

ISOTONIC RESISTANCE TRAINING RELATED  
TO FUNCTIONAL FITNESS, PHYSICAL  
SELF-EFFICACY, AND DEPRESSION  
IN ADULTS AGES 65-85

By

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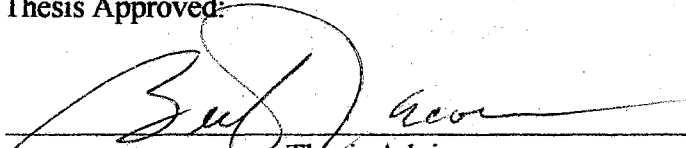
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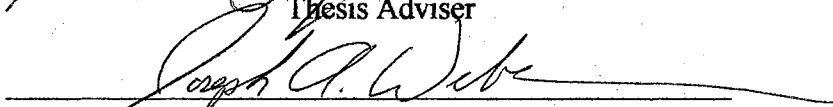
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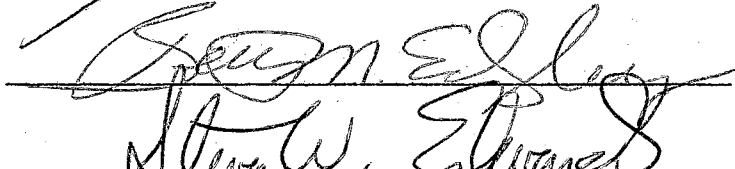
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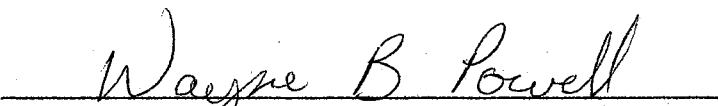
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## CHAPTER I

### INTRODUCTION

Since the nineteenth century, life expectancy has increased dramatically in developed countries. Currently, the American population is growing older and will continue to age as life expectancy further expands. For example, the population of persons aged 65 years and older currently numbers about 31 million, representing 12% of the total U.S. population and is expected to approach 60 million and become 20% of the population by 2025 (Dipietro, 1996). Older adults over the age of 80 years constitute the fastest growing segment of the national population. Between 1950 and 1980 the population of the very elderly (80 + years of age) increased by 281% (Gilford, 1988). The continuing growth of this segment of the population is projected to increase from 2 million in 1980 to 16 million by the year 2050 (Gilford, 1988). The unprecedented changes that are occurring in the older adult population will continue to increase interest in how to maintain quality of life and autonomy into and throughout the "golden years". The paramount issues of aging extend far beyond merely adding "years to life," but rather now must emphasize the importance of adding "life to years" or in other words improving the quality of life. The term quality has been defined as "degree of excellence" or "superiority in kind" and offers the words "property," "character," and "attribute" as synonyms (Katz, 1987). As people age they usually want to remain

independent, retain physical abilities, and continue free from becoming a burden on friends, the community and especially family members. An important factor enabling a person to maintain an independent, active, and productive lifestyle is "functional health." Generally speaking, functional health is the ability of an individual to carry out activities that are related to "normal" levels of functioning. Often functional health refers to carrying out basic functions such as normal activities of daily living (NADL's) related to personal, home, and community well-being.

Gilford, (1988) suggests that many older adults are characterized by greater fragility of bony structures, decreasing vision, declining physical strength, and insufficient balance which contributes not only to an increased risk of falls but resultant greater severity of injuries (fractures), more depression and dementia, forecasting an imminent need for acute and long-term health care services. Disability among the elderly certainly is not a new problem. Since the 1975 report of the U.S. Federal Commission on Chronic Illness, physical disability among the elderly has received increasing public and professional attention. The commission estimates a rate of 4,402 chronic diseases per 1,000 persons 65 years of age and older, compared with a prevalence of 407 chronic diseases per 1,000 persons under 16 years of age (Jette & Branch, 1981). The high prevalence of chronic conditions and associated expenses in the elderly coupled with the dramatic shift occurring in the age structure of American society accounts for an increasing concern about disability among the elderly as a major health consideration.

The onset and severity of many chronic and acute diseases in the elderly is generally attributed to one of two causes: primary aging (senescence), or secondary aging

(senility). Primary aging is a biological process which produces time-related changes in the human organism. These changes are heavily rooted in heredity, are inevitably detrimental, and occur independently of acquired disease, stress or trauma. Primary aging has traditionally been called "normal aging" or "universal aging."

Secondary aging refers to defects or disabilities which are the result of environmental factors. The human organism is subjected to forces from the general environment (such as those within a certain geographic location or workplace), as well as those personally inflicted by individual choice relative to behavior or lifestyle. Examples of environmental stressors which contribute to secondary aging are cigarette smoking, poor diet, air pollution, and lack of physical activity. Often, conditions which are labeled as "age related," (i.e. coronary artery disease, osteoporosis), result from a combination of primary and secondary factors (Blazer, 1990). Since secondary aging is largely a result of environmental factors, it stands to reason that these conditions can be controlled or managed. The most effective way to prevent secondary aging is to modify negative health behaviors and attempt to improve personal health. The prevention of chronic illness and improvement in personal health involves effort. For many young and old persons the benefits seem too far removed and the cost too great to make positive lifestyle changes. However, the causes, symptoms and treatments of chronic and acute illness in the elderly has profound implications for all sectors of society and more emphasis needs placed in the development of positive health promotion programs.

A unique feature of gerontological study is that the aging process is an extremely personalized endeavor. There is a great deal of heterogeneity within the older

population. In fact, some feel that “elderly persons are the most heterogeneous of any age spectrum with regard to characteristics” (Dannefer, 1988). Health, particularly in this age group, is multidimensional. It involves physical and mental health, the capacity for performing the normal ADL’s, and the social, economic, and environmental resources needed to maintain an independent lifestyle outside health care facilities (Kane & Kane, 1987).

The term “Health Promotion” defined by (O’Donnell, 1994) states:

“Health promotion is the science and art of helping people change their lifestyle to move toward a state of optimal health. Optimal health is defined as a balance of physical, emotional, social spiritual, and intellectual health. Lifestyle changes can be facilitated through a combination of efforts to enhance awareness, change behavior, and create environments that support good health practices.”

