Method Of Exercise Instruction And Exercise Frequency Among Older Women Diagnosed With Osteoporosis

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METHOD OF EXERCISE INSTRUCTION AND EXERCISE FREQUENCY
AMONG OLDER WOMEN DIAGNOSED WITH OSTEOPOROSIS

by

TINA D. HIGHFILL

A Thesis Submitted in Fulfillment of the Requirements for the Degree of Master of Science in Nursing in the Division of Nursing Mississippi University for Women

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AMONG OLDER WOMEN DIAGNOSED WITH OSTEOPOROSIS

by

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Abstract

Osteoporosis is a major health concern for 8 million women in the US. Although there is no cure, exercise has been identified as a preventive measure against bone loss. Medical costs for osteoporosis are expected to be $60 billion by 2020. The purpose of this study was to determine if there was a difference in the method of exercise instruction and frequency of exercise among older women diagnosed with osteoporosis. Orem’s Self-Care Deficit Theory of Nursing has been selected as the theoretical framework. A non-experimental, comparison design was used. A convenient sample consisted of 16 females over age 50, diagnosed with osteoporosis who attended an osteoporosis support group in a southern rural state. Data were collected using a researcher designed demographic survey and exercise questionnaire. Collected data were analyzed using descriptive statistics, analysis of variance (ANOVA), frequency, percentage, and rank order. There were no significant differences between groups, therefore, the researcher failed to reject the null hypothesis. Additional findings revealed a statistically significant difference between groups (p = 0.0065, F = 13.8216, df = 4) regarding educational level and exercise frequency. The groups with members having higher levels of education exercised more frequently. Walking was a preferred exercise. The number one exercise barrier was pain (43.75%) with co-morbidity and pain (12.75%) second. Younger women, women given exercise instruction by physical demonstration, or women less than or equal to their
approximate ideal body weight exercised more frequently. The women who exercised before being diagnosed with osteoporosis, had longer support group attendance, or were given formal exercise instruction exercised more frequently after being diagnosed with osteoporosis. Recommendations for further studies might include replication of the study to include a more culturally diverse group of participants. Replication of the study to include male and female subjects of diverse ages and varying levels of exercise participation. Conduction of a correlational study relating demographic variables such as age, education, and weight with frequency of exercise. Conduction of a comparison study of types of exercise performed related to the types of exercise instruction. Conduction of a correlational study to relate added variables such as identification of previous fractures, bone mineral density readings of the subjects, with frequency of exercise. A better understanding of the role of exercise instruction in persons with osteoporosis will provide clinicians with more comprehensive, clinical knowledge and possibly prevent fractures or other osteoporosis related complication.
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_You are never given a wish without also being given the power
to make it true— Richard Bach_
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Method of Exercise Instruction and Frequency of Exercise in Older Women Diagnosed with Osteoporosis

Chapter I

Osteoporosis is a disease well defined by low bone mass and structural deterioration leaving an individual at an increased risk for fractures especially of the hip, spine, and wrist. The loss of bone mass often leads an individual down a debilitating path of inactivity and health problems especially in the aging individual. Osteoporosis, a major challenge confronting today’s health care professional, is a preventable disease that mainly affects older Caucasian and Asian women. However, this disease can affect people of all ages, sexes, and ethnic backgrounds.

Purpose of the Study

The purpose of this study was to determine if the method of exercise instruction given to older women diagnosed with osteoporosis would influence the frequency with which these women exercise. This study can help establish the need for improved exercise instruction for persons with osteoporosis to promote a regular pattern of exercise frequency that is essential for the maintenance of bone mass and functional ability of the aging female.

Establishment of the Problem

According to the National Osteoporosis Foundation (NOF) osteoporosis is one of
the major health problems threatening approximately 28 million individuals in the United States (US). Eight million women have been diagnosed with osteoporosis and 14.4 million women have low bone density, placing them at increased risk for this disease. Medical costs for care of these fractures were approximately $14 billion in 1995 and are expected to be $60 billion by the year 2020 (National Osteoporosis Foundation, 1999). Osteoporosis is responsible for more than 1.5 million fractures annually, affecting one in two women in their lifetime.

Greater emphasis has been placed on the need for osteoporosis education and preventive intervention such as exercise. Regular physical activity and weight-bearing exercise are now recognized as critical elements in the prevention of disease and health enhancement in adulthood, (Taggert & Conner, 1995; Ory & Cox, 1994; American College of Sports Medicine, 1998). Researchers contend that exercise is a known initiator of bone because of mechanical loading, muscular activity, and gravity that stimulate the bone cells to grow. The rate of bone loss is highly individualized and is greatly accelerated in postmenopausal women (Notelovitz, 1997; Lowenthal & Kirschner, 1994; Dowd & Cavalieri, 1999; Taaffe, Duret, Wheeler, & Marcus, 1999).

It is suggested through review of literature that older participants’ exercise barriers were greater than their motivation to exercise even though the older participants were more knowledgeable about the risks and benefits of exercise. Exercise barriers often have a greater impact on an individual’s decision to exercise than their knowledge of potential risk of not exercising. Most prevention has been aimed toward young premenopausal women rather than postmenopausal women (Taggert & Conner, 1995).
Exercise programs may modify some risk factors for osteoporosis, decrease risk of fracture, and have been shown to have a positive influence on functional abilities. This is especially true of postmenopausal women who engage in regular exercise. The advantage of exercise is greater with weight-bearing exercise. Certainly, assertive exercise programs with a variety of strength training, weight-bearing activities, and aerobic activities appear to have an even greater impact on decreasing bone loss, if performed regularly. The influence on functional abilities and decrease in risk of fracture have been linked to the amount and intensity of physical activity. Women who are more active in exercise and daily activities report fewer functional difficulties (Heinonen & Kannus, 1996).

The decision to exercise as a permanent part of the individual’s lifestyle could promote good health and improve the adaptation to normal aging. This would have a positive influence on the level of physical activity and maintenance of good health as the woman ages. This idea magnifies the increasing importance of the older women’s need to participate in exercise regularly. Healthy aging implies staying as active as possible thereby decreasing the risk of osteoporosis and other preventable diseases. Many phenomena associated with growing old are the very changes that regular exercise can potentially reverse or prevent (Elward & Larson, 1992).

While some individuals are advised by their health care provider to perform exercise, many are not given the proper exercise instruction to guide them in the best type, technique or frequency of the exercise. Researchers have not identified whether insurance status impacts an older woman’s chance of receiving exercise instruction from
a qualified health care provider, nor does research indicate whether insurance companies will cover exercise facility costs or memberships. Lack of insurance coverage for exercise-associated programs has been identified as a potential barrier to participation in structured exercise programs (Rochon & Gurwitz, 1999). It is commonly known that insurance companies do not routinely cover exercise prescriptions or facility costs for those individuals requiring formal exercise instruction or a place to exercise. Exercise, if not performed properly, can be a health hazard rather than health preventive measure (Kerschan et al, 1998).

Significance to Nursing

According to the Center for Disease Control and Prevention (1999) Healthy People 2000 objectives, physical fitness and osteoporosis prevention are listed as the number one and two objectives for Healthy People 2010, respectively. Osteoporosis management is a major challenge confronting the health care provider. Practitioners, therefore, are in the perfect position to educate patients concerning risk factors of osteoporosis, teach prevention intervention, and raise the level of awareness. Every visit to a nurse practitioner is an opportunity for prevention. Implemented preventive health techniques, such as exercise, can be beneficial to older patients. There is enough data to conclude that it is clinically wise for the nurse practitioner to attempt to initiate an exercise plan or increase the level of present exercise of older individuals with osteoporosis or those at risk for the disease. By determining the best method of exercise instruction to yield the most frequent exercise adherence, the nurse practitioner can more appropriately develop exercise prescriptions for the older patient.
This study can provide educational benefits to nursing students and nurses in practice. These nurses can have a better understanding of the impact that osteoporosis has on society. This study can also assist health care providers in identifying and understanding what motivators effectively encourage individuals to increase and adhere to exercise programs. These motivators can also be considered when referring individuals to structured therapy programs for formalized exercise intervention or instruction. Nurses can be made aware of the benefits of exercise, types of exercises available, and the best method of instruction in order to provide teaching to their patients as a means of prevention and management of osteoporosis. Through proper exercise instruction and a routine program of exercise participation, people can live more comfortable, productive, and safe lives with osteoporosis.

The available literature regarding osteoporosis revealed little research concerning method of exercise instruction and exercise frequency. There have been several studies with differing opinions concerning benefits of exercise and types of exercise in individuals with osteoporosis. However, the researchers do not address method of instruction and frequency concerning exercise. Benefits of this study could add to the body of knowledge concerning exercise as prevention and treatment of osteoporosis.

**Theoretical Framework**

Dorothea Orem's Self-Care Deficit Theory of Nursing was selected to guide the theoretical framework for this study. Orem focused on what nurses do to assist the person to move toward positive health. Orem presented explanations of how nursing actions function in practice to enhance health and well-being. According to Orem (1995),
a person’s well-being was associated with health, success of an individual’s efforts to maintain health, and adequacy of their resources to restore health. She further emphasized that as individuals engage in self-care, they apply their acquired and operational abilities to deliberately care for themselves. Orem’s Self-Care Theory comprised three related theories; theory of self-care; theory of self-care deficit; and theory of nursing systems. Each system works together to maintain a healthful, functioning life, continued personal development, and well-being of an individual.

The self-care theory described why and how individuals care for themselves. According to Orem (1995) the elderly have developed ways of caring for themselves. These ways may or may not be the best ways of caring for themselves from a health care provider’s point of view, but they have purpose and value for the elder. At times the elder must learn new ways of self care because of altered or declining health status as with osteoporosis.

Orem (1995) defined self-care as the practice of activities that maturing and mature persons initiate and perform, within time frames, on their own behalf in the interests of maintaining life, healthful functioning, continuing personal development, and well-being. Self-care is dependent on the formulation of factors to be manipulated to keep functioning and development within normal ranges to promote life, health, and personal well-being. Individuals undertake self-care to obtain their desired results, maintain, or improve their quality of life (Orem, 1995). Primary prevention such as physical fitness requires commitment to regular exercise, motivation, and desire to maintain good health. Goals to be met through self-care might include maintenance of
balance between activity and rest and prevention of hazards to human life. Other goals might include well-being, promotion of human functioning and development according to individual potential, known limitations, and their desire to be normal (Orem, 1995).

Self-care deficits exist when the therapeutic self-care demand of an individual exceeds the self-care ability, legitimizing the need for nursing direction (Orem, 1995). As a condition extends over time, health deviations occur. The kinds of health care demands that an individual may require are dependent on the effects of the condition and the desired quality of life of the individual. Diseases or injuries not only affect specific bodily structures, but also affect functioning of the individual and may be permanent or temporary.

The theory of nursing systems described how nurses could perform or assist an individual to perform therapeutic actions in response to self-care deficits. The nurse would assist the individual in knowing or meeting her own needs. The role of nursing has been viewed as a set of roles or functions, not as concrete technical procedures (Chinn & Kramer, 1999). Nurses and patients should act together to mutually set and achieve goals of health restoration, promotion, or maintenance. It is the deliberate action of the individual to provide self-care. Self-care and the care given by the nurse are premised on human activity rather than passivity (Orem, 1995). This concept emphasizes the special concern of the nurse for a person’s need for planning and management of self-care actions on a continuum to sustain life and health or to recover from illness or injury. Deliberate practical actions of nurses in coordination with actions of the individual,
provide guidance for the individual to restore self-care function, modify function, or develop new functions to overcome the self-care deficit.

Using this model, through prescriptive exercise instruction, the health care provider can provide the guidance necessary to assist the individual with osteoporosis to overcome her limitations and regulate her functioning at a desired level of self-care. The effectiveness of self-appraisal and self-management affect the performance of the other actions in which a person engages (i.e., occupational, household, self-care, family participation).

**Problem Statement**

The difference between the method of exercise instruction and exercise frequency could be important in the prevention of functional deterioration in women with osteoporosis. Determining the appropriate method of instruction most effective in teaching exercise to women with osteoporosis could be beneficial in increasing the frequency with which these women perform appropriate weight-bearing exercise.

**Research Hypothesis**

Research has shown that exercise is essential in maintaining bone mass and functional ability of persons with osteoporosis. However, experts disagree on the frequency of exercise, type of exercise, and amount of weight-bearing activity necessary to increase bone mass. Little information is known about the method of exercise instruction most appropriate for the individuals suffering from the daily pain and limitations of osteoporosis. One research hypothesis was selected to guide the current study.
The hypothesis is as follows;

1. There is no difference in exercise frequency among older women diagnosed with osteoporosis who receive different methods of exercise instruction.

Definition of Terms

For clarity, the following terms have been theoretically and operationally defined for this study.

1. **Women**
   
   **Theoretical:** Adult females (Merriam-Webster, 1999)
   
   **Operational:** Females, over age 50 attending an osteoporosis support group, who have been previously diagnosed with osteoporosis by a health care provider, who have not received exercise instruction, or who have received previous exercise instruction for osteoporosis either by verbal instruction, written instruction, video tape instruction, physical demonstration, or a combination of these methods

2. **Osteoporosis**

   **Theoretical:** Increased porosity of the bone (Merriam-Webster, 1999)
   
   **Operational:** A medically diagnosed condition of increased porosity of the bone making them weaker and brittle

3. **Exercise**

   **Theoretical:** Physical activity to develop fitness (Merriam-Webster, 1999)
   
   **Operational:** Physical activity of 20 minutes or more involving muscular activity of variable resistance that follows a routine pattern and develops fitness
4. **Method of Instruction**

**Theoretical:** A pattern of communicating a skill or information (Merriam-Webster, 1999)

**Operational:** A pattern of communicating a skill or information as determined by responses to the Highfill Exercise Questionnaire

**Assumptions**

The following assumptions guided this study:

1. Osteoporosis is a significant health problem for women.
2. Individuals have the ability to make health conscious decisions.
3. Individuals are knowledgeable about whether or not they have a diagnosis of osteoporosis.
4. Health conscious decisions are a form of self-care.
5. Older women are capable of participating in exercise.

**Summary**

This chapter presented information concerning the risks and incidence of osteoporosis, a preventable disease well defined by low bone mass and structural deterioration. Degeneration from osteoporosis has placed a vast number of Americans at an increased risk for fractures especially of the hip, spine, and wrist. Exercise programs may modify some risk factors for osteoporosis and have been shown to have a positive influence on functional abilities of an individual. The benefits of exercise participation were presented. Because people may engage in physical activity for a variety of reasons, health care providers need to identify and understand what factors effectively encourage
patients to increase their level of physical activity and adhere to exercise regimes.
Orem’s self-care deficit theory was described and related to the current study. The
purpose, research hypothesis, assumptions and definition of terms were defined. The
following chapter will review literature supporting the current study.
Chapter II

Review of Literature

Reduced levels of physical activity have been associated with an increased risk of osteoporosis in most epidemiological studies. Intervention studies have shown beneficial effects of exercise regimes on bone mineral density. However, researchers have not yet established which specific forms of physical activity are most strongly associated with bone mineral density in postmenopausal women. Furthermore, it remains unclear which type of physical activity during a particular age period would be most beneficial for prevention of a decline in bone mass and density. Controversy exists concerning the benefits of formalized exercise prescriptions over home-based programs. The following studies support the recommendation to increase physical activity throughout the life span, particularly during the early ages as a means of osteoporosis prevention. The research studies identified also support the need for more formalized exercise training initially to increase adherence to exercise regimes continued outside the structured therapy environment.

