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Relationships of Osteoporosis Health Beliefs to Practiced Exercise Behaviors of Women

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RELATIONSHIP OF OSTEOPOROSIS HEALTH BELIEFS TO PRACTICED EXERCISE BEHAVIOR OF WOMEN

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ABSTRACT

RELATIONSHIP OF OSTEOPOROSIS HEALTH BELIEFS TO PRACTICED EXERCISE BEHAVIOR OF WOMEN

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The purpose of this study was to examine the relationship of health beliefs contained in the Health Belief Model to practiced exercise behavior of women. A descriptive correlation design was used with a convenience sample of 201 women. The revised version of the Osteoporosis Health Belief Exercise Scale developed by Kim, Horan, Gendler and Patel (1991b) was used to measure health beliefs related to osteoporosis. The ARIC/Baecke questionnaire of Habitual Physical Activity was used to measure life style physical activity. Health motivation and exercise benefits were found to be positively correlated to exercise behavior. However, susceptibility and exercise barriers were inversely correlated to exercise behavior. Perceived exercise barriers and health motivation explained the greatest variance in exercise behaviors. The Health Belief Model can be used as a guide by nurses to promote health behaviors consistent with research findings.

Dedication

To my mother, Janet Honeywell, who has taught me the value of education, and has been a steadfast supporter and motivator.

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Table of Contents

List of Tables

List of Appendices

CHAPTER ONE

INTRODUCTION AND PURPOSE

Introduction

Osteoporosis is a major public health problem affecting as many as 15 to 20 million individuals in the United States (National Institutes of Health [NIH], 1984). While both sexes are affected, osteoporosis is more prevalent in women. By age 65, approximately 25 percent of all white women have had one or more fractures. Seventy percent of these fractures are caused by osteoporosis (Crilly, Horsman, Marshall, & Nordin, 1978). Over 1.3 million fractures, including 247,000 fractures of the hip, occur in the United States every year (Public Health Report [PHR], 1987). Hip fracture patients have a high mortality rate because of complications that result from the fractures (Resnick & Greenspan, 1989). Of the patients who experience hip fractures, 20 percent die within the first year, 20 percent become totally dependent, 25 percent partially dependent and only 30 to 35 percent recover independence after that first year (Cummings, Kelsey, Nevitt, & Nordin, 1986).

The cost of osteoporosis in the United States is estimated to be $10 billion dollars a year (Special Committee of Aging [SCA], 1989). While osteoporosis is indeed costly to society, the human costs must also be

measured in suffering and in loss of an older person's independence. More attention to prevention efforts is needed to sustain the quality of life and well-being of individuals in later life.

Osteoporosis is defined as a decrease in skeletal mass and density. Bone is living tissue that undergoes active remodeling throughout life with new bone continually being formed and old bone reabsorbed. The rate of formation exceeds reabsorption until peak bone mass is achieved at about 35 years of age. Osteoporosis is caused by a decreased rate of bone formation and an increased rate of bone reabsorption, or a combination of both factors (Coralli, Raisz, & Wood, 1986).

The skeleton consists of two types of bone, trabecular bone which has an open meshwork structure and cortical bone which has a compact structure. There are two distinct types of osteoporosis. Type 1 occurs during the first few years after natural or surgically induced menopause when women experience a brief period of accelerated bone loss affecting mainly the trabecular bone. This occurs because of the postmenopausal deficiency of estrogen, a hormone that helps the body convert calcium to bone. From five to ten percent of the female population suffers from Type 1 osteoporosis (Public Health Report, 1987). Clinical manifestations include vertebral crush fractures and Colle's fractures

of the wrist (Persky & Alexander, 1989). Type 2 osteoporosis occurs in both men and women over 75 years old (Special Committee on Aging, vol. 2, 1989) and is thought to be a consequence of age-related changes. It afflicts ninety percent of the women and twenty five percent of the men in this age group. Both the cortical and trabecular bone are affected and result primarily in fractures of the hip and wedge deformities of the spine (Persky & Alexander, 1989). A diet adequate in calcium and regular exercise are prevention measures effective for both types of osteoporosis. However, estrogen replacement therapy is the most important factor in the prevention of Type 1 osteoporosis (Horsman, Gallagher, Simpson, & Nordin, 1977).

Osteoporosis is a complex, multifaceted disorder. Inadequate exercise is only one of a number of factors that contribute to this disorder. Other important factors are age, sex, race, family history, menopause and calcium intake (Aloia et al., 1985; Spencer, 1982). Calcium intake and exercise habits are two risk factors that can be controlled by the individual. A change in dietary habits and exercise could ultimately prevent or at least retard, the rate of bone loss. Researchers generally agree that the pathological effects of osteoporosis can be lessened by regular exercise and by maintaining an adequate dietary calcium intake throughout

life (Coralli, Raisz, & Wood, 1986; Grisso, Baum, & Turner, 1990; Nordin, 1983; White, 1986).

Exercise has several benefits for older individuals. Bone mineral content is higher in the elderly who exercise at least 20 minutes, three days a week (Smith, Reddan, & Smith, 1981). Exercise is also beneficial in reducing falls in the elderly. Such benefits result from increased muscle strength, postural stability and agility. As they age, however, people tend to be less active and often do not incorporate regular exercise into their life style.

The elderly group is the fastest growing segment of our population. They are at the greatest risk for developing osteoporosis. By the year 2000, the number of people over 65 years of age is expected to represent 13 percent of the population and this number may climb to 21.8 percent by 2030 (American Association of Retired Persons [AARP], 1989). Thus, the aging of the American population may result in an increase of the problem of osteoporosis.

Research indications are that careful assessment of health beliefs may assist choice of intervention in health teaching to foster self-care practices related to treatment of chronic illness (Redecker, 1988). Because osteoporosis is now recognized as a condition that can be prevented or delayed in its development, assessment

of health beliefs and teaching preventive behaviors can be valuable in preventing this health problem.

Nurses are in a position to fill an important role in educating the public about health behaviors that can prevent or slow down the process of osteoporosis. While assessing a client's health knowledge the nurse has the potential to influence the client's awareness of the relationship between health behaviors and the risk of developing osteoporosis. Therefore, the nurse has an opportunity to increase longevity and especially improve the health of women through teaching about calcium intake and regular exercise activities.

Changes in dietary and exercise habits are difficult to initiate and maintain. Knowledge gained from health education does not always translate into subsequent health behaviors. This suggests that more detailed knowledge by the mediators of these behavior changes is needed. Therefore, in order to gain a deeper understanding of health behaviors aimed at osteoporosis prevention, it is important for nurses to consider the influence of psychological variables that can effect behavior change. Identification of such variables could enhance the differentiation of health promotion strategies.

Since its introduction, the Health Belief Model (HBM) developed by Hochbaum, Kegels, Leventhal and Rosenstock (1950) has been used in a variety of studies

of health behavior including disease detection and prevention (Janz & Becker, 1984; Kim, Horan, Gendler, & Patel, 1991a). The HBM provides the conceptual framework for this study. The impact of the HBM on participation in disease detection has been studied by a variety of investigators (Becker, Kabeck, Rosenstock, & Ruth, 1975; Brailey, 1986; Champion, 1984, 1985, 1987, 1988; Hallal, 1982; Rutledge, 1987; Trotta, 1980). The results were varied, but suggested that certain health beliefs are useful in predicting specific behaviors. Only one study has been found that utilizes the HBM to look at osteoporosis preventive behaviors (Kim et al., 1991a).

Purpose

The purpose of this study is to examine the relationship of osteoporosis health beliefs to practiced exercise behavior of women. Identification of relationships among these variables could add to existing nursing knowledge concerning behavior change in individuals that are at high risk for developing osteoporosis. This knowledge could be used by nurses in developing creative interventions that can effectively modify complex lifestyle practices.

This study will build on previous studies that utilized the HBM, specifically the work of Kim et al. (1991a), who utilized the HBM framework and developed the Osteoporosis Health Belief Scale (OHBS). In

addition, it is expected that results from the study will help refine the OHBS.

CHAPTER TWO

REVIEW OF LITERATURE, CONCEPTUAL FRAMEWORK AND HYPOTHESES

Review of the Literature

Research, utilizing the Health Belief Model (HBM), is extensive. It's use with the elderly, however, is limited and only one study was found that utilized the HBM to examine osteoporosis prevention behaviors (Kim et al., 1991a). The literature review for this study includes the application of the HBM in previous studies of preventive health behaviors and early disease detection. The review will also include prior research of the relationship of exercise behavior to osteoporosis.

Health Belief Model Related Research

The HBM has generated prolific research regarding health behaviors related to disease detection (Brailey, 1986; Burack & Liang, 1989; Champion, 1987; Hallal, 1982; Kegeles, 1963; Macrae, Hill, St. John, Ambikapathy, & Garner, 1984; Stillman, 1977; Trotta, 1980). The HBM was also applied to studies of disease prevention behaviors in asymptomatic subjects (Aho, 1974; Allard, 1989; Becker, 1985; Kim et al., 1991a; Knight & Hay, 1989; Maiman, Becker, Kirscht, Haefner, & Drachman, 1977; Tirrell & Hart, 1980). The results were varied, but suggested that certain HBM variables are useful in predicting specific behaviors.

