

AN ASSESSMENT OF RISK FACTORS AND ATTITUDE TOWARD PHYSICAL  
ACTIVITY IN POSTMENOPAUSAL WOMEN COMMITTED TO AN  
OSTEOPOROSIS RELATED RESEARCH PROJECT

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A DISSERTATION  
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COLLEGE OF HEALTH SCIENCES

BY  
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October 15<sup>th</sup>, 1991

Date

To the Dean of the Graduate School:

I am submitting herewith a dissertation written by Judy O. Hammond entitled "An Assessment Of Risk Factors and Attitude Toward Physical Activity In Postmenopausal Women Committed To An Osteoporosis Related Research Project." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Community Health Education.

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DEDICATION

To the honor and memory of my father,

Mr. Bill Oliver  
(July 1909-May 1991)

and to my uncle

Mr. Ray Stewart  
(December 1916-June 1991)

## ACKNOWLEDGMENTS

I wish to express my appreciation and special thanks to the chairperson of my dissertation committee and my graduate advisor, Dr. Ruth Tandy, for her continued support, guidance, and encouragement. She has inspired me not only through the duration of my dissertation, but also during the entirety of my doctoral graduate experience. I have grown educationally, professionally and personally because of her influence on my life.

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Risk factors were retrospectively identified in 98 post menopausal subjects considered at risk for primary, Type I osteoporosis. The relationship between identified risk factors and exercise participation by volunteer postmenopausal females was investigated. Attitude toward physical activity was determined for both the experimental (those who elected to exercise) and control groups (those who elected not to exercise). Eight selected risk factors were assessed: chronological age, years post menopause, ethnic background, exercise history, calcium intake, smoking, hormone therapy, and menopause history. Attitude toward physical activity was assessed by the use of Kenyon's ATPA Inventory. The experimental group had a significantly lower number of risk factors than did the control group ( $p = >.0001$ ). The experimental subjects had a significantly more positive exercise history than those in the control group ( $\chi^2 = 18.643$ ,  $p = >.0001$ ). More than half of the

control group (55.6%) and the experimental group (54.7%) had a calcium intake less than 800 mg/day. Assessment of attitude toward physical activity revealed no significant difference between groups; however, ATPA scores in the health and social subdomains revealed positive responses by both groups. No significant relationship was found between attitude toward physical activity and level of physical fitness.

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## CHAPTER I

### INTRODUCTION

Osteoporosis has been identified as a major health problem for postmenopausal women. The monetary cost of this debilitating disease to the health care system has been estimated to be between \$7 and \$12 billion a year in the United States alone (Bauer, 1991; Levin, 1991; National Osteoporosis Foundation, 1991). In addition, the cost of the physical pain, loss of independence, and the psychological adjustment to the disfigurement that osteoporosis causes is not measurable.

The prevalence of osteoporosis is enormous. It has been referred to as "the most common skeletal disorder in the world, and is second only to arthritis as the leading cause of musculoskeletal morbidity in the elderly" (Kaplan, 1985, p. 95). Current estimates suggest that osteoporosis affects approximately 75 million people in the United States (Christiansen, 1991). Statistics additionally report that between 1.3 to 1.7 million skeletal fractures occur annually as a result of osteoporosis (Bourguet, Hamrick, & Gilchrist, 1991; Gambrell, 1991). It is estimated that "fifty percent of women more than 65 years

of age have bone mineral density below the fracture threshold" (Lukert, 1982, p. 480). Since osteoporosis has been designated as such a major health problem and because the incidence of this disease increases with age, and the life expectancy in America continues to be extended, programs for the prevention and treatment of osteoporosis need to be investigated.

### Background

Osteoporosis results from the loss of bone minerals, which leads to crippling skeletal disfigurements accompanied by a high incidence of bone fractures. These fractures are most common in the wrist, the hip, and the vertebra. A fracture of the distal radius can leave a permanent change in the shape and appearance of the wrist. Hip fractures can leave a person with a limp or permanently confined to a bed or wheelchair. The compression fractures in the vertebra result in a stooped appearance from an excessive dorsal kyphosis. Some women have lost up to eight inches in height due to this type of spinal fractures (Fardon, 1985). This compression of the upper torso results in an appearance demonstrated by the arms hanging lower, the head being thrust forward, the abdomen protruding and the ribs approaching the pelvis. Figure 1 demonstrates this deformity.



Figure 1. Deformity Associated With Osteoporosis

Osteoporosis is a disease "characterized by low bone mass, microarchitectural deterioration of bone tissue leading to enhanced bone fragility, and consequent increase in fracture risk" (Christiansen, 1991, p. 107). Bones in healthy adults are constantly being remodeled (i.e., bones are going through an equal process of bone resorption and bone formation). With osteoporosis, the bone resorption exceeds the bone formation and thus a low bone mass occurs. Figure 2 demonstrates the process of bone remodeling.

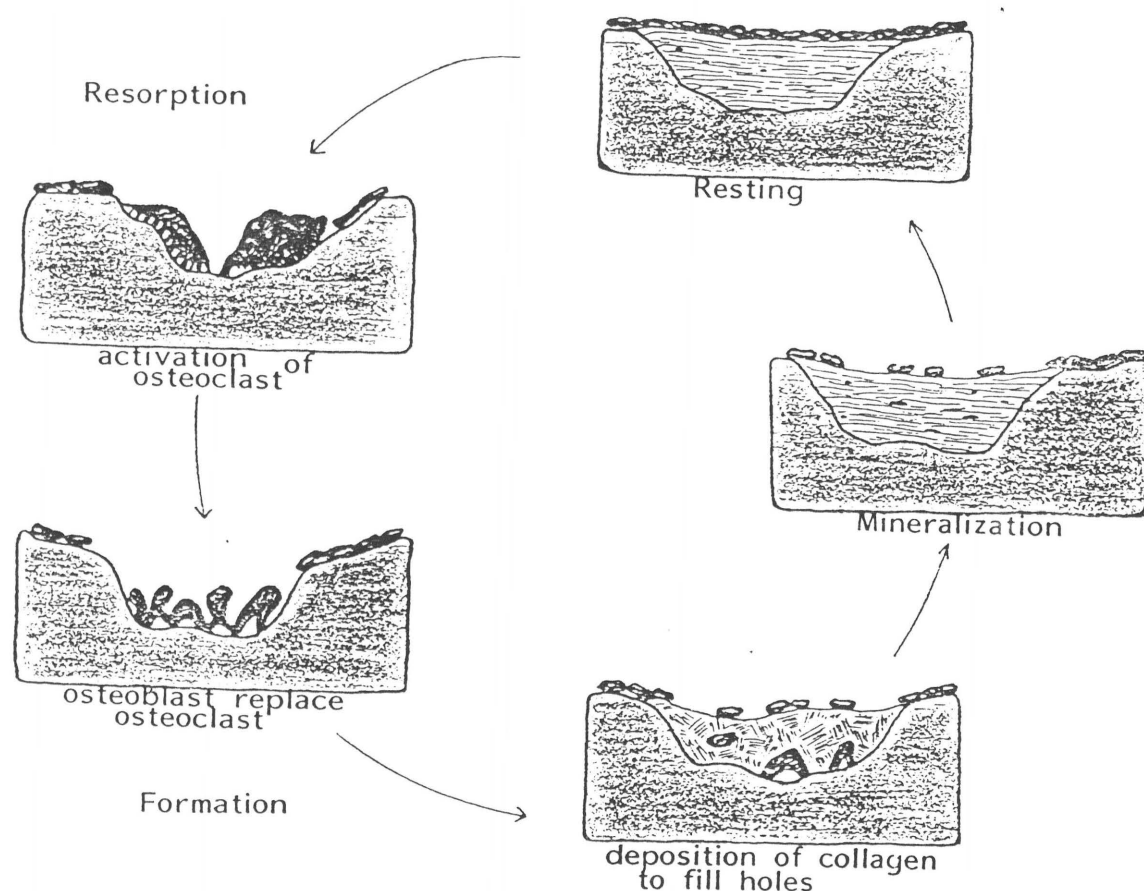


Figure 2. Process of Bone Remodeling (Adapted from Levin, 1991, p. 83)

There are basically two forms of the disease: primary osteoporosis and secondary osteoporosis. The first type, known as primary osteoporosis, is demonstrated by a low mass of bone while the ratio of calcified to uncalcified matrix remains normal. This primary type is further separated into Type I, which is known as postmenopausal osteoporosis, and Type II, which is known as senile osteoporosis. Type I is seen in women within 5 to 20 years after menopause. During this period, the rate of bone loss can exceed 3% per year which is a rate 10 times higher than previous to menopause (Levin, 1991).

Two kinds of bone are found in the human skeleton: trabecular and cortical. Trabecular bone is the spongy bone found in the middle of the bones and cortical bone is found around the outside of bones. Primary Type I osteoporosis demonstrates basically greater trabecular bone loss than cortical bone loss. This paper is limited to subjects who are being assessed for Type I Osteoporosis.

Primary Type II osteoporosis is seen in both sexes after the age of 70 and may be "triggered by an age-related decrease in osteoblast function and impaired production of  $1,25(\text{OH})_2$  vitamin D, leading to secondary hyperparathyroidism" (Grisanti, 1989, p. 60). Table 1 outlines the difference between Type I and Type II primary osteoporosis.

Table 1

Comparison of Type I and Type II Osteoporosis

	Type I	Type II
Etiology	Related to menopause	Related to aging
Sex ratio (F/M)	6/1	2/1
Type of bone loss	Mainly trabecular	Mainly trabecular & cortical
Age when presents	5 to 20 years past menopause	70 or older

Secondary osteoporosis is basically a disease process that is related to some other metabolic disorder that causes the decrease in bone mass. Some of the underlying causes of secondary osteoporosis include:

hyperparathyroidism, Cushing's syndrome, rheumatoid arthritis, hypogonadism, hyperthyroidism, diabetes mellitus and chronic renal failure.

Commonly recognized controllable risk factors that are associated with the development of osteoporosis include: hormone deficiencies, nutritional deficiencies, smoking, and the lack of weight bearing physical activity. Other

identified, but questionable, controllable risk factors include: leanness, alcohol abuse, and high fiber, protein, or phosphate intake. Uncontrollable risk factors include: gender, age, ethnic origin, history of premenopause surgical oophorectomy, and postmenopausal status. In addition to the above mentioned risk factors,

endocrine disorders (premature menopause, hyperthyroidism, hyperparathyroidism, or hyperadrenocorticism), gastrointestinal disorders (peptic ulcer disease, malabsorption syndrome, lactase deficiency, or subtotal gastrectomy), and certain medications (corticosteroids, heparin, thyroid hormone, aluminum-containing antacids, furosemide, or anticonvulsants)" (Dourguet, et al. 1991, p. 265)

are medical conditions that are known to increase the danger of osteoporosis.

The best treatment for osteoporosis, at this time, is preventing and prolonging the rate of bone loss by risk factor reduction. Even though it is impossible to change those uncontrollable risk factors, and it is most difficult to alter medically necessary treatments that increase the risk of osteoporosis, there are still several health behaviors that are known to prevent and slow down its progression. These include taking estrogen after



menopause, ingesting adequate amounts of calcium, not smoking, and routinely participating in weight bearing physical activities.

### Rationale for the Study

Assessment of risk factors for developing a debilitating disease, such as osteoporosis, is the first step in prevention. Only after the risk factors are identified, can an individual intervene to make changes in lifestyle behaviors that could possibly alter the outcome of a condition that is known to limit one's optimal health status.

Specific health behaviors may be implemented by developing positive attitudes. Positive attitudes toward healthy behaviors can be influenced by multiple factors including such variables as social environment, health knowledge, learning experiences and motivation. Therefore, when factors that can promote positive attitudes toward a specific health behavior are available, a predisposition of commitment to that activity is likely to result (Bedworth & Bedworth, 1978).

Since one of the goals of health educators is to motivate the public to participate in activities that can prevent disease, research needs to be devoted to recognition of risk and identification of ways that can

enhance health behaviors. Individual assessment and health education are the primary ways to discover risks for developing osteoporosis. Participation in weight bearing physical activity is considered one of the easiest and most uncomplicated ways of reducing the risk of developing complications from osteoporosis. Therefore, identification of those at risk and encouraging participation in weight bearing physical activity appears to be an ideal place to begin a prevention and treatment program.

Most recent research has focused on high school and college subjects as target populations for behavioral studies in relation to physical activity. This probably occurs because the younger subjects are so easily accessible for research endeavors. Very few studies have dealt specifically with the older woman and the problems she encounters with any specific health behavior (Smith & Theberge, 1987). Even so, the older woman could benefit from advice based on solid research. Physical activity can delay and sometimes prevent health problems, such as osteoporosis, in the female as she ages. Thus, it seems important that physical activity be considered for all ages of women in formal research endeavors. The paucity in reported research further supports the need to place emphasis on the older woman and on ways to encourage her to participate in effective physical activity.

Identification of positive attitudes toward physical activity in individuals who have demonstrated incorporation of this health behavior into their lifestyle can offer valuable insight to health educators. This information can aid health educators in planning programs concerned with the development of positive attitudes by their clients toward a health behavior such as physical activity. It can also help the clients to select the most feasible program to accomplish this objective.

#### Purpose of the Study

The purpose of this study was to retrospectively identify risk factors associated with the development of osteoporosis and to investigate the relationship between the identified risk factors and exercise participation by volunteer postmenopausal females who were committed to an exercise-related osteoporosis research project. The relationship between the level of physical fitness and attitude toward physical activity of these volunteer research subjects was also investigated.

#### Statement of the Problem

The problem in this study was to determine if there was a difference between two groups (control and experimental) and the identified risk factors for

osteoporosis previously determined for each participant. The experimental group consisted of subjects who had volunteered to participate in organized weight bearing physical activity. The control group included subjects who elected not to participate in the organized weight bearing physical activity. Additionally, the relationship between attitude toward physical activity and the level of physical fitness of all subjects was determined. This study was conducted at the University of Texas at Tyler (UTT) using volunteer subjects who participated in a research study that was initially designed to investigate the effects of exercise and estrogen therapy on osteoporosis development in postmenopausal women.

### Hypotheses

The following hypotheses were tested at the .05 level of significance:

1. There is no significant difference between groups for each of the following osteoporosis risk factors: (a) chronological age, (b) years post menopause, (c) ethnic background, (d) exercise history, (e) calcium intake, (f) smoking, (g) estrogen use, and (h) menopause history.
2. There is no significant difference between groups in their number of identified risk factors associated with osteoporosis.

3. There is no relationship between attitude toward physical activity measured by the subdomains of Kenyon's ATPA Inventory and the levels of physical fitness of all postmenopausal research subjects measured by predicted  $\text{VO}_2$  values.

4. There is no significant difference between groups in attitudes toward physical activity as measured by the subdomains of Kenyon's ATPA Inventory (Kenyon, 1968).

#### Definition of Terms

Definitions inherent to this study are presented below:

Estrogen replacement therapy. Replacement of estrogen by supplementation. This type of therapy is generally given to those women who have had their uterus removed and are postmenopausal from either a natural process or from surgical intervention. This type of therapy is usually expressed by the letters ERT.

Hormone replacement therapy. This is a type of hormone replacement recommended for those women who are postmenopausal and still have an intact uterus. It consists of supplementation with both estrogen and progesterone in order to reduce the risk of endometrial cancer that is associated with estrogen therapy in women with a postmenopausal intact uterus. This type of therapy

is usually expressed by the letters HRT.

Osteoporosis. A disease process in which there is an exaggeration in the normal process of bone loss that results in bone mass becoming so low that bone fractures can occur without insult.

Type I, Primary Osteoporosis. A type of osteoporosis better known as postmenopausal osteoporosis that involves bone mineral loss associated with both surgical and spontaneous menopause. Unless noted otherwise, all reference to osteoporosis will refer to the postmenopausal, Type I, osteoporosis.

Postmenopausal. The period of time after menopause when all evidence of ovarian function and estrogen production has stopped.

Risk Factors. "Events or entity that contributes to the cause of another event" (Bowers & Thompson, 1984, p. 3). The risk factors referred to in this paper are those events or entities that have been indicated as relating to the cause or progression of osteoporotic bone changes in postmenopausal women.

The definition of terms as designated by Kenyon (1968) include:

Attitude. "A latent or non-observable, complex, but relatively stable behavioral disposition reflecting both direction and intensity of feeling toward a particular

object, whether it be concrete or abstract" (p.567).

Physical Activity for Aesthetic Experience. Activity that gives opportunities to observe the beauty of human movement.

Physical Activity for Ascetic Experience. Activity that provides a physical challenge for the participant.

Physical Activity for Catharsis. Activity that affords an individual an opportunity for recreation and relaxation.

Physical Activity for Health and Fitness. Activity that promotes better health, provides opportunities for getting into better condition, and is engaged in for health and fitness reasons.

Physical Activity for Social Experience. Activity that gives an individual a chance to meet new people and to be with friends for social experiences.

Physical Activity for the Pursuit of Vertigo. Activity that provides opportunities for thrills and excitement.

#### Limitations

The following two limitations were inherent to this study:

1. The subjects were volunteers from a moderately small East Texas community who were participants in an

osteoporosis research study, and thus did not necessarily represent a true random sample of postmenopausal women.

2. The variables investigated were physiological parameters, health surveys, demographic data and attitude scores. Other variables such as sociological history, psychological profiles and other potential risk factors for osteoporosis not identified in the hypothesis were not considered.

#### Delimitation

The following delimitation was identified in this study:

Subjects for this study consisted of only a selected group of 98 female volunteers between the ages of 40 and 70 who verified that they were postmenopausal. Subjects in the osteoporosis project at UTT who were not postmenopausal or who were at risk for osteoporosis because of other medical reasons were not included in this study.



## CHAPTER II

### REVIEW OF LITERATURE

Literature that reflects risk factors involved with osteoporosis is abundant and selected studies in the area, relevant to this study, are reviewed in this chapter. Research studies relating to attitude toward physical activity are limited. Those utilizing Kenyon's ATPA Inventory as their instrument are presented in the second section of this chapter following a review of the risk factors associated with osteoporosis.

#### Risk Factors and Osteoporosis

Bones are constantly changing because of a remodeling process that consists of bone formation (deposition) and resorption (withdrawal). When bone formation and resorption are in balance, strong, dense bones are formed. When the remodeling process is altered so that bone resorption is greater than bone formation, bone density lessens. This decrease in bone density is the physiological basis for osteoporosis and is known as involutional bone loss (Aisenbrey, 1987).

There are numerous factors that influence risk for developing osteoporosis. Most of these factors are associated with either reduced bone mineral formation or

excessive resorption of bone minerals (Peck et al., 1988). Osteoblasts are bone forming cells that are responsible for the deposition of bone minerals and increases in bone density. One factor that is associated with stimulation of osteoblasts is weight-bearing activity. The inhibition of osteoblasts occurs with the lack of weight-bearing activity, chronic malnutrition, smoking and normal aging processes.

Osteoclasts are bone forming cells that are responsible for the resorption phase of bone remodeling. Some of the factors that are thought to inhibit these cells include: weight bearing activity, estrogen, vitamin D intake and calcium intake. In contrast, stimulation of osteoclasts can result from: lack of weight-bearing activity, menopause, inadequate calcium intake and normal aging processes. Prevention and treatment of osteoporosis is aimed at identification and alteration of risk factors associated with imbalance in deposition and resorption of bone minerals.

Controllable risk factors are those factors that are within the power of an individual to modify. Some of the risk factors that are consistently associated with a lower risk of developing complications from osteoporosis include: a positive history of exercise involvement, an adequate and consistent calcium intake, a negative smoking history and

the use of estrogen replacement after menopause.

### Exercise History

Regular, weight bearing exercise has been associated with the prevention of bone loss by increasing stress from gravity and developing of muscle mass. This is accomplished because "muscular contraction and gravity create piezoelectric forces which affect bone remodelling" (Chow, Harrison, Brown, & Hajek, 1986, p. 233). In addition, stimulation of bone growth factors, increase in blood flow within the bone and mechanical forces associated with osteoblast growth can result from weight bearing physical activity (Peck, Riggs & Bell, 1987).