Researchers have studied ways to motivate society to make lifestyle changes toward prevention of osteoporosis. Weight-bearing exercise has been singled out as an identified factor that individuals can control in efforts to prevent this disease. Taggart and Conner (1995) studied the correlation between exercise habits, health beliefs, and
osteoporosis knowledge among female college students. The purpose of the study was to determine the relationship between age, osteoporosis knowledge, knowledge of osteoporosis risk factors, and motivation to change behaviors to a more healthy lifestyle. The researchers hypothesized that a positive correlation existed among the variables of osteoporosis knowledge, age, and motivation to exercise.

A descriptive, correlational design was used to learn the strength of the relationship between exercise habits, osteoporosis knowledge, and health beliefs. The population in this study included all female college students aged 18 to 53 years old. A convenience sample of 113 students who were enrolled in a basic health course was selected for the study. The site was a commuter college with a large number of older, non-traditional students.

Demographic data were collected to assess the risk factors and age of the participants. The participants used a self-response method to answer statements on the Health Belief Model Scale (HBMS) and Osteoporosis Knowledge Test (OKT). Each statement had a Likert format for responses. Cronbach alphas for internal consistence ranged from 0.61 to 0.80 for each variable subset. Reliability was established by test-retest method at 90% by the scale's authors. The OKT was created from a review of literature by the authors and approved by a panel of experts for content validity (Taggart & Conner, 1995).
Researchers found that the participant mean age was 27. Older students had a greater understanding of risk factors for developing osteoporosis. The majority (84%) of the sample were white, with only 8% reporting a family history of osteoporosis, and 25.7% admitting lack of exercise. The exercise frequency mean was five times per week. Younger participants exercised more frequently than the older participants.

A statistically significant relationship between frequency of exercise and osteoporosis knowledge or frequency of exercise and health beliefs emerged. Taggert and Conner (1995) determined that the students who were most aware of the benefits of exercise also were the most knowledgeable about osteoporosis ($r = 0.25, p = 0.01$). Students who perceived osteoporosis as a severe disease were more aware of their own risk factors for the disease ($r = 0.24, p = 0.05$). The older the student, the higher the knowledge ($r = 0.19, p = 0.04$), and the more motivated they were to change their lifestyle ($r = 0.19, p = 0.05$). The older participants recognized more barriers to exercise than the younger participants ($r = 0.94, p = 0.01$). These barriers were identified as difficulty starting a new habit, interference with routine, and lack of social support.

The researchers determined a strong correlation between age and the perception of exercise barriers. The researchers postulated that the older participants’ exercise barriers were greater than their motivation to exercise even though the older participants were more knowledgeable about the risks and benefits of exercise. Based on findings, Taggert & Conner suggested that exercise programs should begin in childhood and continue throughout the life span of the individual.
The study conducted by Taggert and Conner (1995) provided direction for the current researcher to bolster support for exercise programs beginning early in life and continued throughout the life span of an individual. The authors identified exercise barriers having a greater impact on persons’ decisions to exercise than knowledge of the potential risks of not exercising. The findings of the Taggert and Conner research are relevant to the current study and support the need for additional research concerning exercise frequency and osteoporosis.

As the aging population escalates, osteoporotic fractures have become a common occurrence related to the lack of weight-bearing activity. Researchers have suggested that most prevention has been aimed toward young premenopausal women who are more likely to be motivated to participate in health-related physical activities.

Heinonen and Kannus (1996) studied the effect of high-impact exercise on selected risk factors for osteoporotic fractures among 98 healthy, sedentary female volunteers aged 35 to 45 years. The purpose of this study was to investigate whether an 18-month regimen of high-impact, weight-bearing exercise would change bone mineral density (BMD), muscular performance, and balance in healthy premenopausal women. The researcher hypothesized there would be an increase in BMD, muscular performance, and balance among healthy premenopausal women following high-impact, weight-bearing exercise intervention over an 18-month time period.

Two hundred, forty-two women who responded to a local newspaper advertisement were included in the study by Heinonen and Kannus (1996). After the exclusion of 144 women, 98 subjects were randomly assigned to either an exercising
group (n = 49) or a non-exercising control group (n = 49). Baseline measurements of each participant were taken before beginning the exercise program. Baseline BMD measurements were done at 12 and 18 months. All scanning and analyses were done by the same operator. The coefficient of variation of the BMD measurements ranged from 0.5% to 0.8%, and the scanner was calibrated daily. Isometric strength was measured using a dynamometer. The participants’ legs also were evaluated with a vertical countermovement jump test with and without the addition of 10% of the participant’s body mass. The participants also were evaluated regarding vertical jump, dynamic balance, running time, and walking to assess cardiorespiratory fitness, oxygen consumption per minute (VO), and heart rate.

Training sessions were three times per week for 18 months and were supervised by one of four experienced exercise leaders. Each session included a warm-up, multidirectional high-impact exercises, callisthenics, and a cooling down phase. The women were asked to maintain their pre-study activity level in addition to the study exercises. The participants were interviewed every four months to monitor any changes in their exercise habits. At eight and 12 months all the women wore pedometers on two occasions for three consecutive days to assess daily physical activity.

Heinonen and Kannus (1996) used general linear models with the restricted maximum likelihood estimation to assess the effects of the exercise intervention at 12 and 18 months on the BMD, muscular performance, dynamic balance, and cardiorespiratory fitness. This type of analysis allowed incorporation of incomplete data and adjusted baseline differences into the models. With the acceptance of an equal dropout rate (n =
the sample size of the study provided 90% statistical power to detect a difference between the groups of about 2% in BMD at a significance level of \( p < 0.05 \). The mean baseline characteristics for age, height, weight, body mass index, and percentage body fat of the volunteers were equal for both groups.

Heinonen and Kannus (1996) reported 83% training compliance (2.5 times per week). The mean daily physical activity was unchanged at 10,000 steps per day (SD 2400) in the training group and 9,800 steps per day (SD = 2800) in the control group. The estimated mean distance walked per day was unchanged at 8 km (M = 2) in both groups.

Researchers, Heinonen and Kannus (1996), reported post-training difference between training and control groups adjusted for baseline values were statistically significant at a 95% confidence interval (CI) on BMD for lumbar spine (0.015, \( p = 0.002 \)), femoral neck (0.012, \( p = 0.006 \)), distal femur (0.017, \( p < 0.001 \)), patella (0.007, \( p = 0.036 \)), proximal tibia (0.026, \( p = <0.001 \)), and calcaneus (0.010, \( p < 0.001 \)). Post-training difference between training and control groups were not statistically significant at a 95% CI on trochanter BMD (0.006, \( p = 0.13 \)) and distal radius (20.002, \( p = 0.37 \)).

The researchers reported no statistical difference in the isometric strength tests between the two groups. However, in the vertical jump, the training group participants did significantly better than the control participants with (36, \( p = <0.001 \)) and without (21, \( u = 0.007 \)) weight. Post-training difference between training and control groups were not statistically significant at a 95% CI for running (-0.3, \( p = 0.082 \)). The post-training
group was significantly higher in VO (31, p = <0.001) than the control group. Energy or calcium intakes between the groups during the study did not change.

Heinonen and Kannus (1996) determined that high-impact, weight-bearing exercise had a systematic, positive effect on axial and leg bones with improvements in muscle strength and balance. These researchers were able to demonstrate that exercise programs may modify some risk factors for osteoporosis and osteoporotic fractures in a positive direction.

The researchers concluded that the high attendance (80%), high compliance (83%) and minimum need for medical services (16 visits over 18 months) demonstrated that the decision to exercise could promote good health, improve adaptation to the social environment, and assist adjustment to changing personal conditions all of which contribute to aging well. Heinonen and Kannus agreed that training effects are likely to disappear once training has been discontinued and, therefore, the exercises described in this study should become a part of the individual’s lifestyle to prevent osteoporosis and osteoporotic fractures in later life. Exercise performed on a regular basis may be an efficient, feasible, and inexpensive way to prevent osteoporosis and osteoporotic fractures.

Heinonen and Kannus (1996) implied the additional need for research in the area of exercise and osteoporosis and osteoporotic fractures among women. These researchers connoted that little research was available regarding exercise as a preventive measure to osteoporosis. Heinonen and Kannus demonstrated, however, that with motivation and
compliance individuals may have a positive influence on their level of physical activity and health as they age.

The importance of the Heinonen and Kannus (1996) study to the current research was that it highlighted the significant factors related to an individual's participation in physical activity, and the effects of exercise on that individual. The Heinonen and Kannus study investigated effects of various exercise regimes on several variables including BMD in premenopausal women, while the current study focused on the effect of instructional method on exercise frequency among women with osteoporosis.

Physical activity has been associated with increased bone mass, improved muscle strength, balance, and coordination. This combination of effects raised the question for Gregg, Cauley, Seely, Ensrud, and Bauer, (1998) of whether physical activity prevents osteoporotic fractures. The purpose of the study was to learn whether higher levels of physical activity were related to lower incidences of hip, wrist, and vertebral fractures in older women. The researchers hypothesized that a positive correlation existed among the variables of physical activity levels and the incidence of hip, wrist, and vertebral fractures.

A prospective cohort design was used to determine the association of types, amounts, and intensity of physical activity with risk for fracture in older women. Gregg et al expanded their previous analysis of the Study of Osteoporotic Fractures cohort. The setting for the study was in four clinical centers in Maryland, Minnesota, Oregon, and Pennsylvania. The study was conducted over 9.6 years. The population for the study included 9704 Caucasian women aged 65 years or older who were patients from the four
clinical sites and were recruited from population-based lists. All participants were interviewed and measured for baseline data collection.

To assess pre-study physical activity, participants used a self-response method to answer statements on the modified version of the Harvard Alumni Questionnaire. Each participant was asked to report the frequency, duration, and quantity of their participation in 33 physical activities during the past year. A self-report of inactivity and self-rated health status was supplied by each participant.

Body weight and height were recorded using a balance-beam scale and stadiometer. Bone mineral density (BMD) was measured at the distal radius and calcaneus. Hip abduction was also measured. Participants were contacted every four weeks to inquire about fractures which were confirmed by radiographic reports and films.

Gregg et al stratified women within exercise intensity groups according to their self-reports, measurements, and interview responses. Analysis of covariance (ANCOVA) adjusted for age and chi-square tests of homogeneity were used to evaluate potential confounders across physical activity levels. Proportional hazards regression was done to calculate the relative risk (95% CIs) for hip and wrist fractures associated with physical activity level. A multivariate model was used that included osteoporosis risk factors and functional difficulty. Logistic regression was used to analyze vertebral fractures by applying a similar modeling strategy to that of the multivariate model.

A statistically significant relationship between frequency of exercise and osteoporotic fractures emerged. Women who were more active were less likely to report functional difficulties, had higher self-rated health, and had higher calcaneal and distal
radius BMD ($p < 0.001$) than did inactive women. Women in lower quintiles of total physical activity had lower BMD, heavier body weight; were more likely to smoke; less likely to use estrogen or alcohol; and had lower calcium intakes than women in higher quintiles ($p < 0.05$). The least active women had the greatest fall rate (12%) followed by the most active women (11.9%). Moderately active women had the least fall rate (9.6 to 10.2%). The researchers determined that after an average follow-up period ($M = 7.6$ years), the study group sustained hip, wrist, and vertebral fractures (CI, 4.4%, 5.4%, 5.4%, respectively). Hip fracture risks were lowest among women in the highest quintile of total physical activity (relative risk, 0.58, 95%, CI 0.42 to 0.80), compared with the least active (27%) and moderately active women (45%).

The greatest reductions in risk were among women who did moderate-to-vigorous activities per week (relative risk, 0.47, CI 0.32 to 0.68). However, Gregg et al found that women in the third and fourth quintiles with less than two hours of activity per week had a relative risk of 0.76 (CI 0.53 to 1.10). Women who reported low-intensity activities less than two hours per week (relative risk, 0.77, CI 0.60 to 0.99) had a higher relative risk compared with the same level women who reported more than two hours per week, 0.74, (CI 0.56 to 0.98).

Women who reported 10 hours or more per week of heavy chores had a 22% reduced risk (CI 0.02 to 0.39) compared with women who reported less than five hours per week. Women who were sedentary for nine hours or more per day had a 43% higher risk (CI 0.12 to 0.82) than those who were sedentary six hours or less per day. For those women that reported known risk factors for osteoporosis, there was a 4% to 6% weakness
identified in the relationship between physical activity and hip fracture risk. After adjustment for these confounders, highly active women had a 36% reduction risk for hip fracture (multivariate relative risk, 0.64 [CI 45% to 89%]) over the inactive women.

The researchers determined that women who reported heavier chores (multivariate $P$ for trend for heavier chores, 0.09) and higher levels of total physical activity tended to have reduced risk for wrist fracture. Although important, these relations were statistically insignificant ($p>0.2$). Risk for vertebral fractures associated with total physical activity was also not significant ($p>0.2$). Women in the middle quintiles had a significantly reduced odds ratio for vertebral fracture (0.63, CI 0.44 to 0.88). These finding by Gregg et al were not consistent across the quintiles. Women who reported less than two hours of recreational activity per week (odds ratio, 0.70, CI 0.45 to 1.07) had a slightly higher odds ratio than those who reported more than two hours per week (odds ratio, 0.67, CI 0.46 to 0.97).

Gregg et al (1998) surmised that the association of total physical activity with risk for hip fracture was related to both the amount and intensity of physical activity. They also conjectured that exercise would enhance BMD, reducing the likelihood of fracture in the event of a fall. A strong relationship between physical activity and hip fracture was positively correlated. Women who were more active were less likely to report functional difficulties, had higher self-rated health, and had higher calcaneal and distal radius bone mineral density ($p < 0.001$) than lesser active women. The greatest reductions in risk were among women who did moderate-to-vigorous activities weekly.
The researchers recognized several limitations to their study. The participants were primarily white, female, and lived independently which limited generalization to other populations. The assessment tools which were utilized in the study were originally designed for younger populations. Another limitation to their findings was the participants’ use of benzodiazepines and anxiety medications. Additionally, the sample size for vertebral fracture portions of the study were decreased due to attrition. Multi-factorial controls were instituted to accommodate for lack of a randomized design.