Janz and Becker (1984) reviewed 29 HBM related

studies, published during the period 1974-1984 that examined preventive health behaviors and disease detection behaviors. The Health Belief Model constructs used to examine these health behaviors were perceived susceptibility, seriousness, benefits and barriers. Most of the research on the health behaviors supported an association between health beliefs and behaviors. Barriers were found to account for the largest percent of variance in the health behaviors. This was followed closely by perceived susceptibility, benefits and seriousness, in that order. Janz and Becker (1984) concluded that substantial empirical evidence supports the importance of the Health Belief Model dimensions in explaining and predicting a person's health behaviors. However it was noted that, for the most part, studies using the HBM as the conceptual framework have lacked consistent testing and measurement of the variables being studied. Due to the lack of consistency in measurements of the HBM variables, interpretation of the different studies and comparison of findings is difficult. Refinement and standardization of tools was recommended for future studies directed toward the measurement of condition specific beliefs.

Champion (1984), concerned with the inconsistency in application of the model and the lack of valid and reliable instruments for measuring the constructs,

developed and tested an instrument designed specifically for the study of the HBM variables as they related to breast self-examination (BSE). In addition to the four original variables, health motivation was included. Health motivation was first introduced for inclusion in the HBM by Becker (1974). The five variables accounted for a statistically significant amount of the variance (26 percent) in BSE practice. The barriers construct accounted for the largest portion of variance (23 percent) in BSE practice followed by health motivation with 2 percent variance. Women, perceiving multiple barriers, tended to examine their breasts less frequently. Champion's subsequent research of 1985 and 1986 also supported an association between the HBM constructs and BSE practice. A more recent study added knowledge as a variable and revealed that, along with knowledge, barriers and susceptibility were associated with the frequency of BSE (Champion, 1987).

Research regarding the influence of the HBM variables in disease prevention behavior also supports the conceptualization of the HBM. Research, utilizing the HBM in disease prevention, has also been extensive. An example is Allard's (1989) study which adapted Champion's (1984) scale to study disease prevention practices resulting from beliefs about AIDS. The HBM was found to be a good theoretical approach to obtain data

on AIDS related behaviors. The most important modifiable determinants to AIDS prevention behavior were perceived severity of AIDS and perceived susceptibility to it. Using the HBM was also useful for generating knowledge for developing health education programs to promote behavior change to reduce risk and to help contain the AIDS epidemic. Adapting Champion's (1984) tool to a specific health problem makes comparison of findings meaningful (Becker & Joseph, 1988).

Kim et al. (1991a) developed an Osteoporosis Health Belief Scale (OHBS) based on Champion's scale (1984) to measure health beliefs related to osteoporosis. The study is a pioneer study both in application of the HBM to the elderly population and developing an instrument to assess beliefs related to health behaviors specific to osteoporosis prevention, for examples, exercise and calcium intake. In this study, results of discriminant function analysis showed that barriers and health motivation were significant constructs in explaining both calcium intake and exercise behaviors (Kim et al., 1991a). The OHBS is in its initial stages of development. Further use and revisions of the scale were suggested to gather additional information about health beliefs, to facilitate the development of individual programs, to decrease specific barriers and promote health motivation for those at risk of developing osteoporosis.

Exercise Related Research

A review of the osteoporosis related literature indicates that involutional bone loss is a multifaceted disorder. Bone health can be thought of as a chain whose links collectively determine its overall strength. Exercise, as well as gonadal hormones, calcium intake, age, sex and genetics are important links in the chain. Two of these links, calcium intake and exercise, are influenced by behavioral factors. This review will focus on the evidence relating to one of the links in the chain of bone health, that is, exercise behavior.

Regular exercise has been shown to stimulate bone formation and retard bone mass reduction (Aloia, Cohn, Ostuni, Cane, & Ellis, 1978; Huddleston, Rockwell, Kulund, & Harrison, 1980; Krolner, Toft, Nielsen, & Tondevold, 1983). Aloia et al. (1978) found a 2.6 percent increase in total body calcium (a measure of bone mass) in women over 45 years of age who exercised regularly for one year, compared to a decrease of 2.4 percent in a nonexercising control group. Smith and Reddan (1976) reported that elderly women, average age 82 years, who were placed in a moderate exercise program for 36 months demonstrated a 4.2 percent increase in bone mineral content of the radius. Those in the control group showed an expected bone mineral loss of 2.5 percent. The rate of mineral loss in both of these

studies was decreased in response to a regular exercise program. The data support the facts that exercise can modify bone mineral loss and moderate physical activity may increase bone mass.

Krolne et al. (1983) found that improvement in lumbar bone mass resulted from a physical training program in women between 50 and 73 years old. The group exercised 1 hour, twice weekly, for eight months. The lumbar spine bone mineral content of the exercise group increased by 3 to 5 percent where as that of the control group decreased by 2 to 7 percent. A review of the data indicates that physical exercise can inhibit or reverse involutional bone loss from the lumbar vertebrae in normal women. Data evaluation leads to the conclusion that physical exercise may prevent spinal osteoporosis, although the group studied is too small to draw conclusions without further research.

Huddleston et al. (1980) found that increasing the amount of activity above specific levels did not enhance the bone mineral content (BMC) of the radius of lifetime tennis players. Comparing the BMC between the playing arm and the nonplaying arm of the players the mean was 4 to 7 percent higher in the radius of the playing arm.

Dalsky et al. (1988) studied the effect of weight bearing exercise training on lumbar bone mineral content. The sample consisted of thirty five post-menopausal women

between 55 and 70 years. The sample was divided into an experimental group and a control group. The experimental group bone mineral content increased 5.2 percent above baseline after 9 months of exercising 50 to 60 minutes three times a week. After 22 months of regular exercise the average BMC of the experimental group increased 6.9 percent. The control group had a BMC 1.0 percent below the baseline at the start of the program. After the same period, it had no significant change. A BMC was done on the experimental group 13 months after the regular exercise program was discontinued. The bone mass returned to 1.1 percent above baseline. The results of this study lead to the conclusion that weight bearing exercises can lead to significant increases in bone mineral content which would be maintained only by continued training in older, post-menopausal women. When weight bearing exercise stopped, the bone mass reverted to baseline levels. Further studies are needed to determine the threshhold level of exercise that will produce significant increases in bone mass.

Stillman, Lohman, Slaughter, and Massey, (1986) studied a group of women, ages 30 to 85, to investigate the relationship of bone mineral content and levels of physical activity in pre- and post-menopausal women. The participants were divided into low activity, moderate activity or high activity groups. No difference was found

in the bone mineral content between the moderate and low activity groups. The high activity group had a higher bone mineral content. Results of this study suggest that the density of bone is positively related to physical activity with significantly higher bone mineral content in women who maintain an active life style.

Osteoporosis is a major public health problem affecting many individuals in the United States. Researchers, based on current understanding of osteoporosis, generally agree that regular exercise can lessen the pathological effects of osteoporosis by stimulating bone formation and retarding bone mass reduction. This study will build on the study of Kim et al. (1991a), using the Health Belief Model (HBM). An assessment will be attempted to determine if behavior undertaken by participants is reflective of perceived susceptibility to a health threat, perceived seriousness of the threat, perceived benefits from the proposed action, perceived barriers to taking action and general health motivation to maintain or improve health.

The areas discussed in this review of literature were, 1) The HBM regarding behaviors for detection of disease and preventive behaviors in asymptomatic subjects and, 2) The effect of exercise in stimulating bone formation and retarding bone mass reduction. The literature review shows a positive correlation between

regular exercise and bone health. Only one study has been found that utilizes the HBM and osteoporosis preventive behaviors (Kim et al., 1991a).

The purpose of this study is to examine the relationship of the Health Belief Model variables to practiced exercise behavior. This study built on the previous work of Kim et al. (1991a) who utilized the HBM framework to develop the OHBS.

Conceptual Framework

Rates of adherence to recommended medical treatment plans and healthy lifestyle practices tend to be quite low (Gerber & Nehemkis, 1986). Behavior is the result of a complex interaction of interpersonal, familial, cultural and situational factors. More difficult types of behaviors involve an even more complex interplay of a myriad of behavioral determinants. Several models and theories have been developed to explain and predict behavior. The models encompass various combinations of certain factors that are felt to influence behavior. Models which emphasize congnitive behavior aspects and are grounded in Social Cognitive Theory (SCT) are popular frameworks for examining health behavior. These models focus on knowledge, skills, beliefs, motivation and decision making regarding what action to take, as well as feedback relative to the action taken. Models based on SCT also assume that people are capable of rational

decision making.

The Health Belief Model is based on SCT and provides the conceptual framework for this study. This model is probably the one most widely utilized in health behavior research, and has "...very substantial empirical evidence supporting HBM dimensions as important contributors to the explanation and prediction of individuals' health related behaviors" (Janz & Becker, 1984, p.41). It was originally developed to explain and predict behaviors that related to disease prevention, but has since been utilized with illness and sick role behaviors. The following discussion will include an overview of the HBM, definition of the terms specific to this study and a description of how the HBM relates to this study.