Bones can be stressed from gravitational forces from weight-bearing activities and from repetitive dynamic muscle contractions. Several studies have demonstrated that weight-bearing exercise can prevent age-related decline in bone density and in some cases increase the mineral content of bone (Ayalon, Simkin, Leichter, & Raifmann, 1987; Birge & Dalsky, 1989; Chow et al., 1986; Dilsen & Berker, 1989; Stillman, Lohman, Slaughter, & Massey, 1986). Notelovitz (1986) compared muscle strengthening exercises with aerobic exercises in postmenopausal women. He found greater bone densities in the subjects who participated in the muscle strengthening

activities than in the subjects who exercised aerobically (Notelovitz, 1986). Other investigators (Ayalon et al., 1987) have concluded that the exercises that are most useful in preventing bone loss in postmenopausal women are those exercises that are specific for muscles over particular bones. These investigators found a 3.8% increase in bone density in the distal forearm when dynamic bone loading exercises were specific to the arms.

### Calcium Intake

Demographic statistics have revealed that the average American woman has a daily calcium intake of approximately 450 to 600 mg of calcium each day (Beare & Myers, 1990; Notelovitz, 1987). "At this intake, perimenopausal and postmenopausal women develop a negative calcium balance of 40 mg/day, which equates to a bone loss of 1.5% per year" (Notelovitz, 1987, p. 52). This is much lower than the United States recommended dietary allowance (RDA) of calcium for the adult woman which is 800 mg a day. Prevailing osteoporosis research, however, led the 1984 Consensus Conference on Osteoporosis to recommend "that women consume 1,000 to 1,500 milligrams a day [of calcium]" (Whitney, Cataldo, Rolfes, 1991, p. 298). Other sources concur that the recommendation for postmenopausal supplementation with calcium is 1,500 mg each day (Beare & Myers, 1990; Ettinger, 1988; Peck et al., 1987; Recker,

1984; Santora, 1987; Smith & Zook, 1986; Trachtenbarg, 1990).

Bone acts as a reservoir for the minerals in the body. The normal blood calcium level remains relatively constant between approximately 9 and 10 mg/dl. Therefore no blood test can adequately diagnose loss of calcium from the bones. When the body has an increased need for calcium, it will draw the calcium from the bone (resorption) to maintain a balanced intravascular level (Smith & Zook, 1986). Therefore when there is an inadequate intake of calcium or problems with the absorption of calcium, the bone releases calcium into the blood in order to maintain homeostasis.

The diets of the average American woman tend to contain elements that prevent maximal absorption and utilization of calcium. For example the trend to balance the diet with large percentages of protein and fiber reduces the available calcium for bone remodeling.

The average adult woman will absorb only about 30% of the calcium that she consumes (Amschler, 1985; Whitney et al., 1991). This low percentage of calcium absorption decreases even further as the woman grows older. One factor that is associated with the decrease in the calcium absorption is an imbalance of phosphorus and calcium. High phosphorus intake from soft drinks containing phosphoric

acid are sometimes responsible for this imbalance (Phipps, Long, Woods, & Cassmeyer, 1991; Spencer & Kramer, 1986). This phosphoric acid is different from the phosphorus found in foods. The phosphorus in foods can be beneficial in recommended amounts and decreases "urinary calcium... which [results in] deposition of calcium in soft and possibly also in hard tissues, [and] to decreased intestinal absorption of calcium" (Spencer & Kramer, 1986, p. 318). The recommended dietary allowance for phosphorous is 800 mg each day. An average phosphorus intake in the American diet is approximately 1,200 mg each day (Spencer & Kramer, 1986). An extra 1,000 mg of phosphorous can lead to a loss of about 40 mg of calcium each day (Heaney & Recker, 1982).

High fiber foods tend to combine chemically with calcium to prevent its absorption (Whitney et. al., 1991). High protein intake has also been responsible for increased calcium being released from the bones in the remodeling process. This phenomenon causes the calcium to buffer the high nitrogen levels that are caused from the high protein intake (Phipps et al., 1991). The end result is that calcium is excreted at an increased rate (Riggs, 1987; Whitney et al., 1991). One author (Kinnon, 1988) suggested that "doubling protein intake increases urinary calcium losses by 50%; the high-protein diet prevalent in many industrialized countries may be a major factor in the bone

loss of people from these countries" (p. 1536).

### Smoking

Research has demonstrated an association between cigarette smoking and osteoporosis. A study (Aloia et al., 1985) investigating risk factors associated with osteoporosis found that "cigarette smoking was more prevalent among osteoporotic women than among the control subjects" (p. 96). The relationship of smoking and osteoporosis is believed to be based on the antiestrogenic effect of cigarette smoking (Baron, 1984; Baron, La Vecchia & Levi, 1990). Healthstyle, a bimonthly medical newsletter, warned women in Texas that "smoking causes a 30% decrease in estrogen levels in the body (Schuessler & Sanders, 1984).

Baron et al. (1990) summarized current literature on the antiestrogenic effect of smoking on various sites for osteoporotic fractures and concluded that, in relation to spinal fractures, research suggests a "threefold or greater increase in risk" for smokers and "a twofold increase" for fractures of the hip for those who smoke (p. 505).

Smoking cigarettes can interfere with body metabolism and circulation. The exact mechanism of this effect on bone remodeling is not well understood; however, it is known that the nicotine in cigarettes constricts blood

vessels and thus decreases nourishment to the bones. In addition, the chronic lung insufficiency that results from smoking leads to a slight acidosis. This acidotic state is thought to increase the movement of calcium and other minerals from the bone (Fardon, 1985). Physiologically, this is explained by the following:

The decreased exchange of volatile gases because of decreased pulmonary function associated with heavy smoking increases calcium resorption from the bone by changing the acid base balance in the canaliculi around the osteoclast (Jones & Jones, 1981, p. 810).

It has been shown that cigarette smoking has been linked to earlier menopause (Aloia et al., 1985; Baron et al., 1990; Davis, 1986). Baron et al. (1990) reviewed several studies [15 references given] that showed that "menopause typically occurs about 1 to 1.5 years earlier in current smokers than in never smokers" (p. 504). Age at menopause for ex-smokers is generally closer to that which is the norm for those women who have never smoked (Baron, 1984; Baron et al., 1990). Thus, the negative effects of smoking seem to not be as significant in ex-smokers as they are in those who are smoking during the perimenopausal years. Early menopause allows more time for bone density to decrease in the normal life span of a woman.



Additionally, smoking imposes restrictions to interventions, such as estrogen replacement, that are used to prevent or treat overt osteoporosis. The risk of some of the complications associated with estrogen replacement, such as elevated blood pressure, make ERT or HRT too high a risk for those women who smoke.

### Estrogen Use

Estrogen deficiency occurs primarily from oophorectomy or natural menopause. Women who have their ovaries removed prior to menopause lose bone due to estrogen deficiency similar to those women who go through a natural menopause (Richelson, Wahner, Melton & Riggs, 1984). The greatest loss of bone generally occurs in the first 4 to 5 years after estrogen deficiency (Diddle & Smith, 1984).

For those women who go through a natural menopause, the cessation of ovarian function is a gradual process. This process begins, on an average, for the woman at about 40 years of age and ends about 10 years later when menstrual periods cease totally (DeFazio & Speroff, 1984). Women of any age who have oophorectomies premenopausally experience an abrupt change in the naturally produced estrogen. Other endocrinologic changes that occur with menopause include: marked elevations in follicle-stimulating hormone (FSH), absence of progesterone production, decreased androgens, and increased

testosterone. These hormone changes, in combination with estrogen depletion, account for the varied symptoms that are associated with menopause (DeFazio & Speroff, 1984).

At menopause, a rise in blood calcium levels and urinary calcium excretion is expected. This is due to an increase in the bone resorption and a decrease in the bone formation (i.e bone cannot be put back as fast as it is removed). Researchers generally agree that this increased bone turnover is due to "the loss of an antiresorptive action of estrogen receptors in bone" (Nordin, Need, Morris & Horowitz, 1990, p. 24).

The use of estrogen replacement is generally accepted as the most effective way to prevent bone loss after cessation of ovarian function. The etiology of this loss can be from either a natural menopause or from a surgically induced menopause (oophorectomy). The minimum effective dose prescribed is generally .625 mg/day or an equivalent of conjugated estrogen for asymptomatic women (DeFazio & Speroff, 1984; Notelovitz, 1987; Peck et al., 1987). Other researchers have demonstrated that the minimum effective dose of estrogen can be cut down to .3 mg/day if the calcium intake is 1,500 mg/day (Christiansen & Riis, 1987; Lindsay, 1987).

In the postmenopausal state, estrogen replacement therapy is given to women who have had their uteri removed.

It is given in combination with progesterone as hormone replacement therapy to women who still have a uterus to protect against the detrimental long-term effects of unopposed estrogen on the endometrium.

The protective factors associated with estrogen "persist for as long as therapy is provided, and result in reduction in fracture risk of about 50% for fractures of the hip and distal radius to perhaps as much as 90% for vertebral crush fractures" (Lindsay & Thome, 1990, p. 127). If replacement therapy is begun immediately after menopause, bone loss can be delayed. Research has demonstrated that cessation of estrogen results in immediate profound and consistent bone loss (DeFazio & Speroff, 1984; Diddle & Smith, 1984; Notelovitz, 1987).

The timing and duration of estrogen therapy are important considerations. Even a few years before menopause, women have reduced estradiol levels and bone loss. The spine may suffer a 5% to 10% loss during this transitional period. Most experts agree that estrogen therapy could be initiated in a woman who is at high risk for osteoporosis and who shows signs of dwindling ovarian function [most reliably indicated by irregular menses, vasomotor symptoms, and an elevated level of FSH] (Ettinger, 1988, p. 692).

Long term use of estrogen replacement provides protection for as long as the woman continues to take it. A study on long term use of estrogen revealed that the "average bone mineral age [of trabecular bone in the spine] of subjects was 10 to 12 years less than their actual age" (Ettinger, Genant, & Cann, 1985).

Opinions about estrogen replacement after menopause are still diverse because of the association of estrogen to increased incidence of hypertension, biliary disease and breast cancer. The risk-benefit ratio is considered for women who are at risk for developing these diseases. The supplementation with progesterone (HRT) can adversely affect cholesterol levels and thus make supplementation questionable for the woman who still has her uterus intact (Cummings, 1987; Mack & Ross, 1990; Porterfield, 1990). Another drawback to estrogen in combination with progesterone is the return of monthly bleed in a large percentage of women (Porterfield, 1990). Additionally, some women find replacement therapy inconvenient and expensive (Porterfield, 1990). Monetarily, it will cost a woman between \$100 and \$150 a year for hormone replacement. This is a limiting factor for some women.

Estrogen is linked with a reduced incidence of heart disease, stroke, postmenopausal rheumatoid arthritis, and a wide range of postmenopausal symptoms (Mack & Ross, 1990).

For these reasons, in addition to the positive effects on prevention of osteoporosis, the benefits of taking estrogen outweigh the risk associated with replacement therapy after ovarian dysfunction.

#### Additional Controllable Risk Factors

Obesity and muscle mass have been identified as possible protective factors associated with osteoporosis. Research has revealed a lower incidence of osteoporosis in the obese individual. The principle behind this observation is that more weight would result in more stress on the bones in the obese individual. This physical stress would lead to denser bones. Additionally it is thought that the adipose tissue is responsible for greater estrogen stores (Kelsey, 1989). Physiologically, this theory is based on the principle that since endogenous estrogen is produced from androgen precursors found in adipose tissue, the obese postmenopausal woman should have greater amounts of available estrogen.

Stress on bones can come from muscle contraction forces. A study by Hammond, Ballard & McKeown (1987) investigating association of bone width, bone mineral content, and density with body composition variables in postmenopausal women found:

some evidence ... from the higher correlation of fat-free weight and bone measures, that

muscularity had a greater association with higher levels of bone mineral content, bone width, and bone density; whereas, the measures of body fatness were either inconsistent or not associated with bone densities. (p. 275)

Other research has supported this opinion. Zimmerman, Smidt, Brooks, Kinsey & Eekhoff (1990) suggested that strength may be a factor in the determination of BMD [bone mineral density]. Maintenance of strength in those muscle groups with anatomical or functional relationships to the hip and lumbar spine may play a role in the prevention and cessation of the osteoporotic changes that occur. (p. 302)

Thus, research opinion varies on the risk factor for body build: whether it is the obesity, the body composition (morphology), or a combination that has the most beneficial affect on bone structure.

An additional risk factor that is being researched is alcohol consumption. At this time research data report conflicting findings. It has been suggested that the association of alcohol consumption and osteoporosis might be that "alcohol consumption may increase the risk for falls, but have little effect on bone density" (Kelsey, 1989, p. 16). Other authors (Spenser & Kramer, 1986) have

suggested a multifactoral association between alcohol consumption and osteoporosis. They report that poor dietary intake and malabsorption of calcium are directly related to osteoporosis.

Vitamin D is considered an important factor in calcium transport. The recommended dietary allowance for Vitamin D is 400 IU. Doses larger than this can have negative effects, such as increasing urinary calcium without increasing calcium absorption (Spencer & Kramer, 1986).

Other signs of toxicity include:

loss of appetite, headache, weakness, fatigue,  
excessive thirst, irritability, apathy, kidney  
stones, irreversible renal damage,...

calcification of soft tissues (blood vessels,  
kidneys, heart, lungs, tissue around joints,  
[and] death (Whitney et al., 1991, p. 255).

#### Uncontrollable Risk Factors

As a woman ages, the risk for osteoporosis increases. By the time most women are 70, they have lost approximately 30% of their total bone volume (Nordin et al., 1990). These researchers (Nordin et al., 1990) revealed two basic factors associated with bone loss: a chronological age factor and a years-since-menopause factor. It was found that the aging factor accounts for a linear loss that starts at about age 55 and continues at a rate of 1% a year

(Nordin et al., 1990). They also ascertain that the menopausal factor accounts for approximately an 11% loss of bone in the first 5 years after menopause and an additional 5% in the next 20 years (Nordin et al., 1990). Similarly, a study (Hammond et al., 1987) investigating bone density and body composition in various age intervals of postmenopausal females reported progressive bone loss with age.

The incidence of osteoporosis varies according to ethnic background. In Caucasian races, the incidence of osteoporosis is lowest in persons from southern European countries and the Mediterranean basin and highest in those from northern European extraction (Kaplan, 1987). The descendants from northern European countries typically have fair skin and blue eyes. Also at risk are those who have Asian (Oriental) ancestry. Asian and northern European women are typically short, thin and have poor musculature (Ettinger, 1988). The darker skinned races have the least incidence of osteoporosis. "Blacks have a far lower incidence of osteoporosis than some other groups, perhaps because of their 15% higher bone density at all ages" (Davis, 1986, p. 95).

Identification of those who are at risk for osteoporosis is important so that correct therapy can be initiated prior to occurrence of fractures. Further



research investigating occurrence of risk factors in high risk groups should lead to the development of "predictive equations" that can be used to individually adjust therapy (Aloia et al., 1985). At this time, prediction of actual fractures from risk factor analysis has not proven significant (Hemert, Vandenbroucke, Birkenhager & Valkenburg, 1990).

### Attitude Toward Physical Activity

The measurement of attitude can be accomplished by the use of an attitude scale. The Likert-type scale is commonly used for attitude measurement since it utilizes a summated rating analysis of responses to a list of given statements that relate to feelings about a given topic (Albinson, 1974).

Kenyon's (1968) Attitude Toward Physical Activity (ATPA) Inventory was devised to assess the feelings of adults toward the value of physical activity. This assessment tool is a questionnaire consisting of a form for men (DM) and a form for women (DW). Each of these tools contain statements that are divided into six subdomains.

Physical activity for health and fitness is characterized by the contribution to the improvement of health and fitness by the perceived value of physical activity. This belief is based on the idea that health is

desirable and plausible and that it can be improved from physical activity (Kenyon, 1968).

Physical activity as a social experience is a representation of those physical activities which have the primary aim of meeting new people and continuing existing social relationships. Those who view physical activity for this reason believe that when activity is performed with a group, those who share it engage in something meaningful (Kenyon, 1968).

Physical activity as the pursuit of vertigo is depicted by those physical experiences that provide excitement and some element of risk through exposure to speed, sudden changes in direction, and acceleration, while the participant retains some measure of control (Kenyon, 1968). This motivation for physical activity is seeking sensations (not necessarily achieving them) similar to being intoxicated from the excitement that certain movements in physical activity cause.

Physical activity as catharsis concerns the belief that physical activity can provide release from stress, tension and frustration (Kenyon, 1968). It is the purging of accumulated emotions through physical activity.

Physical activity as an ascetic experience characterizes the view of physical activities in terms of experiences involving long and strenuous training with the

need for making some sacrifices (Kenyon, 1968). Typically, high level competition with a strong motive to win is a basis for this subdomain.

Physical activity as an aesthetic experience is described as viewing physical activity in terms of its artistry and beauty (Kenyon, 1968)). This is reflected in the opinion that physical movements demonstrated in certain physical activities are pleasing to observe.

Kenyon (1968) found that the subdomains with the most positive scores were health and fitness, social, aesthetic experience and catharsis; while less positive values were found for vertigo, and ascetic experience. Women showed highest values for the social, health and fitness and aesthetic experience subdomains.

Since its development, Kenyon's ATPA Scales have been used extensively in many research studies (Albinson, 1974; Kenyon and Andrews, 1981). Most of the studies have involved college age subjects and children. Very few studies have investigated attitude toward physical activity in the adult female.

A study (Hammond, 1984) investigating adult female nursing students' attitude toward physical activity found that the subdomain of health and fitness was the only dimension to indicate positive mean responses by all subjects. The mean scores for this subdomain was 54 for

freshman, 51 for junior and 50 for senior nursing students. Similar results were found in another study (Mathes & Battista, 1985) using the ATPA Inventory to investigate college men's and women's motives for participation in physical activity. It was found in that study that the total sample rated health and fitness as the most motivating factor related to participation in physical activity. The study further showed that values for the subdomain of social were significantly higher in women than in men.

The subdomain of health was established as the primary motive for participation in physical activity in a study (Heitmann, 1986) that used the ATPA Inventory to evaluate the older adult. Additionally, this study supported Kenyon (1968) and others (Mathes & Battista, 1985) who found that the subdomain of social reflects a motive for the older woman's participation in physical activity.

A study was conducted assessing "white, middle-class and upper-middle-class clubwomen" (Noland, 1981) using Kenyon's ATPA scales to investigate exercise behavior. The author found a significant positive relationship between attitude toward physical activity and exercise behavior in the older woman (46 to 65 years old).

In contrast, Biddle & Bailey (1985), found that middle aged (mean age = 46) women valued catharsis (mean = 4.3),

social (mean = 4.2) and aesthetic (mean = 4.5) subdomains positively. These subdomains were different from those valued by the males in the study.

### CHAPTER III

#### METHODOLOGY

This study was part of a multifaceted osteoporosis program at the University of Texas at Tyler. This program included the investigation of diet, calcium supplementation, estrogen therapy, physical activity, cardiovascular function, body composition, and bone mass of volunteer premenopausal, menopausal, and postmenopausal subjects, aged 35-72, from the Tyler community. Permission was obtained from the director of the osteoporosis program for this investigator, in the position of project nurse, to use a portion of the subjects and data obtained from their records for the focus of individual research for a doctoral study at Texas Woman's University (Appendix A). The project nurse helped to test the subjects and obtained data for other research projects involved in the osteoporosis program (Appendix B). A list of research presentations and papers that evolved from this program are listed in Appendix C.

The primary focus of this study was to assess risk factors and attitude toward physical activity in the postmenopausal women involved in the program. The

following sections in this chapter describe the research design of this study: (a) Selection of Subjects, (b) Procedures, and (c) Data Analysis.