Recommendations for further studies were suggested by Gregg et al (1998) to evaluate whether different types of physical activity affect other types of osteoporotic fractures. Secondly, studies to investigate whether physical activity affects osteoporotic fractures primarily through effects on the skeleton, muscular fitness, balance, or other mechanisms would be beneficial to society.

The importance of the study conducted by Gregg et al (1998) to the current research was that it explicated the significant factors related to older women’s participation in physical activity. A strong relationship was identified between physical activity and hip fracture risk with greatest reduction in risk among the moderately active women. This is relevant to the current study and supports the need for additional research on the type and frequency of exercise of persons diagnosed with osteoporosis.

Bravo, Pierre, Roy, Payette, and Gaulin (1997) conducted a study to examine the outcomes of water-based weight-bearing exercise programs designed for women with low bone mass. The goal of the study was to find new weight-bearing exercise programs constructed to be performed by the participant in a pool of water. Impact forces are
required for the bone to respond to physical activity which accounts for the lower bone mass among swimmers than other athletes. Researchers speculated that by immersing only half the body in water, the half of the body out of water would produce enough impact on the pool floor to be beneficial to bones.

Seventy-seven community-dwelling postmenopausal women, 50 to 70 years of age, from a Canadian city volunteered for the study. All of the women had either spinal or femoral bone density below the fracture threshold of < 2.5 standard deviations (SD) below the mean of young healthy adults. A test-retest cross-sectional, prospective study design was used to collect data. The women exercised in waist-deep water in a pool for one hour, three days per week for a 12-month period. The sessions were administered by a trained fitness leader. Each session consisted of a 10-minute warm-up, 40 minutes of successive jumps and muscular exercise designed to promote bone assertion, strength, and endurance, followed by a 10-minute cool-down program. Training reached target levels by the fifth week of the study.

The results of the study conducted by Bravo et al (1997) determined spinal bone mineral density (BMD) decreased significantly (p < 0.001), whereas no change in femoral neck BMD (p = 0.90) existed. Five parameters to assess functional fitness of the women were coordination, flexibility, agility, strength/endurance, and cardiorespiratory endurance. All parameters (p = 0.001), except coordination (p = 0.079), were significantly affected by the exercise program. After completion of the exercise program, psychological well-being improved significantly (p = 0.001).
The bone density measurements of the lumbar spine of the women in the study confirmed a reduction of approximately 1% over the 12-month period. This bone loss suggested to Bravo et al (1997) that the water-based exercises in this study did not supply enough force to the bones to reverse the normal progression of osteoporosis. However, the exercise program was successful in improving the parameters of flexibility, agility, strength, and endurance which have been associated risk factors for bone fractures from falls. Bravo et al concluded from their 1997 study that the findings did not provide the expected outcome, however, the women in the study improved both functionally and psychologically following their participation in the water-based exercise program despite a lack of effect on the bone mass.

The study executed by Bravo et al (1997) was important to the current research by providing reinforcement to the concept that it is imperative to have the correct exercise program conducted by trained individuals to elicit the desired effects. However, it is critical to note even though the desired increase in bone mass was not attained, the functional and psychological levels of the women were significantly increased improving the quality of life. Therefore, people who participate regularly in structured exercise programs may benefit from improved functional ability and psychological well-being over that of sedentary persons. In many occasions, a prescriptive exercise plan from a provider underscores the importance of exercise and adherence. Investigation into methods of exercise instruction by the current study would build on the premise of Bravo et al that the correct exercise regime is essential to obtain the proper results.
Back pain, often accompanying osteoporosis, can cause functional disability leading to sedentary lifestyles, bone loss and impaired quality of life. In the OPTIFIT Berlin study performed by Dr. Peter Donhauser of Germany in 1999, three standardized physical training programs were determined to be effective in reducing back pain in osteoporosis participants after only 6 months performance. These programs improved the participants’ ability to perform activities of daily living (ADLs) and prevented bone loss at the spine and hip.

One hundred, thirty women with osteoporosis participated in a 3-year, randomized, prospective, controlled trial. The mean age of the subjects was 60 years. The subjects were divided into four groups, three groups performed standardized exercises and the fourth group served as the control, non-training group. The three training groups consisted of a weight-training exercise group, a low-impact endurance training group, and a balance-training water-gymnastics group. Twice weekly, each groups engaged in 1.5 hours of structured exercise. Calcium, vitamin D, and estrogen supplementation were permitted during the study for the training groups and were mandatory for the control group.

Participants for the study included women who were more than two years postmenopausal, lumbar spine bone mineral density T-score of < -2, and were allowed up to six vertebral fractures. Participants completed questionnaires before beginning training describing their ADLs, sports, daily calcium intake and medical history. Subjects were also asked to rate their back pain using a visual analogue scale (VAS). This scale was used at the beginning and completion of the study to measure the pain.
Data from the OPTIFIT study (Donhauser 1999) revealed that the participants in the weight-training (VAS = -2.5%, \( p < 0.01 \)), endurance (VAS = -1.2%, \( p < 0.01 \)), and balance-training groups (VAS = -1.5%, \( p < 0.01 \)) reported significant decreases in pain scores over baseline. The control group documented an increase in pain score at the completion of the study (VAS = 0.9%, \( p > 0.01 \)). The weight-training (ADL = 10.7%, \( p < 0.01 \)), endurance (ADL = 3.0%, \( p < 0.01 \)), and balance-training (ADL = 3.5%, \( p < 0.01 \)) groups also reported significant gains in their ability to perform ADLs over the control group (ADL = -2.2%, \( p < 0.01 \)).

Percent changes in spine BMD (sBMD) for the participants in the weight-training (sBMD = 1.4%, \( p < 0.05 \)), endurance (sBMD = 3.3%, \( p < 0.05 \)), and balance-training groups (sBMD = 2.1%, \( p < 0.05 \)) were small but significant over the control group’s spine BMD measurements (sBMD = 0.4%, \( p < 0.05 \)). The hip BMD for the participants in the weight-training (sBMD = -0.5%, \( p < 0.05 \)), endurance (sBMD = 1.9%, \( p < 0.05 \)), and balance-training groups (sBMD = 2.9%, \( p < 0.05 \)) were small but significant over the control group’s hip BMD measurements (sBMD = -0.7%, \( p < 0.05 \)). Women in the endurance group demonstrated the greatest improvements and developed better cardiovascular capacity over all the groups. There were no changes in endurance and cardiovascular capacity among the control group. Spinal mobility improved in all women.

With these results, Dr. Donhauser (1999) concluded that symptom improvement and enhanced quality of life could be achieved using weight, endurance, and balance training programs. Therefore, structured physical training should be included in the
management of postmenopausal osteoporosis. The goal of exercise prescriptions would be to increase muscle strength, improve balance/coordination, and to improve chronic pain symptoms.

The study findings by Dr. Donhauser (1999) lends credibility to conduction of research such as the current study. The Donhauser findings suggested that a program designed of appropriate exercises is an important part of the comprehensive management of patients with osteoporosis. Donhauser recommended that a top priority of health care providers should be the prevention and limitation of injuries and fractures because of osteoporosis by preserving or increasing bone mass. Therefore, there is support for the current study which may aid providers in taking an assertive role in the promotion of physical activity for prevention, rather than the passive role in treating problems after-the-fact.

Exercise is essential for maintaining functional independence due to the fact that it improves muscle strength, coordination, and balance which lessen the risks of fall-related fractures in the osteoporotic individual. At the Department of Physical Medicine and Rehabilitation, University of Vienna, Kerschan et al (1998) conducted a study regarding the functional impact of an unvarying exercise program on women after menopause. All subjects were recruited from an outpatient clinic of the University of Vienna. Two-hundred, forty-six nonsmoking women between 45 and 75 years of age without malabsorption or chronic diseases, and lived sedentary lifestyle were chosen for the study. All the women were at least one year postmenopausal, with or without hormone replacement therapy (HRT), and had been evaluated in the clinic five to ten years
previously. Participants for the study were stratified into a training group (T, n = 67) and a control group (C, n = 57). Groups were further stratified into subgroups of those women who took HRT (C: n = 17; T: n = 23), and those women whom did not take HRT (C: n = 30; T: n = 34). All women were advised to consume 1200mg of supplemental calcium with their food.

The exercise program designed by Kerschan et al (1998) consisted of brisk walking, modest jogging, stretching, and exercises directed toward correction of inadequate muscle strength, poor posture, and inadequacies in coordination. The women were instructed to exercise three times weekly for 20 minutes during each session. Twice per week, the women were initially supervised for 45 minutes at each session by a physical therapist. At 6-month intervals, the women attended supervised training sessions five times for correction in exercise performance.

After a follow up period of 7.7 ± 1.1 (mean ± SD) year, 124 of the 246 women were interviewed by Kerschan et al (1998) regarding their training and leisure activities. In addition, the women were given physical examinations including bone density measurements, serum analysis, and urine analysis. During each follow up visit, each subject completed pain disability index (PDI), walking test, muscle strength test, functional assessment of the joints, and x-ray of the spine. Because there were participants more compliant than others, the training group was additionally stratified into highly complaint exercisers (T1, n = 24), those who performed the prescribed program three times per week for at least 20 minutes at each session, and less compliant
exercisers (T2, n = 43), those who performed the prescribed program irregularly, less than one hour per week, or stopped completely.

Kerschan et al (1998) used intention-to-treat analysis to determine differences in height, body weight and body mass index among the groups. The findings showed no significant (p <0.05) differences in these factors. The menopausal age differences were significant (p <0.05) but not clinically relevant [(C) baseline = 58.8 ± 7.4; (C) end of study = 66.0 ± 7.3; (T) baseline = 62.1 ± 5.6; end of study = 70.2 ± 5.6].

In the three group comparison, 36% (n = 24; 48% at 3-year follow up) of the exercise group reported compliance with the home program while 64% (n = 43) were non-compliant with the home program. There were no significant differences (p <0.05) between the groups in terms of PDI (C) = 12.0 ± 14.2; T1= 6.9 ± 8.2; T2 = 10.4 ± 10.3), muscle shortening (C = 28; T1 = 5; T2 = 9), and gait velocity [(self-chosen) C = 71.3 ± 12.2, T1 = 78.6 ± 12.1, T2 = 73.8 ± 13.3; (corrected self-chosen) C = 0.3 ± 0.51, T1 = 0.329 ± 0.05, T2 = 0.311 ± 0.057; (corrected maximal) C= 0.401 ± 0.077, T1= 0.438 ± 0.071, T2 = 0.416 ± 0.054]. Regression analysis showed a significant difference (p = 0.005) in the self-chosen gait velocity on PDI. The higher the corrected self-chosen gait velocity the better chance of reporting a PDI of zero, or no pain, allowing more mobility. This finding was confirmed using multiple regression (p <0.01) (Kerschan et al, 1998).

Analysis by the researchers, Kerschan et al (1998), for 20 age-adjusted matched pairs indicated compliant exercisers had significantly stronger abdominal muscles at the end of the study than the control group (p <0.05; T1 = 3.4 ± 0.2; C = 2.6 ± 0.2). More
compliant exercisers ingested bone-specific medication, such as calcium, than the control subjects (p <0.05; T1 = 10; C = 4). No other differences were appreciated.

According to the researchers, exercisers who performed unvarying home-based exercise programs for the study period of time did not show significant differences in pain induced disability, muscle strength, postural stability, and fracture rate compared to the women who did not exercise regularly. “Although no intergroup differences could be found, a negative association between pain induced disability and corrected self-chosen gait velocity existed. Therefore, gait velocity can be regarded as an objective parameter of functional impairment” (Kerschan et al, 1998, 330).

Intervention studies with postmenopausal women are rare and provide conflicting results especially where compliance is concerned. The unvarying exercise program designed by Kerschan et al (1998) did not incorporate enough force to show intergroup differences. However, after an almost 8-year period, these researchers were able to show evidence of adherence to the exercise program in 36% of the elderly women who were sedentary prior to the study. Therefore, the Kerschan et al study adds credence to the idea that previously sedentary elders can improve their functional abilities by engaging in regular exercise. This is relevant to the current study which investigated various methods of exercise instruction and the frequency with which the exercises were performed by older women diagnosed with osteoporosis.

In review of a similar study, Preisinger, Alacamlioglu, Pils, Saradeth, and Schneider (1995) presented findings from a 3-year study instituted to evaluate the efficacy of therapeutic exercises in the prevention of bone loss. In this study, 146 untrained,
sedentary, Caucasian women between the ages of 45 and 75 years were selected. In addition, the women must have been at least one year postmenopausal, free of chronic diseases, nonsmokers, and were not taking estrogen or other substances that would alter bone composition. The women were consecutively, randomly assigned to either an exercise group (group 1) or a control group (group 2). At the 3-year follow up, the exercise group was further stratified into regular exercisers (group 1a) who exercised at least three times per week for a minimum of 20 minutes per session and irregular exercisers (group 1b) who exercised less than one hour per week, were inconsistent with the routine, or stopped completely.

The exercise program consisted of warm ups, stretches, and complex exercises to improve movement patterns. The participants’ performance was supervised by a qualified therapist 20 times during the first 10-week period and five times every six months for the remainder of the 3-year study period. Bone density testing was performed at baseline and 6-month intervals by the researchers, Preisinger et al (1995). Physical activity, exercising patterns, complaints, and dietary intake were self-reported on questionnaires by the participants.

Preisinger et al (1995) administered a one-way ANOVA and Scheffe’s test to learn the results of the study. The null hypothesis was rejected when \( p < 0.05 \). At the completion of a 3-year study span, the researchers were able to confirm a 48% (\( n = 39 \)) compliance rate among the 146 women [(1a) \( n = 39 \); (1b) \( n = 43 \); (C) \( n = 64 \)]. Significant bone loss (\( p < 0.01 \); mean regression slopes in percent per year ± SEM) occurred in group
1 (distal, -1.1 ± 0.3; proximal, -1.2 ± 0.3) as well as in group 2 (distal, -1.7 ± 0.2; proximal, -1.9 ± 0.2).

On the cross-sectional analysis by Preisinger et al (1995), no significant differences in changes of bone density were appreciated between group 1 and group 2. However, the mean regression slopes at both forearm sites (proximal and distal) were significantly less negative in group 1a (u = NS, distal, -0.3 ± 0.2; u =<0.03, proximal, -0.7 ± 0.2) than in group 1b (p <0.02, distal, -1.8 ± 0.3; p <0.0001, proximal, -1.6 ± 0.2) or group 2 (p <0.0001, distal, -1.7 ± 0.2; p <0.0001, proximal, -1.9 ± 0.2).