The HBM provides a framework for understanding why people may not accept available opportunities to detect illness early or to follow through with recommended disease prevention practices. It is most applicable to voluntary health related actions that involve an element of uncertainty. Because it is a psychosocial model, it is only applicable to behavior that can be explained by a person's attitudes and beliefs. The HBM encompasses a value expectancy approach which attributes behavior to the value an individual places on an expected outcome of their action and also to the perception by the individual that the specific behavior will result in the expected

outcome.

The hypotheses of the HBM are that health related behavior occurs as a result of the interactive and combined effects of: (a) readiness to comply with recommended actions and (b) modifying and enabling factors (Becker, 1974). The factors that influence readiness to act include those dimensions known as the health beliefs: (a) perception of a threat to health, (b) belief that the health threat will be serious, (c) belief that the action will result in the expected outcome, (d) belief that there are not insurmountable barriers which preclude goal attainment, and (e) motivation to perform a health behavior (see Appendix A). Perception of a threat to health are how susceptible to an illness the individual perceives self to be and how serious an effect the individual believes the illness would have on life.

Although health motivation has always been viewed as a significant dimension of health behavior in the HBM, it was not explictly delineated as a major variable until 1974. Health motivation is characterized as a concern about health, a health consciousness and a high saliency of health in one's value system.

In a meta-analysis of research using the HBM, it was found that multiple HBM dimensions predicted health behaviors significantly more often than did single

predictors (Reinstein, 1986). Thus, the model provides a framework upon which to explore osteoporosis preventive health behaviors. The model includes variables which are not necessarily immutable and which may be amenable to nursing interventions. If significant correlations between the health beliefs of the HBM and exercise behavior are found, then those beliefs that are below a level necessary for appropriate behavior can be identified and nursing interventions tailored to alter beliefs and modify behavior.

The HBM is a model that is limited to explaining and predicting behaviors that are due to attitudes and beliefs (Janz & Becker, 1984, p. 44). Although regular exercise behavior might have a habitual component, as is often the case with regular habits, there are also significant components of attitudes and beliefs. The regularity with which one exercises is largely a function of the health beliefs one holds and subsequent formulation of attitudes about exercise behavior. Exercise behaviors also represent behaviors that are under voluntary control. Thus, they are contingent upon a woman's decision to act or not to act, according to the beliefs and attitudes she holds.

The HBM can be applied to osteoporosis prevention behaviors as indicated by the following examples related to each of the HBM variables. If a woman's responses to

the Osteoporosis Health Belief Scale (OHBS) indicated she perceived herself as susceptible, she would see herself as being vulnerable to contracting osteoporosis. The perception of seriousness is a combination of an emotional arousal created by the thought of osteoporosis and perceptions of the kinds of difficulties osteoporosis would represent to the woman. For example, a woman might perceive that having osteoporosis would result in physical disability, causing an inability to continue to work or function in roles, as a wife or mother. In regard to the benefits variable, if a woman perceived regular exercise was beneficial, she would believe a regular exercise activity would decrease the severity of osteoporosis should she contract the illness. Examples of barriers that might be perceived by a woman with regard to regular exercise activity to prevent osteoporosis include: (a) not feeling strong enough to exercise regularly, (b) having no place to exercise, (c) exercising takes too much time or (d) believing exercise upsets her daily routine. If the OHBS indicated a woman was motivated toward health, she would be more likely to obtain regular exercise and obtain regular medical check-ups.

Definition of Terms

This study will utilize an adapted version of the HBM (see Appendix A).

Health beliefs refers to attitudinal components of health behaviors and collectively includes: susceptibility, seriousness, benefits, barriers and health motivation.

Susceptibility refers to the perceived risks of developing osteoporosis.

Seriousness is concerned with a perceived degree of personal threat related to developing osteoporosis. Threat is defined as perceived harmful consequences of osteoporosis.

Benefit refers to perceptions regarding the effectiveness of osteoporosis prevention behaviors.

Barriers are perceptions of negative components of osteoporosis prevention behaviors which would be undertaken to prevent osteoporosis.

Health motivation relates to a state of concern about general health matters which results in positive health activities and willingness to seek and comply with recommendations that are believed to decrease disease.

Exercise behavior refers to long term patterns of physical activities. In this study, exercise behavior refers to a combination of sport and leisure activities.

Hypotheses

Using the Osteoporosis Health Belief Scale (Kim et

al., 1991b) the following hypotheses will be explored in this study:

1) There will be a positive relationship between the strength of health beliefs related to susceptibility, seriousness, benefits, health motivation and the level of exercise behavior.

2) There will be a negative relationship between the strength of health belief related to barriers and the level of exercise behavior.

In addition to testing the hypothesis, the following research question will be addressed, "Which health beliefs account for the greatest proportion of variance in exercise behavior of women?"

The independent variables identified for this study are health beliefs related to susceptibility, seriousness, benefits, barriers and health motivation. The dependent variable is the level of exercise behavior.

CHAPTER THREE

METHODOLOGY

Research Design

This study was conducted using a descriptive correlation design. The purpose of the study was to examine the relationship of osteoporosis health beliefs to the practiced exercise behavior of women. A correlation design was chosen as a good fit for this study because it has been accepted by researchers as an effective design for investigating complex relationships between attitudes, beliefs and behaviors.

A correlation design offers several advantages: (a) It is an appropiate design for examining psychological variables that are inherently not able to be manipulated, thus are not conducive to an experimental design. (b) It is strong in realism, because the data were collected in a natural setting. Thus, the conclusions from this study have a strong potential for practical application in the clinical/real life setting (Polit & Hungler, 1987). However, the major limitation to the validity of this study is the limited ability of the correlation design to elucidate cause and effect inferences. Another limitation is the generalization of findings from this study due to the use of a self-selected sample. To correct for a self-selected sample, a large sample was used (N = 201). The larger the sample size,

the more representative of the population the study is likely to be (Polit & Hungler, 1987).

Since this study focused on the relationship between osteoporosis prevention behaviors and beliefs consistent with the Health Belief Model, the use of a correlation design was congruent with the purpose of the study and was appropriate for the research problem. A larger sample size is more representative of a population and supports exploring the relationships between beliefs and behavior.

Sample and Setting

A convenience sample of 201 women was selected for this study. Data collection took place in a metropolitan area of western Michigan. The subjects were recruited from senior centers, apartment complexes which housed senior citizens, clients from an outpatient mammography clinic and employees from a university and a public school system. The varied interviewing sites were selected in order to obtain a sample representing a cross section of social, economic and employment groups. The criteria for inclusion in the study were female; at least 35 years of age; oriented to person, place and time; could understand and respond using the English language; and have no prior diagnosis of osteoporosis. The demographic data for subjects' age, education, race and the question of friend or relative having diagnosis

of osteoporosis are presented in Table 1.

Table 1

Frequency and Percent of Demographic Variables

Characteristics	Frequency	Percent
Age:		
35 - 44	58	28.9
45 - 54	45	22.4
55 - 64	39	19.4
65+	59	29.3
Education:		
6 - 12 years	88	43.7
13 - 19 years	90	44.7
20 - 27 years	23	11.4
Race:		
Black	6	3.0
White	194	96.5
Other	1	0.5
Friend/Relative has osteoporosis		
Yes	73	36.3
No	128	63.7

The average age of subjects who volunteered for the study was 56 years. The range of ages was 35 to 95 years. The majority of the subjects had education beyond high school with the average years of education nearly 15 years (14.7). Approximately ninety-seven percent of the subjects were Caucasian. Sixty three percent did not have a friend or relative diagnosed with osteoporosis. The sampling procedure used in this investigation was purposive in nature.

Instruments

This study used the Osteoporosis Health Belief Exercise Scale (Kim et al., 1991b) to measure health beliefs about osteoporosis, and the ARIC/Baecke Questionnaire of Habitual Physical Activity (Baecke, Burema, & Frizters, 1982) to examine long term patterns of physical activity. In addition, each subject completed a general information sheet, supplying demographic data on age, race and education.

Demographic Data Sheet

Eligibility for inclusion in this study was determined using a Demographic Data Sheet (See Appendix B). This included the subject's ethnic background, age, years of school completed, height and weight. The subject was asked if a prior diagnosis of osteoporosis had been made and was assessed for being oriented to

person, place and time. Eligibility requirements were for a woman to be at least 35 years of age, oriented to person, place and time, understand and respond to the English language and have no prior diagnosis of osteoporosis.

Osteoporosis Health Belief Exercise Scale

The Osteoporosis Health Belief Exercise Scale (OHBES) is included in a revised version of the 56 item Osteoporosis Health Belief Scale (OHBS) which was developed by Kim et al. (1991b) (See Appendices C and D). The OHBS was based on Champion's (1985) Health Belief Model instrument related to breast self-examination (BSE). The OHBS consisted of two subscales which addressed nutrition and exercise behaviors, the OHBCS (Osteoporosis Health Belief Calcium Scale) and the OHBES respectively. That is, the OHBES includes only those subscales of the OHBS that address exercise behavior. The OHBCS was not used in this study.