### Selection of Subjects

The subjects for this study consisted of 98 Caucasian women between 40 and 70 years of age who had volunteered for assessment and participation in the Osteoporosis Research Program at the University of Texas at Tyler. The subjects for the major program included premenopausal, menopausal, and postmenopausal women who learned about the program through local television advertisements, newspaper notices, and referrals from local physicians. The selected subjects for this study consisted of only the postmenopausal section of women. Identification of the postmenopausal status of the women was based on the following criteria:

1. Written statement by the subject's personal physician on the physician screening form concerning the subject's postmenopausal status.
2. Written response by the subject on the medical history that she had been without menstrual periods for at least one year.
3. Written response by the subject on the medical history that she had both ovaries surgically removed.

4. Written response on the medical history that the subject had been placed on hormone replacement therapy (HRT) or estrogen replacement therapy (ERT) by her private physician for signs and/or symptoms of menopause.

Those subjects who reported postmenopausal status related to some medical problem such as chemotherapy, steroid use, or an endocrine problem were eliminated from this study.

The volunteer subjects who met the stated criteria attended an orientation meeting prior to the beginning of the study. At this meeting they were told the requirements, risks, and benefits of the program and were given the opportunity to ask questions. All volunteers were asked on a survey to determine if they wished to participate in the program and to indicate their preference for being in either the exercise group (experimental) or in the non-exercise group (control). They were then given an application for the program and were asked to fill out medical, gynecological, and physical activity histories (Appendix D).

The volunteer subjects were not randomly assigned to the experimental and control groups due to practical and ethical limitations. The needed commitment of personal time for the exercise sessions restricted some subjects from participation in the experimental group. However, exercise classes were scheduled to meet at times that would



be feasible for both working and non-working women so that employment status would not be a major factor in group selection. Also, some of the subjects decided to enroll in the exercise classes after they were told about the purpose of the project and the risk factors associated with osteoporosis that were being investigated.

The project physician then reviewed the applications and medical histories. Those who had not indicated any physical reason for not being excluded from the program were asked to notify their individual private physicians of their interest in the program and to obtain a medical consent for participation (Appendix D).

At each phase of the osteoporosis program, the subjects were informed about the purpose, testing procedures, risk, discomforts, and benefits for each assessment test. They were asked to sign various consent forms (Appendix E). Periodic informal classes were held to explain what osteoporosis was and how it could be identified and treated. A graduate level class was scheduled with nationally known experts in the field of osteoporosis research as the guest lecturers. All subjects were invited to attend these lectures without signing up for the class.

### Procedures

Demographic data and risk factor assessment for each subject were obtained from the medical histories and the physician screening forms which had been filled out by the subjects and their private physicians at the beginning of the study. The subjects for this study had been tested for cardiorespiratory fitness by use of a graded treadmill exercise test. Aerobic capacity expressed in  $\text{VO}_2$  ( $\text{ml/kg/min}$ ) was obtained from this physiological testing.

Eight identified risk factors associated with osteoporosis in Caucasian women were assessed. Age was assessed in five intervals according to the following groups: 65 years and older, 60 to 64 years, 55 to 59 years, 50 to 54 years, and those less than 50 years old. The time period since menopause was assessed and categorized as 15 or more years, 10 to 14 years, 5 to 9 years, and 0 to 4 years.

Ethnic background, the third risk factor, was evaluated as being from northern European descent. In order to qualify for having the risk of northern European descent, at least two of the grandparents were reported as having national origins from a northern European country. This information was obtained from the Texas Woman's University Human Nutrition Research form that each subject completed (Appendix D). The following origins listed on

the form were considered as northern European: Scottish, English, Irish, Swedish, German, Finnish, Dutch, Balkan, Norwegian, Belgian, Welsh, and Danish. Subjects were also given the option of specifying their inherited ethnic background.

The fourth risk factor for osteoporosis was a self-reported exercise history. The subjects were not considered at risk if they reported a previous history of consistent exercise three times per week for 20 or more minutes. An exercise history of less frequent exercise sessions or duration of the time spent in exercise placed the subject in the risk category.

A low calcium intake was considered the fifth risk factor to be assessed. When the women came for the physiological testing, they were asked about their diet and dietary or vitamin supplements that they had been taking. Assessment of calcium intake was based on both dietary intake and supplements taken by each subject. The program director, a graduate assistant, and this investigator were available to help the women assess individual calcium intake. Those subjects who reported a calcium intake of 800 mg or more each day were considered to be at low risk for this factor. Those who reported less than an 800 mg intake of calcium each day were considered as having this additional risk factor.

The smoking history was the sixth risk factor. Only those subjects who were currently smoking were assessed as having the risk factor. Determination of the smoking status was derived from the health history (Appendix D).

The seventh risk factor for osteoporosis was that of estrogen use. Only those women who were taking estrogen were considered low risk. Those women who had never taken estrogen or who had taken estrogen sporadically were considered at risk for this factor. Information about hormone therapy was derived from the health history (Appendix D).

The last risk factor to be assessed was the menopausal history. If menopause resulted from a surgical procedure where both ovaries were removed, the subject was considered at risk for this factor. If the history revealed a natural menopause, no additional risk was allotted since the menopausal status was assessed as a separate risk factor. Information about the menopausal history was gathered from the health history (Appendix D).

The experimental group agreed to participate in specially designed exercise classes at least four times a week for 60 minutes each session. The classes consisted of aerobic conditioning and weight training. Both groups agreed to be retested for various physiological parameters at 6-month intervals over a 3-year period.

Attitude toward physical activity was assessed by the use of Kenyon's ATPA Inventory. A copy of the tool, written instructions for filling it out, consent for the use of the data in the study, and a grading key for scoring the questionnaire are found in Appendix F. Permission to use this tool was obtained from Dr. Gerald S. Kenyon prior to administering it to the subjects (Appendix A). The statements are mixed with some of the items being positively stated while others are stated negatively so that the subjects taking the test are unlikely to form a pattern on the scoring tool.

Factorial validity of the ATPA Scales was established by Kenyon (1968) when they were first used in a research study using image analysis. Hoyt's analysis of variance demonstrated a reliability of the six subdomains which ranged from .72 to .89. A reassessment of the tool was made ten years later by another researcher (Zaichkowsky, 1978) who demonstrated similar validity with the reliabilities for the subdomains ranging from .80 to .90. Based on the data gathered, she concluded that "this attitude instrument contains sound items (item analysis), factorial (construct) validity, and high internal consistency" (Zaichkowsky, 1978, p. 146).

The ATPA Inventory for adult women (form DW) was used with minor alterations made in the wording to clarify the

meaning for this particular population of women. The word changes were as follows:

1. "Physical Education Programs" was changed to "Health Education Programs," since the department at the University of Texas At Tyler that was responsible for this program was referred to as the Health Education Department. This reference was more familiar to this group of women.

2. "For the chance to try out for the U. S. Women's Olympic Team" was changed to read "for a chance to try out for a National Marathon Race". This was more realistic for this age woman as a strong motivational incentive.

This tool was distributed to each subject at a pre-physiological testing meeting. Instructions for filling out the tool were discussed and questions were answered. Subjects were told to fill out the questionnaire at their own leisure and to bring the tool back when they were to be physiologically tested or to mail it back to the investigator. Those who did not bring the tool back at the time of physiological testing or who had not been given one because of absence at the pre-physiological testing meeting were given the opportunity to fill out an ATPA Inventory while they waited for various aspects of the testing procedure.

Grading of the ATPA Inventory was accomplished by entering responses to each item on the inventory for each

subject into a DEBASE program. Numerical scores were based on evaluating each response as being either positively or negatively stated on a likert-type scale. Scores ranged from 1 to 7 for each statement. The score for a very strongly agree (VSA) response for a positively expressed statement was given a value of 7; whereas, a VSA response to a negatively expressed statement was given a value of 1. An undecided (U) response resulted in a score of 4. The score for a very strongly disagree (VSD) response for a positively expressed statement was given a value of 1, while a VSD response to a negatively expressed statement was given a value of 7. Values for strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD) were achieved using the same continuum. Table 2 displays the key to grading the ATPA Inventory. The weighting guide as positive or negative and designation of the subdomain for each of the 54 statements on the ATPA Inventory is found in Appendix F.

Scores for each subdomain of the ATPA Inventory were determined for each subject. The subdomains identified on the ATPA Inventory are:

Aesthetic Experience (Ae) -- physical activity for  
aesthetic experience.

Ascetic Experience (As) -- physical activity to meet  
a physical challenge.

Table 2

Key to Grading the ATPA Inventory

	VSA	SA	A	U	D	SD	VSD
+ Positive	7	6	5	4	3	2	1
- Negative	1	2	3	4	5	6	7

NOTE: VSA = very strongly agree, SA = strongly agree, A = agree, U = undecided, D = disagree, SD = strongly disagree, VSD = very strongly disagree.

Catharsis (c) -- physical activity for recreation and relaxation.

Health and Fitness (H) -- physical activity for health and fitness.

Social Experience (S) -- physical activity for social purposes.

Pursuit of Vertigo (V) -- physical activity for thrills and excitement.

Table 3 reflects the number of items and the range of possible scores for combined responses from statements in each subdomain. Combining the scores for each of the six subdomains resulted in the total ATPA score for each subject.



Table 3

ATPA Scores

	Number of statements	Lowest <sup>1</sup> score	Median <sup>2</sup> score	Highest <sup>3</sup> score
Sub-domain				
Ae	9	9	36	63
As	8	8	32	56
C	9	9	36	63
H	11	11	44	73
S	8	8	32	56
V	9	9	36	63
Total	<u>54</u>	<u>54</u>	<u>216</u>	<u>374</u>

Note: <sup>1</sup>Lowest score was achieved by multiplying the number of statements by the most negative response score.

<sup>2</sup>Median score was achieved by multiplying the number of statements by the undecided score (4) which indicated neither a positive or negative response.

<sup>3</sup>Highest score was achieved by multiplying the number of statements by the most positive response score.

## Data Analysis

Median values, frequencies and percentages were computed for all variables for each group. The categories for description of subjects were determined according to the following criteria: (a) age groups divided into 5

intervals, (b) years past menopause at 5-year intervals, (c) ethnic background as northern European or other, (d) exercise history as no regular exercise, some exercise, or exercise 3 times a week for 20 minutes or more, (e) calcium intake as less than 800 mg per day, less than 1,500 mg but more than 800 mg per day, and more than 1,500 mg per day, (f) smoking as yes or no, (g) estrogen use as none, on-and-off use and hormone replacement therapy (HRT) or estrogen replacement therapy (ERT), and (h) menopausal history as early surgically induced or natural menopause.

The relationship between groups for the individual risk factors was assessed by use of Chi square. Further assessment was made by use of a phi-prime coefficient for any significant Chi square value.

Computation of differences between groups for the combined number of risk factors was calculated by use of an independent t test. Assessment of subjects having a particular risk factor was based on the risk factor being present or not being present according to the following criteria:

1. Age -- All ages were included because of the description of subjects in this study.
2. Postmenopausal status -- All subjects were included because of the description of subjects in the study.

3. Ethnic background -- northern European descent placed the subject at higher risk.

4. Exercise history -- Lack of consistent exercise history described by a frequency of three times a week for 20 minutes or more placed the subject at a higher risk.

5. Calcium intake -- A calcium intake of less than 800 mg/day by the subjects placed them at risk.

6. Smoking history -- Subjects who reported that they were currently smoking were placed in the risk category for this variable.

7. Estrogen use -- The lack of estrogen supplementation from either estrogen replacement therapy or hormone replacement therapy placed the subject at risk.

8. Menopausal history -- A history of surgically induced menopause placed the subject at risk.

Multiple correlation with a Pearson's  $r$  was utilized to assess the relationship between ATPA scores and the predicted  $VO_2$  values for all subjects in this study. A multivariate  $t$  test was used to assess differences between the groups scores on the ATPA Inventory.

## CHAPTER IV

### PRESENTATION OF THE FINDINGS

The purpose of this study was to identify risk factors associated with osteoporosis in a group of postmenopausal women who had volunteered for an osteoporosis-related research project. The relationship between selected groups and risk factors was identified. Also the relationship between attitude toward physical activity and fitness level was determined. The relationship between attitude toward physical activity and group membership was additionally examined. This chapter presents an analysis of the findings of the study presented under the following headings: (a) Description of the Subjects and (b) Analysis of the Data.

#### Description of the Subjects

Demographic data assessed in this investigation were based on risk factor determination for each subject. The frequency and percentage of total for each research group were calculated and reported according to intervals in which the risk factors were divided. Table 4 represents the five age intervals for the 98 subjects according to

group. As this table illustrates, the control group had 45 subjects, and the experimental group had 53 subjects.

Table 4

Descriptive Statistics for Age

Group	Age (in years)	Frequency	%
Control	65 and older	6	13.3
	60-64	10	22.2
	55-59	10	22.2
	50-54	12	26.7
	less than 50	<u>7</u>	<u>15.6</u>
	Total	45	100.0
Experimental	65 and older	8	15.1
	60-64	14	26.4
	55-59	14	26.4
	50-54	15	28.3
	less than 50	<u>2</u>	<u>3.8</u>
	Total	53	100.0

The biggest difference in percentage of subjects in an

age interval was for the "less than 50 years old" interval. The control group had 15.6% of its subjects who were less than 50 years old; whereas, only 3.8% of subjects in the experimental group was in this younger age interval.

The number of years since the subjects experienced menopause are found in Table 5. The data are presented in 5-year intervals.

Table 5

Descriptive Statistics for Years Past Menopause

Group	Interval	Frequency	%
Control	15 or more	11	24.4
	10-14	12	26.7
	5-9	10	22.2
	0-4	<u>12</u>	<u>26.7</u>
	Total	45	100.0
Experimental	15 or more	12	22.6
	10-14	17	32.1
	5-9	12	22.6
	0-4	<u>12</u>	<u>22.7</u>
	Total	53	100.0

Table 6 presents the demographic data related to the ethnic background for the subjects. Of the 98 subjects in the study, only five reported a native origin other than northern European descent. Two of these considered themselves of American Indian and Spanish descent, and three described themselves of southern European descent. There were no subjects of African or Oriental descent in this sample.

Table 6

Descriptive Statistics for Ethnic Background

Group	Ethnic Background	Frequency	%
Control	northern European	44	97.8
	Other	<u>1</u>	<u>2.2</u>
	Total	45	100.0
Experimental	northern European	49	92.5
	Other	<u>4</u>	<u>7.5</u>
	Total	53	100.0

Table 7 indicates the reported exercise history of the

subjects in both groups. Regular exercise history was reported by 60.4% of the subjects in the experimental group; whereas, only 17.8% of the subjects in the control group reported a history of regular exercise.

Table 7

Descriptive Statistics for Exercise History

Group	Exercise History	Frequency	%
Control	No previous exercise	19	42.2
	Some previous exercise	18	40.0
	Regular exercise	<u>8</u>	<u>17.8</u>
	Total	45	100.0
Experimental	No previous exercise	9	17.0
	Some previous exercise	12	22.6
	Regular exercise	<u>32</u>	<u>60.4</u>
	Total	53	100.0

Table 8 reflects the descriptive statistics for calcium intake for the subjects in both groups. This table shows that 55.6% of the control group and 54.7% of the



experimental group had a calcium intake of less than 800 mg each day. None of the subjects in either the control or the experimental group reported a calcium intake of 1,500 mg or more each day.

Table 8

Descriptive Statistics for Calcium Intake

Group	Calcium Intake (mg/day)	Frequency	%
Control	less than 800	25	55.6
	800 to 1499	<u>20</u>	<u>44.4</u>
	Total	45	100.0
Experimental	less than 800	29	54.7
	800 to 1499	<u>24</u>	<u>45.3</u>
	Total	53	100.0

The descriptive statistics for smoking are presented in Table 9. Only five subjects in the entire study reported that they were currently smoking. These smokers comprised 6.7% of the control group and 3.8% of the experimental group.

Table 9

Descriptive Statistics for Smoking

Group	Smoking Status	Frequency	%
Control	Currently smokes	3	6.7
	Doesn't smoke	<u>42</u>	<u>93.3</u>
	Total	45	100.0
Experimental	Currently smokes	2	3.8
	Doesn't smoke	<u>51</u>	<u>96.2</u>
	Total	53	100.0

The descriptive statistics for use of estrogen may be found in Table 10. The use of estrogen was divided into intervals of none, on-and-off therapy, and on therapy. The subjects were considered to be on therapy if they were currently being supplemented with estrogen through hormone replacement therapy which consisted of replacement of both estrogen and progesterone or if they were consistently supplemented with estrogen only since menopause. On-and-off interval was assigned to subjects who reported various periods of hormone supplementation since menopause. This included subjects who had started some type of hormone

Table 10

Descriptive Statistics for Estrogen Use

Group	Hormone Therapy	Frequency	% <sup>1</sup>
Control			
	none	14	31.1
	on and off	20	44.4
	HRT or ERT	<u>11</u>	<u>24.4</u>
Total		45	100.0
Experimental			
	none	23	43.4
	on and off	11	20.8
	HRT or ERT	<u>19</u>	<u>35.8</u>
Total		53	100.0

Note:<sup>1</sup> Rounded to the nearest tenth

replacement and had now stopped using hormones and those subjects who had started hormones after a time interval had elapsed following menopause. Also those subjects who reported sporadic use of hormones since menopause were placed in this category.

Table 11 contains the descriptive statistics for the

menopausal history of the subjects. This table shows that 33.3% of the control and 24.5% of the experimental group had a surgically-induced menopause.

Table 11

Descriptive Statistics for Menopausal History

Group	Menopausal History	Frequency	%
Control	Surgically Induced	15	33.3
	Natural	<u>30</u>	<u>66.7</u>
	Total	45	100.0
Experimental	Surgically Induced	13	24.5
	Natural	<u>40</u>	<u>75.5</u>
	Total	53	100.0

The results of the ATPA Inventory are described on Tables 12 and 13 and Figures 3 and 4. The median score and high and low ranges for each subdomain are presented in Table 12 according to the research group. The scores for each research group are also presented.

Table 12

Descriptive Statistics for ATPA Scores

Variables	Median Scores (ranges)	
	Control	Experimental
Subdomains		
Aesthetic	35 (19-46)	32 (20-51)
Ascetics	22 (12-32)	24 (9-35)
Catharsis	33 (13-48)	33 (22-45)
Health	48 (28-71)	49 (30-73)
Social	33 (18-44)	34 (25-43)
Vertigo	21 (11-34)	21 (8-35)
Total ATPA Score	190 (111-240)	190 (144-242)

Figure 3 shows a comparison of the median scores for each subdomain of the ATPA Inventory for each research group. Also demonstrated, for comparison purposes, is the median score for each subdomain for the Kenyon ATPA

Inventory. This Kenyon median score reflects a score that would be achieved if all statements were neither positive nor negative which is designated on the Inventory as Undecided.

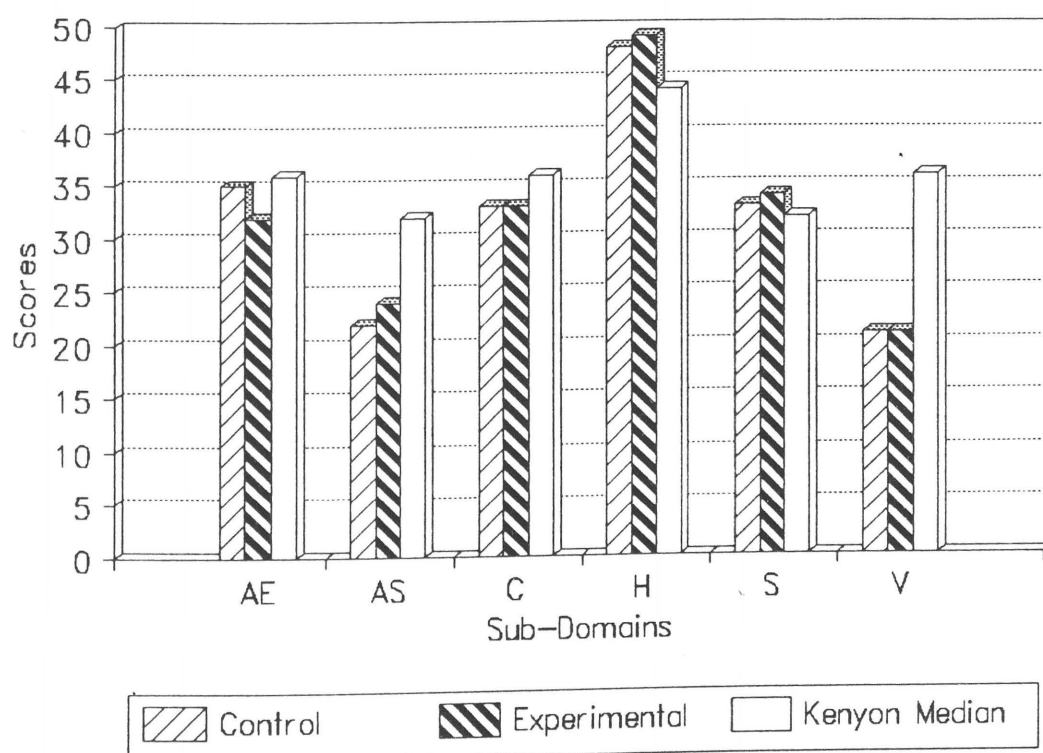


Figure 3. ATPA Scores

Table 13 presents adjusted median scores for all subdomains of the ATPA Inventory. This adjustment was made

in order to compare scores for each subdomain with the other subdomains and to compare the subject's scores to Kenyon's median scores. This adjustment was made by dividing the median score by the number of questions in each subdomain.