The emphasis placed on the dimensions of optimal health (physical, emotional, social, spiritual, and intellectual) is important to this investigation because as previously mentioned, health for older adults is multidimensional and a personal endeavor. Consequently, as adults grow older, their definition of health broadens to encompass more than just a physical health state. Health becomes more functional and includes the abilities older persons need to maintain their lifestyle and independence through the performance of everyday activities (DiCicco & Apple, 1968) appropriate for their age and gender (Patrick, Bush & Chen, 1973).

The dimensions of optimal health are described below because the purpose of the investigation is twofold: 1) to provide older adults an opportunity to participate in a health promotion program potentially supporting them in many if not all of the

dimensions of optimal health, and 2) more specifically to assess the relationship between isotonic resistance training and the physical, psychological, and functional characteristics of the participants prior to during and after a ten week resistance training intervention.

There are many different dimensions of optimal health including those previously listed and others such as the cultural, occupational, vocational, community and environmental aspects. Five dimensions are discussed in this study based on past theoretical support and the quality of empirical evidence supporting each. All five dimensions are described below to illustrate why they are important to the study and how they are associated with health promotion.

### **Physical Health**

Physical well-being includes being physically fit, eating nutritiously, being free from chemical dependency and other harmful behaviors, being aware of early symptoms of sickness, getting adequate sleep and rest, and preventing accidents (Seiger, Vanderpool & Barnes, 1995). In addition, Adams, Bezner & Steinhardt, (1997) define physical wellness as a positive perception and expectation of physical health.

### **Emotional Health**

Emotional health is a dynamic process that can change from day to day. All people have their good days and their bad days and no one has total control over their emotional states (joy, sadness, anger, fear, anxiety, shyness, loneliness, and minor depression). However, emotionally healthy people have balance among their emotions



and know when to express them appropriately and comfortably. Emotionally healthy people have learned to adjust and cope successfully with stress and their personal problems (Seiger, Vanderpool & Barnes, 1995).

### **Social Health**

Social health means having satisfying relationships and interacting well with others. The idea of being socially well suggests having a network of family members, friends, and others who can be called upon during times of need. This concept also recommends establishing a sense of belonging within a community (Seiger, Vanderpool & Barnes, 1995).

### **Spiritual Health**

Spiritual health is a personal endeavor which provides meaning and purpose in life. It can be described as beliefs, values, faith, creed, principles, morals, or ethics. It is knowing the purpose in life and being more comfortable expressing love, joy, peace, and fulfillment. It includes helping oneself and others achieve maximum potential (Seiger, Vanderpool & Barnes, 1995).

### **Intellectual Health**

Intellectual health includes the ability of a person to think and be a problem solver; process information; question and evaluate; learn from life experiences; and be flexible, creative and open to new ideas (Seiger, Vanderpool & Barnes, 1995).

Intellectual wellness has also been defined as the perception of being internally energized by an optimal amount of intellectually stimulating activity (Adams, Bezner & Steinhardt, 1997).

It has been proven in numerous studies (Fylkesnes & Forde, 1991; Manning & Fullerton, 1988; Adams, Bezner & Steinhardt, 1995) that positive correlations exist between exercise and the development of these dimensions of optimal health. However, the majority of the research discusses the effect physical activity and cardiovascular exercise (i.e. jogging, walking, swimming and bicycling) have on these dimensions. There is evidence that resistance training contributes significantly to the development of the physical dimension of optimal health, but there are limited data suggesting a relationship between muscular strength development and the emotional, social or intellectual dimensions of optimal health especially in older adults. Currently, research involving resistance training is becoming more recognized, advanced, and thoroughly investigated. This research study provided an opportunity to explore the effect isotonic resistance training had on the physical, psychological, and functional aspects of health in an elderly population.

Resistance training (strength training) has become a popular activity for people of different gender, race, socioeconomic status, educational level, and more recently age. Many people are becoming more aware of their health and well-being thus they engage in resistance training to look and feel better. Today's resistance trainers are generally classified into seven categories:

Power lifters are generally interested in developing raw strength to compete in power lifting contests. They generally compete in only three events-the squat, bench press, and dead lift. Power lifters use extremely heavy weight to develop strength.

Competitive weight lifters are usually athletes interested in developing two lifts used in Olympic competition, the two handed snatch and the two handed clean and jerk. Their exercise routines vary in repetitions, sets, and intensity.

Many athletes participate in resistance training to improve sport performance and develop general all-around strength. Athletes often exercise specific muscles which enhance their athletic abilities. Resistance training programs for athletes vary tremendously, however, many athletes and coaches prefer to perform heavy resistance training in the "off season" to develop strength, and perform light resistance training during the season to maintain strength.

Body builders are generally most interested in developing their physique through tremendous musculature and/or great definition. Their exercise routines vary immensely, however, they generally train the entire body by doing repeated sets of a particular exercise.

Many men and women fit none of the above classifications. In regards to resistance training the average person varies from recreational sporting participants to individuals who are interested in losing weight (body fat) and firming their muscles. Many would like to become stronger but generally do not care to become heavily muscled. Some would like to improve muscles which have been injured. A resistance

training program for the average person may vary in number of sets, repetitions, and intensity levels.

The disparity in physical capabilities of older adults is vast. Some older adults are more capable of participating in recreational sporting activities or normal daily activities than the average person. However, others have significant difficulties functioning physically on a daily basis. Both of these groups may be capable of benefiting from a properly designed resistance training program.

When participating in exercise (specifically resistance training) safety should be of ultimate importance. When older adults participate in resistance training the safety factor should be even greater due to possible inadequate knowledge and experience in resistance training, limited physical capabilities, and insufficient balance. The variation in resistance training programs for older adults is limitless. Some programs are aimed at assisting individuals in maintaining physical strength through high repetitions, few sets, and moderate intensity. While other programs are developed to assist individuals in daily activities such as standing, bending, and lifting. These programs begin slowly with limited repetitions, sets, and low intensity. There is one basic reason why physicians permit resistance training for older participants. From a medical standpoint, it is to restore strength in an individual and assist in providing that person an opportunity to physically function as well as possible. Depending on a specific injury, age of the participant, prior fitness level, and other factors, the number of repetitions, sets, and intensity for the program is determined.

The interest of this investigation concerns strength development among older adults. This classification of individuals need further examining in regard to resistance training exercise. Studies dealing with aging individuals and resistance training exercise confirm that strength does increase in older adult populations with properly implemented exercise programs (Rogers & Evans, 1993; Fiatarone, Marks, Ryan, Meredith, Lipsitz, & Evans, 1990). Furthermore, many other related studies show significant increases in muscle strength and endurance due to resistance training (Brown, McCartney, & Sale, 1990; Grimby, Aniansson, Hedberg, Henning, Grangard, & Kvist, 1992; Pyka, Lindenberger, Charette, & Marcus, 1994).