The OHBS consisted of seven subscales: Susceptibility, seriousness, health motivation, benefits of calcium intake, benefits of exercise, barriers of calcium intake and barriers of exercise (See Appendix C). As was discussed earlier, the tool was separated into two scales: the OHBCS and OHBES. Each of the scales share three common subscales measuring susceptibility, seriousness and health motivation. The subscales measuring benefits

and barriers relate only to calcium intake and exercise behaviors. The OHBCS and OHBES may be administered separately, using five subscales each.

To date, the original OHBS has been used in one previous study (Kim et al., 1991a). For the present study, the original OHBS used by Kim et al. (1991a) was revised to include 56 items (See Appendix C). Based on psychometric analysis the number of items measuring each OHB variable was reduced to six with a total of 42 items in the OHBS. For this study, only the OHB Exercise Scale was extracted and used with a total number of 30 items.

Items in the OHBES are reflective of the five theoretical dimensions (susceptibility, seriousness, benefits, barriers and health motivation) of the HBM. Since six items are included for each of the five HBM variables, there are a total of 30 items in the final version of the OHBES. The strength of the five HBM variables are rated using a 5-point Likert type scale ranging from strongly disagree (1) to strongly agree (5). Thus, the total possible score for the individual subscale measuring each of the HBM dimensions ranges from 6 to 30. Questions in the OHBS are worded at a fifth grade reading level to accommodate the general public.

Internal consistency of the OHBES was evaluated

using Cronbach alpha. Reliability coefficients ranged from .71 (seriousness) to .82 (susceptibility and barriers exercise) (See Table 2). Stability of the OHBES was examined using a subsample of 51 women who were tested at a 3 week interval. With the exception

Table 2

Reliability Data for the OHBES Subscales

Subscale	No. of items	Items included*	Cronbach's Alpha (N = 201)	Test-Retest (n = 51)
Susceptibility	6	1, 3 - 7	.82	.84
Seriousness	6	8, 10, 11 13, 14, 16	.71	.79
Benefits Exercise	6	17, 18, 19 21 - 23	.81	.63
Barriers Exercise	6	32, 33, 35 36 - 38	.82	.80
Health Motivation	6	49, 51, 53 - 56	.73	.67

(*) This column indicates items from the OHBS included in the final 30 item version of the OHBES.

of the benefits exercise subscale, the test-retest correlation coefficients ranged from .67 (health motivation) to .84 (susceptibility). The benefits exercise subscale had a coefficient of .63.

A review of the literature and input from nursing

faculty and nurses in practice were utilized to establish content validity for the items. The construct validity of the OHBES was evaluated by factor analysis. The six factors accounted for 51.5 percent of the total variance.

ARIC/Baecke Habitual Physical Activity Questionnaire

This questionnaire, developed by Baecke, Burema and Frijters (1982), measures long term patterns of physical activity. The self administered questionnaire about habitual physical activity was administered to young males (n = 139) and females (n = 147) in three age groups (20 to 22, 25 to 27, and 30 to 32 years) in a Dutch population. By principal components analysis, three conceptually meaningful factors of physical activity were distinguished. They were interpreted as: 1) physical activity at work; 2) sport activity during leisure time; and 3) physical activity during leisure time excluding sports.

The 39 item questionnaire (See Appendix E) is an instrument used to collect data reflective of total energy expenditure patterns including occupational activity, exercise and sport activity and leisure time activity. All responses are recorded on a 5 - point scale with the exception of the questions concerning the name of a main occupation and the type of sport played. Questions 1 - 16 on the questionnaire consist of occupation activities, questions 17 - 35 consist of exercise or

sport activities and questions 36 - 39 are leisure time activities. Three levels of occupational physical activity were defined with ratings of low, medium or high assigned by ARIC. All occupations are precoded according to the three levels of physical activity. However, to identify the physical activity within a certain occupation, Baecke et al. (1982) included seven items for a self-assessment of the physical activity undertaken in the occupation. Self-assesssment of physical activity in an occupation has been shown to closely parallel the scores of actual physical activity (Chave, Morris, & Moss, 1978). The total possible score for the work index ranges from 1 to 5. Variance in scoring was not allowed for the women who had not worked a year prior to the study. The instrument also lacked inclusion of household chore activities.

For this study, the work index was removed from the computations. Of the 201 subjects, 62 had not worked within the past year and 118 were in work positions that were classified as low work intensity positions. Only 21 were in medium work intensity positions. The rationale for removing the work index was: 1) a nearly homogeneous sampling with 90 percent of the subjects not working or working in a low energy level position, 2) the belief that occupations are not chosen due to the activity within a position and 3) sport and leisure

activities are representative of personal choices or beliefs.

Sports were subdivided into three levels of physical activity, according to Durnin and Passmore (1967), as low, medium and high intensity sports. A sport score was calculated from a combination of the intensity of the sport which was played, the amount of time per week playing that sport and the proportion of the year during which the sport was regularly played. Each of the scores has an associated value number assigned for calculations. The total score of questions 17 through 35 is multiplied by 5 and divided by 4 resulting in the total possible sport index score range of 1 to 5.

The leisure time index records self-assessed responses to usual activities during leisure time. The total possible score for the leisure time index also ranged from 1 to 5. In this study, the combined score from sport and leisure indices was used as a measure of exercise behavior. Combining sport/leisure indices was done because the major focus of this study was to examine the exercise behavior that was representative of personal choices and beliefs. Thus, the total possible score for the combined sport/leisure exercise index ranged from 2 to 10.

The ARIC/Baecke Questionnaire of Habitual Physical Activity is one of ten commonly used physical activity

questionnaires. Jacobs, Ainsworth, Hartman, and Leon (in press) measured each questionnaire against the others to evaluate reliability and validity of the questionnaires at the University of Minnesota. The physical activity questionnaires were studied by comparing the questionnaires with 7 direct and indirect validation measures; treadmill, exercise performance, vital capacity, body fatness, concurrent 14 four-week physical activity histories, accelerometer readings, concurrent physical activity records and concurrent dietary caloric intakes.

Jacobs et al. (in press) found the sport index of the ARIC/Baecke Questionnaire of Habitual Physical Activity was correlated with heavy intensity sport activities determined by a four-week physical history (r = .71). The leisure index was correlated with light intensity activity measured by four-week physical histories (r = .69). The reliability of the questionnaire scored moderate to high on the test-retest reliability coefficients. The reliability coefficients of physical activity measured at one month intervals were; sports index .90; and leisure index .86.

Procedure

Data were collected by three graduate nursing students and six undergraduate nursing and physical therapy students who participated in an extensive training program before data collection began. Following the training, a pilot study was done. Voluntary subjects similar to target respondents were used to insure the questions were clear and would be understood by target respondents. Prior to data collection, permission to conduct the study was obtained from Grand Valley State University's Human Subject Review Committee. Participation in the study was voluntary. Potential subjects were assured that anonymity was guaranteed (See Appendix F).

A description of the study was placed in church bulletins, university and school papers, bulletin boards at senior housing units and a local hospital mammogram clinic. The volunteer subjects were informed about the purpose of the study, their rights regarding confidentiality and voluntary participation and potential benefits. Since no risk to the subjects were anticipated, consent forms were not obtained.

The order in which the questions were presented was predetermined. For this study, the order was; 1) Demographic Data Sheet; 2) Osteoporosis Health Belief

Exercise Scale (OHBES); and 3) ARIC/Baecke Questionnaire of Habitual Physical Activity. A structured interview method was used. The interviewer asked the questions on the Demographic Data Sheet and recorded the answers. For the OHBES, the subjects were given a cue card listing five choices of ways to answer the statement read by the interviewer that best described their beliefs about the statement. For the ARIC/Baecke questionnaire the subject was given a duplicate copy of the questionnaire to read while being interviewed.

Summary

The design and methodology for this study was described in this chapter. The study sample of volunteers consisted of 201 women, 35 years of age and older with no diagnosis of osteoporosis. The three instruments used in this study, the Demographic Data Sheet, the Osteoporosis Health Belief Exercise Scale and the ARIC/Baecke Questionnaire of Habitual Physical Activity were described along with the data collection procedure.

CHAPTER FOUR

ANALYSIS OF DATA

The purpose of this study was to examine the relationship of osteoporosis health beliefs to practiced exercise behavior of women. The findings obtained from the analysis of the data are presented in this chapter. Included are: a) descriptive statistics, b) analysis related to each research hypothesis and c) summary of results.

Research Hypotheses

Two research hypotheses were tested; (1) There will be a positive relationship between the strength of health beliefs related to susceptibility, seriousness, benefits, health motivation and the level of exercise behavior; (2) There will be a negative relationship between the strength of health belief related to barriers and the level of exercise behavior. The relationships of each health belief variable to exercise behavior were evaluated using descriptive and correlational statistics.

The means and standard deviations of the health belief variables are presented in Table 3. A 5-point Likert scale was used to rate 6 items for each variable from strong disagreement (1) to strong agreement (5). The total possible score of the OHBES ranges from 6 to 30.