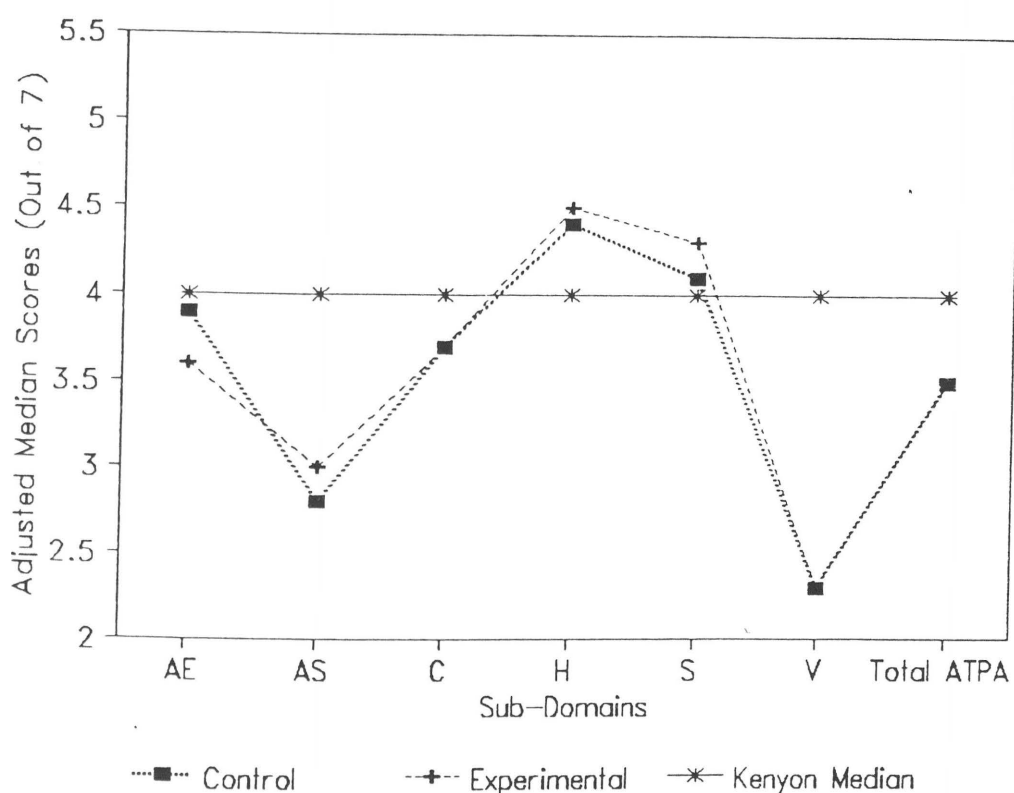
Table 13

Descriptive Statistics for Adjusted ATPA Scores

Variables	Kenyon Median Score	Adjusted Median Scores	
		Control	Experimental
Subdomains			
Aesthetic	4	3.9	3.6
Ascetics	4	2.8	3.0
Catharsis	4	3.7	3.7
Health	4	4.4	4.5
Social	4	4.1	4.3
Vertigo	4	2.3	2.3
Total ATPA Score	4	3.5	3.5

Figure 4 demonstrates the relationship of the scores for the control and experimental groups compared to

Kenyon's scores that have been adjusted for the number of questions in each subdomain. Scores that are represented above Kenyon's median line are considered to represent positive values for that subdomain.



**Figure 4.** ATPA Scores Adjusted for Number of Questions in Each Subdomain

Only the subdomains of Attitude Toward Physical Activity for health and for social reasons were found to be



positive or relating an agree with median response. All scores for the remaining subdomains, by both the control and experimental groups, indicated median responses as negative or disagree. The total mean ATPA scores for both the control and experimental group reflected a negative response.

#### Analysis of Data

The hypotheses for this investigation were tested using the BMDP statistical program (Dixon, 1990). The analyses of the findings are organized according to the hypotheses tested in this study.

The assessment of the relationship of group membership and each of the assessed risk factors was achieved by use of Phi prime analysis. The risk factors were calculated from data presented in tables 4 through 11. The results of the Phi prime correlation coefficients are presented in Table 14. Table 14 reveals that there was no significant relationship between group membership and any risk factor except for that of previous exercise history. A statistically significant difference was found between the observed and expected frequencies of the groups for exercise history ( $\chi^2 = 18.64$ ,  $p > .01$ ). The Phi prime correlation coefficient resulted in a significant relationship being demonstrated between group membership

and this risk factor ( $O' = .44$ ). The two-way Chi square post hoc analysis demonstrated that the significance was between groups for the third interval assessed, which were the subjects who had a history of regular exercise.

Table 14

Chi Square and Phi Prime Correlation Values of Group Membership and Risk Factor Variables

Risk Factors	df	$\chi^2$	p	$O'$
Age	4	4.10	0.39	0.21
Years post menopause	3	0.63	0.89	0.08
Ethnic group	1	0.54 <sup>1</sup>	0.46	0.12
Exercise history	2	18.64	<0.01*	0.44
Calcium intake	1	0.01	0.93	0.01
Smoking	1	0.04 <sup>1</sup>	0.85	0.07
Estrogen	2	6.33	0.04	0.25
Menstrual History	1	0.54 <sup>1</sup>	0.46	0.10

<sup>1</sup>Yates Corrected Chi-square (used for data in 2 x 2 table)  
 \*significant p <.0001

The expected frequency for regular exercisers was 18 and the observed frequency was 8 in the control group whereas

the expected frequency for exercisers was 22 and the observed frequency was 32 in the experimental group. Therefore the frequency of subjects who had a history of previous regular exercise who chose the experimental group was significantly greater than the frequency of subjects who had a history of regular exercise and self-selected the control group.

Assessment of the percentages of subjects with various numbers of risk factors is described in Figure 5 for both

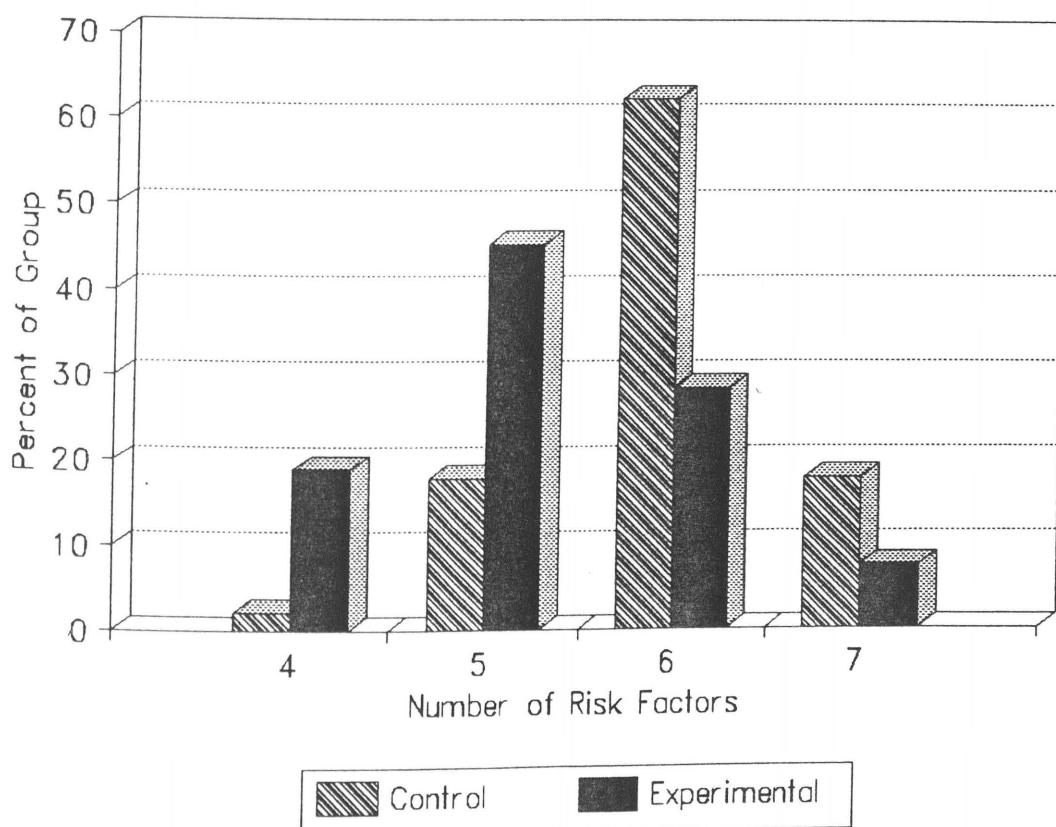


Figure 5. Total Number of Risk Factors

the control and experimental research groups. Eighty percent of the control group had 6 or more identified risk factors while only 35.8% of the experimental group had six or more identified risk factors. The range of risk factors for all subjects, control and experimental, was from four to seven.

Assessment of the significant difference between the experimental and control groups for the number of risk factors was calculated by using an independent  $t$  test. Table 15 demonstrates the results of this analysis.

Table 15

Independent  $t$  Test on Number of Risk Factors

Group	Range (Low-High)	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
1 ( $\underline{n}$ = 45)	3 (4-7)	5.96	+.67	4.16	<.01*
2 ( $\underline{n}$ = 53)	3 (4-7)	5.25	+.85		

Note: Group 1 = control group; Group 2 = experimental group  
\*significant  $p < .0001$

The results of the independent  $t$  test indicated that the mean number of risk factors for the control group was

significantly higher than the mean number of risk factors in the experimental group ( $\underline{t} = 4.61$ ,  $p < .0001$ ).

A Pearson product moment correlation was used to assess the relationship between ATPA scores and the level of fitness of the subjects in each research group. Because of missing data, data for only 39 of the subjects in the control group and 50 of the subjects in the experimental group were analyzed. Table 16 represents the results of this analysis.

Table 16

Pearson Product Moment Correlation of  $VO_2$  Values and ATPA Scores

Subdomains	$VO_2$ Scores	
	Control <sup>1</sup> ( $\underline{n} = 39$ )	Experimental <sup>2</sup> ( $\underline{n} = 50$ )
Aesthetics	-0.0519	0.1542
Ascetics	0.0457	0.1767
Catharsis	-0.1223	-0.0392
Health	0.0315	-0.0282
Social	-0.1518	0.1131
Vertigo	-0.0949	0.2887*

<sup>1</sup> $\underline{r}$  for .05 level of significance = .3246  
<sup>2</sup> $\underline{r}$  for .05 level of significance = .2875  
 \*significant at the .05 alpha level

The only significant relationship between  $VO_2$  values and ATPA scores was for the subdomain of vertigo in the experimental group ( $r = .29$ ). This value demonstrates a weak relationship even though it is statistically significant.

The difference between groups on ATPA mean scores was assessed by use of a multivariate t test. Table 17 describes the multivariate analysis of each of the subdomains with the research groups. The overall multivariate test revealed no significant difference between the two research groups (Hotelling's  $T^2 = 6.07$ ,  $F = .96$ ,  $p = .46$ ).

Table 17

Multivariate Analysis of ATPA Scores

Subdomain	Group	<u>M</u>	<u>t</u>	<u>p</u>
Aesthetics	1	34.49	1.29	.20
	2	32.89		
Ascetics	1	21.87	0.99	.32
	2	22.94		
Catharsis	1	32.87	-0.15	.88
	2	33.07		
Health	1	47.84	-0.89	.38
	2	49.25		
Social	1	32.42	-1.05	.29
	2	33.43		
Vertigo	1	20.56	-0.19	.85
	2	20.79		

Note: Group 1 = control; Group 2 = experimental

## CHAPTER V

### SUMMARY, DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

The purpose of this study was to retrospectively identify selected risk factors associated with osteoporosis and to determine the differences between each of these identified risk factors for exercising or non-exercising volunteer postmenopausal females. A secondary purpose was to investigate the difference between the research groups and the number of identified risk factors for osteoporosis. The difference between attitude toward physical activity and research group selection was investigated as well as the relationship between attitude toward physical activity and level of physical fitness.

The study was conducted at the University of Texas at Tyler using volunteer postmenopausal subjects who had agreed to participate in a major research project that was initially designed to investigate the effects of exercise and estrogen use in the development of osteoporosis in postmenopausal women. The subjects for this retrospective study consisted of 98 Caucasian postmenopausal females who had responded to a request for volunteers from the Tyler community. These women self-selected themselves into the



control group (non-exercisers) and the experimental group (exercisers). Both groups participated in the assessment and testing aspects of the study while the experimental group additionally volunteered to spend 3 years in an organized exercise program. This chapter provides a summary of the study, discussion of the research findings, conclusions drawn from the research and recommendations for further study.

#### Summary of the Study

The hypotheses investigated in this study and the statistical decisions that were reached regarding these hypotheses are as follows:

1. There is no significant difference between groups for each of the following osteoporosis risk factors:

- (a) chronological age - **ACCEPTED**
- (b) years past menopause - **ACCEPTED**
- (c) ethnic background - **ACCEPTED**
- (d) exercise history - **REJECTED**
- (e) calcium intake - **ACCEPTED**
- (f) smoking - **ACCEPTED**
- (g) estrogen use - **ACCEPTED**
- (h) menopause history - **ACCEPTED.**

The Chi square analysis revealed no significant difference for any risk factor except that of exercise history. A

post hoc analysis demonstrated that the number of subjects with a previous history of regular exercise was significantly larger in the experimental group than in the control group. The Phi prime coefficient indicated a significant relationship between group membership and exercise history ( $O = .44$ ).

2. There is no significant difference between groups in their number of identified risk factors associated with osteoporosis. **REJECTED**. An independent  $t$  test demonstrated that the mean number of risk factors for the control group was significantly higher than the mean number of risk factors for the experimental group.

3. There is no relationship between attitude toward physical activity measured by the subdomains of Kenyon's ATPA Inventory and the level of physical fitness of all postmenopausal research subjects measured by predicted  $VO_2$  values. **ACCEPTED** for subdomains of aesthetics, ascetics, catharsis, health and social for both the control and experimental groups. **REJECTED** for subdomain of vertigo in the experimental group only. A Pearson product moment correlation showed no relationship between  $VO_2$  values and ATPA scores except for the subdomain of vertigo in the experimental group ( $r = .29$ ).

4. There is no significant difference between groups in attitude toward physical activity. **ACCEPTED**. A

multivariate  $t$  test revealed no significant difference between groups for the subdomains of Kenyon's ATPA Inventory.

In addition to the findings related to the hypotheses, it was found that 93 of the total 98 subjects reported an ethnic background of northern European descent. It was also determined that 55.6% of the control group and 54.7% of the experimental group had a calcium intake of less than 800 mg each day. Evaluation of the ATPA Inventory scores revealed that only the sub-domains of health and social were assessed as reflecting positive attitudes toward physical activity.

### Discussion

The group of volunteer women assessed in this study was at high risk for postmenopausal Type I osteoporosis, but did not represent a random sample of the women in the Tyler community. Only 66% of the Tyler population is Caucasian (Census Report--Tyler, Texas, 1990). Since all the women in the study considered themselves as Caucasian, a large percentage of the Tyler community was not represented in this study.

The subjects' self-reported histories reflected an interest in personal health. This supposition is based on the fact that a large percent of the subjects first heard

of the program from their own private physicians. In addition, other subjects reported that they became interested after reading about the program in the health sections of the local newspaper. The question and answer sessions that were held resulted in relevant dialogue pertaining to osteoporosis. All of this implies that these women had a genuine interest in osteoporosis and a real desire to learn more about this disease and how it could affect them.

The testing sessions required this investigator to spend extended amounts of time with the individual subjects. Thus, subjective assessments in relation to lifestyle and education level were made. The subjects appeared to represent the middle to upper class of women in the Tyler community. Most of them did not work outside of the home and their physical appearance reflected comfortable lifestyles. Even though the education level and social class of the subjects was not established in this study, personal interaction with the subjects indicated that most of the women in the study were affluent, educated, and were most knowledgeable about health related subjects. Several were wives of physicians, preachers, and wealthy business men. Others had established themselves as respected business women and educators in the Tyler community. Lindsay (1986), a noted

osteoporosis researcher, stated that "osteoporotic fracture syndromes are disorders of affluence" (p. 14). The demographics detailed above would support the opinion that the volunteers in this study were in this additional high risk category.

Of particular importance was the demonstrated willingness of these women to subject themselves to the various physiological testings, inquiries, and invasion of their personal time. This acceptance made them excellent research subjects. These women, as a whole, took the project seriously and voiced the willingness to "do just about anything" that was asked of them. The return of 100% of the questionnaires from the subjects is confirmation of this evaluation.

The subjects in this study demonstrated risk factor assessments for osteoporosis somewhat different from recent published research. Research statistics report that "about 75% of women in the United States consume less than the current recommended dietary allowance [RDA] of 800 mg of calcium" (Cummings, 1987, p. 5). This study found that approximately 50% of the subjects consumed less than the recommended dietary allowance for this mineral. This 800 mg of calcium intake, however, is still lower than the amount that is currently being recommended.

In 1984, the NIH Consensus Panel recommended

1,000 mg/day for estrogen-replete perimenopausal women and 1500 mg/day for estrogen-deprived perimenopausal women... The Committee on Dietary Allowances of the National Academy of Science also recently recommended 1,000 mg/day for perimenopausal women... (Heaney & Recker, 1987, p. 29).

The large number of subjects in this study who demonstrated low intakes of calcium was probably related to their lack of accurate information on the subject. Possibly few physicians in the Tyler community address nutrition in their patient teaching. It is interesting to note that while assessments and testing were being made, many questions were voiced about what was recommended for calcium intake. The subjects were told that 1,500 mg of calcium each day was what was recommended by the researchers in the osteoporosis project. Most of the women stated that they were going to increase their calcium intake after hearing this recommendation.

The 5.1% incidence of smoking in this group of women was much smaller than other studies have reported.

One researcher reported that "almost 50% of women born between 1921 and 1940, who are now 46 to 65 years old, are or were smokers" (Cummings, 1987, p. 5). The incidence of female white-collar smokers in the entire adult population

in 1987 was 26.6% (Department of Health and Human Services, 1991). Even though this study considered only the risk for smoking if the women were currently smoking and not the entire lifetime smoking history, the percentage of smokers in this study was small in contrast to national reported norms. The explanation of why such a large percentage of these women portrayed this health behavior and did not portray some of the other health behaviors is not explained by the data obtained in this study.

Even though the mean values for each of the controllable risk factors of calcium intake, smoking, hormone therapy, and menopause history (surgical induced early menopause) did not reach statistical significance between groups, the number of subjects who were at risk for each controllable risk factor was lower in the experimental group than in the control group.

The statistically significant difference that was determined for previous exercise participation shows that the experimental group had a more active exercise history than did the control group prior to volunteering for the research project. This is understandable because the program was advertised as an "exercise related" research program. This in itself would attract many subjects who already had this health behavior incorporated into their lifestyle. It seems reasonable that those who were in the

habit of exercising would elect to continue this activity.

