceived risk and the frequency of exercise. Therefore, data collection was limited.

The tool used to measure perceived risk only asked one question. Using additional questions related to perception of risk would have proved useful and may have produced critical data for interpretation of the findings. These items may have included an assessment of personal risk, assessment of known and unknown risks or hazards, and an assessment of controllable and uncontrollable risks. It may also have been helpful to assess the subjects value of health and their ability to control their health.

Recommendation for Future Research

This study was designed to describe information about perceived risk and exercise frequency. This investigation is the first level of inquiry on which further research is developed.

Foremost, further study is needed about women and Coronary Heart Disease. Quality articles reviewing or studying this matter are notable few. When these findings are compared with research done on osteoporosis, it is clear than much work needs to be done.

Further study of perceived risk and personal behavior (exercise) is recommended. To date, not many studies have been done that are applicable to women, especially menopausal women. As health care professionals focus on patient outcomes, the identification and prevention of risk will become all important.

A study designed to examine what women perceive as health risks, and why or why not they choose to do so would be beneficial. A study of this nature may provide insight into the understanding of risk perception. Another study may look at what information is provided to women by health care providers at the time of menopause. This study may reveal what information is needed by this population.

Studies that examine personal health behaviors and how the relate to the HBM would add support to this useful framework for understanding client behavior. Such studies may provide insight into motivating factors which may affect health behaviors.

These studies would produce data that is necessary in providing information affecting standards of care, and education of clients and practitioners. Finally, further study will benefit the patient by improving the quality of care that is delivered and its outcome. It will also advance the practice of health promotion and illness prevention which is the APN's future.

APPENDIX A

Research Team

APPENDIX A

Research Team

Marilyn Rothert, R.N., PhD., F.A.A.N. College of Nursing	Principal Investigator
Geri Talarczyk, R.N., EdD. College of Nursing	Co-investigator
Georgia Padonu, R.N., Dr.PH. College of Nursing	Co-investigator
David Rovner, M.D. College of Human Medicine	Co-investigator
Margaret Holmes-Rovner, PhD. College of Medicine	Co-investigator
Neal Schmitt, PhD. College of Social Science	Co-investigator
Jill Kroll, PhD. Research Associate	Co-investigator

APPENDIX B

Perceived Risk Instrument

Check your answer sheet. You should now be filling in row number 26

26. On a scale of less than 1% to 100%, how likely DO YOU THINK YOU are to get menopausal symptoms bothersome enough to seek medical attention?

1 = 10% or less	5 = 41% - 50%	8 = 71% - 80%
2 = 11% - 20%	6 = 51% - 60%	9 = 81% - 90%
3 = 21% - 30%	7 = 61% - 70%	10 = 91% - 100%
4 = 31% - 40%		

27. On a scale of less than 1% to 100%, how likely DO YOU THINK YOU are to get a fracture due to osteoporosis?

1 = 10% or less	5 = 41% - 50%	8 = 71% - 80%
2 = 11% - 20%	6 = 51% - 60%	9 = 81% - 90%
3 = 21% - 30%	7 = 61% - 70%	10 = 91% - 100%
4 = 31% - 40%		

28. On a scale of less than 1% to 100%, how likely DO YOU THINK YOU are to get heart disease?

1 = 10% or less	5 = 41% - 50%	8 = 71% - 80%
2 = 11% - 20%	6 = 51% - 60%	9 = 81% - 90%
3 = 21% - 30%	7 = 61% - 70%	10 = 91% - 100%
4 = 31% - 40%		

29. On a scale of less than 1% to 100%, how likely DO YOU THINK YOU are to get cancer of the uterus?

1 = 10% or less	5 = 41% - 50%	8 = 71% - 80%
2 = 11% - 20%	6 = 51% - 60%	9 = 81% - 90%
3 = 21% - 30%	7 = 61% - 70%	10 = 91% - 100%
4 = 31% - 40%		

30. On a scale of less than 1% to 100%, how likely DO YOU THINK YOU are to get side effects from hormone replacement therapy?