Table 3

Means and Standard Deviations of Health Belief Variables

Variable	Mean	Standard Deviation
Susceptibility	15.72	4.48
Seriousness	18.19	3.69
Health Motivation	23.84	2.94
Benefits	24.65	2.90
Barriers	12.24	3.90

The means of health motivation and benefits of exercise were high with small standard deviations, indicating the group of women who volunteered to be in the study were homogeneous with respect to their belief in general health motivation and the benefits of exercise to prevent osteoporosis. The mean of barriers is low indicating that the subject population perceived few barriers preventing exercise.

The mean and standard deviation of the combined sport/leisure exercise scores are presented in Table 4. The range of the combined sport/leisure index is from 2 - 10. The mean of sport/leisure activity is below the middle score of six. This indicates the subjects in this

study were low in exercise behavior.

Table 4

Mean and Standard Deviation of Exercise Behavior Variable

Index	Mean	Standard Deviation
Sport/Leisure Index	4.61	0.96

Pearson Product Moment Correlation Coefficients between each health belief variable and sport/leisure index are presented in Table 5. There was an inverse relationship between the sport/leisure exercise and the health belief susceptibility variable ($r = -.21$, $p < .001$) and an inverse but not significant relationship with the belief that the disease process of osteoporosis is serious. Benefits of exercise and health motivation were positively related to sport/leisure exercise ($r = .30$, $p < .001$; $r = .29$, $p < .001$). Barriers demonstrated an inverse relationship with the sport/leisure exercise ($r = -.40$, $p < .001$).

Table 5

Correlations Between Health Beliefs and Sport/Leisure Indices

	Sus.	Ser.	Ben.	Bar.	HM	S/LI
Sus	-	.17*	-.09	.23**	-.24**	-.21**
Ser		-	.02	.17*	-.05	-.11
Ben			-	.45**	.40**	.30**
Bar				-	-.40**	-.40**
HM					-	.29**

One-tailed test of significance

* $p < .05$

** $p < .01$

Note: Sus. = Susceptibility Bar. = Barriers
Ser. = Seriousness HM = Health Motivation
Ben. = Benefits S/LI = Sport/Leisure Index

Hypothesis 1, stating that there will be a positive relationship between the strength of health beliefs related to susceptibility, seriousness, benefits, health motivation and the level of exercise behavior, was only partly supported by the data from this study. The data supports hypothesis 2, that there will

be a negative relationship between the strength of health belief related to barriers and level of exercise behavior.

Data were further analyzed using a stepwise multiple regression to examine the research question: "Which health beliefs account for the greatest proportion of variance in exercise behavior of women?" The data from this analysis is presented in Table 6.

Table 6

Stepwise Multiple Regression of Health Beliefs on Sport/Leisure Exercise Behavior

Step	Var. Entered	b.wt.	t	Mult R	R2	R2 Change	F
1.	Barriers	-.083	4.79	.398	.158	.158	37.36*
2.	Health Motivation	.053	2.32	.424	.180	.022	21.78*

* p <.01

The results of the multiple regression analysis indicated that the combination of the barriers and health motivation variables specified in the health belief model accounted for 18 percent of variance in exercise

behavior. Examining each health belief variable independently, barriers accounted for the largest portion of variance (15.8 percent) on the dependent variable of sport/leisure exercise behavior. The health motivation variable accounted for 2 percent of the dependent variable, leaving the concepts of susceptibility, severity and benefits adding insignificant amounts to the total variance.

Summary

The findings from this study indicated that health motivation and benefits were significantly correlated to exercise behavior ($r = .29$, $p < .01$; $r = .30$, $p < .01$). Whereas, susceptibility and barriers were inversely correlated to exercise behavior ($r = -.21$, $p < .01$; $r = -.40$, $p < .01$). However, the relationship between seriousness and exercise behavior was not significant.

Results from multiple regression analysis showed that barriers health beliefs accounted for 15.8 percent of the total variance in exercise behaviors. The health motivation variable added 2 percent of the total variance in the exercise behavior.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

Discussion

The purpose of this study was to investigate the relationship of osteoporosis health beliefs to practiced exercise behavior of women. Building on the previous study by Kim et al. (1991a) the research objectives were; 1) to explore the relationship between the strength of health beliefs related to susceptibility, seriousness, benefits, barriers and health motivation and the level of exercise behavior, and 2) to determine which health beliefs account for the greatest proportion of variance in explaining exercise behavior in women.

The findings from this study support the hypothesis that there is a positive relationship between the health beliefs related to benefits and health motivation with exercise behavior. The beliefs of susceptibility and barriers were inversely correlated to exercise behavior, and the relationship between seriousness and exercise behavior was not significant.

The findings from the multiple regression analysis showed that barriers and health motivation accounted for the greatest proportion of variance in exercise behavior of women. These findings are consistent with that of Kim et al. (1991a). Champion (1984) and Trotta

(1980) also found barriers and health motivation predicted the behavior of breast self-examination.

The Health Belief Model (HBM) postulates that if a woman perceives herself to be susceptible to an illness, she is more likely to engage in preventive behavior. An individual's perception of being susceptible to a health problem can be a motivating factor promoting health actions. However, the women in this study who perceived themselves susceptible to osteoporosis were less likely to engage in exercise behavior ($r = -.21$, $p < .01$). This unexpected finding may be partly explained by the fact that this study used a descriptive correlational research design. Therefore, it is possible to infer that women who did not perceive themselves to be susceptible to osteoporosis may have been already engaging in health practices, and did not have any symptoms relating to osteoporosis. Hence, they perceived themselves to be at reduced risk for developing osteoporosis.

Tirrell and Hart (1980) also found an inverse relationship between perceived susceptibility and compliance to exercise regimen. Tirrell and Hart (1980) suggested that women who perceive themselves as being most susceptible to a health problem be less compliant to health actions. Also, women who believed they were less susceptible or who thought they had little

influence on their health state were more compliant.

The inverse relationship between susceptibility belief and exercise behavior may be the result of problems related to measurement of the exercise behavior. The subjects for this study ranged in age from 35 to 95 with 56 years of age being the median. Fifty two percent of the women were 35 to 54 years old. It is possible that, although older women in this study may have believed they were susceptible to osteoporosis, they were physically active in homemaking chores that are not measured by the ARIC/Baecke Questionnaire of Habitual Physical Activity. The questionnaire was designed for the younger population resulting in difficulty discriminating between the physically active and inactive older people.

Perceived barriers accounted for the strongest relationship to exercise behavior ($r = -.40$, $p < .01$). It was noted that the greater the number of perceived barriers, the lower was the level of exercise behavior. In fact, in this study, subjects as a group had a relatively low level of exercise behavior ($M = 4.61$). Barriers, viewed as preventing exercise behavior, were: not feeling strong enough to exercise regularly, having no place to exercise, regular exercise took a lot of time and was uncomfortable and boring. The findings of this study suggest the greater the number of perceived

barriers, the lower the level of exercise practices. This is consistent with findings from studies by Kim, et al. (1991a) and Tirrell & Hart (1980).

The HBM predicts that the stronger the beliefs of health motivation and benefits, the more likely women would engage in exercise behaviors. In this study, health motivation and perceived benefits of exercise behavior were significantly correlated with exercise behavior ($r = .29$, $p < .01$; $r = .30$, $p < .01$). Exercise was viewed by subjects as a way to help build strong bones, to cut down on chances of broken bones, to promote good feelings about self when exercising and the feeling that exercising protects one from osteoporosis. The concept that physical activity has many health benefits has been well established.

The HBM postulates that seriousness is the concern with the perceived degree of personal threat related to developing osteoporosis. According to the HBM the individuals who perceive osteoporosis to be a serious condition are more likely to engage in exercise behavior. However, in this study, the relationship between perceived seriousness and exercise behavior was negative and not significant ($r = -.11$, $p > .05$). As Champion (1985) stated it is possible for individuals to perceive seriousness when personal preventive action is not taken. Likewise, in this study, women who are

already engaged in exercise behavior might have perceived osteoporosis to not be a serious condition.

Conclusions

Hypothesis 1 was partly supported by this study. There was a weak but significant positive correlation between beliefs of health motivation and benefits to exercise behavior ($r = .29$, $p < .01$); $r = .30$, $p < .01$). The variable of susceptibility had a weak but significant inverse correlation to exercise behavior ($r = -.21$, $p < .01$). Hypothesis 2 was supported by a significant inverse relationship between the strength of health beliefs of barriers and the level of exercise behavior ($r = -.40$, $p < .01$). The result from multiple regression analysis showed that barriers and health motivation were the two most important health beliefs explaining exercise behavior of women.

Application to Nursing

The findings of this study indicate that barriers and health motivation were important constructs in explaining exercise behaviors. The nurse needs to determine which items individuals perceive as barriers to exercise behavior. After identifying perceived barriers, appropriate interventions can be jointly developed by the nurse and the client. With individualized strategies to overcome barriers, sport/leisure activities might increase. These

activities may vary greatly among women and may contribute to differences in the prevention of disease in older women. Preventive care has the potential to improve both the health and longevity of women. The significant inverse relationship between barriers and exercise behavior is an important reminder for nurses involved with health teaching. Perceived barriers to exercise can contribute in a significant way to noncompliance.