There was a significant difference between the control group and the experimental group for the total number of identified risk factors. Knowledge about the risk to one's health is not an assurance of participation in risk lowering behaviors. It seems that all of the subjects were interested in learning more about their own health based on the fact that they entered the program on a volunteer basis. This may be directly related to prior health care habits such as regular check-ups and social status where this health behavior is the norm. The difference between groups for the number of risk factors is meaningful because it emphasizes that knowledge about, interest in a health risk, and access to facilities to change one's risk are not enough to change behavior.

There was a significant relationship between the subdomain of vertigo and the experimental group. Even so, there is little relevance to this finding based on the overall negative value of this score on the ATPA Inventory and the lack of any significant difference between groups for this particular subdomain.

There was no difference between groups for any of the subdomains of Kenyon's Attitude Toward Physical Activity Inventory. The subdomains of health and social did, however, reflect positive responses by both the control and



the experimental group. This assessment agrees with the research of Heitmann (1986). He concluded that the primary motive for engaging in physical activity is for health reasons among all groups of older adults who were tested. Additionally, Heitmann (1986) determined that "the older female age groups are more motivated to participate for social reasons" (p. 203) than are younger women or males. This interest by older women in health and the social aspects of activity probably reflect the attention given to exercise by the media. Exercise is reported as a way to improve general health and the socialization aspects of physical activity are demonstrated as being a part of the "in crowd" in most media approaches.

It is important to recognize the fact that the women in this study were volunteers. This detail separates them from "the general population." A previous study using Kenyon's ATPA Inventory warned that older volunteer subjects appreciate health and social benefits of physical activity; whereas, a more general population of older subjects demonstrates more neutral scores in all subdomains of this tool (Shephard, Montelpare, Berridge, & Flowers, 1986). The only two mean positive values found in this study were for the subdomains of health and social. Since all of the research subjects (control and experimental) in this study were volunteer subjects, this

study corroborates the previous study by Shephard et al. (1986). He suggested that

"the health education classes encouraged a belief in the social and the health value of physical activity. If this trend were to be confirmed ..., a health education programme might be a useful initial tactic to establish receptive attitudes in potential recruits before introducing an employee fitness programme. (p. 178)

These findings substantiate the recommendation of using health emphasis and socialization as foundations when starting programs to reduce risk for osteoporosis that are aimed at attracting interested postmenopausal women. A program that involves educating clients about the risks associated with osteoporosis and risk-reduction skills, followed by providing for socialization would likely be well-received by middle and upper class postmenopausal Caucasian females.

### Conclusion

No significant difference was found between the experimental and control groups for any osteoporotic risk factor except that of exercise history. The number of subjects in the experimental group with a previous history

of regular exercise was significantly larger than those in the control group. The mean number of risk factors for the control group was significantly higher than the mean number for the experimental group. There was no significant difference between groups in attitude toward physical activity and no relationship was found between attitude toward physical activity and level of physical fitness for all subjects.

#### Recommendations for Further Study

The study of risk factors associated with osteoporosis and the prevention and treatment modalities for this debilitating disease need to be continued in future research endeavors. Identification of risk factors can help health educators design programs for risk reduction. One researcher (Raisz, 1987) expressed the goals of future research concerning osteoporosis in opening statements at the Ross Conference on Medical Research where he stated:

At present, our knowledge of the epidemiology of osteoporosis and the efficacy of preventive measures is much too limited... Better definition of risk and of the efficacy of prevention has become a major research need.

(p. 2)

The following recommendations are suggested for future studies:

1. The list of risk factors for osteoporosis should be expanded in future research endeavors. Also, identification of better ways to recognize additional risk factors would be helpful.

2. Research that continues to assess attitude toward risk lowering behaviors needs to be conducted in order to develop treatment programs for osteoporosis. Part of this research should include the development of a new and more current tool to assess attitude toward physical activity specifically for the older woman.

3. The selection of subjects in future studies related to osteoporosis needs to include a more representative group of women who reflect a cross section of all women in America. Women of all ethnic groups, socioeconomic classes, and ages with various lifestyle and medical histories need to be included in future studies.

5. Usefulness of available resources for education about controllable risk factors associated with osteoporosis needs to be investigated.

6. An assessment needs to be done to determine changes in number of controllable risk factors for osteoporosis after interventions to reduce those factors have been implemented.

7. Behavioral studies related to osteoporosis prevention in relation to exercise participation should be undertaken.

8. Further osteoporosis prevention research needs to be conducted investigating the reasons why people engage in health related behaviors.

9. Identification of factors that are involved in changing health behaviors associated with risk reduction should be explored further in future osteoporosis research attempts.

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APPENDIX A  
LETTERS OF PERMISSION



The  
University of  
Lethbridge

4401 University Drive  
Lethbridge, Alberta, Canada  
T1K 3M4  
403-329-2550

DEPARTMENT OF SOCIOLOGY

1988 07 19

Ms. Judy Hammond  
8307 Southland  
Tyler, Texas  
U.S.A. 75703

Dear Ms. Hammond,

In reply to your letter of June 29, you certainly have my permission to use the ATPA scales once again under the same conditions.

With regard to your questions, unfortunately, I have not worked with these scales or in the areas you describe for some years now and therefore I am not as well informed as I might be.

With regard to CATPA, again I have not followed the developments here except to say that I certainly have respect for the persons developing this approach.

Best wishes for an early and successful completion of your dissertation. Again, I would be interested in learning of your findings.

Yours sincerely,

GERALD S. KENYON  
Professor

GSK/blh



THE UNIVERSITY OF TEXAS AT TYLER  
1900 UNIVERSITY BOULEVARD • TYLER, TEXAS 75701 • (214)566-1471

SCHOOL OF EDUCATION  
AND PSYCHOLOGY

August 1, 1988

Dean of HPERD  
Texas Woman's University  
P. O. Box 23717  
Denton, Texas 76204

Dear Sir:

This letter is to confirm that Judy Hammond has my permission to use a study group here as a basis for her disseration research. Judy has been involved with this research group since its inception (1985) here at The University of Texas at Tyler. She has both assisted with the testing phase of my research program and has been involved with the data analysis, including the presentation of 4 papers at professional meetings.

If I can provide any futher information do not hesitate to contact me.

Sincerely,

A handwritten signature in cursive script, reading "Joyce E. Ballard".

Joyce E. Ballard,  
Associate Professor

APPENDIX B  
RESEARCH REPORTS



THE UNIVERSITY OF TEXAS AT TYLER  
3900 UNIVERSITY BOULEVARD • TYLER, TEXAS 75701 • (214)366-1471

SCHOOL OF EDUCATION  
AND PSYCHOLOGY

Department of  
Health and Physical Education

December 27, 1985

TO: Millie Munoz, Chairperson  
Faculty Research Committee

FROM: Joyce E. Ballard

RE: Final Report for Research Project #86

Please find attached copies of 7 abstracts which have been submitted to 3 professional organizations (American Alliance of Health, Physical Education, Recreation and Dance; American College of Sports Medicine; and Nurses Association of the American College of Obstetricians and Gynecologists) for presentation in spring and summer meetings, 1986. At the present moment I do not know, which abstracts, if any will be accepted but I felt that these abstracts represent a good summary of the overall project in which measurement was made of: bone density, cardiovascular fitness, body composition, and perceived exertion. A total of 92 subjects completed this study and in the 4 cells in which I had proposed 10 Ss each, I ended up with 18, 15, 8, and 9. I am currently in the process of preparing a manuscript for publication on the bone density work and Barry McKeown, Ph.D., who has cooperated with me on this study is preparing a manuscript on body composition.

I would like to identify all individuals whose names appear on the abstracts because without a lot of support from several individuals it would not have been possible for me to complete this project on schedule. The following persons participated in this project without remuneration, except for publication rights:

Helen Graham, M.D., Project Physician; Tyler, Tx  
Barry McKeown, Ph.D., Exercise Physiologist; The University of Texas at Arlington; Arlington, Tx  
Alice Milner, Ph.D., Chairperson, Department of Nutrition and Food Sciences; Texas Women's University; Denton, Tx  
Betty Tirey; M.S., Community Education Coordinator, The University of Texas Health Center at Tyler; Tyler, Tx  
\*Sharon McCoy, B.A., Graduate Student, Clinical Exercise Physiology, The University of Texas at Tyler; Tyler, Tx  
Judy Hammond, M.A., R.N., C., Project Nurse; Texas Eastern School of Nursing;

APPENDIX C  
RELATED RESEARCH

PROFESSIONAL PAPERS AND PRESENTATIONS  
RELATED TO OSTEOPOROSIS RESEARCH AT UTT

- Ballard, J., B. McKeown, H. Graham, A. Milner, and S. Ainkgraf. (May 29, 1986) "THE EFFECT OF PHYSICAL ACTIVITY AND ESTROGEN THERAPY UPON BONE LOSS IN POSTMENOPAUSAL FEMALES, AGED 50 TO 68 YEARS." The American College of Sports Medicine, National Conference; Indianapolis, IN.
- Ballard, J., B. McKeown, H. Graham, and S. Zinkgraf. (April 11, 1986). "EFFECT F THREE LEVELS OF PHYSICAL ACTIVITY UPON CARDIOVASCULAR FUNCTION IN 84 FEMALES, 50-70 YEARS OLD." American alliance of Health, Physical Education, Recreation and Dance, National Conference; Cincinnati, OH.
- McKeown, B., J. Ballard and S. McCoy. (April 13, 1986) "SOMATOTYPE AND BODY COMPOSITION OF 50-70 YEAR OLD FEMALES." American Alliance of Health, Physical Education, Recreation, and Dance, National Conference; Cincinnati, OH.
- McKeown, B., J. Ballard, and S. McCoy (May 30. 1986). "ESTIMATION OF BODY FATNESS FROM MEASUREMENTS OF BONE MINERAL SKINFOLDS AND AGE IN 50-70 YEAR OLD CAUCASIAN FEMALES." American College of Sports Medicine. National Conference; Indianapolis, IN.
- Hammond, J. (March 1986). "OSTEOPOROSIS: A COSTLY DISORDER." Texas Nurses Association Annual Convention; Houston, TX.
- Hammond, J., J. Ballard, B. McKeown, H. Graham, and S. McCoy. (August 1986). "BONE DENSITY MEASURES: THEIR ASSOCIATION WITH BODY COMPOSITION VARIABLES IN 50-70 YEAR OLD CAUCASIAN FEMALES." National Conference of the Nurses Association of the American College of Obstetricians and Gynecologist: Minneapolis, MN.
- Graham, H., J. Ballard, J. Hammond, B. McKeown, and S. Zinkgraf. (August 1986). "THE EFFECT OF PHYSICAL ACTIVITY AND ESTROGEN THERAPY UPON INVOLUTIONAL BONE LOSS IN THREE GROUPS OF POST MENOPAUSAL FEMALES, AGED 50-68 YEARS. National Conference of the Nurses Association of the American College of Obstetricians and Gynecologist; Minneapolis, MN.

Hammond, J. (November, 1986). "OSTEOPOROSIS: BODY COMPOSITION AND HORMONE VARIABLES." Sigma Theta Tau's Baylor Research Conference; Dallas, TX

McKeown, B., E. Guinn, and J. Ballard. (May 29, 1987). "THE EFFECTS OF AEROBIC AND WEIGHT TRAINING EXERCISE UPON CARDIOVASCULAR FUNCTION AND PHYSICAL WORK CAPACITY IN PRE AND POST MENOPAUSAL FEMALES, AGED 35-72 YEARS." National Conference of the American College of Sport Medicine; Las Vegas, Nevada.

Ballard, J., B. Tirey, B. McKeown, and S. Zinkgraf. (April 17, 1987). "RATINGS OF PERCEIVED EXERTION AS A BASIS OF EXERCISE PRESCRIPTION IN POSTMENOPAUSAL FEMALES, AGED 50-70." National Conference of the American Alliance of Health, Physical Education, Recreation and Dance; Las Vegas, Nevada.

McKeown, B., J. Ballard and S. McCoy. (April 14, 1987). "THE ESTIMATION OF BODY DENSITY IN 50-70 YEAR OLD CAUCASION FEMALES." National Conference of the American Alliance of Health, Physical Education, Recreation and Dance; Las Vegas, Nevada.

Schaberg, G., J. Ballard, B. McKeown, and S. Zinkgraf. (April 15, 1987). "THE EFFECT OF EXERCISE UPON BODY COMPOSITION IN PRE AND POSTMENOPAUSAL FEMALES, AGED 35-70 YEARS." National Conference of the American Alliance of Health, Physical Education, Recreation, and Dance; Las Vegas, Nevada.

Ballard, J., S. McCoy, B. McKeown, and S. Zinkgraf. (April 10, 1988). "THE EFFECT OF TWO EXERCISE MODES UPON BONE MASS, PHYSICAL WORK CPACITY, AND BODY COMPOSITION IN 41 POSTMENOPAUSAL FEMALES, AGED 50-70 YEARS." National Conference of American Alliance of Health, Physical Edication, Recreation, and Dance; Kansas City, Missouri.

McKeown, B., S. Bryars, J. Ballard, and S. Zinkgraf. (April 10, 1988). "GENERALIZED EQUATIONS FOR BODY DENSITY ESTIMATION FROM SKINFOLD MEASUREMENTS OF 35-72 YEAR OLD WOMEN." National Conference of the American Alliance of Health, Physical Education, Recreation, and Dance; Kansas City Missouri.



- Hammond, J. (April 1988). "CURRENT RESEARCH IN OSTEOPOROSIS." Nursing Research Conference at The University of the Virgin Islands. St. Thomas, USVI.
- Huggins, A., B. McKeown, J. Ballard, S. Zinkgraf. (April 9, 1988). "SPINAL, FEMORAL, AND RADIAL BONE MINERAL INDEX AND BODY COMPOSITION IN 100 FEMALES, AGED 35-72 YEARS." National Conference of American Alliance of Health, Physical Education, Recreation, and Dance; Kansas City Missouri.
- Bryars, S. J. Ballard, B. Kc Keown, and S. Zinkgraf. (April 10, 1988). "CROSS-VALIDATION OF GENERALIZED SKINFOLD EQUATIONS FOR PREDICTING BODY DENSITY OF 35-72 YEAR OLD WOMEN." National Conference of American Alliance of Health, Physical Education, Reacreation, and Dance; Kansas City, Missouri.
- Holtz, J., J. Ballard, B. McKeown, and S. Zinkgraf. (April 10, 1988). "THE EFFECT OF ONE YEAR OF EXERCISE TRAINING UPON THE BONE MINERAL INDEX OF PREMENOPAUSAL FEMALES, AGED 35-50." National Conference of the American Alliance of Health, Physical Education, Recreation, and Dance; Kansas City, Missouri.
- Huggins, A., J. Ballard, B. McKeown, and S. Zinkgraf. (May 26, 1988). "ESTIMATION OF BODY DENSITY IN 100 FEMALES, AGED 35-72 YEARS." National Conference of the American College of Sports Medicine; Dallas, Texas.

PROFESSIONAL PAPERS AND PRESENTATIONS  
RELATED TO DISSERTATION PRESENTED BY  
JUDY HAMMOND

Presented professional research session at Nursing Honor Society's Research Conference at The University of the Virgin Islands in Saint Thomas, USVI, on "Osteoporosis: new area for nursing research." April 1988.

Presented professional paper to Baylor's Sigma Theta Tau's Research Conference in Dallas, Texas on "Osteoporosis; Body composition and hormone variables." October 1986.

Presented a research session at NAACOG's Excellence in Perinatal and Women's Health Nursing Research Conference in Minneapolis Minnesota on "Bone density measures: Their association with body composition variables in 50 to 70 year old females." August 1986. Abstract published in JOGNN, August 1987.

Co-authored a research paper presented at NAACOG's Research Conference in Minneapolis, Minnesota in August of 1986 on "The effects of physical activity and estrogen therapy upon involutional bone loss in post menopausal females aged 50 to 68." Abstract published in JOGNN, September 1987.

Presented clinical research paper at the Texas Nurses Association's Annual Convention in Houston, Texas on "Osteoporosis: A costly disorder." March 1986.

## APPENDIX D

### DATA COLLECTION AND HEALTH HISTORY FORMS

UNIVERSITY OF TEXAS AT TYLER  
DEPARTMENT OF HEALTH AND PHYSICAL EDUCATION  
OSTEOPOROSIS RESEARCH STUDY 1985-1986  
SURVEY TO DETERMINE PARTICIPATORY STATUS IN STUDY

NAME:

ADDRESS:

PHONE #:

BIRTHDATE:

After hearing about The University of Texas at Tyler  
1985-1986 Osteoporosis Research Study, please indicate  
whether or not you wish to participate.

\_\_\_\_\_ Yes I wish to participate  
\_\_\_\_\_ No I would prefer not to participate at this time

After hearing about the research protocol for the Exercise  
Group and the research protocol for the Control Group,  
please indicate in which group you wish to participate.

\_\_\_\_\_ Control Group  
\_\_\_\_\_ Exercise Group

If you wish to participate as an exercise subject, please  
indicate your preference for exercise classtime.

\_\_\_\_\_ 6:10 a.m. Any 4 days  
\_\_\_\_\_ 8:15 a.m. M W Th F  
\_\_\_\_\_ 12:00 p.m. T Tu W Th  
\_\_\_\_\_ 5:30 p.m. M Tu W Th  
\_\_\_\_\_ Other, please  
specify \_\_\_\_\_

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

UNIVERSITY OF TEXAS AT TYLER  
DEPARTMENT OF HEALTH AND PHYSICAL EDUCATION  
OSTEOPOROSIS RESEARCH STUDY

Please complete the following information as accurately as possible:

Name \_\_\_\_\_ Birth Date \_\_\_\_\_  
Mailing Address \_\_\_\_\_ Age \_\_\_\_\_  
City \_\_\_\_\_ Zip \_\_\_\_\_ Phone (H) \_\_\_\_\_  
(H) \_\_\_\_\_

SECTION I-EXERCISE HISTORY (Please circle your answers)

Are you currently a regular exerciser? YES NO

If no, please skip to Section II.

If yes, please complete the following:

Approximately how many times/week do you exercise? 1 2 3 4 5 6  
Approximately how many mins/session do you exercise? 15 20 25 30 45 60  
Other \_\_\_\_\_

Approximately how many months have you regularly exercised? 6 12 18 24 30 36  
Other \_\_\_\_\_

Principal mode or modes of exercises? \_\_\_\_\_

Comments regarding exercise history \_\_\_\_\_

SECTION II HORMONE THERAPY HISTORY (Please circle your answers)

Have you ever received hormone therapy? YES NO

If no, please skip to Section III.

If yes, please complete the following:

Are you currently receiving hormone therapy? YES NO

If yes, how long \_\_\_\_\_ when started \_\_\_\_\_  
date

If you are not currently receiving hormone therapy but have in the past, please  
indicate approximate dates \_\_\_\_\_ to \_\_\_\_\_  
started stopped

Description of hormone therapy which you are or have taken \_\_\_\_\_  
Medication Name

Medication Dosage \_\_\_\_\_

Comments regarding hormone therapy history \_\_\_\_\_

SECTION III GENERAL MEDICAL HISTORY (Please circle your answers)

Have you ever been told that you have kidney disease? YES NO

If yes, please explain \_\_\_\_\_

Have you ever been told that you have cardiovascular disease? YES NO

If yes, please explain \_\_\_\_\_

Muscular, Bone-joint History:

	Yes	No	Date
Any muscular injuries or illness	Yes	No	_____
Muscular weakness	Yes	No	_____
Muscle pain at rest	Yes	No	_____
Muscle pains at exertion	Yes	No	_____
Any bone or joint (including spine) injuries or illness	Yes	No	_____
Swollen joints	Yes	No	_____
Painful joints	Yes	No	_____
Flat feet	Yes	No	_____
Other:	Yes	No	_____

Explain: \_\_\_\_\_

Risk Factor Profile: - Do you have any of the following:

## Family History of:

_____ heart disease	_____ high blood pressure
_____ sedentary life style	_____ high serum lipids
_____ stressful life style	_____ stroke
_____ Diabetes mellitus	_____ obesity (overweight)
_____ smoke cigarettes	

Smoking:

Smoke now? Yes No Packages, cigars, pipe bowls per day \_\_\_\_\_

How many years? \_\_\_\_\_

Smoke in past? Yes No Packages, cigars, pipe bowls per day \_\_\_\_\_

How many years? \_\_\_\_\_

How old were you when you started? \_\_\_\_\_

In case, you have stopped, when did you? \_\_\_\_\_

Why? \_\_\_\_\_

Weight:

Present weight \_\_\_\_\_

Weight gain in past 10 years. \_\_\_\_\_ lbs.