According to the researchers, Preisinger et al (1995), the findings of their study implied, that in the elderly, the effect of exercise on bone mass is dependent upon the subjects’ motivation to exercise consistently. The women who exercised regularly had significantly less bone loss than did the group that ceased to exercise or the group that did not exercise regularly. The Preisinger et al study aided the current study in establishing that elders can learn to exercise safely and can perform exercises adequately to prevent or retard bone loss. The current study focused on methods of exercise instruction which could lead to better performance and adherence of the exercise regime in women who are diagnosed with osteoporosis.

Many individuals are given exercise plans for self-care and prevention by qualified therapists. However, the elderly often times have problems with comorbidity which could interfere with an individual’s ability to completely adhere to an exercise program. Research is limited on the effects of the number of exercises an individual should be prescribed to foster compliance with the program. Past researchers’ views have
pendulously swung toward the opinion that the higher the number of treatments a person is given the less likely they are to adhere to the treatment program. Henry, Rosemond, and Eckert (1999) set out to study whether older adults perform and adhere better when they are prescribed fewer or greater numbers of exercises.

Eleven women and four men, aged 67 to 82 years (M= 72.8), who were living independently were selected for the Henry et al (1999) study. The fifteen subjects were divided into three groups containing five members each. The subjects were randomly prescribed two, five, or eight generic exercises to perform at home for seven consecutive days. The subjects were given exercise instruction by a therapist at the initial session. The subjects were asked to record the number of repetitions for each exercise performed each day and document their performance in a daily, self-reported diary. The subjects returned to the therapist within seven to ten days following instructions for evaluation. The participants were given a check mark by the therapist for each set of ten repetitions per exercise per day.

Using Kruskal-Wallis one-way ANOVA, Henry, Rosemond, and Eckert (1999) discovered a difference among the groups (H = 6.195, df = 2, p < 0.046). The average scores for the groups that were given two, five, and eight exercises were 11.4, 8.2, and 4.4, respectively. The results indicated no differences among groups with two, five, or eight exercises. Henry et al found a difference in performance scores among groups. An apparent tendency was that the median performance score (12 indicated a perfect score) of each exercise group decreased as the number of exercises increased. Dunn’s post hoc test revealed a difference occurred between the group that was prescribed 2 exercises and
the group that was prescribed 8 exercises (11.5:12; 11:12; 10.25:12; respectively).

The data suggest that performance decreased when subjects were prescribed five or more exercises. A correlation analysis of the exercise compliance, as measured by an exercise log, and of performance, as measured by direct observation by the therapist, yielded a correlation coefficient of 0.54. A moderate correlation was found between the performance assessment tool scores and the self-report percentage rates, making the correlation positive. This would demonstrate high compliance rates among the subjects.

According to the researchers, Henry et al (1999), adults tend to perform curative exercises more consistently than preventative exercises and the length of time the exercises are to be performed may influence adherence. As in this study, the exercises were prescribed for seven days. Therefore, individuals who are given exercise prescriptions for long periods of times may show less adherence to the regimes especially if the exercises were prescribed for prevention rather than cure. Data from the Henry et al study supports the current study in providing knowledge for assisting health care providers to prescribe home exercise programs for elders. Data supports the fact that fewer exercises may yield better performance and adherence among elders.

Exercise regimes for the elderly, more often than not, have included walking. Krall and Dawson-Hughes (1994) conducted a study to determine if walking aside from other activities would have an influence on bone density and rates of bone loss from the lumbar spine and whole body of postmenopausal women. Initially, there were 276 participants that enrolled in a 1-year vitamin D supplementation trial. Of that 276 women, 37 were excluded due to missing information, non-compliance, or conditions
associated with altered rated of bone loss. The remaining 239 women were Caucasian, between the ages of 45 and 72 years of age ($M = 62 \pm 5$ years), and at least two years postmenopausal ($M = 13.5 \pm 6.8$ years). The women were all ambulatory and in good general health.

During the study, each participant came to the testing site five times between June 1989 and July 1990 to obtain baseline data. Bone density measurements of the whole body and lumbar spine (L2-L4) were made during this time, repeated at six months and one year intervals. The subjects completed an activity questionnaire by self-report method. The subjects self-reported the number of miles walked per week and the amount of time spent in 14 sport and/or leisure activities per week. Dietary intake of calcium, vitamin D, and caffeine within six months previous to the study were estimated with a food frequency questionnaire by the researchers.

Krall and Dawson-Hughes (1994) surmised from their study that walking out of doors was the predominant form of leisure activity (baseline $M = 5.3 \pm 5.5, 85\%$). Fifty-nine percent of the women at baseline were engaged in at least one of the 14 sports for a mean time of $0.7 \pm 1.0$ hours per week. Forty-five percent of the women at baseline were engaged in gardening for a mean time of $0.5 \pm 0.7$ hours per week. Lower activity was detected in the spring. Significant correlations between the fall and spring in the number of miles walked ($r = 0.57, p <0.001$) and in the number of hours of sports ($r = 0.65, p <0.001$) were indicated but not in the number of hours of gardening ($r = 0.09, \text{NS}$).

According to the findings of this study at baseline, “walking was not independent of sports and gardening activities” (Krall & Dawson-Hughes, 1994, p.23). Positive
correlations were identified by Krall and Dawson-Hughes (1994) between current miles walked and hours of sports ($r = 0.30, p < 0.001$) and between miles walked and hours of gardening ($r = 0.20, p < 0.01$). The linear trend in mean BMD was significant at the whole body ($p = 0.006$). The adjusted mean for the women who walked more than 7.5 miles per week was higher than for the women who walked less than one mile per week ($p = 0.015$). The linear trend at the spine was not significant ($p = 0.20$). The linear relationship between miles walked and whole-body BMD was maintained at the 6-month evaluation ($p = 0.009$) and at the 1-year evaluation ($p = 0.008$) in spite of seasonal changes in BMD.

Krall and Dawson-Hughes (1994) postulated that women who habitually walked more than 7.5 miles per week would have a higher mean bone density at the whole body, legs and trunk regions of the body based on the findings of their study. The researchers deduced that the amount of strain placed on the skeleton by walking may not be equal to the benefits of vigorous activity. However, walking would produce enough force to reduce rates of bone loss in areas of the legs in postmenopausal women.

The study produced by Krall and Dawson-Hughes (1994) enhances the current study by providing additional information to the body of knowledge concerning the type and frequency of exercise necessary to yield results which could retard or prevent bone loss. Studies such as this one are rare and lend evidence to assist health care providers in determining appropriate exercises for women in efforts to deter bone degeneration. The Krall and Dawson-Hughes research provided a foundation for the current study in which the impact of methods of exercise instruction were compared.
There are several instructional methods for teaching exercise techniques which can be utilized by individuals seeking advise. Friedrich, Cermak, and Maderbacher (1996) conducted a study for the purpose of investigating whether the mode of teaching exercises affected performance or impairment among individuals. The researchers examined 96 patients who were referred to an orthopedic clinic for exercise instruction. Of the subjects selected for the study, 33 were women and 54 were men with complaints of neck and back pain. The subjects were between 20 and 70 years old (M = 48 years) with at least a six week history of neck or lumbar pain. None of the participants in the study had prior formalized exercise training. All subjects were randomly assigned to receive one of three different brochures (A, B, or C). The exercises in each brochure were described and illustrated differently although the goal of treatment was essentially the same.

The subjects were additionally assigned to one of two groups. The subjects in group one were given individual instructions by a physical therapist (n=47), brochures (A: n = 15; B: n = 17; or C: n = 15), attended eight treatment sessions, and had initial and follow up evaluations. Group one participants were told to perform the home exercise program for 20 minutes on the days they were not treated in the clinic. The 40 subjects in group two were given a brochure (A: n = 15; B: n = 13; or C: n = 13) by a therapist and told which exercises to perform. None of the 40 subjects in group two were given individual instructions by the therapist. The subjects in group two exercised for 20 minutes per day on their own without guidance of a therapist. Pain intensity was recorded using a visual analogue scale at baseline and follow up visits.
The researchers reassessed the subjects' performance four days after the brochures of exercises were given out. A three-grade scale was used to assess the status of the subjects with a grade of one being the best and grade three being the worst. Blinded examinations of the subjects were conducted by three different reviewers who did not have knowledge of the group or assignments. A reliability study assessing the interobserver agreement among the three reviewers yielded a kappa coefficient of 0.88.

T-tests, U-tests, and chi-square tests were used by Friedrich et al (1996) to analyze data. ANOVA was used to compare brochure groups. Ranking correlations were used to establish the links between the dependent variables. The researchers rejected the null hypothesis if \( p < 0.01 \). No differences between the groups were observed at baseline. At follow up, the supervised group (\( p < 0.01 \)) had improved in the exercise performance over the unsupervised group (\( p = 0.9 \)). The supervised group (\( p < 0.01 \)) had improved in the muscle status over the unsupervised group (\( p = 0.9 \)). The quality of the exercise performance correlated both with muscle status improvement (\( r = -0.38, p < 0.01 \)) and with pain relief (\( r = -0.47, p < 0.01 \)), as was muscle status improvement to pain relief (\( r = 0.30, p < 0.01 \)), according to findings of Friedrich et al (1996).

Findings of Friedrich et al (1996) provided additional foundation to the necessity of providing patients with individual instructions for exercise techniques by a qualified therapist rather than merely handing them written information in order to achieve better outcomes. It was similar to the current study in that both studies examined methods of exercise instruction given to osteoporosis patients. They differed, however, as the Friedrich et al study looked at the effects of instruction on muscle status and pain relief,
while the current study ascertained the impact of exercise instruction on exercise frequency. Some individuals may need correction or positive feedback from the health care provider concerning technique which can not be achieved by using brochures. The Friedrich et al (1996) study adds empirical evidence to the current study which suggests that compliance and outcomes may be directly related to the status of the individual’s relationship with the health care provider.

In recent years, there has been increasing evidence of the benefits of exercise to the American public. Health care providers have been encouraged to counsel individuals about exercise and the benefits exercise can provide. Americans’ sedentary lifestyles have given rise to the need for providers to prescribe exercise as not only curative but preventive treatment. Wee, McCarthy, Davis, and Phillips (1999) identified factors associated with exercise counseling by US physicians. For the purpose of data collection, these researchers utilized national population-based supplement survey (Year 2000) survey to the 1995 National Health Interview Survey.

The researchers for the study had 17,317 respondents to the Year 2000 supplement survey. Of this number, 9,711 persons had seen a physician within the previous year and 9,299 had been counseled about exercise. Thirty-four percent of the 9,299 respondents were counseled about exercise while at their last clinic visit.

Wee et al (1999) discovered that women (n = 59) were more likely to be counseled, with an adjusted odds ration (AOR) of 1.15 (95%CI, 1.02-1.29). The race of an individual did not affect counseling practices. The physicians were found to counsel adults over the age of 30 years more often than the younger patients with patients 40 to 49
years of age counseled most often (AOR, 1.71 [95% CI, 1.34-2.20]). The college graduate (AOR 1.0 [95% CI]), persons with income over $50,000 per year (AOR 1.0 [95% CI]), and those persons with Medicare (AOR 1.09 [95% CI, 0.82-1.45]) were counseled more often than others. Persons who were obese with a body mass index (BMI) ≥ 30 were more likely to be counseled (BMI 30-34, AOR 1.90 [95% CI, 1.61-2.24]; BMI 35-39, AOR 2.52 [95% CI, 1.80-3.52]; BMI ≥40, AOR 3.34 [95% CI, 2.19-5.10], respectively) than individuals with cardiac disease (AOR 1.81 [95% CI, 1.52-2.14]) or diabetes (AOR 1.87 [95% CI, 1.46-2.38]).

The national rate of physician counseling determined by Wee et al (1999) was 34% among patients who saw a physician in the previous year for a medical evaluation. These researchers speculated that physicians appeared to counsel as a form of secondary prevention as evidenced by the higher levels of counseling among persons who had comorbid conditions. Wee et al further speculated that physicians failed more often then not to counsel adults who were between 25 and 35 years, sedentary, and with low socioeconomic status. These individuals could be at risk for osteoporosis and should be counseled regarding exercise benefits to aid in the prevention of osteoporosis. Thus, this study is relevant to the current research. The findings from the Wee et al study supported beliefs, as earlier studies have indicated, that exercise prevention should begin early in life and extend throughout the lifespan.

Wee et al study focused on exercise counseling frequency performed by physicians for a number of patient groups with differing diagnoses. The current study looked closer at women who were diagnosed with osteoporosis. The current research
compared methods of exercise instruction conducted by varying professionals to the frequency with which the exercises are performed by the women in the study.

**Summary**

In this selective literature review, the benefits of exercise, frequency of exercise, methods of exercise instruction, and the need for providers to become aggressive toward exercise prescriptions were discussed. The researcher found discrepancies in the literature reviews regarding the most appropriate exercise prescription for women with osteoporosis. The majority of the researchers did agree that moderate weight-bearing exercise performed three or more times per week for a minimum of 20 minutes would be beneficial to older women with osteoporosis in efforts to prevent additional bone loss. There was little data available concerning relationships between method of exercise instruction and frequency of exercise needed to yield appropriate results to prevent or retard bone loss. Therefore conduction of the current study was appropriate to add to the knowledge base of exercise and osteoporosis in women.
Chapter III

Methodology

The purpose of this study was to determine if the method of exercise instruction given to older women diagnosed with osteoporosis would influence the frequency with which these women exercised. This study could help establish the need for improved exercise instruction for persons with osteoporosis to promote a regular pattern of exercise frequency which is essential for the maintenance of bone mass and functional ability of the aging female.

Design of the Study

The most appropriate structure for this study was a non-experimental, comparison design. A comparison group design allowed the researcher to better interpret the findings for the women who had a higher exercise frequency among the study groups with different methods of exercise instruction. The researcher observed phenomena as they naturally occurred without intervening in any way. Data collection was performed at one point in time using a cross-sectional design that compared exercise frequency between groups of women who received different methods of exercise instruction.

Variables

Independent Variable. The independent variable was the method of exercise instruction, i.e., personal demonstration, written instruction, video taped instruction, verbal instruction, or a combination of methods.
Dependent Variable. The dependent variable was the frequency of exercise performed by the older women diagnosed with osteoporosis.

Control Variables. The control variables were the rural location of the data collection; selection of only female population who are members of a support group; age range of 50 years or older; and previous diagnosis of osteoporosis by a health care provider.

Setting.

The study setting was an osteoporosis support group in a rural, southern state. The support group had been in existence for approximately 12 to 18 months prior to this study. The support group was established and organized by a single chairperson who was employed by a local medical organization within the rural community of approximately 40,000 residents.

Population.

The accessible population of all women over the age of 50 who were members the osteoporosis support group and had previously been diagnosed with osteoporosis by a health care provider was chosen for the study. Also, the women had either not received exercise instruction for osteoporosis or had previously received exercise instruction specifically for osteoporosis either by verbal instruction, written handout, video taped instruction, physical demonstration, or a combination of these methods. All women lived within driving distance of the support group, however, this was not an exclusionary factor for the study.
Sample.