Health motivation was the second highest variable predictor and is positively correlated to exercise behavior as was found in the previous study by Kim et al. (1991a). Collecting and analyzing data on attitudes toward good health would assist nurses designing a plan for individual clients in order to reduce barriers and increase health motivation. The HBM can be a guide in the nurses role to encourage clients to adopt preventive health behaviors consistent with research findings.

Limitations

The sample for this research, although adequate in size, was too homogeneous and thus limits generalization to a larger population. The majority of the sample participants were Caucasian with an average of nearly 15 years of schooling. A more heterogenous sample is recommended for any future studies which should include

different racial groups, greater range of education levels, different socioeconomic status and more age strata.

One of the instruments used in the study was the ARIC/Baecke questionnaire that was designed to measure three categories of activities: work, leisure and sport. These provide a fairly comprehensive evaluation of the total spectrum of activity patterns. The questionnaire was able to be self-administered. A disadvantage of the ARIC\Baecke tool is a need for a more precise definition of terms. Activities performed always, sometimes or never may not mean the same thing in each population under study or even in different age strata of the same population. With a score range of 1 to 5 each activity is in a relatively narrow distribution and could lead to incorrect conclusions.

The ARIC/Baecke questionnaire was developed for a younger strata and does not lend itself well to inclusion of older strata of the population. As women age, active daily living activities may become an important element in discriminating between a moderately active or sedentary lifestyle. Although women may keep very active in the home with homemaking activities, this factor was not included in the instrument. Leisure and sport activities vary in kind, intensity and duration. The level of physical activity common among the older population strata should not be

exclusively determined by participation in sport/leisure activities as the major indicator of their physical activity. Failure to determine a statistically significant relationship of all health belief variables to physical activity in this study may be reflective of the tool used to assess exercise behavior.

Recommendations for Future Research

This study should be replicated on a sample with different demographic characteristics to further evaluate the efficacy of the OHBES. Additional studies could help determine whether groups with different characteristics vary in health beliefs and behavior. This study could also be expanded to include men, assessing their health beliefs and exercise behaviors to prevent osteoporosis.

Valid and reliable instruments need to be developed and tested to adequately measure physical activities in older population. Developing a physical activity tool that is able to measure habitual physical activity in the older groups would facilitate the ability to determine relationships between the health belief variables and exercise behavior.

A study could be made of the cues reflective of both internal and external forces that "trigger" women to exercise regularly. Future studies using the HBM could also be conducted to help better understand

factors that influence persons to choose healthier life styles in order to help reduce the chances of osteoporosis.

Continued use is recommended of the Osteoporosis Health Belief Exercise Scale. Expansion of the scale to incorporate the variable of self-efficacy is suggested for expanding the model for the purpose of explaining, predicting and influencing behavior.

Summary

In this study, the investigator sought to determine if there was a relationship between the health beliefs related to susceptibility, seriousness, benefits, barriers, health motivation and the level of exercise behavior. In addition, the question of which health beliefs accounted for the greatest portion of variance in exercise behavior of women was addressed. Health motivation and benefits of exercise behavior were found to be positively related to exercise behavior. Susceptibility and barriers were inversely related to exercise behavior. In this study, barriers and health motivation were found to have the most predictive power relating to exercise behavior.

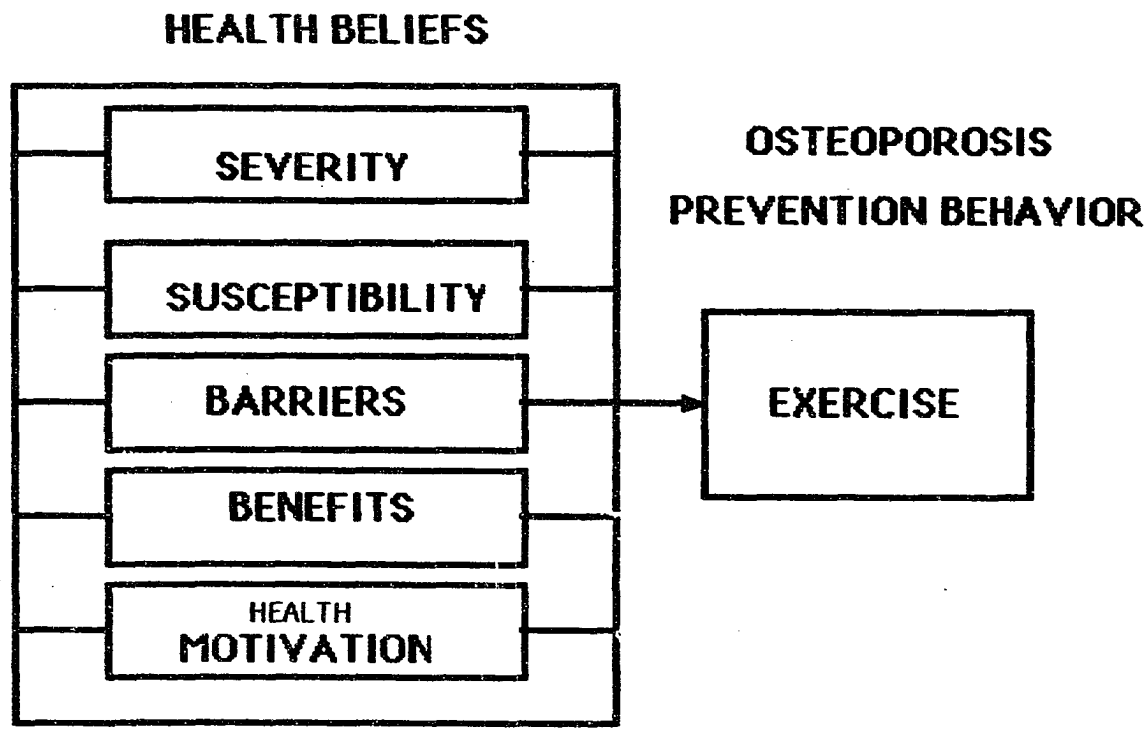
The ARIC\Baecke Questionnaire of Habitual Physical Activity was designed to measure habitual physical activity of a younger age group. Failure to observe a positive correlation of health belief to the

susceptibility variable may be reflective of the tool used to assess activity. Possible explanation for the findings were discussed, implications for nursing practice proposed and suggestions for further research presented.

APPENDICES

APPENDIX A

Conceptual Framework: Health Belief Model



APPENDIX B

DEMOGRAPHIC DATA SHEET

Date: _____ **ID #** _____

Interviewer # _____

Data Collection Site: _____

I need to have some information about you.

1. **How old are you?** _____ **(in years)**

2. **How many years of school have you completed?** _____ **(in years)**

3. **How tall are you?** _____ **feet and** _____ **inches**

   (CODE: in cm) _____

4. **How much do you weigh? (in pounds)** _____

5. **Are you (Interviewer: If race is apparent, do not ask this question)**

   _____ 1. **American Indian**

   _____ 2. **Black**

   _____ 3. **Pacific/Asian**

   _____ 4. **White**

   _____ 5. **Other Specify:** _____

6. **Do you have osteoporosis?**

   _____ 1. **Yes**

   _____ 2. **No**

   (Interviewer: If the person says "yes", terminate the interview and thank the person for his/her assistance.)

7. **Do you have friends or relatives who have osteoporosis?**

   _____ 1. **Yes**

   _____ 2. **No**

Interviewer: If you have experienced any special problems during the interview with this person, record the nature of the problem.

_____

_____

_____

8. ____ 1.yes ____ 2. No Orientation to 3 spheres.

10-90

APPENDIX C

ID NO: _____

OSTEOPOROSIS HEALTH BELIEF SCALE

(Interviewer: Read the following instruction SLOWLY)

Osteoporosis (os-teo-po-ro-sis) is a condition in which the bones become excessively thin (porous) and weak so that they are fracture prone (they break easily).

I am going to ask you some questions about your beliefs about osteoporosis. There are no right or wrong answers. Everyone has different experiences which will influence how they feel. After I read each statement, tell me if you STRONGLY DISAGREE DISAGREE, are NEUTRAL, AGREE, or STRONGLY AGREE with the statement. I am going to show you a card with these five choices. When I read each statement, tell me which one of the five is your choice.

It is important that you answer according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe. We need the answers that best explain how you feel.

(Test administrator: Before administration of the scale, check whether the participant can read the five choices on the card. If the person is unable to read them, you need to read the five choices after each statement).