Weight at age 20 \_\_\_\_\_ 30 \_\_\_\_\_ 40 \_\_\_\_\_ 50 \_\_\_\_\_

Are you dieting? Yes No Why? \_\_\_\_\_

Exercise:

Do you exercise regularly? Yes No

Type of exercise \_\_\_\_\_

Frequency (How many times per week?) \_\_\_\_\_

Duration (How long each day) \_\_\_\_\_

IS your occupation: Sedentary ( ) Active ( )

Inactive ( ) Heavy work ( )

Name \_\_\_\_\_

## Self Administered Pre Exam Test Medical History Form

General Medical History

Date \_\_\_\_\_

Any medical complaint? \_\_\_\_\_ Yes No \_\_\_\_\_

Any major illness in the past? \_\_\_\_\_ Yes No \_\_\_\_\_

Any hospitalization? \_\_\_\_\_ Yes No \_\_\_\_\_

Are you taking any medication (list) \_\_\_\_\_ Yes No \_\_\_\_\_

Family History of:

Relation \_\_\_\_\_

Heart attack	Yes	No	_____
High Blood Pressure	Yes	No	_____
High Cholesterol or Triglyceride levels	Yes	No	_____
Diabetes	Yes	No	_____
Congenital Heart Disease	Yes	No	_____
Muscular illness	Yes	No	_____
Other:	Yes	No	_____

Explain: \_\_\_\_\_

Cardio-Respiratory History:

Date \_\_\_\_\_

Any Heart disease	Yes	No	_____
Heart murmur	Yes	No	_____
Occasional chest pains	Yes	No	_____
Chest pains on exertion	Yes	No	_____
Chest pressure on exertion	Yes	No	_____
Fainting	Yes	No	_____
Heart palpitations	Yes	No	_____
Varicose veins	Yes	No	_____
Any disease of arteries	Yes	No	_____
Daily coughing	Yes	No	_____
Cough produces sputum	Yes	No	_____
High blood pressure	Yes	No	_____
Shortness of breath at rest	Yes	No	_____
Shortness of breath supine	Yes	No	_____
Shortness of breath after two flights of stairs	Yes	No	_____
Asthma	Yes	No	_____
Chronic Bronchitis	Yes	No	_____
Emphysema	Yes	No	_____
Other:	Yes	No	_____

Explain: \_\_\_\_\_

Name: \_\_\_\_\_ Subject Number: \_\_\_\_\_ Age: \_\_\_\_\_

1. Are you including more calcium in your diet since joining the study?  
 \_\_\_\_\_ Yes \_\_\_\_\_ No
2. Please assess your present nutritional practices relating to calcium:
  - a. Dietary calcium through eating food \* \_\_\_\_\_ (number of daily serving/day)  
 (see below) \_\_\_\_\_ Calcium mg.
  - b. Calcium Supplementation: \_\_\_\_\_ amount in mgs.  
 \_\_\_\_\_ kind of calcium
  - c. When are you taking supplemental calcium? \_\_\_\_\_ times a day  
 \_\_\_\_\_ mgs/dose
  - d. Are you taking calcium with meals? \_\_\_\_\_ Yes \_\_\_\_\_ No
  - e. Do you feel you are regularly getting adequate calcium (1000 for pre-menopausal and 1250-1500 for postmenopausal) with diet and/or supplements? \_\_\_\_\_ Always \_\_\_\_\_ Occasionally \_\_\_\_\_ Never
3. Are you obtaining Vitamin D in \_\_\_\_\_ calcium supplement  
 \_\_\_\_\_ multiple vitamin  
 \_\_\_\_\_ other: \_\_\_\_\_ (specify)
4. Are you presently on hormone therapy? \_\_\_\_\_ Yes \_\_\_\_\_ No. If so, please define type and dosage, and for what reason prescribed: \_\_\_\_\_  
 \_\_\_\_\_  
 Date therapy began: \_\_\_\_\_
5. FOR CONTROL SUBJECTS ONLY:
  - a. How often and how long are you presently exercising a week?  
 \_\_\_\_\_
  - b. What types of exercise are you participating in? \_\_\_\_\_  
 \_\_\_\_\_
  - c. Is this more than you were doing before the study began? \_\_\_\_\_
  - d. Are you in any formal exercise group? \_\_\_\_\_. If so, explain: \_\_\_\_\_  
 \_\_\_\_\_



6. Have you conveyed the importance of preventative measures against osteoporosis (i.e. calcium supplements or proper amounts of dietary calcium, weight bearing exercise and some cases of estrogen therapy) to your family, \_\_\_\_ and to your friends? \_\_\_\_

\*One serving (providing approximately 300 mg of calcium) is equal to:

- 1 cup skim, whole, and buttermilk
- 1 cup yogurt
- 1 1/2 oz. cheddar cheese (hard cheeses)
- 1 1/2 c. ice cream or ice milk
- 2 c. cottage cheese
- 4 oz. salmon
- 2 1/2 oz. sardines

## UNIVERSITY OF TEXAS AT TYLER

## DEPARTMENT OF HEALTH AND PHYSICAL EDUCATION

## PHYSICIAN'S NOTIFICATION OF PATIENT'S APPLICATION FOR RESEARCH STUDY

TOPIC: "The effects of vigorous physical training upon cortical and trabecular bone in pre- and post-menopausal females, aged 35-65 years."

PRINCIPAL INVESTIGATORS: Joyce E. Ballard, Ph.D.

Your patient \_\_\_\_\_ has expressed interest in serving as a  
(Name of Research Subject)  
subject in a research study which is being conducted at The University of Texas at Tyler in the Department of Health and Physical Education. Subjects will be administered informed consent in this study.

PURPOSE OF STUDY The purpose of this study is to evaluate the effects of vigorous physical training upon cortical and trabecular bone mineral content and bone width in pre- and post-menopausal females, aged 35-65 years in order to determine the following: 1) whether bone mineral content and width can be enhanced as a result of regular vigorous physical activity, and if so, at what age or ages? and 2) whether the involutional bone loss associated with menopause can be slowed down as a result of vigorous physical training or whether this loss is due to the aging process or other factors. A control group will be utilized in order to make comparisons with the experimental group.

METHODOLOGY OF STUDY Females between the ages of 35 and 65 years who are without known heart disease and who are not at high risk with exercise are being sought for this study. This study includes both a testing phase and an exercise training phase. Three testing sessions will be conducted on each subject during the first year of a two-year training period. The tests will be conducted as follows: pre-test, mid-year test, and post-year test. Control subjects will take the same tests as the experimental subjects but will not be involved in the training program. The testing procedures consist of the following:

1) Body composition assessment--hydrostatic weighing and skinfold measurements will be determined to assess body fatness and lean body mass.

2) Make out forms and keep records for following: a) self-administered medical history, b) dietary records, c) informed consent.

3) Functional Capacity Test--A submaximal (85% age predicted maximal HR) graded exercise test will be utilized to write appropriate exercise prescription for the training phase of this study.

The training procedures for this study will consist of the following phases for the experimental subjects only: 1) Warm-up (10 minutes)--flexibility exercises; 2) Aerobic exercise (25 minutes)--walking, jogging, aerobic dancing, cycling, or swimming; and 4) Cool-down (5 minutes)--post exercise stretching and recovery. Individualized exercise prescriptions will be written for each subject based upon the pre-test. Subjects will be asked to exercise 4 days/week for 45 weeks during the first year of a 2-year training period. The exercise sessions will be 60 minutes in duration and the intensity will be approximately 70% of maximal HR.

BENEFITS TO THE SUBJECTS Information from this study will be made available to the subject and/or her personal physician upon request.

THE UNIVERSITY OF TEXAS AT TYLER/DEPARTMENT OF HEALTH AND PHYSICAL EDUCATION  
OSTEOPOROSIS RESEARCH STUDY  
PHYSICIAN SCREENING FORM

PATIENT NAME \_\_\_\_\_ DATE \_\_\_\_\_  
Last First Initial  
ADDRESS \_\_\_\_\_ Age \_\_\_\_\_ Phone \_\_\_\_\_

I consider the above individual as: \_\_\_\_\_  
\_\_\_\_\_ Healthy with no known disease  
\_\_\_\_\_ Low risk for heart disease  
\_\_\_\_\_ Prone to heart disease  
\_\_\_\_\_ Cardiac patient  
\_\_\_\_\_ Other (Explain) \_\_\_\_\_

Please fill in the information below if it available (If subject was in osteoporosis research study 1984-1985 only note any changes which may have occurred during the past year):

Diagnostic Data	Present Physical Activity	EKG	Rhythm
1. No heart disease	1. Very Active	1. Normal	1. Sinus
2. Pneumatic	2. Normal	2. Abnormal	2. Atrial fibr.
3. Congenital	3. Limited	3. Infarct	3. Frequent PVCs
4. Hypertension	4. Very Limited		4. Other _____
5. CAD			
6. Other _____	Metabolic Bone Disease _____		
	Kidney Disease _____		

Date of Last Complete Physical Examination \_\_\_\_\_

Present Medications \_\_\_\_\_

Blood Pressure \_\_\_\_\_ Cholesterol \_\_\_\_\_ mg% LDL \_\_\_\_\_ mg%

Abnormalities you are aware of \_\_\_\_\_

Based on the general health status of my patient I know of no reason why my patient should not participate in the osteoporosis research study and realize it will consist of the following parts:

1. Body composition assessment by hydrostatic weighing and skinfold procedures.
2. Nutritional assessment by computerized program from patient's dietary records.
3. Functional capacity test according to the Guidelines of American College of Sports Medicine: (85% age predicted max heart rate) graded exercise test.
4. Bone mineral content with a Norland single photon absorption technique at the distal and midshaft radius of the nondominant arm. Radiation dose < 100 millirems.
5. Exercise training, conducted 4-days/week for 45 weeks for 60 minutes/session based on an individualized exercise prescription.

\_\_\_\_\_  
Date \_\_\_\_\_

Physician Signature

Type on Print

Name of Physician \_\_\_\_\_  
Address \_\_\_\_\_ Telephone \_\_\_\_\_

\*A Symptom Limited Maximal completed by the patient's personal physician may be substituted for the Functional capacity test. Send such data to:

Joyce E. Ballard, Ph.D.

\*Control subjects will not be involved in the Training Program.

Department of Health/Physical Education  
University of Texas at Tyler  
Tyler, Tx 75701  
Phone: 566-1471 Ext 323

## TEXAS WOMAN'S UNIVERSITY

## HUMAN NUTRITION RESEARCH -- TWENTY-YEAR FOLLOW-UP

Case Number (1.1,2,3,4) \_\_\_\_\_ Sex (1.5) Circle F M Age (1.6,7) \_\_\_\_\_ Date of Test (1.8,9) \_\_\_\_\_

## ACTIVITY

(1.10)  
Present(1.11)  
During Last  
12 months(1.12)  
During Last  
10 years

## Occupational activity

0. Not employed . . . . .	_____	_____	_____
1. Part-time employed . . . . .	_____	_____	_____
2. Full-time employed . . . . .	_____	_____	_____

Participation in athletic recreational activities such as golf, tennis, cycling, skiing, bowling and dancing.

(1.13)

(1.14)

(1.15)

0. No participation . . . . .	_____	_____	_____
1. Occasional participation--once a month . . . . .	_____	_____	_____
2. Seasonal participation--twice a month . . . . .	_____	_____	_____
3. Seasonal participation--once a week . . . . .	_____	_____	_____
4. Seasonal participation--over once a week . . . . .	_____	_____	_____
5. Year-round participation--twice a month . . . . .	_____	_____	_____
6. Year-round participation--once a week . . . . .	_____	_____	_____
7. Year-round participation--over once a week . . . . .	_____	_____	_____

Activities of daily living (mark 1 if true, 0 if false.)

(1.16)

(1.17)

(1.18)

1. Makes shopping trips of any type at least three times a week. (Includes window shopping, groceries, meals out, etc.) . . . . .	_____	_____	_____
2. Daily involved in either preparing meals or cleaning up afterwards . . . . .	_____	_____	_____
3. Does some yard work of any degree at least once a week in season . . . . .	_____	_____	_____
4. Some involvement in cleaning, mopping, sweeping, or vacuuming floors at least once a week . . . . .	_____	_____	_____
5. Some involvement in washing or ironing clothes at least once a week . . . . .	_____	_____	_____

(1.19,20)

(1.21,22)

(1.23,24)

6. Total score . . . . .	_____	_____	_____
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Present Employment:

Type of Position	How long employed	Between what ages	Physical activity required			Location of Work	
			1. Light	2. Medium	3. Heavy	0. Indoors	1. Outdoors
(1.25,26)	(1.27,28,29)		(1.30)			(1.31)	

Past Employment:

Type of Position	How long employed	Between what ages	Physical activity required			Location of Work	
			1. Light	2. Medium	3. Heavy	0. Indoors	1. Outdoors
(1.32,33)	(1.34,35,36)		(1.37)			(1.38)	
(1.35,40)	(1.41,42,43)		(1.44)			(1.45)	

Sun Exposure:

0. Never      1. Occasionally      2. Regularly

How often do you sunbathe:

Presently (1.46) . . . . .

During last 12 months (1.47) . . . . .

During last 10 years (1.48) . . . . .

About how much time do you spend outdoors each day:      1 hr. or less      2 hrs.      3 hrs.      4 hrs. or more

Presently (1.49) . . . . .

During the last 12 months (1.50) . . . . .

During the last 10 years (1.51) . . . . .

Please place 4 checkmarks in the boxes to indicate the national origins of your 4 grandparents: (1.52,53,54,55)

For example, if 2 are of Scottish descent, 1 of English, 1 of Irish, mark as follows:

Scottish ☒ ☐ ☐      English ☒ ☐ ☐      Irish ☒ ☐ ☐Scottish ☐ ☐ ☐      French ☐ ☐ ☐      Swedish ☐ ☐ ☐      German ☐ ☐ ☐      Russian ☐ ☐ ☐      English ☐ ☐ ☐      Italian ☐ ☐ ☐Finnish ☐ ☐ ☐      Dutch ☐ ☐ ☐      Balkan ☐ ☐ ☐      Irish ☐ ☐ ☐      Spanish ☐ ☐ ☐      Norwegian ☐ ☐ ☐      Belgian ☐ ☐ ☐African ☐ ☐ ☐      Welsh ☐ ☐ ☐      Greek ☐ ☐ ☐      Danish ☐ ☐ ☐      Polish ☐ ☐ ☐      Eastern Mediterranean ☐ ☐ ☐If other, please specify \_\_\_\_\_ ☐ ☐ ☐ \_\_\_\_\_ ☐ ☐ ☐ \_\_\_\_\_ ☐ ☐ ☐Use of Medications

0. Never      1. Occasionally      2. Regularly      3. Do not know

How often do you use vitamins at present? \_\_\_\_\_ (1.56)

If you do, what type, if known \_\_\_\_\_

How often have you used vitamins over the past 20 years? \_\_\_\_\_ (1.57)

If regularly, what type, if known \_\_\_\_\_

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Use or medication (continued)	0. Never	1. Occasionally	2. Regularly	3. Do not know	
How often do you use calcium tablets or calcium wafers at present?	_____	_____	_____	_____	(1.52)
If regularly, what type, if known	_____	_____	_____	_____	
How often have you used calcium tablets or wafers in the past 10 years?	_____	_____	_____	_____	(1.53)
If regularly, how many per day	_____	_____	_____	_____	
How often do you use female hormones at present?	_____	_____	_____	_____	(1.60)
If regularly, what type, if known	_____	_____	_____	_____	
For how long(1.61,62,63)	_____	_____	_____	_____	
For what condition(1.64)	_____	_____	_____	_____	
How many daily(1.65)	_____	_____	_____	_____	
How often have you used female hormones in the past?	_____	_____	_____	_____	(1.66)
If regularly, what type, if known	_____	_____	_____	_____	
For how long(1.67,68,69)	_____	_____	_____	_____	
For what condition(1.70)	_____	_____	_____	_____	
How many daily(1.71)	_____	_____	_____	_____	
At what age(1.72,73)	_____	_____	_____	_____	
How often do you use cortisone-like hormones at present?	_____	_____	_____	_____	(2.6)
If regularly, what type, if known	_____	_____	_____	_____	
For how long(2.6,7,8)	_____	_____	_____	_____	
For what condition(2.9)	_____	_____	_____	_____	
How many daily(2.10)	_____	_____	_____	_____	
How often did you use cortisone-like hormones in the past?	_____	_____	_____	_____	(2.11)
If regularly, what type, if known	_____	_____	_____	_____	
For how long(2.12,13,14)	_____	_____	_____	_____	
For what condition(2.15)	_____	_____	_____	_____	
How many daily(2.16)	_____	_____	_____	_____	
At what age(2.17,18)	_____	_____	_____	_____	
Medical History: Have you ever been confined to bed for an illness for more than two months? 1. Yes _____ 0. No _____					
If yes: What was the illness	How long were you confined	At what age			
_____ (2.20)	_____ (2.21,22)	_____ (2.23,24)			
_____ (2.25)	_____ (2.26,27)	_____ (2.28,29)			
_____ (2.30)	_____ (2.31,32)	_____ (2.33,34)			

Mark the word that best describes your usual bowel habits: (2.35)

1. Diarrhea 2. Looseness 3. Normal 4. Constipation

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Medical History (continued)

Have you ever had	1. Yes	0. No	9. Do not know	
Overactive Thyroid Gland	_____	_____	_____	(2.36)
If yes, at what age(2.37,38) _____				
For how long(2.39,40,41) _____				
Diabetes	_____	_____	_____	(2.42)
If yes, at what age(2.43,44) _____				
Rheumatoid Arthritis	_____	_____	_____	(2.45)
If yes, at what age(2.46,47) _____				
Kidney Stones	_____	_____	_____	(2.48)
If yes, at what age(2.49,50) _____				

Bone Fracture History

	1. Yes	0. No	
Have you ever broken any bones?	_____	_____	(2.51)

If Yes:

Which bone or bones	How did it happen	If confined to bed, how long	How did it happen
_____ (3.5,6)	_____ (3.7,8)	_____ (3.9,10)	_____ (3.11,12)
_____ (3.13,14)	_____ (3.15,16)	_____ (3.17,18)	_____ (3.19,20)
_____ (3.21,22)	_____ (3.23,24)	_____ (3.25,26)	_____ (3.27,28)
_____ (3.29,30)	_____ (3.31,32)	_____ (3.33,34)	_____ (3.35,36)

Have any blood relatives (for examples father, mother, brother, and so forth) broken any bones?