Strength gains normally occur through inducement of tension on skeletal muscle. This inducement of tension must be greater than the normal daily-incurred stress in order to increase strength (Rasch & Burke, 1978). This higher level of stress is commonly referred to as the "overload principle," and is the universally accepted method for muscle strength development (Walters, 1958).

The overload principle may take the form of any of three basic resistance training applications: isometric, isotonic, or isokinetic. All of these modes have been proven to increase strength, but the most accepted method, due to its versatility and high rate of strength increases in trainees, is the isotonic mode of training (Allen, 1976). Numerous research investigations support the fact that isotonic resistance training exercise significantly increases muscular strength (Frontera, Meredith, O'Reilly, Knuttgen, & Evans, 1988; Charette, McEvoy, Pyka, Snow-Harter, Guido, Wiswell, & Marcus, 1991).

Thus, isotonic resistance training was implemented as the method of exercise for older adults in this study.

### **Justification of the Study**

This study explored the effect isotonic resistance training had on specific physical, psychological, and functional characteristic in older adults. This investigation helped to determine the effects physical strength has on both the body and mind. Additional knowledge related to increasing physical strength in the elderly could play a significant role in helping older adults live more productive, meaningful, and fulfilling lives. Not only could such information be helpful to older individuals, but exercise physiologist, health promotion specialist, gerontologist, and psychologist may all benefit from the findings.

### **Statement of the Problem**

The primary objective of this study was to determine if a 10 week isotonic resistance training program would significantly affect voluntary muscular strength, functional fitness, physical self-efficacy, and depression in adults ages 65-85. More accurately, the intent was to compare mean scores of voluntary muscular strength and mean scores of functional fitness, physical self-efficacy, and depression at the pre-test, mid-test, and post-test data points to determine any significant differences between an experimental and a control group.

## **Delimitations**

The delimitations for this study were as follows:

1. This study was delimited to 39 volunteer citizens ranging in age from 65 to 85 within the community of Stillwater, Oklahoma.
2. This study was delimited to three 50 minute training sessions per week for 10 weeks between March and May, 1997.
3. The participants were randomly assigned to one of two groups as follows: Resistance Training Exercise Group; Control Group.
4. All participants were assessed for strength, functional fitness, physical self-efficacy and depression three times throughout the study.
5. Experimental participants attempted to perform two sets of ten repetitions with approximately ninety seconds between sets on eight different exercises.

## **Limitations**

The limitations for this study were as follows:

1. No attempt was made to control the socializing between participants during the isotonic resistance training exercise sessions.
2. No attempt was made to control the diet of the participants during the intervention period.
3. No attempt was made to control the amount of rest the participants obtained during the intervention and testing periods.

4. Daily activities of the participants other than the resistance training exercise were not controlled.
5. Participants were volunteers from the Stillwater community and were enthusiastic about beginning a resistance training program.
6. Attendance and adherence were uncontrolled factors which could potentially influence the results of the investigation.
7. The relatively small sample size (39 participants) could limit the generalizability of the results.
8. Exercise intensity and proper training technique could not be completely controlled for participants receiving the intervention.

### **Assumptions**

The following assumptions were made for this study:

1. The control participants would maintain present activity status and not participate in any resistance training exercise.
2. The experimental participants would maintain present activity status with the exception of the provided resistance training intervention.
3. All participants would exert maximum effort with concern to safety and technique on all physical, psychological, and functional assessments.
4. The experimental participants would exert maximum effort with concern to safety and technique during all resistance training sessions.



5. The participants would maintain sufficient motivation in an attempt to improve their strength and functional fitness during the assessment periods.
6. The experimental participants would maintain sufficient motivation in an attempt to improve their strength during exercise sessions.

### **Hypotheses**

The hypotheses for this study were as follows:

1. There will be no significant difference between the experimental and control group on mean strength scores for the bench press before and after the treatment.
2. There will be no significant difference between the experimental and control group on mean strength scores for the latissimus dorsi pulldown before and after the treatment.
3. There will be no significant difference between the experimental and control group on mean strength scores for the seated leg press before and after the treatment.
4. There will be no significant difference between the experimental and control group on mean agility/dynamic balance scores before and after the treatment.

5. There will be no significant difference between the experimental and control group on mean eye-hand coordination scores before and after the treatment.
6. There will be no significant difference between the experimental and control group on mean upper arm strength/endurance scores before and after the treatment.
7. There will be no significant difference between the experimental and control group on mean grip strength scores before and after the treatment.
8. There will be no significant difference between the experimental and control group on overall Physical Self-Efficacy Scale scores before and after the treatment.
9. There will be no significant difference between the experimental and control group on Perceived Physical Ability scores before and after the treatment.
10. There will be no significant difference between the experimental and control group on Physical Self-Presentation Confidence scores before and after the treatment.
11. There will be no significant difference between the experimental and control group on Geriatric Depression Scale scores before and after the treatment.

## Definition of Terms

The following conceptual definitions and terms are used in this study:

1. Functional Fitness is one's ability to successfully carry out specific, fundamental activities of daily living such as light housekeeping, food preparation, grocery shopping, and hobbies.
2. ADL's Activities of Daily Living) refers to normal daily tasks that are basic to surviving independently such as eating, drinking, toileting, dressing, and bathing.
3. Contraction occurs when tension exists within a muscle. It does not imply that any visible shortening or lengthening of the muscle takes place.
4. Concentric contraction occurs in rhythmic activities in which the muscle shortens as it develops tension.
5. Eccentric contraction occurs when external resistance exceeds muscle force and the muscle lengthens while developing tension.

### Contractions with Relationship to Joint Movement

1. Isometric contraction occurs when a muscle attempts to shorten throughout a range of motion but is unable to overcome resistance.
2. Isotonic contraction occurs when a muscle equally shortens and lengthens throughout the concentric and eccentric contraction phases.
3. Isokinetic contraction occurs when muscle tension generates force during movement at a preset, fixed speed. This enables the muscle to mobilize its maximum force generating capacity throughout a full range of motion.