SUSCEPTIBILITY	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
	1	2	3	4	5
1. Your chances of getting osteoporosis are high.	SD	D	N	A	SA
2. Your health makes it more likely that you will get osteoporosis.	SD	D	N	A	SA
3. Because of your body build, you are more likely to develop osteoporosis.	SD	D	N	A	SA
4. It is extremely likely that you will get osteoporosis.	SD	D	N	A	SA
5. There is a good chance that you will get osteoporosis.	SD	D	N	A	SA
6. You are more likely than the average person to get osteoporosis.	SD	D	N	A	SA
7. Your family history makes it more likely that you get osteoporosis.	SD	D	N	A	SA

10/90 Permission to use this scale has been granted by K. Kim.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
SERIOUSNESS	1	2	3	4	5
8. The thought of osteoporosis scares you.	SD	D	N	A	SA
9. Having osteoporosis would make it harder for you to do the things that you have to do every day.	SD	D	N	A	SA
10. If you had osteoporosis you would be crippled.	SD	D	N	A	SA
11. Your feelings about yourself would change if you got osteoporosis.	SD	D	N	A	SA
12. If you got osteoporosis, the problems would last the rest of your life.	SD	D	N	A	SA
13. It would be very costly if you got osteoporosis.	SD	D	N	A	SA
14. When you think about osteoporosis you get depressed.	SD	D	N	A	SA
15. You are afraid to even think about osteoporosis.	SD	D	N	A	SA
16. If you got osteoporosis it would be very serious.	SD	D	N	A	SA
BENEFITS					
17. Exercising regularly prevents problems that would happen from osteoporosis.	SD	D	N	A	SA
18. You feel better when you exercise to prevent osteoporosis.	SD	D	N	A	SA
19. Exercising regularly helps to build strong bones.	SD	D	N	A	SA
20. Exercising regularly prevents pain from broken bones.	SD	D	N	A	SA
21. Exercising to prevent osteoporosis (also?) improves the way your body looks.	SD	D	N	A	SA
22. Exercising regularly cuts down on the chances of broken bones.	SD	D	N	A	SA
23. You feel good about yourself when you exercise to prevent osteoporosis.	SD	D	N	A	SA
24. When you exercise regularly you feel like you are protecting yourself from osteoporosis.	SD	D	N	A	SA

(Interviewer: Read the following instruction SLOWLY)

For the following 7 questions, when I say "taking in enough calcium" it means taking enough calcium by eating calcium rich foods and/or taking calcium supplements.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
	1	2	3	4	5
25. Taking in enough calcium prevents problems that would happen from osteoporosis.	SD	D	N	A	SA
26. You have lots to gain from taking in enough calcium to prevent osteoporosis.	SD	D	N	A	SA
27. Taking in enough calcium helps to build strong bones.	SD	D	N	A	SA
28. Taking in enough calcium prevents future pain from osteoporosis.	SD	D	N	A	SA
29. You would not worry as much about osteoporosis if you took in enough calcium.	SD	D	N	A	SA
30. Taking in enough calcium cuts down on your chances of broken bones.	SD	D	N	A	SA
31. You feel good about yourself when you take in enough calcium to prevent osteoporosis.	SD	D	N	A	SA

BARRIERS

32. You feel like you are not strong enough to exercise regularly.	SD	D	N	A	SA
33. You have no place where you can exercise.	SD	D	N	A	SA
34. Exercising regularly takes a lot of time.	SD	D	N	A	SA
35. Your spouse or family discourage exercising.	SD	D	N	A	SA
36. Exercising regularly would mean starting a new habit which is hard to do.	SD	D	N	A	SA
37. Exercising regularly makes you uncomfortable.	SD	D	N	A	SA
38. Exercising regularly upsets your every day routine.	SD	D	N	A	SA
39. Exercising is boring.	SD	D	N	A	SA

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
	1	2	3	4	5
40. Calcium rich foods cost too much.	SD	D	N	A	SA
41. Calcium rich foods do not agree with you.	SD	D	N	A	SA
42. Calcium rich foods are likely to make you gain weight.	SD	D	N	A	SA
43. You do not like calcium rich foods.	SD	D	N	A	SA
44. Eating calcium rich foods means changing your diet which is hard to do.	SD	D	N	A	SA
45. In order to eat more calcium rich foods you have to give up other foods that you like.	SD	D	N	A	SA
46. Calcium rich foods have too much cholesterol.	SD	D	N	A	SA
47. Calcium supplements do not agree with you.	SD	D	N	A	SA
48. Calcium supplements cost too much.	SD	D	N	A	SA

HEALTH MOTIVATION

49. You eat a well-balanced diet.	SD	D	N	A	SA
50. You often do things to make you healthy.	SD	D	N	A	SA
51. You look for new information related to health.	SD	D	N	A	SA
52. You exercise at least three times a week.	SD	D	N	A	SA
53. Keeping healthy is very important for you.	SD	D	N	A	SA
54. You try to discover health problems early.	SD	D	N	A	SA
55. You have a regular health check-up even when you are not sick.	SD	D	N	A	SA
56. You follow recommendations to keep you healthy.	SD	D	N	A	SA

APPENDIX D ID NO: _____

OSTEOPOROSIS HEALTH BELIEF SCALE

(Interviewer: Read the following instruction SLOWLY)

Osteoporosis (os-teo-po-ro-sis) is a condition in which the bones become excessively thin (porous) and weak so that they are fracture prone (they break easily).

I am going to ask you some questions about your beliefs about osteoporosis. There are no right or wrong answers. Everyone has different experiences which will influence how they feel. After I read each statement, tell me if you STRONGLY DISAGREE DISAGREE, are NEUTRAL, AGREE, or STRONGLY AGREE with the statement. I am going to show you a card with these five choices. When I read each statement, tell me which one of the five is your choice.

It is important that you answer according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe. We need the answers that best explain how you feel.

(Test administrator: Before administration of the scale, check whether the participant can read the five choices on the card. If the person is unable to read them, you need to read the five choices after each statement).

SUSCEPTIBILITY	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
	1	2	3	4	5
* 1. Your chances of getting osteoporosis are high.	SD	D	N	A	SA
2. Your health makes it more likely that you will get osteoporosis.	SD	D	N	A	SA
* 3. Because of your body build, you are more likely to develop osteoporosis.	SD	D	N	A	SA
* 4. It is extremely likely that you will get osteoporosis.	SD	D	N	A	SA
* 5. There is a good chance that you will get osteoporosis.	SD	D	N	A	SA
* 6. You are more likely than the average person to get osteoporosis.	SD	D	N	A	SA
* 7. Your family history makes it more likely that you get osteoporosis.	SD	D	N	A	SA

10/90 * Indicates the items used in the OHBES.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
SERIOUSNESS	1	2	3	4	5
*8. The thought of osteoporosis scares you.	SD	D	N	A	SA
9. Having osteoporosis would make it harder for you to do the things that you have to do every day.	SD	D	N	A	SA
*10. If you had osteoporosis you would be crippled.	SD	D	N	A	SA
*11. Your feelings about yourself would change if you got osteoporosis.	SD	D	N	A	SA
12. If you got osteoporosis, the problems would last the rest of your life.	SD	D	N	A	SA
*13. It would be very costly if you got osteoporosis.	SD	D	N	A	SA
*14. When you think about osteoporosis you get depressed.	SD	D	N	A	SA
15. You are afraid to even think about osteoporosis.	SD	D	N	A	SA
*16. If you got osteoporosis it would be very serious.	SD	D	N	A	SA
BENEFITS					
*17. Exercising regularly prevents problems that would happen from osteoporosis.	SD	D	N	A	SA
*18. You feel better when you exercise to prevent osteoporosis.	SD	D	N	A	SA
*19. Exercising regularly helps to build strong bones.	SD	D	N	A	SA
20. Exercising regularly prevents pain from broken bones.	SD	D	N	A	SA
*21. Exercising to prevent osteoporosis (also?) improves the way your body looks.	SD	D	N	A	SA
*22. Exercising regularly cuts down on the chances of broken bones.	SD	D	N	A	SA
*23. You feel good about yourself when you exercise to prevent osteoporosis.	SD	D	N	A	SA
24. When you exercise regularly you feel like you are protecting yourself from osteoporosis.	SD	D	N	A	SA

* Indicates the items used in the OHBES

(Interviewer: Read the following instruction SLOWLY)

For the following 7 questions, when I say "taking in enough calcium" it means taking enough calcium by eating calcium rich foods and/or taking calcium supplements.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
	1	2	3	4	5
25. Taking in enough calcium prevents problems that would happen from osteoporosis.	SD	D	N	A	SA
26. You have lots to gain from taking in enough calcium to prevent osteoporosis.	SD	D	N	A	SA
27. Taking in enough calcium helps to build strong bones.	SD	D	N	A	SA
28. Taking in enough calcium prevents future pain from osteoporosis.	SD	D	N	A	SA
29. You would not worry as much about osteoporosis if you took in enough calcium.	SD	D	N	A	SA
30. Taking in enough calcium cuts down on your chances of broken bones.	SD	D	N	A	SA
31. You feel good about yourself when you take in enough calcium to prevent osteoporosis.	SD	D	N	A	SA

BARRIERS

* 32. You feel like you are not strong enough to exercise regularly.	SD	D	N	A	SA
* 33. You have no place where you can exercise.	SD	D	N	A	SA
34. Exercising regularly takes a lot of time.	SD	D	N	A	SA
* 35. Your spouse or family discourage exercising.	SD	D	N	A	SA
* 36. Exercising regularly would mean starting a new habit which is hard to do.	SD	D	N	A	SA
* 37. Exercising regularly makes you uncomfortable.	SD	D	N	A	SA
* 38. Exercising regularly upsets your every day routine.	SD	D	N	A	SA
39. Exercising is boring.	SD	D	N	A	SA