1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_ (3.37)

If Yes:

Which relative	Which bone or bones	At what age	How did it happen
_____ (3.38)	_____ (3.39,40)	_____ (3.41,42)	_____ (3.43,44)
_____ (3.45)	_____ (3.46,47)	_____ (3.48,49)	_____ (3.50,51)
_____ (3.52)	_____ (3.53,54)	_____ (3.55,56)	_____ (3.57,58)
_____ (3.59)	_____ (3.60,61)	_____ (3.62,63)	_____ (3.64,65)

Dental History

In regard to your teeth: (4.5)

Do you have:

4. Permanent teeth only _____	3. Complete upper plate _____	2. Partial upper plate _____	1. Complete lower plate _____	0. Partial lower plate _____
----------------------------------	----------------------------------	---------------------------------	----------------------------------	---------------------------------

At what age did you have your first plate? \_\_\_\_\_ (4.6,7)

Do you have trouble keeping your plate fitted? 1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_ (4.8)

Tobacco and Alcoholic Beverage Usage

	0. Never	1. Yearly	2. Weekly	3. Daily	Duration of use (Years)
1. Cigarettes (4.8)	_____	_____	_____	_____	(4.10,11) _____
2. Tobacco (chew) (4.12)	_____	_____	_____	_____	(4.13,14) _____
3. Snuff (4.15)	_____	_____	_____	_____	(4.16,17) _____
4. Cigars/pipe (4.18)	_____	_____	_____	_____	(4.19,20) _____ (4.21,22) _____ (4.23,24,25) _____
5. Beer/Wine (4.26)	_____	_____	_____	_____	(4.27,28) _____
6. Liquor (4.29)	_____	_____	_____	_____	(4.30,31) _____ (4.32,33) _____ (4.34,35,36) _____

Reproductive History (Women Only)

At what age did your periods (menstrual) begin? \_\_\_\_\_ (4.37,38)

Were they (4.39) 1. Regular \_\_\_\_\_ 2. Irregular \_\_\_\_\_ 3. Never began \_\_\_\_\_

Have your menstrual periods ended? (4.40) 1. Yes \_\_\_\_\_ 2. No \_\_\_\_\_

If Yes:

At what age did they end (4.41,42) \_\_\_\_\_

Did they end (4.43) 1. Naturally \_\_\_\_\_ 2. By surgery \_\_\_\_\_ 3. By X-ray \_\_\_\_\_

Have your womb or ovaries been surgically removed? 1. Yes \_\_\_\_\_ 2. No \_\_\_\_\_ (4.44)

If Yes, please indicate those removed (4.45)

0. Womb only \_\_\_\_\_ 
 1. One ovary \_\_\_\_\_ 
 2. Both ovaries \_\_\_\_\_ 
 3. Womb and one ovary \_\_\_\_\_ 
 4. Womb and both ovaries \_\_\_\_\_

5. Do not know \_\_\_\_\_

Have you ever been pregnant? 1. Yes \_\_\_\_\_ 2. No \_\_\_\_\_ (4.46)

If Yes, how many times (4.47,48) \_\_\_\_\_

Have you born children? 1. Yes \_\_\_\_\_ 2. No \_\_\_\_\_ (4.49)

If Yes, how many (4.50,51) \_\_\_\_\_

Did you breast-feed your infants? 1. Yes \_\_\_\_\_ 2. No \_\_\_\_\_ (4.52)

If Yes, how many months for each child? 1st child (4.53,54) \_\_\_\_\_; 2nd child (4.55,56) \_\_\_\_\_; 3rd child (4.57,58) \_\_\_\_\_; 4th child (4.59,60) \_\_\_\_\_; 5th child (4.61,62) \_\_\_\_\_; 6th child (4.63,64) \_\_\_\_\_

Have you ever experienced chronic back pain or bone pain?

1. Yes \_\_\_\_\_ 2. No \_\_\_\_\_

If Yes, where? \_\_\_\_\_ At what age? \_\_\_\_\_



Tobacco and Alcoholic Beverage Usage

	0. Never	1. Yearly	2. Weekly	3. Daily	Duration of use (Years)
1. Cigarettes (4.9)	_____	_____	_____	_____	(4.10,11) _____
2. Tobacco (chew) (4.12)	_____	_____	_____	_____	(4.13,14) _____
3. Snuff (4.15)	_____	_____	_____	_____	(4.16,17) _____
4. Cigars/pipe (4.18)	_____	_____	_____	_____	(4.19,20) _____ (4.21,22) _____, 23, 24, 25
5. Beer/Wine (4.26)	_____	_____	_____	_____	(4.27,28) _____
6. Liquor (4.29)	_____	_____	_____	_____	(4.30,31) _____ (4.32,33) _____, 34, 35, 36

Reproductive History (Women Only)

At what age did your periods (menstrual) begin? \_\_\_\_\_ (4.37,38)

Were they (4.39) 1. Regular \_\_\_\_\_ 2. Irregular \_\_\_\_\_ 3. Never began \_\_\_\_\_

Have your menstrual periods ended? (4.40) 1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_

If Yes:

At what age did they end (4.41,42) \_\_\_\_\_

Did they end (4.43) 1. Naturally \_\_\_\_\_ 2. By surgery \_\_\_\_\_ 3. By X-ray \_\_\_\_\_

Have your womb or ovaries been surgically removed? 1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_ (4.44)

If Yes, please indicate those removed: (4.45)

1. Womb only \_\_\_\_\_ 2. One ovary \_\_\_\_\_ 3. Both ovaries \_\_\_\_\_ 4. Womb and one ovary \_\_\_\_\_ 5. Womb and both ovaries \_\_\_\_\_

6. Do not know \_\_\_\_\_

Have you ever been pregnant? 1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_ (4.46)

If Yes, how many times (4.47,48) \_\_\_\_\_

Have you born children? 1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_ (4.49)

If Yes, how many (4.50,51) \_\_\_\_\_

Did you breast-feed your infants? 1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_ (4.52)

If Yes, how many months for each child? 1st child (4.53,54) \_\_\_\_\_; 2nd child (4.55,56) \_\_\_\_\_; 3rd child (4.57,58) \_\_\_\_\_

4th child (4.59,60) \_\_\_\_\_; 5th child (4.61,62) \_\_\_\_\_; 6th child (4.63,64) \_\_\_\_\_

Have you ever experienced chronic back pain or bone pain?

1. Yes \_\_\_\_\_ 0. No \_\_\_\_\_

If Yes, where? \_\_\_\_\_ At what age? \_\_\_\_\_

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CEREALS

How many TIMES a WEEK do you eat cooked or dry cereal? . . . . . 0 1 2 3 4 5 or \_\_\_\_\_

What is the average size of each serving in CUPS? . . . . . 0 1/4 1/2 3/4 1 or \_\_\_\_\_

STARCHES

How many pieces of bread, rolls, or muffins do you eat each day? . . . . . 0 1 2 3 4 5 or \_\_\_\_\_

How many MEALS a WEEK do you eat potatoes, noodles, rice, macaroni  
or other starches? . . . . . 0 1 2 3 4 5 or \_\_\_\_\_

What is the average size of each serving in CUPS? . . . . . 0 1/4 1/2 3/4 1 or \_\_\_\_\_

VEGETABLESHow many MEALS a WEEK do you eat Spinach, Broccoli or other leafy  
greens? . . . . . 0 1 2 3 4 5 or \_\_\_\_\_

What is the average size of each serving in CUPS? . . . . . 0 1/4 1/3 1/2 1 or \_\_\_\_\_

How many MEALS a WEEK do you eat dried Peas, Beans or other legumes? . . . . . 0 1 2 3 4 or \_\_\_\_\_

What is the average size of each serving in CUPS? . . . . . 0 1/4 1/3 1/2 1 or \_\_\_\_\_

How many MEALS a WEEK do you eat Beets, Peas, Lettuce or other  
vegetables? . . . . . 0 1 2 3 4 5 or \_\_\_\_\_

What is the average size of each serving in CUPS? . . . . . 0 1/4 1/3 1/2 1 or \_\_\_\_\_

FRUITSHow many CUPS a DAY do you eat or drink Orange or Grapefruit juice  
or fruit? . . . . . 0 1/4 1/3 1/2 1 or \_\_\_\_\_How many CUPS a DAY do you eat Peaches, Pears, Bananas or other  
fruit or juice? . . . . . 0 1/4 1/3 1/2 1 or \_\_\_\_\_

THE UNIVERSITY OF TEXAS AT TYLER  
CARDIORESPIRATORY FITNESS EVALUATION

NAME \_\_\_\_\_ M/F DATE \_\_\_\_\_ TIME \_\_\_\_\_ AM/PM

AGE \_\_\_\_\_ HEIGHT \_\_\_\_\_ WEIGHT \_\_\_\_\_

MEDICATIONS \_\_\_\_\_

ESTIMATED HRMAX \_\_\_\_\_ TARGET HR \_\_\_\_\_ ( 5 ) TECHNICIAN \_\_\_\_\_

[illegible]

COMMENTS:

APPENDIX E  
CONSENTS TO ACT AS SUBJECTS

## Department of Nutrition and Food Sciences

## Texas Woman's University

Consent to Act as a Subject for Research and Investigation

1. The purpose of this study is to assess the mineral content of the forearm and hand in order to assess the effects of exercise and a combination of exercise and estrogen therapy upon bone loss in postmenopausal females, aged 50-67 years.
2. I hereby consent to undergo the following procedures:
  - a. A nutritional questionnaire
  - b. An x-ray of the left hand for mineral analysis
  - c. Bone mineral analyzation of the nondominant arm of radius (distal-1/10, and midshaft-1/3) with the Norland-Cameron bone mineral analyzer.
3. The procedures of the investigation have been explained to me by:

\_\_\_\_\_  
Name

4. The radiation dose delivered to the hand (x-ray) and to the distal and midshaft of the radius will be approximately 168 millirems and less than 100 millirems (series of 4 scans), respectively. The bone mineral analyzer exposes a section of tissue only 5.0 millimeters wide and 2.0 centimeters in length. The dose to the whole body will be 0.

5. Standard procedures will be utilized for x-ray measurement. Lead aprons, shielded room and a registered x-ray technician will be available for all testing.

Benefits to Subject

As a participant in this study, I realize I may receive my own test result and the final results of the entire project when the study is concluded in August, 1985. It is the aim of this project to educate participants regarding the problems of osteoporosis and possible preventive measures to minimize risk of this disorder.

Having gained an understanding of the test procedures that I will perform, I consent to participate in this research study. I understand that my data will be held in strictest confidentiality but I agree to allow the investigators to use my data in research publications. Participation in this study is voluntary and I understand that I can withdraw at any time.

In case of injury associated with this research project please report directly to the principal investigator at TWU, Alice Milner, Ph.D., Chairperson of the Nutrition and Food Sciences Department. If in your estimation there has been a breach in protocol as described in this informed consent, please contact Jim Koukl, Ph.D., Chairperson of The University of Texas at Tyler Human Subjects Investigation Committee. I hereby signify that I have received a copy of this informed consent

\_\_\_\_\_  
Initial

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Date

\_\_\_\_\_  
Principal Investigator

UNIVERSITY OF TEXAS AT TYLER  
DEPARTMENT OF HEALTH AND PHYSICAL EDUCATION

CONSENT TO ACT AS A SUBJECT FOR RESEARCH AND INVESTIGATION

PROTOCOL TITLE: "The effects of vigorous physical training upon cortical and trabecular bone in pre- and post-menopausal females, aged 65 years."

\_\_\_\_\_ Control Subject \_\_\_\_\_ Experimental  
Participant's Name

Purpose of Study: The purpose of this study is to evaluate the effects of vigorous physical training upon cortical and trabecular bone mineral content and bone width in pre- and post-menopausal females, aged 35-65 years in order to determine the following: 1) whether bone mineral content and width can be enhanced as a result of regular vigorous physical activity, and if so, at what age or ages? and 2) whether the involutional bone loss associated with menopause can be slowed down as a result of vigorous physical training or whether this loss is due to the aging process or other factors.

Description of Research: Two experimental groups (EG) and two control groups (CG) of thirty subjects each (pre-menopausal EG/CG, 35-49 years; and post-menopausal EG/CG, 50-65 years) will be evaluated for the effects of a vigorous training program upon bone parameters. Subjects will be screened by their own physician to determine health status. Subjects will be tested three times (pre-test, mid-year test, and post-year test) during the first year of a two-year training program. Training for this study will consist of the following phases: 1) warm-up (10 minutes); 2) aerobic exercise, i.e., walking, jogging, aerobic dancing, cycling, or swimming (25 minutes); 3) weight training (20 minutes); and 4) cool-down (5 minutes). Training sessions will be conducted 4x/week for 60 minutes/session for 45 weeks during the first year. Individualized exercise prescriptions will be written for each subject based upon the initial tests.

Testing and Training Procedures: I hereby agree to undergo the following procedures:

- (1) Complete anthropometric data
- (2) Complete an inventory regarding any changes during the last six month period in estrogen therapy, calcium intake, or exercise habits.
- (3) Complete a submaximal graded exercise test (85% max HR) to determine physical work capacity.
- (4) Complete bone mineral analyzation at mid-shaft and distal end of radius.
- (5) Complete hydrostatic weighing test.
- (6) Complete 4-60 minute training sessions/week for 50 weeks.

Risk and Discomforts Associated with Testing and Training: During the exercise and/or during the exercise training, there exists the possibility of certain changes occurring. These changes include abnormal blood pressure, fainting, disorders of the heart beat, and in very rare instances of heart attack. Every effort will be made to minimize these risks by the preliminary screening by your physician and by observation during the testing and training. Emergency equipment and trained personnel are available to deal with unusual situations

which may arise. Emergency procedures have been established and are routinely practiced by all testing and training personnel. Low-level radiation (approximately 1/100 the radiation exposure of a skeletal x-ray of the forearm) will be experienced during the bone mineral analyzation of the forearm by the Norland single photon absorption technique. All safety precautions required by the license governing this equipment will be carefully followed. Approval by the subject's physician will be required in order for subjects to undergo this test.

**Benefits of Study to Subjects:** As a participant in this study, I realize I may receive my own test results and the final results of the entire project when the study is concluded. It is the aim of this project to educate participants regarding the problems of osteoporosis and possible preventive measures to minimize risk of this disorder. It is hoped that the effects of exercise will be helpful in bone development and maintenance for the subjects of this study. All test results will be made available upon request to the referring physician.

**Understanding of Participants:** I have been given an opportunity to ask any questions concerning the testing and/or training procedures of this study and the investigators have been willing to answer my questions. I hereby authorize Dr. Joyce Ballard and/or Dr. Helen Graham, the investigators to administer the testing and training protocols of this study.

I have been told and understand that my participation in this study is voluntary and that I may refuse to participate without penalty or loss of benefit to which I am otherwise entitled. Furthermore, I have been told and understand that I am able to withdraw my consent and to stop my participation in this study at any time, and that such withdrawal of consent or discontinuation will involve no penalty or loss of benefits to which I am otherwise entitled.

I have been assured that confidentiality will be preserved and that my name will not be revealed in any reports or publications resulting from this study, without my expressed consent. All data will be coded by subject number and the master list identifying subject numbers and names will be kept in a locked file. Additionally all data will be kept in a locked cabinet.

I have been informed that should I suffer any physical injury as a result of participation in this research that I will be advised to seek medical advice and services from my own physician. I understand, that in the absence of negligence on the part of The University of Texas at Tyler personnel, I cannot expect to receive any payment for hospital expenses or any financial compensation for such injury.

If I have any questions concerning my participation in this project I shall contact Dr. Joyce Ballard, (214) 566-1471, Ext 323. If I have any questions concerning my rights as a subject I shall contact Dr. James Schwane, Chairperson Human Subjects Investigation Committee, at (214) 566-1471, Ext 323. I understand that I may contact Dr. Helen Graham at (214) 593-2056 about any research-related injury.

Based upon the above, I consent to participate in this research project and have received a copy of the consent form.

\_\_\_\_\_  
Initial.

\_\_\_\_\_  
DATE

\_\_\_\_\_  
SIGNATURE OF PARTICIPANT

I have discussed this project with the participant, using a language which is understandable and appropriate. I believe that I have fully informed this participant of the nature of this study and its possible benefits and risks and I believe that this participant understands this explanation.

\_\_\_\_\_  
SIGNATURE OF INVESTIGATOR

\_\_\_\_\_  
DATE

THE UNIVERSITY OF TEXAS AT TYLER  
DEPARTMENT OF HEALTH AND PHYSICAL EDUCATION  
OSTEOPOROSIS RESEARCH PROJECT

CONSENT TO ACT AS A SUBJECT FOR RESEARCH AND INVESTIGATION

MENOPAUSAL STATUS: \_\_\_\_\_PREMENOPAUSAL \_\_\_\_\_POSTMENOPAUSAL

1. PURPOSE. The purpose of this study is to assess the mineral content of the lumbar spine and of the femur in order to assess the effects of exercise and a combination of exercise and estrogen therapy upon bone status in pre and post menopausal females, aged 35-70 years.

2. EXPLANATION OF THE TESTS. The lumbar spine scan (L1-L5) will be performed while you are lying on your back on a padded surface with your legs elevated and placed over a padded box. The test will not require you to wear any special attire or to disrobe, except to remove any metal objects attached to your clothing such as the buckle of a belt, etc. This test will take approximately 20 minutes.

The femur (hip) scan will be performed immediately after the spine scan and will require that you continue to lie on your back with your legs fully extended and your ankles attached to a small box placed between your feet. The ankles are attached in this manner in order to stabilize the hip. This test will take approximately 30 minutes.

3. RISKS/DISCOMFORTS FOR ALL SUBJECTS. The radiation to which you will be exposed is 5-15 mrad to local tissue and 2 mrad to the ovaries from the spine scan and 5-15 mrad to local tissue and negligible to the ovaries from the femur scan. The radiation exposure from a pelvic x-ray is up to 100 mrad.

4. ADDITIONAL RISKS/DISCOMFORTS FOR PREMENOPAUSAL SUBJECTS. Since there is a possibility of pregnancy at the time of this test, you have been asked to undergo the following procedure. You have been asked to schedule this test during a normal menstrual cycle or within 7 days after a normal menstrual cycle and have completed a pregnancy test. I hereby confirm that I have complied with this request.

\_\_\_\_\_  
Signature of Subject

The results of the pregnancy test have been checked by \_\_\_\_\_  
and have been confirmed to be negative.

5. BENEFITS TO SUBJECTS. As a participant in this study, I realize I may receive my own test results and the final results of the entire project when the study is concluded in the Fall of 1988. It is the aim of this project to educate participants regarding the problems of osteoporosis and possible preventive measures to minimize risk of this disorder. The results of these bone scans, which are priced to you at \$47.50 but are normally priced at \$285.00 will be sent to your personal physician for diagnostic purposes.

Having gained an understanding of the test procedures that I will perform. I consent to participate in this research study. I understand that my data will be held with strictest confidentiality but I agree to allow the investigators to use my data in research publications. Participation in this study is voluntary and I understand that I can withdraw at any time.



In case of injury associated with this research project please report directly to the principal investigator, Dr. Joyce Ballard. If in your estimation there has been a breach in protocol as described in this informed consent, please contact Dr. James Schwane, Chairperson of the University of Texas at Tyler Human Subjects Investigation Committee. I hereby signify that I have received a copy of this informed consent

\_\_\_\_\_  
Initials

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Signature of Witness

APPENDIX F

QUESTIONNAIRE, CONSENT, AND SCORING TOOLS

ATTITUDE TOWARD PHYSICAL ACTIVITY  
QUESTIONNAIRE

The purpose of this questionnaire is to determine some of the attitudes people may have when they are working on health related behaviors, such as the prevention of Osteoporosis. There are no right or wrong answers, so just respond with your first impression to each statement.

There are 7 possible responses to each statement on this questionnaire that range from very strongly agree (VSA) to very strongly disagree (VSD). There is an undecided response (U) that would indicate uncertainty or that you feel that the statement doesn't relate to you. The remaining responses indicate various degrees of feeling to the statements.

For example:

I am proud to be an American	<del>VSA</del> SA A U D SD VSD
If given a choice, I would choose spinach rather than ice cream.	VSA SA A U D <del>SD</del> VSD
I would rather have a clean house than a well kept yard.	VSA SA A <del>U</del> D SD VSD

These responses indicate that this subject is very proud to be an American (very strongly agree), Likes ice cream more than spinach (strongly disagree), but does not necessarily dislike spinach, and is undecided about which she would prefer, a clean house or a well kept yard.

Instructions:

1. Mark an "X" over the response that best expresses how you feel about each statement.
2. Return the entire questionnaire when you come in for your physical assessment.

### Consent

Responding to the following questionnaire and returning it will indicate consent for use in this phase of the research project with the understanding that individual data will be held in strictest confidentiality.

\_\_\_\_\_  
(signature of subject)

Thank you for taking the time and effort to complete and return this questionnaire. A summary report will be available at UTT after the results are evaluated.