4. Extension refers to the unfolding of a body part or increasing the angle of the joint.
5. Flexion refers to two body parts connected at a joint angle being brought closer together thus decreasing the joint angle.
6. Progressive Resistance Training refers to an exercise training program designed to develop muscular strength by progressively increasing the weight load (amount of weight) being lifted.
7. Repetition refers to one complete cycle of a resistance training exercise from the starting position, through the sequence of movements, and back to the initial position.
8. Set refers to the total number of repetitions performed through continuous movement.
9. Intensity refers to the amount of stress placed upon a particular muscle or muscle group which if adapted properly will assist in developing stronger and larger muscles.

### **Musculature with Relationship to Development**

1. Hypertrophy refers to an increase in skeletal muscle size (muscle cells) due to an increase in weight load throughout strength training.
2. Latissimus dorsi is the triangular shaped muscle that curves upward from the lower back, around the side, and up to the armpit. It is responsible for pulling the arms backward, forward, upward, and downward.

3. Pectoralis Muscle Group includes the Pectoralis major and Pectoralis minor, both of which are responsible for raising the intercostals to aid inhalation. The Pectoralis major is primarily responsible for pulling the upper arm forward and across the chest.

4. Quadricep Muscle Group includes the Vastus medialis, Vastus lateralis, Vastus intermedius, and the Rectus femoris, all of which are primarily responsible for extending the knee.

5. Hamstring Muscle Group includes the Bicep femoris, Semitendinosus, Semimembranosus, and Sartorius, all of which are responsible for flexing the leg.

## **CHAPTER II**

### **LITERATURE REVIEW**

Age related decreases in muscle strength and mass have frequently been observed in humans (Clarkson, Kroll, & Melchionda, 1981; Gutmann & Hanzlikova, 1976; Larsson & Karlsson, 1978; Larsson, Sjodin, & Karlsson, 1978). The American College of Sports Medicine (ACSM) suggests that muscle mass may decrease by 30% between the ages of 30 and 70. This decline in muscle mass with aging is associated with declines in muscular strength (Kallman, Plato, & Tobin, 1990), metabolic function (Bloesch, Schultz, Breitenstein, Jequier, & Felber, 1988; Tzankoff, & Norris, 1977), and cardiovascular function (Fleg & Lakatta, 1991). The reduced muscle strength of the elderly has been attributed to aging itself and to lower levels of physical activity that produces a decline in muscle function (Haskell, 1985). Loss of strength may have a direct effect on the capacity of elderly women and men to maintain personal independence. Currently, only one in four older persons exercises regularly and maintains a level of activity recommended by specialists on aging (Rocca, 1991). Within this ratio, strength training is quite often not performed by these individuals, resulting in musculoskeletal decline.

In the United States, surveys have shown that after the age of 74, 28 % of men and 66 % of women cannot lift objects weighing greater than 4.5 kg (Jette & Branch,

1981). In the very old, a prime determinant for admission to a care giving institution is the inability to complete simple activities of daily living (Hamdorf, Withers, Penhall, & Haslam, 1992; Shephard, 1990). A growing body of evidence indicates that this decline in muscular strength and resultant decrease in functional ability is largely due to physical inactivity (Haskell, 1985; Rogers, & Evans, 1993; Stamford, 1973; Wagner, LaCroix, Buchner, & Larson, 1992). Thus, physical activity is an important component in maintaining independent living since such activity demands continuous muscular movement. In addition, by the year 2030, unless some major improvements are made in the disabling rates of the elderly, 14 million adults will not be able to conduct their daily activities independently (Zedlewski, Barnes, Burt, McBride, & Meyer, 1990).

### **Muscular Strength in Older Adults**

Recent studies indicate that older individuals can increase their muscle mass with resistance training (Brown, McCartney, & Sale, 1990; Fiatarone et al., 1990; Fiatarone, O'Neill, Ryan, Clements, Solares, Nelson, Roberts, Kehayias, Lipsitz, & Evans, 1994; Frontera, Meredith, O'Reilly, Knuttgen, & Evans, 1988; Nelson, Fiatarone, Morganti, Trice, Greengerg, & Evans, 1994; Nichols, Omizo, Peterson, & Nelson, 1993; Pyka, Lindenberg, Charette, & Marcus, 1994; Sipila & Syominen, 1995). These studies have provided significant data regarding the effects of resistance training on muscle mass and strength gains in our older population. Studies by (Grimby et al., 1992; Frontera et al., 1988; Fiatarone et al., 1994) have looked at the effects of resistance training on the strength and muscle mass in older men and women and reported significant gains in both

quadricep strength and midthigh regional muscle mass among their subjects when introduced to a resistance training protocol. There is also evidence that even the very old/frail can realize the positive benefits of strength training. In fact, high intensity resistance training is capable of inducing dramatic increases in muscle strength in frail men and women up to 96 years of age (Fiatarone et al., 1994). Exercise, particularly resistance training exercise, has also been shown to increase reaction time and kinesthetic balance (Vanfraechem & Vanfraechem, 1977). Additional studies (DiPietro, Caspersen, Ostfeld, & Nadel, 1993; & Carter, Williams, & Macera, 1993) have proven not only the positive benefits related to muscular strength and muscular mass regarding resistance training, but also the positive outcomes associated with physical functional abilities in older adults.

### **Functional Abilities Throughout Aging**

In recent years, there has been a growing interest among behavioral scientists, gerontologists, and other health professionals involving physical functional abilities throughout the aging process. The focus on physical functioning is in part attributable to an increasing awareness that many older persons judge their quality of life in terms of their ability to carry out everyday activities independently and effectively (Katz, 1987). Physical functional abilities, as defined by a number of investigators, include physiological and neuromuscular capacities (Carter et al., 1993). Common physiological capacities associated with physical functional ability include muscle strength, muscle endurance, flexibility, cardiorespiratory endurance, and body composition. Typical



neuromuscular capacities important to physical functional ability include balance/posture, body mobility/agility, manual dexterity, speed of movement, and reactive capacity (Bouchard, Sheppard, Stephens, Sutton, & McPherson, 1990; Corbin & Lindsey, 1991; Pate, 1988).