* Indicates the items used in the OHBES.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
	1	2	3	4	5
40. Calcium rich foods cost too much.	SD	D	N	A	SA
41. Calcium rich foods do not agree with you.	SD	D	N	A	SA
42. Calcium rich foods are likely to make you gain weight.	SD	D	N	A	SA
43. You do not like calcium rich foods.	SD	D	N	A	SA
44. Eating calcium rich foods means changing your diet which is hard to do.	SD	D	N	A	SA
45. In order to eat more calcium rich foods you have to give up other foods that you like.	SD	D	N	A	SA
46. Calcium rich foods have too much cholesterol.	SD	D	N	A	SA
47. Calcium supplements do not agree with you.	SD	D	N	A	SA
48. Calcium supplements cost too much.	SD	D	N	A	SA

HEALTH MOTIVATION

*49. You eat a well-balanced diet.	SD	D	N	A	SA
50. You often do things to make you healthy.	SD	D	N	A	SA
*51. You look for new information related to health.	SD	D	N	A	SA
52. You exercise at least three times a week.	SD	D	N	A	SA
*53. Keeping healthy is very important for you.	SD	D	N	A	SA
*54. You try to discover health problems early.	SD	D	N	A	SA
*55. You have a regular health check-up even when you are not sick.	SD	D	N	A	SA
*56. You follow recommendations to keep you healthy.	SD	D	N	A	SA

* Indicates the items used in the OHBES.

APPENDIX E

ID NO.: _____

ARIC/BAECKE QUESTIONNAIRE OF HABITUAL PHYSICAL ACTIVITY*

Before we ask you about your physical activity, we would like you to answer several questions regarding your current or most recent occupation. please answer the following:

1. Please place an X here if you never worked: 35 1☐ Never worked

   IF YOU RESPONDED THAT YOU HAVE NEVER WORKED, DO NOT COMPLETE QUESTIONS 2 - 7. CONTINUE WITH QUESTION 9 ON PAGE 2.

2. What (is/was) your (current/most recent) occupation?
   (If you held more than one job, please record your occupation for the job having the most hours per week)

   _____

3. (Are/Were) you self-employed for this occupation? 36 1☐ Yes 2☐ No

4. Please list the name of (your/your most recent) employer business/company:

   _____

5. What kind of business or industry (is/was) that? (Describe the activity at the location where employed

   _____
   (for example: hospital, newspaper publishing, mail order house, auto engine manufacturing, etc.)

6. List what (are/were) your most important activities or duties?
   (for example: selling cars, keeping account books, etc.)

   _____

   _____

7. Please place an X by the choice which best describes your (current/most recent) occupation *(check only ONE response)*:

   37
   1☐Employee of private company, business, or individual for wages, salary, or commissions
   2☐Federal government employee
   3☐State government employee
   4☐Local government employee
   Self-employed in own business, professional practice, or farm:
   5☐Own business, not incorporated
   6☐Own business, incorporated
   7☐Working without pay, in family business or farm

   8. Census Code ☐☐☐ 38

EPI/SAF 011(1-5) 2/87 Ver. 1

Permission to use this questionnaire has been granted by D. Jacobs.

Now we would like to ask you about your physical activity. We are interested in your physical activity during the past year. Please place an X by the number related to your choice.

9. Please place an X here if you do not work: 1☐ I do not work

IF YOU RESPONDED THAT YOU DO NOT WORK, DO NOT COMPLETE QUESTIONS 10-16. CONTINUE WITH QUESTION 17.

10. At work you sit:
1☐ Never 4☐ Often
2☐ Seldom 5☐ Always
3☐ Sometimes

11. At work you stand:
1☐ Never 4☐ Often
2☐ Seldom 5☐ Always
3☐ Sometimes

12. At work you walk:
1☐ Never 4☐ Often
2☐ Seldom 5☐ Always
3☐ Sometimes

13. At work you lift heavy loads:
1☐ Never 4☐ Often
2☐ Seldom 5☐ Very often
3☐ Sometimes

14. After work you are physically tired:
1☐ Never 4☐ Often
2☐ Seldom 5☐ Very often
3☐ Sometimes

15. At work you sweat:
1☐ Never 4☐ Often
2☐ Seldom 5☐ Always
3☐ Sometimes

16. In comparison with others your own age, you think your work is physically:
1☐ Much lighter 4☐ Heavier
2☐ Lighter 5☐ Much Heavier
3☐ As Heavy

17. Do you exercise or play sports? 49 1☐Yes 2☐ No

IF YOU DO NOT EXERCISE OR PLAY SPORTS, DO NOT COMPLETE QUESTIONS 18-32. CONTINUE WITH QUESTION 33.

18. Which sport or exercise do you do most frequently?

_____ ☐☐☐ 50

19. How many hours a week do you do this activity?

1☐ Less than 1
53 2☐ At least 1 but not quite 2
3☐ At least 2 but not quite 3
4☐ At least 3 up to and including 4
5☐ More than 4

20. How many months a year do you do this activity?

1☐ Less than 1
54 2☐ At least 1 but not quite 4
3☐ At least 4 but not quite 7
4☐ At least 7 up to and including 9
5☐ More than 9

21. Do you do other exercises or play other sports? 55 1☐ Yes 2☐ No

IF NO, DO NOT COMPLETE QUESTIONS 22-32. CONTINUE WITH QUESTION 33 ON PAGE 4.

22. What is your **second** most frequent exercise or sport?_____

☐☐☐ 56

23. How many hours a week do you do this activity?

1☐ Less than 1
59 2☐ At least 1 but not quite 2
3☐ At least 2 but not quite 3
4☐ At least 3 up to and including 4
5☐ More than 4

24. How many months a year do you do this activity?

1☐ Less than 1
60 2☐ At least 1 but not quite 4
3☐ At least 4 but not quite 7
4☐ At least 7 up to and including 9
5☐ More than 9

25. Do you do other exercises or play other sports? 61 1☐Yes 2☐ No

IF NO, DO NOT COMPLETE QUESTIONS 26-32. CONTINUE WITH QUESTION 33.

26. What is your **third** most frequent exercise or sport?_____

☐☐☐ 62

27. How many hours a week do you do this activity?

1☐ Less than 1
65 2☐ At least 1 but not quite 2
3☐ At least 2 but not quite 3
4☐ At least 3 up to and including 4
5☐ More than 4

28. How many months a year do you do this activity?

1☐ Less than 1
66 2☐ At least 1 but not quite 4
3☐ At least 4 but not quite 7
4☐ At least 7 up to and including 9
5☐ More than 9

29. Do you do other exercises or play other sports? 67 1☐Yes 2☐No

IF NO, DO NOT COMPLETE QUESTIONS 30-32. CONTINUE WITH QUESTION 33

30. What is your **fourth** most frequent exercise or sport?_____

☐☐☐ 68

31. How many hours a week do you do this activity?

1☐ Less than 1
71 2☐ At least 1 but not quite 2
3☐ At least 2 but not quite 3
4☐ At least 3 up to and including 4
5☐ More than 4

32. How many months a year do you do this activity?

1☐ Less than 1
72 2☐ At least 1 but not quite 4
3☐ At least 4 but not quite 7
4☐ At least 7 up to and including 9
5☐ More than 9

In addition to time spent exercise or participating in sports, most people have time that is considered leisure. The following questions refer to your usual activities during leisure time.

33. In comparison with others of your own age, your physical activity during leisure time is:

73
1☐ Much less
2☐ Less
3☐ The same
4☐ More
5☐ Much more

34. During leisure time you sweat:

74
1☐ Never
2☐ Seldom
3☐ Sometimes
4☐ Often
5☐ Very often

35. During leisure time you play sports or exercise:

75
1☐ Never
2☐ Seldom
3☐ Sometimes
4☐ Often
5☐ Very often

36. During leisure time you watch television:

76
1☐ Never
2☐ Seldom
3☐ Sometimes
4☐ Often
5☐ Very often

37. During leisure time you walk:

77
1☐ Never
2☐ Seldom
3☐ Sometimes
4☐ Often
5☐ Very often

38. During leisure time you bike:

78
1☐ Never
2☐ Seldom
3☐ Sometimes
4☐ Often
5☐ Very often

39. How many minutes do you walk and/or bike to and from work?

79
1☐ Less than 5
2☐ At least 5 but not quite 15
3☐ At least 15 but not quite 30
4☐ At least 30 but not quite 45
5☐ 45 or more

* Adapted from ARIC/BAECKE Questionnaire of Habitual Physical Activity

APPENDIX F

INFORMATION TO PARTICIPANTS

Hello, I am _____, a nursing/physical therapy student (graduate nursing student) at Grand Valley State University. I am helping in the osteoporosis study which is being conducted by several faculty members and graduate students at Grand Valley State University. As you may know, osteoporosis is a condition in which the bones become very brittle and weak so that they break easily. For this project, we would like to ask you some questions about osteoporosis, specifically your exercise and food intake and what you know and feel about osteoporosis.

It will take about about one hour. Information you give to me will be kept confidential. You can withdraw participation at any time. Would you be willing to help us?

10-90

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