1 = 10% or less	5 = 41% - 50%	8 = 71% - 80%
2 = 11% - 20%	6 = 51% - 60%	9 = 81% - 90%
3 = 21% - 30%	7 = 61% - 70%	10 = 91% - 100%
4 = 31% - 40%		

APPENDIX C

Calendar Instrument

ACTIVITY RECORD CALENDAR

January 1993

ID#_____
Month 0 1 2 3 4 5
6 7 8 9 10 11 12

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
C1 H1 E3	C1 H2	C1 E3 H2	C1 H2	C1 H2 E3	C1 H2 1	C1 E3 H2 2
C1 H2 3	C1 H2 E3 4	C1 H2 5	C1 H2 6	C1 H2 7	C1 H2 8	C1 H2 E3 9
C1 H2 10	C1 H2 E3 11	C1 H2 12	C1 H2 E3 13	C1 H2 14	C1 H2 15	C1 H2 16
C1 H3 17	C1 H3 E3 18	C1 H3 19	C1 E3 20	C1 H3 E3 21	C1 H3 22	C1 H3 E3 23
24 C1 H3 / C1 H3 31	C1 H3 E3 25	C1 H3 26	C1 E3 27	C1 H3 E3 28	C1 H3 E3 29	C1 H3 30

Instructions

Activity	Symbol
Exercise	E_1
Calcium	C_1
Hormone Replacement Therapy... Appt. to discuss HRT	H_1
Premarin and Cyclic Progesterone	H_2
Premarin / Provera	H_3
Aerobic Exercise Video	E_3

1. Use this calendar to record the activities you planned on your personal plan form. If you chose activities under the categories exercise, calcium intake or HRT, the symbol for the activity is listed already.

2. If your Personal Plan lists an activity not on the key to the left, write the activity planned and assign a symbol for it (do not use E, C or H).

3. Each day of the month that you perform an activity as planned, place the appropriate symbol in the box for that day.

4. If you change your planned activity during the month, indicate the change on you plan form and write in the new activity on one of the blank lines at the left. If the new activity replaces another activity in the same category, assign the same letter but use a different subscript number. For example, if you changed from aerobic walking [E1] to swimming, you would assign the symbol E2 for swimming.

REMEMBER: RECORD YOUR ACTIVITIES EVERY DAY!

APPENDIX D

UCRHIS APPROVAL

MICHIGAN STATE
UNIVERSITY

November 5, 1996

TO: Carol L. Hill
1150 Bennington Drive
Lansing, MI 48917

RE: IRB#: 96-705
TITLE: THE RELATIONSHIP OF PERCEIVED RISK OF CORONARY HEART DISEASE AND OSTEOPOROSIS TO FREQUENCY OF EXERCISE IN MENOPAUSAL WOMEN
REVISION REQUESTED: N/A
CATEGORY: 1-E
APPROVAL DATE: 11/05/96

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/ CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Marilyn Rothert

OFFICE OF
RESEARCH
AND
GRADUATE
STUDIES

University Committee on Research Involving Human Subjects (UCRIHS)
Michigan State University
232 Administration Building
East Lansing, Michigan
48824-1046
517/355-2180
FAX: 517/432-1171

LIST OF REFERENCES

LIST OF REFERENCES

Allen, S.H. (1993). Primary osteoporosis. Postgraduate Medicine, 93 (8), 43-55.

Ali, N.S. & Bennett, S. J. (1992). Post menopausal women-factors in osteoporosis preventive behaviors. Journal of Gerontological Nursing, 18 (12), 23-32.

Amsterdam, E., Eliot, R.S., & Stampfer, M.J. (1993). Women and heart disease. Patient Care, 27 (5), 71-73.

Becker, M.H., Haefner, D.P., & Karl, S.V. (1977). Selected psychosocial models and correlates of individual health-related behaviors. Medical Care, 15, 27-46.