Selection of the study subjects was accomplished by utilizing convenience sampling. A target sample of 100 women was determined. All subjects, who met the study criteria and agreed to participate, were selected for the study. There were a total of 30 people who attended the support group meeting. Women under 50 years of age and all males were excluded from the study. There were 16 women that did meet study criteria who participated in the research and comprised the sample (n = 16). Some sampling bias did exist due to the convenience sampling method. The participants had varying levels of ethnical, educational and financial backgrounds. The women also had varying levels of overall health, height and weight.

Instrumentation.

Two instruments were administered to collect data in this study. The data collection instruments chosen for this study were the Demographic Survey and the Highfill Exercise Questionnaire. These instruments were researcher developed based on content from review of literature, experts in the field, and previous experience as a healthcare provider in the field of rehabilitation. The instruments were reviewed by a panel of experts to establish face validity and clarity. Both instruments took less than 10 minutes to complete using a simple check or write in response method by the participants.

Demographic Survey: The Demographic Survey contained three write-in questions concerning age, height, and weight. There were four questions that were answered using a simple check method. These questions concerned ethnicity, highest level of education, type of health insurance, and rating of overall health. To maintain
confidentiality, this instrument did not contain names or identifying data of the participants and was kept in a locked, secure area accessible only by the researcher. This survey provided data for descriptive analysis in averages and percentages for the population surveyed. (see Appendix A).

**Highfill Exercise Questionnaire:** This research designed questionnaire contained 11 questions that participants answered by a simple check method or write-in response method for response statements. There was no established validity or reliability for the instrument. However the questionnaire contained content gleamed from current literature and was presented to a panel of experts for review. Therefore, for the purpose of this study, face validity was assumed. This questionnaire provided the researcher with information confirming osteoporosis diagnosis by a health care provider, the type of exercise instruction given, frequency of exercise, and method of exercise instruction. The Highfill Questionnaire also asked for responses regarding barriers to exercise. The number one barrier to exercise was identified by the participant. The questionnaire obtained additional information regarding the length of support group participation and whether insurance covered the costs of exercise instruction (see Appendix B). To maintain confidentiality, this instrument did not contain names or identifying data of the participants and was kept in a locked, secure area accessible only to the researcher. The women were divided into groups for analysis based on their responses to the questions regarding method of exercise instruction. For scoring and comparison purposes, one point were given for each exercise session of at least 20 minutes per week. This scoring procedure was repeated for each of the groups with differing methods of exercise
instruction to allow for comparison among the groups. Only group scores were reported in the research.

Procedure.

Protection of human rights was provided prior to the study by obtaining approval of the Mississippi University for Women Committee on the Use of Human Subjects in Experimentation (IRB) (see Appendix C). A letter was sent by the researcher to the support group’s chairperson to obtain permission to conduct the study at one of the group’s regular meetings. The researcher explained to the chairperson, via the letter of request, that the participants who were willing to volunteer and who met the study criteria would be asked to complete a survey and questionnaire that would take no more than 10 minutes to complete. It was explained to the facility that the researcher would attend a regular meeting of the support group to explain study criteria and distribute consent forms to those meeting study criteria. The researcher would be present to collect data instruments upon completion by the participants. It also was explained to the chairperson that no names or identifying numbers were on the instruments to ensure confidentiality of the participants. The support group chairperson was asked to sign the letter of consent as evidence of permission (see Appendix D). Approval from the selected support group chairperson was obtained by the researcher prior to the study. A date and time was scheduled for the researcher to conduct the study.

The researcher furnished refreshments for all attendees of the support group meeting as was customary of the group’s monthly speaker. Refreshments were made available to all group attendees, regardless of their participation status in the study. The
group attendees were informed by the researcher that partaking of the refreshments provided to them did not obligate anyone to participate in the study.

The researcher attended a monthly meeting of the support group. Potential participants were females over the age of 50 years attending the support group; who had previously been diagnosed with osteoporosis by a health care provider; who had not received exercise instruction for osteoporosis or had received previous exercise instruction for osteoporosis either by verbal instruction, written instruction, video taped instruction, physical demonstration or a combination of these methods. Those subjects who met the study criteria (n= 13) were given a brief explanation of the research verbally and in writing on the consent form (see Appendix E). Participants also were informed verbally and in writing that they could withdraw from the study at any time. Participants also were informed that their inclusion in the support group would in no way be affected by the decision to participate or not participate in this study. Participants meeting study criteria were given consent forms to sign and asked to participate. The subjects gave permission for voluntary participation in the study by signature on the consent form (see Appendix E). The consent was obtained without overt or covert coercion. The women who met the criteria and agreed to participate in the study were given the Demographic Survey and the Highfill Exercise Questionnaire to self-answer (see Appendices A & B). The participants were asked to complete the forms without assistance from others or sharing responses.

The subjects’ right of conservation of personal resources was well respected by requesting approximately 10 minutes of their time to complete the survey and
questionnaire as explained in the consent. There was absolutely no expense to participants to be included in the study. There were no personal or financial gains associated with participation. The status or activity in the support group would not be affected by the subject’s decision to participate or decline participation in the study. Refreshments were donated by the researcher to the entire support group regardless of the subject’s inclusion in the study.

The subjects were informed of their right to freedom from arbitrary hurt or intrinsic risk of injury. There was no evidence of identified mental or physical harm as a result of participation in the study. The subject’s right to privacy was maintained by excluding participant names and identification numbers from the survey and questionnaire. The researcher personally collected the completed surveys and questionnaires from the study participants. The collected data was kept in a locked, secure area accessible only by the researcher. The instruments were hand scored by the researcher and analyzed. The women were divided into groups based on their response to the type of exercise instruction received as indicated on the self-report survey and questionnaire. The data was analyzed to answer the research question. Individual scores were not reported in the research.

Data Analysis.

Descriptive statistics was used to analyze the responses to the Demographic Survey which described and synthesized data in averages and percentages for the population surveyed. In order to analyze the data, scoring methods for the Highfill Questionnaire were predetermined. A two-way ANOVA (p=0.05) was selected to
analyze the questionnaire which indicated the significance of difference in exercise between groups based on type of exercise instruction given.

Limitations.

The limitations of the research study included variables that could not be controlled. These included the women’s preconceived ideas about their definition of exercise, ideas and attitudes about exercise, and the quality of exercise instruction previously given. Additional limitations were the educational level, level of health and ethnicity of the subjects. Participant sharing among themselves of previous exercise knowledge prior to the study could not be controlled. Other factors included limited time frame for data collection, and use of a convenience sample rather than random sampling. The quota sample was collected from a small population of rural women in a small geographic location from the same support group. Therefore, the statistical results cannot be generalized to larger populations.

Summary

The purpose of this study was to determine if the method of exercise instruction given to older women diagnosed with osteoporosis would influence the frequency with which these women exercised. Data were obtained using the Demographic Survey and Highfill Exercise Questionnaire. A total of 16 usable surveys were collected for analysis.
Chapter IV

The Findings

The purpose of this study was to determine if the method of exercise instruction given to older women diagnosed with osteoporosis would influence the frequency with which these women exercised. Orem’s (1995) Self-Care Deficit Theory of Nursing was chosen as the theoretical framework to guide this study. The sample consisted of 16 women over 50 years of age diagnosed with osteoporosis who attended an osteoporosis support group in a southern rural state. Thirty people agreed to participate in the study, however, 14 were excluded from the study because of gender, age, and diagnosis of osteopenia rather than osteoporosis. Data were collected using a demographic survey and the Highfill Exercise Questionnaire. Descriptive statistics, analysis of variance (ANOVA), and rank order were used to analyze the data. Description of the sample, data analyses, and additional findings are presented in this chapter.

Description of the Sample

Sixteen women over 50 years of age, diagnosed with osteoporosis, and members of an osteoporosis support group in a southern rural state participated in this study. The subjects were from 59 to 82 years of age, with the mean being 71.8 years (SD = 6.18). The ages are described in Table 1. The height of the women ranged from 60 to 68 inches (M = 63.28, SD = 1.90). The self-reported weight of the women ranged from 94 to 183
pounds \((M = 128.81, SD = 22.15)\). Additional demographic characteristics were ascertained from the demographic survey. Responses indicated that of the 16 participants, 100% were Caucasian.

Table 1

<table>
<thead>
<tr>
<th>Age</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-59 years</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>60-69 years</td>
<td>4</td>
<td>25.00</td>
</tr>
<tr>
<td>70-79 years</td>
<td>10</td>
<td>62.50</td>
</tr>
<tr>
<td>80-89 years</td>
<td>1</td>
<td>6.25</td>
</tr>
</tbody>
</table>

Note. \(N = 16\).

The participants were surveyed regarding the type of current health insurance coverage. The majority of the participants (75%, \(n = 12\)) reported to have Medicare and a private co-policy to Medicare as their primary sources of insurance coverage (see Table 2). One woman only had Medicare and another had Medicare and Medicaid. There were two of the younger women who reported having private insurance policies. One of the survey questions asked the women to rate their overall health status ranging from very poor to excellent. A majority (44%, \(n = 7\)) of the women rated their health status as average. Four women rated their health as poor (25%). Four participants rated their health as good (25%). Only one woman proclaimed herself to be in excellent health. Although several women reported co-morbidity, none of the participants rated themselves in very poor health (see Table 2).
Table 2

Current Health Insurance Coverage and Self-Reported Health Status Distribution of Sample by Frequency and Percentage

<table>
<thead>
<tr>
<th>Variable</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Health Insurance Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicare and Co-Policy</td>
<td>12</td>
<td>75.00</td>
</tr>
<tr>
<td>Medicare Only</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>Private Insurance</td>
<td>2</td>
<td>12.50</td>
</tr>
<tr>
<td>Medicare and Medicaid</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>Self-Reported Health Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>Good</td>
<td>4</td>
<td>25.00</td>
</tr>
<tr>
<td>Average</td>
<td>7</td>
<td>43.75</td>
</tr>
<tr>
<td>Poor</td>
<td>4</td>
<td>25.00</td>
</tr>
<tr>
<td>Very Poor</td>
<td>0</td>
<td>00.00</td>
</tr>
</tbody>
</table>

Note. N = 16.

The self-reported educational level on the demographic survey ranged from grade school (1 to 8 years) to post graduate (5+ years college) with all participants reporting at least a high school education. The average educational level for the 16 women was at least one year college (see Table 3).
Table 3

Self-Reported Educational Level of Sample by Frequency and Percentage

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade School, 1-8 yrs.</td>
<td>0</td>
<td>00.00</td>
</tr>
<tr>
<td>High School, 9-12 yrs.</td>
<td>7</td>
<td>43.75</td>
</tr>
<tr>
<td>College 1 year</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>College, 1-2 yrs.</td>
<td>5</td>
<td>31.25</td>
</tr>
<tr>
<td>College, 3-4 yrs.</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>Post Graduate, 5+ yrs.</td>
<td>2</td>
<td>12.50</td>
</tr>
</tbody>
</table>

Note. N = 16.

The participants were assigned groups dependent on the method of exercise instruction they reported. The five groups were as follows: group 1- no exercise instruction, group 2- written exercise instruction, group 3 - verbal exercise instruction, group 4 - exercise instruction by physical demonstration, and group 5- a combination of written and verbal instruction plus physical demonstration. Formal exercise instructions had to have been given by either a nurse, therapist, physician, or combination thereof. This research did not include any exercise instruction preformed by individual or any informal exercise instruction, such as from a friend or co-worker. Subjects were asked to report their exercise status before being diagnosed with osteoporosis and also the current exercise frequency per week. Exercise sessions must have been a minimum of 20 minutes (see Table 4).
Table 4

Participant Age, Height, Weight, Self-Reported Health Status, Exercise Status Prior to Diagnosis of Osteoporosis, and Current Exercise Frequency by Sample Response and Frequency

<table>
<thead>
<tr>
<th>Group</th>
<th>Age Years</th>
<th>Ht. Inches</th>
<th>Wt. Pounds</th>
<th>Health Status</th>
<th>Exercise Before Diagnosis</th>
<th>Current Exercise Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 1</td>
<td>74</td>
<td>63</td>
<td>119</td>
<td>Good</td>
<td>No</td>
<td>7</td>
</tr>
<tr>
<td>Participant 2</td>
<td>63</td>
<td>67</td>
<td>183</td>
<td>Average</td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>Participant 3</td>
<td>74</td>
<td>63</td>
<td>148</td>
<td>Poor</td>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 4</td>
<td>82</td>
<td>62</td>
<td>101</td>
<td>Average</td>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td>Participant 5</td>
<td>76</td>
<td>64</td>
<td>114</td>
<td>Average</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Participant 6</td>
<td>71</td>
<td>66</td>
<td>125</td>
<td>Average</td>
<td>No</td>
<td>5</td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 7</td>
<td>72</td>
<td>63</td>
<td>139</td>
<td>Poor</td>
<td>Yes</td>
<td>3</td>
</tr>
</tbody>
</table>

(table continued)
Table 4 (Cont’d)

Participant Age, Height, Weight, Self-Reported Health Status, Exercise Status Prior to Diagnosis of Osteoporosis, and Current Exercise Frequency by Sample Response and Frequency

<table>
<thead>
<tr>
<th>Group</th>
<th>Age</th>
<th>Ht</th>
<th>Wt</th>
<th>Health Status</th>
<th>Exercise Before Diagnosis</th>
<th>Current Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Years</td>
<td>Inches</td>
<td>Pounds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 8</td>
<td>77</td>
<td>62</td>
<td>160</td>
<td>Average</td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>Participant 9</td>
<td>59</td>
<td>62</td>
<td>126</td>
<td>Poor</td>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>Participant 10</td>
<td>70</td>
<td>60</td>
<td>94</td>
<td>Good</td>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td>Participant 11</td>
<td>66</td>
<td>63</td>
<td>120</td>
<td>Average</td>
<td>No</td>
<td>3</td>
</tr>
<tr>
<td>Group 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 12</td>
<td>79</td>
<td>63</td>
<td>133</td>
<td>Excellent</td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>Participant 13</td>
<td>66</td>
<td>62</td>
<td>114</td>
<td>Good</td>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td>Participant 14</td>
<td>76</td>
<td>67</td>
<td>143</td>
<td>Poor</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Participant 15</td>
<td>76</td>
<td>63</td>
<td>118</td>
<td>Average</td>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>Participant 16</td>
<td>68</td>
<td>63</td>
<td>124</td>
<td>Good</td>
<td>No</td>
<td>3</td>
</tr>
</tbody>
</table>

Note. N = 16. *Current exercise frequency per week for 20 minutes or more at each session.
Results of Data Analysis

This research study was guided by one research hypothesis, “There is no difference in exercise frequency among older women diagnosed with osteoporosis who receive different methods of exercise instruction.” The study participants completed a brief demographic survey and the Highfill Exercise Questionnaire which were scored based on participants’ self-reported responses to the questions.