Aging of physiological dimensions is characterized by functional declines in work capacity, strength and endurance, muscle mass, flexibility, bone mineral density loss, and cardiac output (Gorman & Posner, 1988; Osness, 1986; Smith & Zook, 1975). Such functional declines have been shown to be more rapid and significant in sedentary elders compared to active older individuals. Clearly, much of the deterioration in physiological dimensions that occurs with age are preventable; exercise is known to preserve a number of physiological responses in the elderly (Barrow & Smith, 1983; Thompson, Crist, Marsh, & Rosenthal, 1988). (Osness, 1986; Rousseau, 1989; Smith & Zook, 1975; Spirduso, 1975, 1980) testify that neuromuscular capacities also clearly deteriorate with age, however, little is known about the relationship between physical activity habits and functional neuromuscular abilities in aging individuals (Carter et al., 1993).

Although physical functioning of the elderly is a significant concern to most aging individuals and has substantial implications associated with personal independence, people in this age group generally receive little attention until they become dysfunctional and require personal care. Individuals who become dysfunctional and require more care may often lose perceived self-confidence and develop a belief that their physical task performance has been significantly decreased.

## **Theory of Self-Efficacy**

Self-efficacy is a theory of behavior change developed by Albert Bandura in 1977. Self-efficacy is one's belief regarding his or her ability to perform a particular behavior and the belief that if the behavior is performed, it will lead to the anticipated outcome. This belief affects whether individuals will initiate a specific behavior and how long they will persist in their attempts to achieve that behavior (Desmond & Price, 1988). Bandura's self-efficacy theory is a social cognitive model of behavioral causation which proposes that behavior, physiological and cognitive factors, and environmental influences all function as interacting determinants of one another (Bandura, 1986). Efficacy cognitions are directly relevant to the particular behavior of concern and are therefore subject to change as a function of environmental stimuli (McAuley, 1993). That is, positive mastery experiences are likely to facilitate increases in personal efficacy, whereas failures are likely to result in debilitated perceptions of personal capabilities (McAuley, 1993). Self-efficacy cognitions have consistently been shown to be important determinants of physical activity and exercise behavior as well as social, clinical and health related behaviors (Bandura, 1986; O'Leary, 1985; McAuley, 1993). It is important to realize that self-efficacy is not concerned with the skills an individual has but, instead, with the judgments of what that individual can do with the skills he or she possesses (McAuley, 1993).

Efficacy expectations and outcome expectations are two components of Bandura's self-efficacy theory. Self-efficacy expectations are the individual's belief in his/her capabilities to execute necessary courses of action to satisfy situation demands

and are theorized to influence the activities that individuals choose to approach, the effort expended on such activities, and the degree of persistence demonstrated in the face of failure or aversive stimuli (Bandura, 1986). An outcome expectation is the belief that a given behavior will more likely occur if the outcome is highly valued. According to McAuley (1993), the following narrative emphasizes this point. In testing the physical functioning of elderly patients diagnosed with osteoarthritis of the knee, a health promotion professional asked the patient who had difficulty walking whether or not he could climb a short flight of stairs. The patient responded positively and, with great difficulty and a few near falls, climbed up and down the stairs twice. For many individuals of similar condition, such a feat would not be perceived as possible. Even when skills are limited, however, belief and a high sense of self-efficacy can allow one to accomplish objectives that do not appear physically conceivable. On the otherhand, low self-efficacious individuals tend to give up, attribute failure internally and experience greater anxiety or depression (Bandura, 1982).

Bandura and his associates have demonstrated that peoples' self-efficacy experiences have important effects on their thought patterns, the emotional arousal they experience, and their behavior (Bandura, 1977; Bandura, Adams, Hardy, & Howells, 1980; Bandura & Schunk, 1981). They have determined that self-efficacious behavior occurs in a variety of components. Specifically, they maintain that strong perceived self-efficacy is based upon the gradual acquisition of complex social, cognitive, linguistic and physical skills through personal or socially mediated experiences (Ryckman, Robbins, Thornton, & Cantrell 1982). Many current self theories, however, fail to examine these

self-efficacy components individually and utilize instead only global measures of self-concept to predict performance across situations (Rogers, 1959; Wylie, 1974). Finally, construction of the Physical Self-Efficacy (PSE) Scale was prompted by the fact that existing measures are primarily oriented toward assessment of attitudes regarding body appearance and do not measure individual differences in perceived physical competence directly-nor do they pay any attention to individuals' feelings of confidence in displaying these skills in the presence of others (Wylie, 1974).

Physical self-efficacy is a relatively new measure of self concept developed and validated by (Ryckman et al., 1982). The scale consists of two subdimensions of perceived physical competence: Perceived Physical Ability (PPA) and Physical Self-Presentation Confidence (PSPC). These two subdimensions measure (a) individuals' generalized expectancies concerning their perceived competence in performing tasks involving the use of physical skills, and (b) their level of confidence in displaying these skills and having them evaluated by others. (Ryckman et al., 1982) showed that persons perceiving themselves as skillful had higher self-esteem, an internal locus of control, a lack of social anxiety and self-consciousness, and a tendency to engage in adventurous physical activities as well as disinhibiting sexual experiences.

Based on Bandura's theory (1977) of self-efficacy, this type of instrument could have potential value in assisting physical educators in developing adapted programs for persons who have experienced a significant loss of perceived physical efficacy (Ryckman, et al., 1982). The sense of loss of self-efficacy may also be characteristic of older individuals, and the (PSE) scale may provide a method to detect this disability.

## **Depression the State of Sadness**

As previously discussed, evidence suggests that habitual physical activity can positively influence a broad range of health conditions both physiological and psychological. Physical activity and fitness have been linked to risk or symptom reduction in coronary heart disease, cancer, and osteoporosis (Bouchard, Shephard, Stevens, Sutton & McPherson, 1990); all causing mortality, (Blair, Kohl, Paffenbarger, Clark, Cooper & Gibbons, 1989); anxiety, (Petruzzello, Landers, Hatfield, Kubitz & Salazar, 1991); and depression (Camacho, Roberts, Lazarus, Kaplan & Cohen, 1991).

Depression is a state of extreme sadness that is generally accompanied by lethargy and slow thinking, but sometimes may be characterized by restless agitation (Carlson, 1990). Depressive illnesses have been identified as the most prevalent and important mental health problem of later life (Cohen, 1990; Zarit & Zarit, 1984). In an epidemiological study of depression in an elderly community population, 19% were reported to suffer from mild dysphoria, and 8% were more severely depressed (Blazer, Hughes & George, 1987). In addition, among persons in another community, between 1% and 2% suffered major or clinical depression. Dysthmic disorder, a more chronic and milder form of depression, was found among an additional 2%. Individuals suffering significant depressive symptoms secondary to adjustment (often adjustment to physical illness) made up an additional 4% to 8% (Blazer, 1990).