Bellantoni, M.F. (1996). Osteoporosis preventions and treatment. American Family Physician, 54 (3), 986-989.

Bloomfield, S.A., Williams, N.S., Lamb, D.R., & Jackson R. (1993). Non-weight bearing exercise may increase lumbar spine bone mineral density in healthy post-menopausal women. American Journal of Physical and Medical Rehabilitation, 72 (4), 204-209.

Bond, K. (1991). Osteoporosis. NAACOG'S Clinical Issues, 2 (4), 498-507.

Corrao, J.M., Becker, R.C., Ockene, I.S., & Hamilton, G.A. (1990). Coronary heart disease risk factors in women. Cardiology, 77 (suppl. 2), 8-24.

Dalsky, G.P. (1987). Exercise: its effect on bone and mineral content. Clinical Obstetrics and Gynecology, 30 (4), 820-830.

Das, B.N. & Banka V.S. (1992). Coronary artery disease in women. Postgraduate Medicine, 91 197-203.

Drinkwater, B.L., Grimston, S.K., Raab-Cullen, D.M., & Snow-Harte, C.M. (1995). The American College of Sports Medicine position stand on osteoporosis and exercise. Medicine and Science in Sports and Exercise, 27 (4), I-vii.

Eaton, C.B., LaPance, K.L., Garber, C.A., Assaf, A.R., Lasater, T.M., & Carleton, R.A. (1995). Sedentary lifestyle and risk of coronary heart disease in women. Medicine and Science in Sports and Exercise 27 (11), 1535-1539.

Gambert, S.R., Schultz, B.M., & Hamdy, R.C. (1995). Osteoporosis, prevention and treatment. Endocrinology Metabolism Clinics of North America, 24 (2), 317-371.

Gregory, C.A. (1982). Possible influence of physical activity on musculoskeletal symptoms of menopausal women. Journal of Obstetrics and Gynecological Nursing, March-April, 103-107.

Gregory, T. (1993). What's unique about CHD in women? Patient Care, November, 21-50.

Harris, S.S., Caspersen, C., DeFriese, G.H., & Estes, H.J. (1989). Physical activity counseling for healthy adults as a primary preventive intervention in the clinical setting. The Journal of the American Medical Association, 261 (24), 3590-3598.

Heath, G.W., & Smith, J.D. (1994). Physical activity patterns among adults in Georgia: results from the 1990 behavior risk factor surveillance system. The Southern Medical Journal, 187 (4), 435-438.

Jackson, G. (1994). Coronary artery disease in women. The British Medical Journal, 309 (6954), 555-556.

Janz, N.K., & Becker, M.H. (1984). The health belief model: a decade later. Health Education Quarterly, 11 (1), 1-49.

Kanmel, W.B. & Wilson, P.W. (1995). Risk factors that attenuate the female coronary disease advantage. Archives of Internal Medicine, 155 January, 57-61.

Langlie, J.K. (1977). Social networks, health beliefs and personal health behavior. Journal of Health and Social Behavior, 18: 244-280.

Larson, K.H., & Shannon, S.C. (1984). Decreasing the incidence of osteoporosis related injuries through diet and exercise. Public Health Reports, 99 (6), 609-613.

Lindsay, R. (1993). Prevention and treatment of osteoporosis. The Lancet, 341 (8848), 801-803.

Lindsay, R., Marcus, R., & Recker, R. (1996). Osteoporosis: what's new in prevention and treatment. Patient Care, 30 (14), 24-38.

Mullet, E., Duquesnoy, C., Raiff, P., Fahrasmane, R., & Namur, E. (1993). The evaluative factor of risk perception. Journal of Applied Social Psychology, 23 (19), 1594-1605.

Ost, D.H. (1995). Perceived risk. The American Biology Teacher, 57 (4), 235-237.