The researcher sought to determine if there was a difference in the method of exercise instruction and exercise frequency among older women diagnosed with osteoporosis. Since there was only one participant in group 3 (verbal instruction), this group was excluded from the analysis to decrease the possibility of skewed data. Analysis of Variance (ANOVA) was used to determine if there were significant differences between and within the groups. Using a confidence interval of 95% (p < 0.05) no significant difference emerged (p = 0.9999, F = 0.0019, r² = 0.0001) between the four groups (verbal instruction excluded) of women given different methods of exercise instruction and the frequencies with which they currently performed exercise (see table 5). Since no significant differences emerged, the researcher failed to reject the null hypothesis.

Besides the ANOVA, the Bartlett’s Test for Homogeneity of Variance was used to determine if the assumptions required for ANOVA were satisfied in the groups being compared. Bartlett’s test suggested that there was no significant difference (p = 0.8947). Therefore, it was concluded that the variances were homogeneous with 95% confidence, p < 0.05. This supports the finding that there are no true significant differences in the
groups based on the data analyzed. The following data in Table 6 depicts the comparison of the groups.

Table 5

**Analysis of Variance Comparing Methods of Exercise Instruction and Exercise Frequency Among Older Women Diagnosed with Osteoporosis**

<table>
<thead>
<tr>
<th>Group</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>3</td>
<td>8.403</td>
<td>2.801</td>
<td>0.0019</td>
</tr>
<tr>
<td>Within groups</td>
<td>56</td>
<td>80460</td>
<td>1437</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>80470</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Groups include group 1 (no exercise instruction), group 2 (written instruction), group 4 (physical demonstration), and group 5 (physical demonstration, written, and verbal instruction). Group 3 (verbal instruction) excluded for analysis. *^a n = 15.*

Table 6

**Bartlett’s Test for Homogeneity of Variance Comparing Methods of Exercise Instruction Groups**

<table>
<thead>
<tr>
<th>Group</th>
<th>M</th>
<th>q</th>
<th>p</th>
<th>95% CI of difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 vs Group 2</td>
<td>1.0000</td>
<td>0.1022</td>
<td>P &gt; 0.05</td>
<td>-35.68 to 37.68</td>
</tr>
<tr>
<td>Group 1 vs Group 4</td>
<td>0.7778</td>
<td>0.07947</td>
<td>P &gt; 0.05</td>
<td>-35.90 to 37.46</td>
</tr>
<tr>
<td>Group 1 vs Group 5</td>
<td>0.4844</td>
<td>0.04950</td>
<td>P &gt; 0.05</td>
<td>-36.20 to 37.16</td>
</tr>
<tr>
<td>Group 2 vs Group 4</td>
<td>-0.2222</td>
<td>0.02271</td>
<td>P &gt; 0.05</td>
<td>-36.90 to 36.46</td>
</tr>
<tr>
<td>Group 2 vs Group 5</td>
<td>-0.5156</td>
<td>0.05268</td>
<td>P &gt; 0.05</td>
<td>-37.20 to 36.16</td>
</tr>
<tr>
<td>Group 4 vs Group 5</td>
<td>-0.2933</td>
<td>0.02997</td>
<td>P &gt; 0.05</td>
<td>-36.97 to 36.39</td>
</tr>
</tbody>
</table>

*Note.*  
*^a q = 1 - p* for a binomial variable. Group 3 excluded from analysis to lessen skewing of data.  
*^b n = 15.*
Additional Findings

This research was conducted in an attempt to obtain findings regarding methods of exercise and exercise frequency among women diagnosed with osteoporosis. The subjects recorded self-reported responses to survey questions. The subjects in the study were divided into five groups based on their responses to the method of exercise instruction the women received. Several additional findings emerged and are summarized below.

Group 1. The participants (n = 3) in group 1 received no exercise instruction. Their ages ranged from 63 to 74 years (M = 70.33; SD = 6.35). The women had been members of the support group from 0 to 6 months (SD = 0.58) with the average being approximately four months (see Table 7). The women were of average height (M = 64.33, SD = 2.31) and weight (M = 150, SD = 32.05). All of the women reported to have completed the twelfth grade level in school but had not had any college level classes. The three women varied in the type of insurance coverage they had. One woman had Medicare, the second a private insurance, and the third had Medicare along with a copolicy. The three women also reported differing states of health. The first woman reported good health status while the second woman reported average, and the third reported only poor health. All the women reported no previous exercise instruction for osteoporosis (see Table 8). Two of the women (66.67%) reported that they exercised before joining the support group. When the women were asked how often per week they exercised for at least 20 minutes or more at each session, the women reported 7, 4, 0 times per week respectively (M = 3.67, SD = 3.51, see Table 4).
**Group 2.** The participants (n = 3) in group 2 (written instruction) had been members of the support group for more than 12 months (see Table 7). Two of the women reported to have received previous written exercise instruction for osteoporosis from a therapist while the third woman received instruction from her physician. Only one woman (33.34%) reported she exercised before joining the support group. The participants (n = 3) in group 2 ranged in age from 71 to 82 years with a mean age of 76.33 and standard deviation of 5.51. The women were of average height (M = 64, SD = 2) and weight (M = 113.33, SD = 12.01). All of the women reported to have completed the twelfth grade level in school and one woman had completed post graduate studies. The three women had Medicare and a co-policy as their major insurance coverage, however, the insurance did not pay for the exercise instructions. The three women reported to all be in good health. When the women were asked how often per week they exercised for at least 20 minutes or more at each session, the women reported 7, 0, 5 times per week respectively (M = 4, SD = 3.61, see Table 4).

**Group 3.** Only one participant reported having received verbal exercise instruction for osteoporosis which incidently was from a therapist and a physician. This participant had been a member of the support group from 10 to 12 months and did exercise before joining the support group (see Table 4). She was 72 years of age, 63 inches tall, and weighed 139 pounds. She had completed post graduate studies. She reported her major insurance coverage to be Medicare and a co-policy which did not pay for her exercise instruction. The participant reported she walked three times per week for at least 20 minutes or more at each session.
Group 4. The participants (n = 4) in this group (physical demonstration) had been members of the support group from 7 to 12 or more months (see Table 7). All of the women reported previous exercise instruction for osteoporosis by physical demonstration. The exercise instruction was conducted by a therapist (n = 3) and a physician (n = 1). The participants (n = 4) in group 4 ranged in age from 59 to 77 years with a mean age of 68 and standard deviation of 7.53. The women had been members of the support group from 7 to 12 or more months with the average being approximately 9 to 10 months (SD = 0.96). The women were of average height (M = 61.75, SD = 1.26) and weight (M = 125, SD = 27.15). All of the women reported to have completed the twelfth grade level in school and had at least one year of college level classes. The four women varied in the type of insurance coverage they had. Three women had Medicare and a co-policy, the other women had a private insurance. One woman’s insurance did pay for exercise instruction with a therapist. The four women also reported differing states of health. The first and fourth women reported good health status while the second woman reported poor health, and the third reported good health. Seventy-five percent of the women reported that they exercised before joining the support group. When the women were asked how often per week they exercised for at least 20 minutes or more at each session, the women reported 3 to 7 times per week (M = 4.25, SD = 1.89, see Table 4).

Group 5. The participants (n = 5) in this group (written, verbal, and physical demonstration) had been members of the support group from 7 to 12 or more months with an average time of 9 to 10 months (see Table 4). All the women reported previous exercise instruction for osteoporosis by demonstration, as well as written and verbal
instruction. Two participants reported having had instruction from only a therapist. One woman had instruction from only a physician. The final participant in this group reported she had received instruction from a combination of a nurse, therapist and physician. The five women ranged in age from 66 to 79 and were of average height ($M = 73, SD = 5.66$) and weight ($M = 126.4, SD = 11.72$). Three of the participants in group 5 had graduated from high school. One participant had completed a year of college classes, and the final participant had completed 1 to 2 years of college. Three of the women (60%) reported that they exercised before joining the support group. When the women were asked how often per week they exercised for at least 20 minutes or more at each session, the women reported 0 to 7 times per week ($M = 3.4, SD = 2.51$, see Table 4).

### Table 7

**Support Group Association by Frequency and Percentage**

<table>
<thead>
<tr>
<th>Variable</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support Group Association*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3 months</td>
<td>2</td>
<td>12.50</td>
</tr>
<tr>
<td>4-6 months</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>7-9 months</td>
<td>4</td>
<td>25.00</td>
</tr>
<tr>
<td>10-12 months</td>
<td>2</td>
<td>12.50</td>
</tr>
<tr>
<td>12+ months</td>
<td>7</td>
<td>44.00</td>
</tr>
</tbody>
</table>

*Note. N = 16.*
### Table 8

**Current Exercise Frequency and Type of Exercise Instructor by Frequency, Percentage, Mean, and Standard Deviation**

<table>
<thead>
<tr>
<th>Variable</th>
<th>f</th>
<th>%</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Exercise Frequency</strong>a</td>
<td></td>
<td></td>
<td>3.66</td>
<td>0.49</td>
</tr>
<tr>
<td>0 times / week</td>
<td>3</td>
<td>18.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 times / week</td>
<td>5</td>
<td>31.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 times / week</td>
<td>3</td>
<td>18.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 times / week</td>
<td>1</td>
<td>6.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 times / week</td>
<td>4</td>
<td>25.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type of Exercise Instructor</strong>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapist</td>
<td>7</td>
<td>53.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician</td>
<td>4</td>
<td>31.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapist and Nurse</td>
<td>1</td>
<td>7.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapist, Nurse, Physician</td>
<td>1</td>
<td>7.60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Current exercise frequency of 1 time per week, 2 times per week, and 6 times per week were not reported by the sample f = 0, 0%.

*a N = 16. b n = 13.*

A statistically significant additional finding emerged using ANOVA to determine a difference between groups (p = 0.0065, F = 13.8216, df = 4) regarding educational level and exercise frequency. The groups with members having higher levels of education exercised more frequently than the groups with members having lower levels of education (see Table 10).
Table 9

Analysis of Variance Comparing Educational Level and Exercise Frequency

<table>
<thead>
<tr>
<th>Group *</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>4</td>
<td>21.439</td>
<td>5.3597</td>
<td>13.8216*</td>
</tr>
<tr>
<td>Within groups</td>
<td>5</td>
<td>1.9389</td>
<td>0.3878</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>23.378</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Groups include group 1 (no exercise instruction), group 2 (written instruction), group 4 (physical demonstration), and group 5 (physical demonstration, written, and verbal instruction). Group 3 (verbal instruction) excluded for analysis. * \( p \leq 0.05 \) (\( p = 0.006523 \)).

The number one exercise deterrent in group 1 was pain. The second deterrent was interference of other medical problems that prevented exercise (see Table 11).

The responses of the women in group 2 varied in their preferred exercise. Group 2 received only written exercise instruction. One woman reported walking as her favored form of exercise. A second participant reported walking and the use of free weights in her exercise regime. The third participant in this group reported walking, floor exercises, and aerobics as her preferred forms of exercise (see Table 10). Pain was the number one exercise barrier for group 2 as was group 1 (see Table 11).
Table 10

Current Type of Exercise by Rank Order using Frequency and Percentage

<table>
<thead>
<tr>
<th>Rank</th>
<th>Exercise</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Walking</td>
<td>5</td>
<td>31.25</td>
</tr>
<tr>
<td>2</td>
<td>Walking and floor Exercises</td>
<td>2</td>
<td>12.50</td>
</tr>
<tr>
<td>2</td>
<td>Walking and Stationary Bike</td>
<td>2</td>
<td>12.50</td>
</tr>
<tr>
<td>4</td>
<td>Walking and Weights</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>4</td>
<td>Walking and Stair-Stepper</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>4</td>
<td>Walking and Gardening</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>4</td>
<td>Walking, Floor and Aerobics</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>4</td>
<td>Walking, Floor, Aerobics, Weights</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>4</td>
<td>Floor exercises</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>4</td>
<td>Gardening</td>
<td>1</td>
<td>6.25</td>
</tr>
</tbody>
</table>

Note. N = 16.

There was only one participant in group 3, the verbal instruction group. This participant reported that she walked for exercise (see Table 10). This participant further identified that a combination of pain and other health problems prevented her participation in regular exercise (see Table 11).

All of the women in group 4 (physical demonstration instruction) reported different types of normally performed exercise, however, they all included walking as a part of their exercise regime (see Table 10). The women all reported different reasons for not exercising regularly. Half the participants in this group reported pain to be the
number one reason for not exercising (see Table 11). The women were permitted to write in a reason for not exercising in the “other” selection. Two responses were included.

“I plan to start tomorrow” and “I do not feel I need to exercise, because I do a lot of housework.”

The fifth exercise group had received a combination of exercise instruction, written, verbal, and physical demonstration. All of the women in group 5 reported related types of regularly performed exercise. Four of the women included walking in combination with a stair-stepper, stationary bike, or gardening as a part of their exercise regime. The fifth participant reported only floor exercises as her major form of exercise (see Table 10). The number one self-reported reason for not exercising among this group was strictly due to pain (see Table 11).

The reported exercises were analyzed for rank order according to the most frequent (f = 5) type of exercise, walking without additional activity, to the seven least favored exercises. The seven less chosen activities all included walking except two which were floor exercises and gardening. These seven were equally selected (f = 1) by participants within all five groups. The middle ranking exercises which made up 25% of the chosen exercises/activities were walking and floor exercises and walking with stationary bike riding. Both activities were equally selected (f = 2, 12.50%) by participants performing these activities regularly (see Table 10). Several barriers to regular exercise were identified by the women (see Table 11).
Table 11

Number One Reason Preventing Exercise by Rank Order using Frequency and Percentage

<table>
<thead>
<tr>
<th>Rank</th>
<th>Reason</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pain</td>
<td>11</td>
<td>68.75</td>
</tr>
<tr>
<td>2</td>
<td>Other medical problems</td>
<td>2</td>
<td>12.50</td>
</tr>
<tr>
<td>3</td>
<td>I don’t think I need to exercise.</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>3</td>
<td>I’ll do it “tomorrow.”</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td>3</td>
<td>Pain and other medical problems</td>
<td>1</td>
<td>6.25</td>
</tr>
</tbody>
</table>

Note. N = 16.

There was one open-ended question on the Highfill Exercise Questionnaire which asked the participants how the support group had helped them. Content analysis was used to analyze the responses, and three common themes emerged. The three common themes identified were new information, exercise and medications, and peer support.

**New information.** One of the common themes identified related to new information. Examples of statements which reflected the theme of new information were as follows:

I am given new information that I need that the doctors don’t have time to go into details about.

. . .

The guest speakers have presented very informative programs on different subjects.

. . .