Most attention has been focused on community-dwelling elderly, who tend to be healthier, more functional, and less cognitively impaired than older adults residing in nursing homes. However one study identified 10.5% of nursing home residents suffering

from diagnostically classified forms of depression and an additional 16.5% exhibiting depressive symptomology (Parmelee, Katz, & Lawton, 1989). Another research investigation indicated, among the medically ill and persons in long-term care facilities, clinical depression found in about 12% to 16% of the individuals, with an additional 20% to 30% suffering appreciable depressive symptoms (Blazer, 1990).

Older adults may be exposed to many stressors in life such as loss of status due to retirement, loss of relatives and friends through death, and loss of independence through declining physical health and poorer cognitive functioning. Depression can follow these losses. However, exercise has been found to be an effective treatment for depression in a variety of populations, including elderly persons (Doyne, Ossip-Klein, Bowman, Osborn, McDougal-Wilson, & Neimayer, 1987; Perri & Templer, 1984-1985). Exercise has long been proposed as therapy for depression and in some cases plays a significant role in intervention treatment. Chodzko-Zajko and Ismail (1986) found that depression, measured by the Minnesota Multiphasic Personality Inventory (MMPI), was a powerful discriminator between men ages 27 to 64 who were low in physical fitness and those who were high in physical fitness. Of the 11 psychological variables and the score from the (MMPI), the depression subscale score was second only to blood pressure in the ability to discriminate between these two groups differing in fitness. Also in a study of older adults (60-80 years), 70% of those in an exercise program that met twice a week for nine months reported less depression than they had before they started the program (Uson & Larrosa, 1982). In another study of moderately depressed older adults (mean age 72.5 years), McNeil, LeBlanc, & Joyner (1991) found that exercise and social contact groups,

compared to a wait-listed control group, experienced significant reductions in depression, measured by the Becks Depression Inventory (Beck & Beamesderfer, 1974). Although, the social contact group showed equal reductions in total and psychological depression, only the exercise group experienced decreased somatic symptoms of depression such as poor appetite, increased fatigue, and disturbed sleep (Spirduso, 1995). In the King, Taylor, & Haskel study (1993), the Beck Depression Inventory scores improved after one year of exercise, whether the exercise was of moderate intensity (63%-70% of peak exercise heart rate) or of higher intensity (73%-88% of peak exercise heart rate), or whether the exercise was done three times a week for 1 hour, or five times a week for 30 minutes.

The majority of studies related to exercise and depression involve aerobic exercise intervention. Anaerobic exercise intervention or more specifically resistance strength training exercise has not been thoroughly investigated. However, the results of therapeutic exercise programs for clinically depressed individuals have generally been beneficial (Bennett, Carmack, & Gardner, 1982; Griest, Klein, Eischens, Faris, Gurman, & Morgan, 1979; McCann & Holmes, 1984).

### **Summary**

After a thorough review of the literature, an apparent need to implement quality resistance training programs for our older population appears warranted. The literature indicates benefits both physically and mentally as a result of resistance training, however, there is limited information regarding the results of resistance training on physical self-efficacy, functional fitness, and depression in our older adult cohort. As life expectancy

and life span rates both continue to increase in human beings, the issue of quality versus quantity of life persists. The term quantity refers to (how long) a person may exist. The word quality refers to (how satisfying) a person may live. The quality of life in older adults, particularly frail individuals, is affected by 11 major factors: health status, physical function, energy and vitality, cognitive and emotional function, life satisfaction and feeling of well-being, sexual function, social function, recreation, and economic status (Spiriduso, 1995). Most of these factors highly interact with each other (Spiriduso, 1995). The particular interest in this study is to determine whether the contribution of resistance training will positively affect the physical, psychological, and functional characteristics of older adults.



## **CHAPTER III**

### **METHODS AND PROCEDURES**

This chapter provides a description of the methods utilized to investigate the effect of isotonic resistance training on functional fitness, physical self-efficacy, and depression in adults ages 65-85. The study entailed selecting participants, randomly assigning them to either an experimental or control group, developing a resistance training protocol, operating and conducting measurement instruments to assess performance, statistically analyzing resultant data, and interpreting the data for dissemination.

#### **Selection of Participants**

The study was conducted during the spring semester 1997. The participants in this investigation comprised a convenience sample of older adults from a midwestern town of approximately 60,000 citizens. The participants' introductory packet can be seen in Appendix A. The participants of the study included community residents and University Emeriti Faculty. The (39) volunteering individuals ranged in age from 65 to 85 years, had little or no previous resistance training experience, and were willing to abide by the provisions of the experiment. The provisions stated that all participants would: (1) remain in the experiment the full 10 weeks, (2) maintain their present activity

status with the exception of the assigned treatment group, (3) attend a resistance training workshop prior to the experiment, (4) attend resistance training sessions on a consistent basis, (5) attend all assessment sessions, (6) not practice the experimental procedures outside designated sessions, (7) abide by the resistance training protocol, (8) properly demonstrate the training techniques provided by the researcher during the exercise sessions, and (9) cooperate by exerting maximum effort with concern to safety and technique during all training and assessment sessions. All participants received approval by a physician to be eligible for the experiment and signed written consent as authorized by the Institutional Review Board (IRB#: ED-97-051), January 3, 1997. A copy of the IRB is included in Appendix B.

A total of 13 participants comprised the control group: six women and seven men. All of these participants were Caucasian and were between the ages of 65 and 85 years (mean age = 69). The members of the control group ( $n = 13$ ) did not resistance train and agreed not to engage in resistance training exercise during the 10 week experimental period. Pre, mid, and post-assessments for voluntary muscular strength, functional fitness, physical self-efficacy, and depression provided the only measurements of the control group. The original 13 control participants completed the study and were all available for pre, mid, and post assessments.

The experimental group included 27 volunteer participants: 17 women and 10 men. Of this group, 26 were Caucasian and one female was Asian American. They all met the appropriate age criteria between 65 and 85 years (mean age = 71). Data was collected on 26 of the experimental participants although all participants completed the

investigation. The male participant eliminated from data collection was diagnosed with adult onset muscular dystrophy and was regularly absent, therefore his results were not used in the analysis.