Pender, N.J. (1987). Health-protecting (preventive) behavior. Health Promotion in Nursing Practice (pp 37-56). Norwalk: Appleton & Lange.

Preisinger, E., Alacamlioglu, Y., Pils, K., Saradeth, T., & Schneider, B. (1995). Therapeutic exercise in the prevention of bone loss. A controlled trial with women after menopause. American Journal of Physical Medicine and Rehabilitation, 74 (2), 120-123.

Prince, R.L., Smith, M., Dick, I.M., Price, R.I., Webb, R.G., Henderson, N.K., & Harris, M. (1991). Prevention of postmenopausal osteoporosis: a comparative study of exercise, calcium supplementation and hormone replacement therapy. The Journal of The American Medical Association, 325 (17), 1189-1195.

Recker, R.R. (1993). Current therapy for osteoporosis. Journal of Clinical Endocrinology and Metabolism, 76 (12), 14-16.

Rich-Edwards, J.W., Manson, J.E., Hennekens, C.H., & Burning, J.E. (1995). The primary prevention of coronary heart disease in women. The New England Journal of Medicine, 1332 (26), 1758-1764.

Robertson, D. & Keller, C. (1992). Relationships among health beliefs, self efficacy and exercise adherence in patients with coronary artery disease. Cardiac Care and Recovery, 21 (1), 56-63.

Rosenberg, L. (1993). Hormone replacement therapy: the need for reconsideration. American Journal of Public Health, 83 (12), 1620-1631.

Rosenstock, I.M. (1990). The health belief model: explaining health behavior through expectancies. In K. Glanz, F.M. Lewis, B. Rimer (Eds.), Health Behavior and Health Education (pp 39-60). San Francisco: Josey-Bass.

Rothert, M. (1990). Women's judgements of estrogen replacement therapy. (Research Grant No. NR1245-04A2). Washington, D.C.: U.S. Department of Health and Human Services, Nations Center for Nursing Research.

Rothert, M.L., Holmes-Rovner, M., Rovner, D., Kroll, J., Breer, L., Talarczyk, G., Schmitt, N., Padonu, G., & Wills, C. (in press). An educational intervention as decision support for menopausal women. Research in Nursing and Health.

Skolnik, A. (1990). Medical news and perspectives. The Journal of The American Medical Association, 263 (13), 1751-1752.

Sombert, J.C. & Gomez, H.C. (1992). Clinical therapeutic conference. The Journal of Clinical Pharmacology, 32 774-778.

Stasson, M. & Fishbein, M. (1990). The relation between perceived risk and preventive action: A within-subject analysis of perceived driving risk and intentions to wear seatbelts. Journal of Applied Social Psychology, 20 (19), 1541-1557.

Svendsen, O., Hassager, C., & Christiansen, C. (1993). Effect of an energy-restrictive diet, with or without exercise of lean tissue mass, resting metabolic rate, cardiovascular risk factors and bone in overweight postmenopausal women. The American Journal of Medicine, 95 131-134.

Wark, J.D. (1993). Osteoporosis: Pathogenesis, diagnosis, prevention and management. Balliere's Clinical endocrinology and Metabolism, 7 (1), 151-181.

Wilbur, J., Holm, K., & Dan, A. (1992). The relationship of energy expenditure to physical and psychological symptoms in women at midlife. Nursing Outlook, 140 (6), 269-276.

Witte, K., Stokols, D., Ituarte, P., & Schneider, M. (1993). Testing the health belief model in a field study to promote bicycle safety helmets. Communication Research, 20 (4), 564-586.

Wolmam, R.L. (1994). Osteoporosis and exercise. The British Medical Journal, 309 (6951), 400-403.

Young, N., Formica, C., Azmukler, G., & Seeman, E. (1994). Bone density at weight bearing and non weight bearing sites in ballet dancers: the effects of exercise, hypogonadism and body weight. The Journal of Clinical Endocrinology and Metabolism, 78 (2), 449-453.