I have learned new ways in which I can strengthen my bones.
Exercise and medications. A second theme that was noted was the use of exercise and medications as a means of dealing with the complications associated with osteoporosis. Examples of statements which reflected the theme of exercise and medications were as follows:

The support group has helped me in knowing how to exercise, walking, and the medications to take.

. . .

The support group has helped provide me with information on how to exercise.

Peer support. A third theme that was noted was the peer support that accompanies being a member of the Osteoporosis Support Group. Examples of statements which reflected the theme of peer support were as follows:

"The support group has helped provide me with fellowship." and "Just to be with other people who have the same disease helps me."

Summary

The purpose of this study was to determine if there was a difference in the method of exercise instruction a woman diagnosed with osteoporosis received and the frequency of exercise performed. Subjects (N = 16) completed a demographic survey and exercise questionnaire. Descriptive statistics using frequency, percentage, rank order, ANOVA, and Bartlett’s Test for Homogeneity of Variance were used to analyze the data. No significant differences emerged, therefore, the researcher failed to reject the null hypothesis. Additional study findings revealed a statistically significant difference between the groups regarding educational level and exercise frequency.
Chapter V

The Outcomes

Osteoporosis, a major challenge confronting today’s health care professional, is a preventable disease that mainly affects older Caucasian and Asian women. The disease can also affect people of all ages, gender, and ethnic backgrounds. As the population of America ages, it is imperative that health care professionals understand the problems that can arise from the normal aging process compounded by the problems associated with osteoporosis. The loss of bone mass often leads an individual down a debilitating path of inactivity and leaves them at greater risk of fractures. Many diseases such as osteoporosis can be slowed or prevented through the simple use of an appropriate exercise program. The impact of physical exercise has been well documented throughout the ages as a positive influence on musculoskeletal system. Regular physical activity and weight-bearing exercise have been recognized as critical elements in the prevention of disease and health enhancement especially in the older adult, (Taggert & Conner, 1995; Ory & Cox, 1994; American College of Sports Medicine, 1998).

The purpose of this study was to determine if the method of exercise instruction given to older women diagnosed with osteoporosis would influence the frequency with which these women exercise. Orem’s Self-Care Deficit Theory of Nursing was selected to guide the theoretical framework for this study. Orem focused on what nurse
practitioners do to assist the person to move toward positive health. Orem presented explanations of how nursing actions function in practice to enhance health and well-being. According to Orem (1995), a person’s well-being was associated with health, success of an individual’s efforts to maintain health, and adequacy of the resources available to them to restore health. The elderly have many chronic illnesses. Therefore, the nurse practitioner must focus on health promotion and self-care for the independent elderly. Another area of need for the elderly, according to Orem, is peer or family support as a resource to help restore health.

**Summary of Findings**

The sample for this study consisted of 16 adults who were 50 years of age or older, diagnosed with osteoporosis, and attendees of an osteoporosis support group. The sample was one of convenience, selected from members of an osteoporosis support group in a southern rural state. The consenting participants completed a demographic questionnaire and the Highfill Exercise Questionnaire. Data were analyzed using descriptive statistics, analysis of variance (ANOVA), and rank order.

**Demographic.** The sample consisted of 16 Caucasian females between the ages of 59 and 82 years. The mean age was 70.5. The older participants of the sample (≥ 70 years) exercised less frequently than did the younger of the sample group (M = 4.0 M = 3.55, respectively). The women’s height ranged from 60 to 67 inches, and their weight ranged from 94 to 183 pounds. Every participant had completed a minimum of the twelfth grade in school which made up 44% of the sample. One woman had completed a vocational education of one year of college. Thirty-one percent of the sample had
completed 1-2 years of college, 6% had completed 3 to 4 years, and 13% had completed 5 or more years of college studies. The study determined a statistically significant difference between the groups regarding the subjects’ educational level. The groups with members that were had higher educational levels exercised more frequently than the groups with less educated members ($p = 0.006523$, $df = 4$, $f = 13.8216$, see Table 11).

Seventy-five percent of the sample had Medicare and a co-policy as their source of insurance. Thirteen percent of the total sample had private insurance. Only one participant had medicaid and Medicare, and one participant had only Medicare. The majority of the sample (62%) reported that their insurance did pay for the exercise instruction while 38% reported their insurance did not cover the instruction costs. The largest portion of the sample rated their health status as average which accounted for 44% of the women. Four women (25%) rated their health to be good, four reported their health to be poor (25%), and one woman reported she was in excellent health.

Seven participants had received formal exercise instruction by a therapist which made up 53.8% of the sample while four women had been instructed by their physician (31%). One participant had been instructed in exercise by a therapist and her physician, and another participant had received similar instruction but with the addition of a nurse. Thirty-one percent of the sample reported to have received exercise instruction for osteoporosis by means of written instruction, verbal instruction, and physical demonstration. Twenty-five percent of the sample received exercise instruction only by physical demonstration. Receiving written only instruction accounted for 19% of the total sample’s form of exercise instruction. Only one participant received verbal instruction
and no participants received video exercise instruction. Exercise performed three times per week for a minimum of 20 minutes at each session was reported by the majority (31%) of the sample. Exercise performed seven times per week for a minimum of 20 minutes at each session was reported by 25% of the sample. No exercise (19%) and exercise conducted four times per week for a minimum of 20 minutes at each session (19%) was reported equally by the sample. Only one participant reported exercising five times per week.

When the women were surveyed regarding the type of exercise they normally performed, walking was included in 14 participants’ responses. One participant indicated she normally preferred floor exercises while another participant disclosed gardening. Another question on the survey asked for the sample to select from a list the reasons they did not exercise. Seven women (43.75%) selected pain while 12.5% of the women advised that other health problems prevented them from exercising. Twenty-five percent of the sample selected a combination of pain and other health problems prevented them from regularly exercising. Only 6.25% of the sample wrote that they did not feel they needed to exercise. Another 6.25% said they planned to start “tomorrow.”

Concerning the open-ended question which asked the sample, “How has the support group helped you?”, Three central themes emerged. The most common theme was the availability of new information concerning osteoporosis. The second theme was new educational information about exercise and medications. The third theme that emerged was the availability of peer support and fellowship with other people who have the same disease.
Discussion

This study of women with osteoporosis revealed there was no significant difference between the method of exercise instruction and the frequency with which older women exercise. The insignificant finding may have been attributed to the small sample size and the rural location of the population selected for this study. In small rural communities, there are few primary care clinics from which subjects might have been referred. Therefore, many of the participants in the study may have been referred from the same clinic and have received similar exercise instructions which did not include emphasis on frequency of exercise.

Group 4 (physical demonstration) reported the most frequent exercise per week of all the groups in the study ($M = 4.25$). All four participants in the group received formal, structured exercise instruction from a therapist. One participant received additional exercise instruction from her physician. Group 2 (written instruction) reported the second most frequent exercise per week ($M = 4$). Group 5 (combination methods) were found to exercise the least frequent of all the groups ($M = 3.4$). This finding supports previous studies (Bravo et al, 1997; Donhauser, 1999; Friedrich, 1996; and Wee et al, 1999) which determined that by having the correct exercise program conducted by trained individuals the desired outcome will be elicited. The correct exercise regime could improve symptoms and enhance quality of life. Researchers have agreed that more types of instructions do not necessarily yield better adherence. Individuals seem to be more compliant with fewer instructions that they understand very well rather than several instructions that they don’t understand at all. These findings may have contributed to the
lack of deficiency in exercise from among women receiving various types of instruction. Perhaps the method was not as important as the clarity of the instructions. Patients may tend to perform and learn better with direct supervision and structured programming. This may have accounted for subjects in group 4 who received physical demonstration having the highest frequency of exercise ($M = 4.25$) of all the groups. Perhaps the direct supervision and intense one-on-one instruction motivated them to exercise more often.

When comparing age as a factor for influencing exercise, it was noted that the older participants of the sample ($\geq 70$ years; $n = 11; M = 3.63$) exercised less frequently than did the younger of the sample group ($M = 4.0$). Members of group 5 (combination of methods of exercise instruction) were the second oldest and exercised the least of all the groups. This finding supports the study conducted by Taggert and Conner (1995) which determined a strong correlation between age and the perception of exercise barriers. Taggert and Conner identified that the older participants’ exercise barriers were greater than their motivation to exercise although they were more knowledgeable about the risks and benefits of exercise. However, members of group 2 (written exercise instruction) were the oldest of the participants and exercised the second most frequently of the groups. This finding does not support the Taggert and Conner (1995) study. In the current study, members of group 4, who received instruction by physical demonstration and were the youngest, exercised the most frequently of all the groups. Members of group 5, who received a combination of instructional methods and were the second oldest, were the least active of the groups regarding exercise prior to the diagnosis of osteoporosis. Therefore, the results from the current study support the belief that younger
women may view exercise as more important. Based on Orem’s principles, younger individuals seek to maintain a balance between activity and rest, thus promoting healthy human functioning and a desire to be normal with social groups. Elders, regardless of age, should participate in exercise to improve or maintain a good state of health.

Subjects’ weight in relation to height may have contributed to exercise frequency. Subjects were compared individually outside the parameters of their exercise groups by approximate ideal body weight. Overall, the participants were of average height and weight, however approximately 18.75% were somewhat over their ideal weight. The women who were within good proximity of the ideal body weight (56.25%, n = 9) exercised an average of 3.67 times per week compared to the women who were overweight (n = 3) who only exercised an average of 2.67 times per week. The women that were slightly under their ideal weight (25%; n = 4) exercised the most frequently of the subjects at approximately 4.75 times per week. The findings of the current study support a finding by Gregg et al (1998) which determined that the women with less body weight tend to exercise more frequently than the women with more body weight. In the current study, group 1 (no exercise instruction) had the heaviest women and were the second least active among the groups. Group 2 (written instruction) had the lightest weight women which exercised the second most frequently.

Educational level of participants may have influenced frequency of exercise. Group 4 (physical demonstration) had the members with the highest levels of education. These subjects exercised the most frequently before diagnosis of osteoporosis and after being diagnosed. Group 2 (written instruction) had the second highest educational level,
exercised the least of all the groups before diagnosis, and exercised the second most frequent after diagnosis. Members of groups 2 differ from members of group 4 in that group 2 was the least active of all the groups prior to being diagnosed with osteoporosis. Group 1 (no instruction) had the lowest educational level and exercised the second least frequent after exercise instruction. Members of group 5 (combination of methods) had the second lowest educational level, were the second least frequent exercisers before being diagnosed with osteoporosis, and decreased to the least frequent exercisers of all the groups after diagnosis.

There were no studies reviewed that correlated educational level with frequency of exercise. However, the researcher concluded from the findings of this study, that the higher the educational level of the participant the more the participant is likely to engage in structured exercise. Perhaps, the woman who is better educated has become knowledgeable of the benefits of exercise, and is more motivated to routinely perform exercise as a means of prevention. There appears to be a direct link to educational level and exercise frequency. This woman may read more articles in journals and newspapers which relate to benefits of exercise. These women may have learned computer skills in the course of their education and have access to the vast amount of information concerning exercise that is available on the internet. The subjects with the lower educational level may have been individuals who were employed in more vigorous jobs and did not exercise because they felt they were already active enough. The women with lower educational levels may not be as aware of the benefits to exercise as the more educated women. The women with lower educational levels may not have had access to
educational materials and technology, such as the internet, that the women with higher levels of education may have had.

Health status may have contributed to exercise frequency among subjects. Overall, subjects in group 5 (combination of instructional methods) who were the least active of all the groups, self-reported better levels of health than other groups. Groups 1, 2, and 4, reported their health status as average, but all exercised more frequently than did the member of group 5. However, when analyzing the data by participant rather than groups, the women who self-reported a higher health status did exercise more frequently than their peers who were less active. The women who rated their health status as “good” or better exercised an average of 5 to 6 times per week, whereas the women who rated their health as “average” or worse only exercised approximately 3 times per week. This agrees with studies by Gregg et al’s (1998) and Heinonen and Kannus (1996) who determined that women who were more active had higher self-rated health than did the lesser active women. The women who report higher levels of health are more motivated and compliant with exercise programs. It may also be that women who were in poorer health had more frequent or intense pain which was the number one reason for not exercising more.

When examining motivation and adherence factors, the participants in group 4 (physical demonstration) were the most motivated to exercise prior to diagnosis of osteoporosis and were the most frequent exercisers ($M = 4.25$). The least motivated group prior to diagnosis of osteoporosis was group 2 (written instruction). Groups 1 (no instruction) and 5 (combination of methods) were more active prior to diagnosis of
osteoarthritis and less active after diagnosis. This finding supports the studies conducted by Heionen and Kannus (1996), Gregg et al (1998), and Kerschan et al (1998) which found that women who were somewhat sedentary before exercise instruction were more likely to be sedentary after instruction, indicating lack of adherence to regimes. Orem’s theory emphasizes that elders can learn and benefit from promotional education by the nurse practitioner, however, the action must be deliberate on the part of the participant. There must be a desire for self-care within the individual in need of self-care.

When examining type of exercise, all participants except two included walking as part of their exercise regime. The participants in the current study who had fewer types of exercise incorporated into their regular regimes exercised more frequently than those women with multiple types of exercise. According to researchers (Friedrich et al, 1996; Krall and Dawson-Hughes, 1994; Kerschan et al, 1998; and Henry et al, 1999) moderate amounts of brisk walking as a form of exercise will improve the overall health status of the individual with osteoporosis. Numerous studies have shown the benefits of walking as a form of exercise. Subjects in the review of literature were more compliant with exercise when they were given fewer exercises to perform for shorter periods of time.

Walking is an activity that can be done by most everyone, is economical, and is easily incorporated into the daily lives of the individual. There is no equipment needed to purchase or special place to perform the activity. It is an exercise activity that is safe for people of all ages. Elders are less likely to be able to perform high-intensity aerobic exercise with weight-bearing force to improve bone structure. The problem is not necessarily the age process but the complications of co-morbidity that may prevent other
forms of exercise. Orem’s theory states there must be a balance of activity and rest for the human to function properly. Nurse practitioners should encourage patients to walk as a safe way to add exercise to daily routines.

The elders in this study reported pain as the number one barrier to exercise with complications of co-morbidity as a close second. Studies by Donhauser (1999), Henry et al (1999), and Freidrich et al (1996) found that pain was a very debilitating factor among the elderly population. Exercise can improve bodily functioning to decrease pain and increase the quality of life for individuals suffering from chronic pain associated with osteoporosis. The elderly women in the current study tended to associate level of activity with their health status. The more active they were the higher their self-reported health status. Using Orem’s theory, the nurse practitioner can assist the women with osteoporosis identify barriers to exercise as a means of preventive health, restore self-care abilities, and promote healthy social functioning.

Summary

The majority of the studies reviewed in the literature were similar to the current study concerning findings. Little information was available in the literature regarding the relationship between the method of exercise instruction and its influence on exercise frequency. Most of the studies reviewed focused on weight-bearing exercise and its impact on bone mineral density rather than method of instruction and exercise frequency.