### **Measurement Assessments**

All measurements were performed and recorded in a pre, mid, and post assessment format. A data sheet was used to record all measurement scores. The data sheet is included in Appendix C. The pre-assessments were administered prior to the first week of intervention. The mid-assessments were administered during the fifth week of the intervention, and the post-assessments were administered at the end of the tenth week. Pre, mid, and post assessments for functional fitness and depression were administered 48 hours prior to the voluntary muscular strength and physical self-efficacy evaluation. A schedule was constructed to make sure measurements were performed on the appropriate day and at the correct time. A copy of the schedule can be found in Appendix D.

### **Voluntary Muscular Strength**

To establish an introductory resistance training exercise intensity for the three assessment exercises (bench press, latissimus dorsi pull-down and leg press) each participant's strength was carefully determined by evaluating the maximum number of repetitions performed at a pre-determined percentage of their body weight. Men were assessed at 40 % of their body weight on the bench press, 40% of their body weight on

the latissimus dorsi pulldown, and 100% of their body weight on the leg press using a Universal Multi-Station Hercules Gym Machine (model # 078086). Women were assessed at 35%, 35% and 90% of their body weight on the exercises respectively.

Immediately prior to measurement, each participant with the aid of the researcher, was advised to carefully approach the apparatus, and adjust the equipment to personal fit before getting into position to exercise. The researcher then proceeded to explain the exercise assessment instructions. An example of the cues for a female participant executing the bench press assessment are as follows: (1) "The bench press analysis is being administered." (2) "You will carefully be assessed by determining the maximum number of repetitions you can fully complete in a consistent fluid motion." (3) "The weight you will be lifting is 35% of your body weight." (4) "You will perform as many repetitions as possible until you can no longer continue." (5) "After you can no longer complete a full repetition, your strength for the bench press will be determined by the number of repetitions you successfully completed." (6) "You will get one attempt to lift the weight." (7) "Please exert maximum effort with concern to safety and proper exercise technique." (8) "Do you have any questions?" (9) "You may get into position to exercise." (10) "Remember to inhale during the concentric phase and exhale during the eccentric phase." (11) "Are you ready?" (12) "Remember, safety, breathing, and technique." (13) "You may begin."

After each repetition, the participant was evaluated for safety, positioning, and technique. The criterion for a successful exercise repetition consisted of the participant completing the full concentric and eccentric phases of the exercise. If the participant did

not reach full concentric and eccentric phases of the exercise, the attempt was voided and the assessment terminated. In addition, assessments for voluntary muscular strength occurred in a room free from all other participants to alleviate any extraneous distractions.

After each participant completed one exercise evaluation, they were given three minutes to move to the next apparatus for testing. During this time, participant's scores were recorded. As previously mentioned, the order of the exercises consisted of the bench press, latissimus dorsi pull down, and seated leg press.

After each participant completed the entire assessment procedure, he or she was directed into another room for an immediate cool down. During this time, the participant was visually observed by the researcher for any abnormal physical or mental reactions to the testing procedures such as dizziness, nausea, or faintness. The subject was allowed to leave the testing site after 10 minutes if no abnormal reactions occurred.

### **Functional Fitness**

The Functional Fitness Assessment For Adults Over 60 Years (A Field Based Assessment) was used to measure functional fitness. The instrument was developed by a committee within The American Alliance For Health, Physical Education, Recreation and Dance that was appointed by the Council on Aging and Adult Development. Members of the committee were Marlene Adrian, Bruce Clarke, Werner Hoeger, Wayne Osness (Chair), Diane Raab, and Bob Wiswell. The assessment is designed to measure functional performance of individuals without unusual discomfort or liability.

Participants in this investigation were expected to perform at a maximum intensity within the confines of their present physical condition. The instrument was selected because each assessment item relates to the general fitness of elderly individuals and the battery of tests comprises a comprehensive evaluation of physical functionality. The battery of assessments included: (1) body composition, (2) trunk flexibility, (3) agility and dynamic balance, (4) eye-hand coordination, (5) upper-arm strength, and (6) walking endurance. For the purpose of this investigation, only assessments of height and weight, agility and dynamic balance, eye-hand coordination, and upper-arm strength were used. In addition, a dynamometer was utilized to measure grip strength to complete the assessments for functional fitness. Each examination used in this investigation is described below in further detail.

### **Body Composition**

Body composition was measured using the Ponderal Index which involves a relationship between height and weight. The Ponderal Index labels standing height and body weight as subparameters. In this investigation, standing height and body weight were measured using a Detecto-Medic scale (model # 078091). For this measurement, each participant was asked to remove his or her shoes and turn facing the scale with heels placed together. Each participant was then asked to stand erect with head upright and eyes looking forward. With the participant standing as directed, the researcher took the vertical measurement. The score was recorded in feet and inches to the nearest half inch. One measure was taken for each individual.

Body weight was measured using a the Detecto-Medic scale (model # 078091) calibrated in 1/4 pound increments. Each participant was asked to remove his or her shoes and excess clothing prior to being weighed.

The Detecto-Medic scale was placed on a firm, flat, horizontal surface and the researcher checked the scale for accuracy by weighing known loads prior to assessing each person. After the scale was determined stable and accurate, each participant was asked to step onto the scale and stand as motionless as possible. With the participant standing on the scale as directed, the researcher recorded the weight to the nearest 1/2 pound. A single measurement was documented.

After both subparameters were measured for each participant, body composition was determined by placing a straight line from the standing height measurement to the body weight measurement on the Ponderal Index scale. The intersection at the center of the scale provided the reading of Ponderal Index. The higher the Ponderal Index, the greater degree of body leanness.

### **Agility/Dynamic Balance**

Agility and dynamic balance were measured using an evaluation which involves total lower body activity. It encompasses straight ahead movement, change of direction, and change of body position. The assessment closely relates to the functional movement of individuals throughout daily life situations.

The equipment needed for this measurement included a chair (seat height 16"), masking tape, two cones, and a stopwatch. The initial placement of the chair was

marked with the legs taped to the floor. Measuring from the spot on the floor in front of the chair where the feet were placed, the cones were set up 6' to the side and 5' behind the seated participant. The agility/dynamic balance diagram can be seen in Figure 1. The area utilized for the assessment was well illuminated and the floor was level and nonslippery. In addition, arrows made of masking tape were attached to the floor to guide participants in the proper direction.