ATTITUDE TOWARD PHYSICAL ACTIVITY		very strongly agree	strongly agree	agree	undecided	disagree	strongly disagree	very strongly disagree
1.	I would prefer quiet activities like swimming or golf, rather than such activities as water skiing or sail boat racing.	VSA	SA	A	U	D	SD	VSD
2.	I would gladly put up with the necessary hard training for the chance to run in a National Marathon Race.	VSA	SA	A	U	D	SD	VSD
3.	The most important value of physical activity is the beauty found in skilled movement.	VSA	SA	A	U	D	SD	VSD
4.	Health Education programs should stress vigorous exercise since it contributes most to physical fitness.	VSA	SA	A	U	D	SD	VSD
5.	The years of strenuous daily training necessary to prepare for today's international competition is asking a lot of today's women.	VSA	SA	A	U	D	SD	VSD
6.	The need for much higher levels of physical fitness has been established beyond all doubt.	VSA	SA	A	U	D	SD	VSD
7.	Among the best physical activities are those which represent a personal challenge, such as skiing, mountain climbing, or heavy weather sailing.	VSA	SA	A	U	D	SD	VSD
8.	Among the most desirable forms of physical activity are those which present the beauty of human movement such as modern dance and water ballet.	VSA	SA	A	U	D	SD	VSD
9.	I would get by far the most satisfaction from games requiring long and careful preparation and involving stiff competition against a strong opposition.	VSA	SA	A	U	D	SD	VSD
10.	Of all physical activities, those whose purpose is primarily to develop fitness, would <u>not</u> be my first choice.	VSA	SA	A	U	D	SD	VSD
11.	The best way to become more socially desirable is to participate in group activities.	VSA	SA	A	U	D	SD	VSD
12.	Almost the only satisfactory way to relieve severe emotional strain is through some form of physical activity.	VSA	SA	A	U	D	SD	VSD
13.	Frequent participation in dangerous sports and physical activities are alright for other people, but ordinarily they are not for me.	VSA	SA	A	U	D	SD	VSD
14.	Health Education programs should place <u>much</u> emphasis upon the beauty found in human motion.	VSA	SA	A	U	D	SD	VSD
15.	If given a choice, I sometimes would choose strenuous rather than light activity.	VSA	SA	A	U	D	SD	VSD
16.	There are better ways of relieving the pressure of today's living than having to engage in or watch physical activity.	VSA	SA	A	U	D	SD	VSD

- |   |                     |
|---|---------------------|
| 17. I like to engage in socially oriented physical activities.  | VSA SA A U D SD VSD |
| 18. A part of our daily lives must be committed to vigorous exercise.   | VSA SA A U D SD VSD |
| 19. I am not particularly interested in those physical activities whose sole purpose is to depict human motion as something beautiful.  | VSA SA A U D SD VSD |
| 20. Colleges should sponsor many more physical activities of a social nature.   | VSA SA A U D SD VSD |
| 21. For a healthy mind in a healthy body, the only place to begin is through participation in sports and physical activities every day.                                       | VSA SA A U D SD VSD |
| 22. The least desirable physical activities are those providing a sense of danger and risk of injury such as skiing on steep slopes, mountain climbing, or parachute jumping. | VSA SA A U D SD VSD |
| 23. Being physically fit is <u>not</u> the most important goal in my life.  | VSA SA A U D SD VSD |
| 24. A sport is sometimes spoiled if allowed to become too highly organized and keenly competitive.  | VSA SA A U D SD VSD |
| 25. I enjoy sports mostly because they give me a chance to meet new people.   | VSA SA A U D SD VSD |
| 26. Practically the only way to relieve frustrations and pent-up emotions is through some form of physical activity.  | VSA SA A U D SD VSD |
| 27. The time spent doing daily calisthenics could probably be used more profitably in other ways.   | VSA SA A U D SD VSD |
| 28. Given a choice, I would prefer motor boat racing or running rapids in a canoe rather than one of the quieter forms of boating.  | VSA SA A U D SD VSD |
| 29. Of all the kinds of physical activities, I don't particularly care for those requiring a lot of socializing.  | VSA SA A U D SD VSD |
| 30. One of the things I like most in sports is the great variety of ways human movement can be shown to be beautiful.   | VSA SA A U D SD VSD |
| 31. Most intellectual activities are often just as refreshing as physical activities.   | VSA SA A U D SD VSD |
| 32. Strength and physical stamina are the most important pre-requisites to a full life.   | VSA SA A U D SD VSD |
| 33. Physical activities that are purely for social purposes are sometimes a waste of time.  | VSA SA A U D SD VSD |

- |  |     |    |   |   |   |    |     |
|--|-----|----|---|---|---|----|-----|
| 34. The self-denial and sacrifice needed for success in today's international competition may soon become too much to ask of a thirteen or fourteen year old girl. | VSA | SA | A | U | D | SD | VSD |
| 35. I am given unlimited pleasure when I see the form and beauty of human motion.  | VSA | SA | A | U | D | SD | VSD |
| 36. I believe calisthenics are among the less desirable forms of physical activity.  | VSA | SA | A | U | D | SD | VSD |
| 37. Watching athletes becoming completely absorbed in their sport nearly always provides me with a welcome escape from the many demands of present-day life.       | VSA | SA | A | U | D | SD | VSD |
| 38. If I had to choose between "still-water" canoeing and "rapids" canoeing, "still-water" canoeing would be my choice.  | VSA | SA | A | U | D | SD | VSD |
| 39. There are better ways of getting to know people than through games and sports.   | VSA | SA | A | U | D | SD | VSD |
| 40. People should spend twenty to thirty minutes a day doing vigorous calisthenics.  | VSA | SA | A | U | D | SD | VSD |
| 41. There is sometimes an over-emphasis upon those physical activities that attempt to portray human movement as an art form.                                      | VSA | SA | A | U | D | SD | VSD |
| 42. Physical activity having an element of daring or requiring one to take chances are desirable.  | VSA | SA | A | U | D | SD | VSD |
| 43. Since competition is a fundamental characteristic of American society, highly competitive athletics and games should be encouraged for all.                    | VSA | SA | A | U | D | SD | VSD |
| 44. A happy life does not require regular participation in physical activity.  | VSA | SA | A | U | D | SD | VSD |
| 45. The best form of physical activity is when the body is used as an instrument of expression.  | VSA | SA | A | U | D | SD | VSD |
| 46. Sports are fun to watch and engage in, only if they are not taken too seriously, nor demand too much energy.   | VSA | SA | A | U | D | SD | VSD |
| 47. Calisthenics taken regularly are among the best forms of exercise.   | VSA | SA | A | U | D | SD | VSD |
| 48. I could spend many hours watching the graceful and well coordinated movements of the figure skater or modern dancer.   | VSA | SA | A | U | D | SD | VSD |
| 49. The best thing about games and sports is that they give people more confidence in social situations.   | VSA | SA | A | U | D | SD | VSD |
| 50. Among the best forms of physical activity are those providing thrills such as sailing in heavy weather or canoeing on river rapids.                            | VSA | SA | A | U | D | SD | VSD |
| 51. Regular physical activity is the major pre-requisite to a satisfying life.   | VSA | SA | A | U | D | SD | VSD |

52. In this country there is sometimes too much emphasis on striving to be successful in sports. VSA SA A U D SD VSD
53. I would enjoy engaging in those games and sports that require a defiance of danger. VSA SA A U D SD VSD
54. Most people could live happy lives without depending upon frequent watching or participating in physical games and exercise. VSA SA A U D SD VSD



FORM DW (WOMEN)

1	V	-
2	As	+
3	Ae	+
4	H	+
5	As	-
6	H	+
7	V	+
8	Ae	+
9	As	+
10	H	-
11	S	+
12	C	+
13	V	-
14	Ae	+
15	H	+
16	C	-
17	S	+
18	H	+
19	Ae	-
20	S	+
21	C	+
22	V	-
23	H	-
24	As	-
25	S	+
26	C	+
27	H	-
28	V	+
29	H	-
30	Ae	+
31	C	-
32	H	+
33	S	-
34	As	-
35	Ae	+
36	H	-
37	C	+
38	V	-
39	S	-
40	H	+
41	Ae	-
42	V	+
43	As	+
44	C	-
45	Ae	+
46	As	-
47	H	+
48	Ae	+
49	S	+
50	V	+
51	C	+
52	As	-
53	V	+
54	C	-

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## ATPA TEST EVALUATION

CODE	AE SCORE	AS SCORE	C SCORE	H SCORE	S SCORE	V SCORE	TOTAL SCORE
0100	31	25	33	43	33	30	195
0101	33	25	29	43	33	21	184
0102	26	22	37	38	25	17	165
0103	23	35	41	43	28	23	193
0107	35	15	33	47	30	11	171
0108	40	17	30	62	35	12	196
0109	32	21	43	53	33	28	210
0111	29	19	33	52	35	17	185
0112	18	12	13	34	25	17	119
0117	32	21	34	48	30	23	188
0161	39	21	27	44	39	23	193
0120	41	24	35	58	36	25	219
0124	37	26	38	46	35	25	207
0126	41	22	28	55	35	27	208
0129	34	26	26	49	33	23	191
0133	26	31	29	58	37	17	198
0135	46	24	44	51	40	21	226
1036	40	21	32	51	35	28	207
0141	26	21	29	46	32	20	174
0142	29	22	25	56	33	17	182
0144	34	17	37	47	36	30	201
0146	29	20	36	52	35	14	186
0147	40	26	30	53	35	26	210
0148	24	19	30	42	28	14	157
0149	24	22	35	50	30	25	186
0152	29	11	30	30	27	17	144
0153	34	20	33	42	31	17	177
0154	38	21	30	49	36	17	191
0155	26	29	29	49	34	28	195
0156	37	26	40	57	35	27	222
0159	37	15	35	43	23	18	171
0161	32	21	37	50	33	17	190
0162	31	20	22	41	38	11	163
0164	31	29	28	42	33	27	190
0165	32	29	24	44	34	22	185
0169	36	23	32	49	35	27	202
0170	40	12	34	49	40	14	189
0172	36	25	37	49	35	28	210
0173	24	23	36	54	27	21	185
0175	27	19	25	38	28	22	159
0176	33	30	43	53	44	34	237
0199	39	22	26	42	30	26	185
0179	28	24	34	55	42	24	207
0183	33	23	36	59	28	16	195
0185	32	23	31	43	31	14	174
0186	25	12	16	28	18	12	111
0187	36	13	30	44	25	23	171
0190	33	14	30	46	23	31	177

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## ATPA TEST EVALUATION

CODE	AE SCORE	AS SCORE	C SCORE	H SCORE	S SCORE	V SCORE	TOTAL SCORE
0192	35	22	30	47	35	19	188
0193	35	25	32	42	33	26	193
0195	36	25	35	40	38	15	189
0199	31	30	36	51	37	24	209
0202	39	18	30	42	28	18	175
0203	38	28	31	46	31	23	197
0205	45	27	48	62	44	14	240
3677	33	26	28	52	38	25	202
3678	31	29	28	42	33	27	190
3682	38	24	32	48	33	24	199
3684	33	22	32	44	30	24	185
3685	51	21	45	73	43	9	242
3687	39	30	34	53	33	35	224
3690	36	18	35	37	29	18	173
3691	20	14	28	58	34	18	172
3693	39	32	34	57	38	20	220
3696	30	20	28	44	36	20	178
3698	40	21	34	51	36	26	208
3699	45	31	36	49	37	30	228
3706	33	26	30	53	28	18	188
3707	36	26	39	54	35	23	213
3708	40	16	37	46	26	17	182
3709	40	28	39	51	41	29	228
3710	37	24	38	50	34	26	209
3712	28	19	29	45	27	18	166
3715	32	28	35	56	38	24	213
3717	27	12	34	53	32	10	168
3719	32	20	34	52	36	25	199
3721	30	33	39	50	28	14	194
3722	36	23	41	50	34	23	207
3723	32	12	43	60	30	9	186
3724	39	17	37	52	27	21	193
3726	32	29	43	66	33	14	217
3727	34	19	45	71	27	17	213
3728	26	9	40	50	28	8	161
3729	40	18	30	44	35	12	179
3731	36	23	16	54	32	18	179
3733	29	17	35	60	29	16	186
3734	29	22	32	45	32	19	179
3739	38	29	38	50	30	23	208
3740	30	26	28	38	32	12	166
3741	32	24	28	40	30	12	166
3743	38	28	32	44	36	27	205
3747	38	25	36	46	36	25	206
3749	43	25	43	61	36	25	233
3752	49	24	34	38	40	16	201
3755	25	23	32	49	33	16	178
3845	29	22	31	41	30	20	173
3846	21	25	24	41	36	20	167
3848	31	27	28	38	36	28	188

APPENDIX G  
DATA COLLECTION TOOL

## DATA COLLECTION TOOL

Subject \_\_\_\_\_ Code # \_\_\_\_\_  
 Group \_\_\_\_\_ (1-2) Age \_\_\_\_\_ (1-2-3-4)  
 Years post menopause \_\_\_\_\_ (1-2-3-4) Ethnic Background \_\_\_\_\_ (1-2)  
 Exercise History \_\_\_\_\_ (1-2-3)  
 Calcium Intake \_\_\_\_\_ (1-2-3)  
 Smoking \_\_\_\_\_ (1-2) Estrogen Use \_\_\_\_\_ (1-2-3)  
 Menopausal History \_\_\_\_\_ (1-2)  
 VO<sub>2</sub> (predicted) \_\_\_\_\_

## 18 Month/2 Year Data

Exercise History \_\_\_\_\_ (1-2-3)  
 Calcium Intake \_\_\_\_\_ (1-2-3)  
 Smoking \_\_\_\_\_ (1-2) Estrogen Use \_\_\_\_\_ (1-2-3)  
 VO<sub>2</sub> (predicted) \_\_\_\_\_

ATPA Scores

Total \_\_\_\_\_  
 Social Experience \_\_\_\_\_ Health and Fitness \_\_\_\_\_  
 Pursuit of Vertigo \_\_\_\_\_ Aesthetic Experience \_\_\_\_\_  
 Catharasis \_\_\_\_\_ Ascetic \_\_\_\_\_

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APPENDIX H  
CODE LOCATION FOR ANALYSIS

## Research Data for Judy Hammond

## Code Location for Analysis

- 1-4      Subject code number
- 5      Group:      1= non-exerciser  
                 2= exerciser
- 6      Age in years:    1= 65 or older  
                         2= 60-64  
                         3= 55-59  
                         4= 50-54  
                         5= less than 50
- 7      Years post menopause:    1= 15 or more  
                                 2= 10-14  
                                 3= 5-9  
                                 4= 0-4
- 8      Ethnic Background:    1= Northern European  
                                 2= Other
- 9      Exercise History:    1=    no    previous    regular  
   exercise  
                                 2=    some   previous   regular  
   exercise  
                                 3= regular previous exercise
- 10-14    VO<sub>2</sub> (ml/kg/min) at the beginning of the study
- 15      Calcium intake:      1= less than 800 mg/day  
                                 2= 800 mg/day to 1499 mg/day  
                                 3= 1500 mg/day or more
- 16      Smoking History:      1= yes  
                                 2= no
- 17      Estrogen use:    1= no  
                                 2= off and on  
                                 3= yes
- 18      Menopausal History: 1= surgical induced  
                                 2= natural
- 19      Two year Exercise History:    1= no  
   2= some  
   3= regular





## APPENDIX I

### RAW DATA

## Raw Data

Code	Number	Group	Age	Years Post-M	Ethnic	Exercise Hx	VO2	Calcium 1	Smoking 1	Estrogen Use 1	M-History	Exercise Hx 2	VO2 2	Calcium 2	Smoking 2	Estrogen 2	Total ATPA	Aesthetic	Ascetic	Catharsis	Health & Fitness	Social	Vertigo	# of Risk Factors
0100	2221	307	52	22	23	1309	42	32	23	1953	1253	334	3333	305										
0101	1254	2308	60	22	23	1309	96	22	23	1843	3252	943	3332	14										
0102	2441	305	32	12	12	2307	49	22	21	1652	6223	738	251	75										
0103	2241	105	50	12	22	2311	60	32	23	1932	3354	143	282	36										
0107	1111	1206	67	12	22	2308	26	32	11	1713	5153	347	301	16										
0108	1441	1207	62	22	23	1307	50	22	23	1964	017	306	235	126										
0109	1111	1205	10	11	22	206	30	32	12	1032	2214	353	332	87										
0111	1222	1305	50	12	23	2307	10	22	23	1852	9193	352	351	74										
0112	1411	1105	50	12	22	222	32	21	19	1912	1213	342	51	76										
0117	1221	1107	64	12	22	107	10	22	23	1883	2213	448	302	36										
0119	2331	1107	68	12	23	1308	01	22	23	1933	9212	744	392	36										
0120	2431	1209	27	12	23	2309	73	22	23	2194	1243	558	362	55										
0124	2211	1208	02	22	23	2309	68	22	23	2073	7263	846	352	55										
0126	2411	1208	24	12	11	1207	73	22	23	2084	1222	855	352	77										
0129	2221	1308	70	12	23	2309	79	22	23	1913	4262	649	332	34										
0133	2331	1306	30	12	23	2310	13	32	23	1982	6312	958	371	74										
0135	1221	1104	15	12	12	1105	59	32	22	2264	6244	451	402	16										
0136	1441	1107	22	12	22	2308	72	32	23	2074	0213	251	352	86										
0140	2341	1104	60	12	23	2208	06	12	23	1742	6212	946	322	05										
0142	2421	1207	06	12	12	12309	45	22	11	8229	2225	563	317	6										
0144	1441	1207	66	22	22	2207	52	22	23	2013	4173	747	363	06										
0146	1331	1307	34	22	23	2307	93	22	23	1862	9203	652	351	44										
0147	1331	1208	99	12	12	2209	68	32	23	2104	0263	053	352	66										
0148	1521	1108	26	12	23	1107	14	22	23	1572	4193	042	281	46										
0149	2521	3	22	23	13	2231	22	31	1862	4223	550	302	55											
0152	2122	305	98	12	12	12308	45	22	11	4429	1130	302	71	74										
0153	1331	1307	04	22	12	12307	33	32	11	1773	4203	342	231	175										
0154	1331	1108	40	12	12	12107	58	32	11	1913	8213	049	361	76										
0155	2441	1309	97	22	12	2310	25	32	11	1952	6292	949	342	85										
0156	1441	1308	65	22	12	2308	56	32	23	2223	7264	057	352	75										
0159	1111	1	12	32	21	3231	17	13	71	5371	5354	323	185											
0161	1541	1307	3																					
0162	2221	1305	91	11	13	2307	10	32	23	1633	1202	241	138	15										
0164	2111	1108	84	12	11	1208	60	12	11	1903	1292	842	233	277										
0165	1431	1108	00	21	32	1108	26	31	13	1853	2229	244	434	226										
0169	1211	1207	40	22	21	1309	12	32	23	2023	3623	324	935	277										
0170	2441	1307	47	22	12	2309	52	32	23	1894	0123	449	401	45										
0172	2331	1307	84	12	31	3																		
0173	1522	1106	82	12	21	1206	75	22	23	1852	423	365	42	72	16									
0175	1341	1108	95	22	12	1107	55	32	11	1592	7192	538	282	26										
0176	1441	1106	17	12	12	1107	33	32	23	2733	3304	353	443	46										

01771411107.661221109.453211853922264230267  
 01791221208.201222209.792212072824345542246  
 01832221308.681232309.433231953323365928164  
 01851431108.181231107.703231743223314331146  
 01861331308.5122123 3211112512162818125  
 01872441106.812232308.153221713613304425235  
 019012412 11222 3131773314304623317  
 01921441108.652222109.352231883522304735196  
 01931541107.331231108.352231933525324233266  
 01951441107.281232109.131231893625354038155  
 01991531208.3322213 2212093130365137247  
 020215111 12111 3221753918304228187  
 02031521107.482231107.043231973828314631236  
 020511112 22312 3232404527486244146  
 36772221307.001222308.452232023326285238255  
 36782321207.612231311.353231903129284233276  
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