Limitations

The design of this study imposed certain constraints upon the generalization of these findings. The study was open to all members of the rural support group, however,
only Caucasian women were available to participate. Therefore, the findings of this study could not be generalized to all women residing in southern rural states. The sample size of the current study utilized was small in number of participants and may not be representative of all women over the age of 50 years in southern rural states. The sample was one of convenience and not ethnically diverse. A larger, more diverse sample may have provided more accurate findings, particularly with regard to the method of exercise instruction received and the frequency of exercise among women in the target age group.

Another limitation may have been the length of time for data collection as the data in this study was collected using a one-time collection method for convenience. The demographic survey and Highfill Exercise Questionnaire were researcher developed and had no established validity or reliability, however, the tools were reviewed and edited by a panel of experts for face validity. Instrumentation bias may have existed. Additionally, there may have been a tendency among the participants to discuss or answer the questionnaires as their colleagues did in an effort to portray similar status within the test group.

Conclusions

Several conclusion were made based on the results of this study. They were as follows:

1. There were no significant differences between the groups with respect to method of exercise instruction and frequency of exercise.

2. Although statistically insignificant, the women less than age 70 had a tendency to exercise more frequently than the women more than age 70.
3. One significant difference emerged between the groups regarding level of education and exercise frequency. The groups with members having higher educational levels exercised more frequently than did the less educated subjects.

4. Although statistically insignificant, the women who were given exercise instruction by physical demonstration exercised more frequently than the women who received other methods of exercise instruction.

5. Although statistically insignificant, the women less than or equal to their approximate ideal body weight had a tendency to exercise more frequently than the women who were over their approximated ideal body weight.

6. The women who exercised previous to a diagnosis of osteoporosis had a tendency to exercise more frequently after diagnosis than the women who did not previously exercise.

7. Women who had longer memberships in the support group had a tendency to exercise more frequently than the women who were new members.

8. The number one barrier to exercise was complaints of pain.

9. Women preferred to regularly perform walking either alone or in combination with other forms of exercise to maintain health

10. Women exercised more frequently when given formalized exercise instruction by a therapist.

11. Orem's Self-Care Deficit Theory of Nursing was an appropriate framework for investigation of the methods of exercise instruction and frequency of exercise among older women diagnosed with osteoporosis.
Implications for Nursing

Implications for nursing were derived from the current study. There were four general areas of interest which concern the nurse or nurse practitioner. These include nursing theory, research, education, and practice.

Nursing Theory. This study was conducted using Orem’s (1995) Self-Care Deficit Theory of Nursing as the theoretical framework. Orem’s foundation is built on the client’s responsibility for self-care and his or her right to make determinations regarding that care. Self-care is dependent on the formulation of factors to be manipulated to keep functioning and development within normal ranges to promote life, health, and personal well-being. As found in this study, the clients that were motivated to exercise prior to the diagnosis of osteoporosis were the same clients that were exercising more frequently. At times the elder must learn new ways of self care because of altered or declining health status as with the need for exercise related to osteoporosis. Primary prevention such as physical fitness requires commitment to regular exercise, motivation, and desire to maintain good health. Goals to be met through self-care might include maintenance of balance between activity and rest and prevention of hazards to human life. This is when the nurse practitioner and the client must establish mutual goals and work together to balance self care.

Nursing research. While the benefits of exercise on bone density and overall health are documented to some degree in the literature, the benefits of varying methods of exercise instruction and their influence on exercise frequency among women with osteoporosis have not been well researched. No studies were available comparing the
methods of exercise instruction and frequency of exercise. The findings of this study suggest that more research is needed to gain greater insight into exactly what type of exercise instruction will yield the most frequent exercise performance and adherence.

The findings of the current study augment the present knowledge of exercise. The relationship between the method of exercise instruction and exercise frequency is an important issue to disseminate to others in the health care field. The idea stemming from exercise instruction and exercise frequency in individuals with osteoporosis is an open forum for gerontological nursing research.

Degeneration from osteoporosis has placed a vast number of Americans at an increased risk for fractures. Exercise programs may modify some risk factors for osteoporosis and have been shown to have a positive influence on functional abilities of an individual. Because people may engage in physical activity for a variety of reasons, health care providers need to identify and understand through research what factors effectively encourage patients to increase their level of physical activity and adhere to exercise regimes.

**Nursing education.** The findings in this study will assist in the advancement of the nurse practitioner's role in providing preventive care to elders and persons affected with osteoporosis. As the need for additional primary health care providers emerges, the nurse practitioner will be prepared to react to the needs of the population. This study will provide educational benefits to nursing students and nurses in practice. Nurses will have a better understanding of the impact that osteoporosis has on society. This study also will assist health care providers in identifying and understanding what motivators effectively
encourage individuals to increase and adhere to exercise programs. These motivators should also be considered when nurse practitioners refer individuals to structured therapy programs for formalized exercise intervention or instruction. As a result of this study, nurse practitioners and students may be made aware of the benefits of exercise, types of exercises available, and the best method of instruction to provide teaching to their patients as a means of prevention and management of osteoporosis. Through proper exercise instruction and a routine program of exercise participation, people can live more comfortable, productive, and safe lives with osteoporosis. The importance of exercise should be incorporated into curricula for schools of nursing.

**Nursing practice.** The nurse practitioner has a responsibility to the client to assist with balancing the self-care needed at any level. According to Orem (1995) the elderly have developed ways of caring for themselves which may differ from the health care provider’s point of view. The nurse practitioner practices primary prevention and would have a major impact in the life of the elder. Clients and nurse practitioners act together mutually to set and achieve goals of health restoration, promotion, or maintenance. Exercise has an important role in the life of elders, especially those with osteoporosis. The nurse practitioner in his/her practice has the responsibility for assessment of the self care needs of an individual, establishment of joint goals, implementation of needs to restore self care, and evaluation of the response to the care implemented.

It is the nurse practitioner’s responsibility to educate the patient appropriately fitting the individual need into the patient’s daily lives to achieve successful outcomes. The nurse practitioner should inquire about the exercise status of each client and include
some exercise instruction at each visit. The nurse practitioner should encourage participation in support groups which provide the individual with peer support, educational literature about the condition, and up-to-date information regarding treatments.

It is important to note that not every individual is physically or financially able to seek formalized exercise instruction in efforts to gain knowledge about proper exercise techniques. Women need to have the information concerning types of exercise and instructions for those exercises made available to them by health care providers. Ultimately, women will have to carry out the exercise regime on her own to perform consistent, regular exercise. During primary care visits, women need to be educated about exercise techniques, frequency, and safety issues that are related to promotion of health and prevention of complications when exercising.

The findings of this study indicated that Orem’s Self-Care Deficit Theory of Nursing provides the nurse practitioner with the framework to promote good health in the elderly. The nurse practitioner promotes functioning and development of the elderly independently as well as within peer groups. This is accomplished in harmony with the person’s potential, known limitations, and the desire to be normal. An individual’s definition of quality of life may be different from that of the nurse practitioner’s. This emphasizes the importance of mutual self-care goals between the nurse practitioner and the patient. These mutual goals will affect the individual’s motivation, adherence, and desire for independence.
Recommendations

Based on the findings of this study, the following recommendations are made for future research:

1. Replication of the study with a larger, randomized sample to include a more demographically diverse group of participants.

2. Replication of the study to include a more culturally diverse group of participants.

3. Replication of the study to include male and female subjects of diverse ages and varying levels of exercise participation.

4. Replication of the study using the demographic tool and Highfill Exercise Questionnaire to establish validity and reliability.

5. Conduction of more research using Orem’s Self-Care Deficit Theory of Nursing as a framework for examining other methods of exercise instruction and frequency.

6. Conduction of a correlational study relating demographic variables such as age, education, and weight with frequency of exercise.

7. Conduction of a comparison study of types of exercise performed related to the types of exercise instruction.

8. Conduction of a correlational study to relate added variables such as identification of previous fractures, bone mineral density readings of the subjects, with frequency of exercise.
References


APPENDICES
APPENDIX A

DEMOGRAPHIC SURVEY
DEMOGRAPHIC SURVEY

Age ________ years  Height _____ ft. _____ in.  Weight _______ pounds

1. Ethnicity/Race:
   ____Caucasian  ___African-American
   ____Native-American  ___ Asian
   ____Other ____________________________

2. What is the highest level of educational you have completed? (Check only 1)
   ____Grade School, 1-8 years  ___College 1-2 years
   ____High School, 9-12 years  ___College 3-4 years
   ___ Vocational Training  ___Post Graduate, 5+ years

3. What type of health insurance do you have? (Check all that apply)
   ___ No Insurance  ___ Co-Policy to Medicare
   ___ Medicaid  ___ Private Policy
   ___ Medicare

4. How would you rate your overall health? (Check only 1 answer)
   ___ Very Poor
   ___ Poor
   ___ Average
   ___ Good
   ___ Excellent
APPENDIX B

HIGHFILL EXERCISE QUESTIONNAIRE
Highfill Exercise Questionnaire

Please briefly answer the following questions.

1. Have you been told by a health care provider you have osteoporosis?
   ____YES  ____NO

2. Have you ever been instructed in exercises for osteoporosis?
   ____YES  ____NO

   If YES, by whom (check all that apply):
   ____Nurse  ____Therapist  ____Physician
   ____Other (Please specify)________________________

3. How long have you been attending the osteoporosis support group?
   ____0 to 3 months  ____10 to 12 months
   ____4 to 6 months  ____More than 1yr
   ____7 to 9 months  ______________________

4. How has the support group helped you?
   ____________________________
   ____________________________
   ____________________________

5. Which method of instruction was used to teach you the proper exercises? (Check all that apply)
   ____Written Material (such as a handout, pamphlet, or book)
     How long ago? _____________________________
   ____Video (such as an exercise tape used in a VCR device)
     How long ago? _____________________________
   ____Demonstration (instructor demonstrated exercises)
     How long ago? _____________________________
   ____Verbal (Instructor told you how to exercise)
     How long ago? _____________________________

6. Did your insurance plan cover the cost of your exercise instruction?
   ____YES  ____NO
7. How often do you exercise for a minimum of 20 minutes at one time?  
(Check only 1 answer)

- ___ Never, 0 times
- ___ 1 time per week
- ___ 2 times per week
- ___ 3 times per week
- ___ 4 times per week
- ___ 5 times per week
- ___ 6 times per week
- ___ 7 times per week
- Other (Write in amount)__________________________________________

8. What type of exercise do you do for 20 minutes or more at one time?  
(Check all that apply)

- ___ Walking
- ___ Water exercises
- ___ Aerobics
- ___ Floor exercises
- ___ Weights
- ___ Stair-stepper
- ___ Bicycling
- ___ Jogging
- ___ Tai Chi
- Other (Write in)________________________________________________

9. What are your reasons for not exercising? (Check all that apply)

- ___ I have pain.
- ___ I do not have time to exercise.
- ___ I do not have transportation.
- ___ I do not have a place to exercise.
- ___ I do not understand how to do the exercises.
- ___ I do not think I need to exercise.
- ___ I have other medical problems that prevent me from exercising.
- ___ Other (write in)______________________________________________

10. What is your number one reason for not exercising? (Check only 1 answer)

- ___ I have pain.
- ___ I do not have time to exercise.
- ___ I do not have transportation.
- ___ I do not have a place to exercise.
- ___ I do not understand how to do the exercises.
- ___ I do not think I need to exercise.
- ___ I have other medical problems that prevent me from exercising.
- ___ Other (write in)______________________________________________

11. Did you exercise regularly before you were told you had osteoporosis?  

- ___ YES
- ___ NO
APPENDIX C

MISSISSIPPI UNIVERSITY FOR WOMEN

COMMITTEE ON THE USE OF HUMAN SUBJECTS IN EXPERIMENTATION
April 26, 2000

Ms. Tina D. Highfill  
P. O. Box W-910  
Campus

Dear Ms. Highfill:

I am pleased to inform you that the members of the Committee on Human Subjects in Experimentation have approved your proposed research as submitted.

I wish you much success in your research.

Sincerely,

Sheila V. Adams, Ed.D.  
Interim Vice President for Academic Affairs

SA:wr

cc: Mr. Jim Davidson  
    Dr. Lynn Chilton
Osteoporosis Support Group  
Ms Gichelle Clark, Chairperson  
830 South Gloster Street  
Tupelo, MS 38801

Dear Ms. Clark;

I am a Registered Nurse and a graduate student at Mississippi University for Women pursuing an advanced practice nursing degree. I am conducting a research study concerning exercise and osteoporosis. The purpose of this study is to determine if there is a difference in exercise frequency of women diagnosed with osteoporosis based on the type of exercise instruction given. The study will be conducted in the spring of 2000.

The subjects in the study will be all women over age 50, diagnosed with osteoporosis by a healthcare provider. They also must have received exercise instruction by either written material, video tape, physical demonstration, verbal instruction, or a combination of methods. Each participant will have the opportunity to refuse to participate and withdraw from the study at any time. Participants will be informed that their decision to participate in the study will in no way affect their inclusion in the support group. Confidentiality will be maintained. The target sample is 100 subjects who attend the osteoporosis support group. Participants meeting the criteria for the study will be given a simple demographic survey and an exercise questionnaire of 11-questions. The questionnaires take no more than 10 minutes to complete. With your permission, the researcher will attend a regular monthly meeting of the support group, explain the study criteria, exclusions from the study, distribute the questionnaire, and then collect the questionnaires upon completion by the participants. There will be no names or identifying numbers on the questionnaires to ensure confidentiality of the participants.

If you desire, the findings of the study will be communicated to you upon completion. Please indicate permission to conduct this study about osteoporosis at the specified facility by signing below. I appreciate your time and consideration as well as your interest in this matter.

Sincerely,

Tina Highfill, RN, SNP

[Signature]

Participating Facility Representative

Date
APPENDIX E

PARTICIPANT CONSENT
Dear Participant,

I am a graduate nursing student from Mississippi University for Women. I am conducting a study concerning exercise and osteoporosis in women over age 50.

I am asking for volunteers for this study that will provide additional information regarding osteoporosis and exercise. This study will help health care providers, like myself, learn more about exercise instruction for women with osteoporosis.

You will be given a Demographic Survey and a Highfill Exercise Questionnaire consisting of seven statements that you will score according to instructions. It will take approximately 10 minutes to complete the questionnaires. Your decision to participate or not to participate in the study will in no way affect your inclusion in the support group. All information will be kept confidential. There are no names or identifying numbers on the questionnaires. You may discontinue participation in this study at any time.

Thank you for your consideration for participation in this research study. Please sign below if you agree to participate in the study.

Sincerely,

Tina D. Highfill, RN, SNP

Your signature below indicates your consent to participate in this research study.

Date _______________  ____________________________
Signature of participant