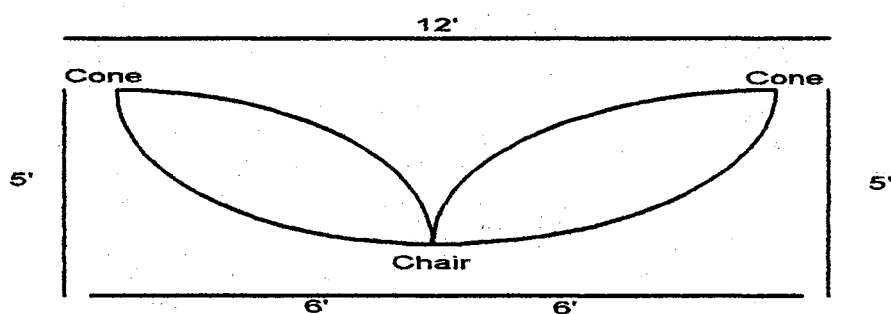


Figure 1. The agility/dynamic balance evaluation (Functional Fitness Assessment For Adults Over 60 Years).

To begin the assessment, the participant was seated with both heels touching the ground. On the signal "Ready, go," the participant rose from the chair, moved toward the right cone going to the inside and around the back of the cone (counterclockwise) and returned to a seated position. After sitting down, the participant raised his or her feet approximately 1" from the floor. Without hesitating, the participant rose, moved toward the left cone going to the inside and around the back of the cone (clockwise) and again returned to the chair completing one circuit. The participant repeated another circuit exactly as the first without hesitation to complete one trial. An entire trial consisted of



circling the cones four times (right, left, right, left). Each participant was directed to go as fast as possible under a controlled and comfortable pace (no running). The researcher emphasized safety consistently throughout the assessment and provided all participants two timed trials. A stopwatch was used to time each trial to the nearest 0.1 second. Each participant was given a 30 second rest between each trial and the fastest trial was recorded.

### **Eye-Hand Coordination**

The “Soda Pop” coordination assessment was used to determine neuromuscular efficiency of the arms and hands. The assessment relates well to daily functions of the arms and concentrates on eye-hand accuracy and quickness.

Three unopened (12 oz.) cans of a soft drink, a stopwatch, a roll of 3/4” masking tape, a table, and a chair were used for the evaluation. Using the 3/4” masking tape, the researcher placed a 30” strip of tape approximately 5” from the edge of the table. For an illustration of the eye-hand coordination evaluation see Figure 2. Measuring in 2 1/2” on both sides of the 30” strip of tape, the researcher placed a 3” strip of tape centered exactly perpendicular to the 30” inch strip of tape every 5”. In total there were six 3” strips of tape placed equally every 5” along the 30” strip of tape with 2 1/2 inches remaining on both sides. For the purpose of this assessment, each “intersection” formed by the crossing of the 3” strips of tape with the 30” strip of tape was assigned a number. The numbers began with one at the far right intersection and continued to six at the far left intersection.

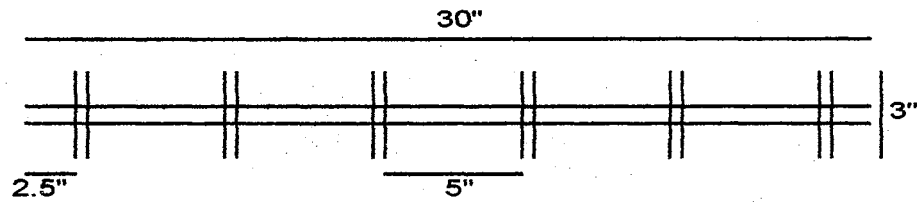


Figure 2. The “Soda Pop” Eye-Hand Coordination Evaluation (Functional Fitness Assessment For Adults Over 60 Years).

To administer the test, the researcher had each participant sit comfortably facing the table. The participant was asked to select a preferred hand to manipulate the cans. If the right hand was selected, the researcher placed one can at intersection one, three, and five. If the left hand was selected, the researcher placed one can at intersection six, four, and two. The assessment began with the participant placing his or her preferred hand on the appropriate can with the thumb up. If right handed the participant began with can one, and if left handed can six was the starting point. When the researcher gave the signal, “Ready, go,” the time began and the participant proceeded to turn the cans of soda upside down in the appropriate order onto the correct intersection. For a right handed individual, can one was turned over and placed at intersection two, can two was turned over and placed at intersection four, and can three was turned over and placed at intersection six. Immediately, the participant returns all three cans beginning with can one, to their original starting places in the opposite direction. On the return trip, the cans are grasped with the thumb facing down. The entire procedure consists of two complete cycles without stopping. In other words, one trip down and one trip back equaled one

cycle. The watch was stopped when the last can was returned to its original position following the second cycle. The participants' preferred hand was used throughout the entire trial. The objective of the assessment was to perform the task as fast as possible, making sure the cans were placed entirely over the taped intersections. If a can was not placed entirely over the intersection at any time throughout the procedure, the trial was repeated from the beginning. Each trial was recorded to nearest 0.1 of a second. Two practice trials were followed by two recorded trials with the fastest recorded trial being scored.

### **Upper Arm Strength/Endurance**

The upper arm strength/endurance assessment involved the primary use of the elbow flexor muscles through a full range of motion. The evaluation required the participant to perform a maximum number of complete repetitions within a 30 second interval. This assessment has shown good predictability of total body strength in older individuals. The equipment necessary for this procedure consisted of two dumbbells one weighing four pounds and the other eight pounds, a 16 inch chair without arms, and a stopwatch. The four pound dumbbell was used to evaluate strength in women and the eight pound dumbbell was used to measure strength in men.

To begin the assessment, the participant was asked to sit in the chair with his or her back straight and flush against the lumbar support. The participant was then asked to look forward and place his or her feet flat on the floor in a comfortable position. The participant's nondominant hand was then placed in his/her lap by the researcher. The

participant's dominant arm was placed in a position hanging straight down and relaxed to the side. The dumbbell was then placed in the participant's dominant hand with the thumb facing away from the body. The researcher stood to the side of the participant's dominant arm and placed his right hand on the participant's dominant bicep. The researcher's left hand was placed near the ground at the point where the participant made full extension throughout the repetition. If the participant did not bring the dumbbell through a full range of motion making contact with the researcher's hand at the full contraction point and at the full extension point the repetition was not counted.

Prior to all upper arm strength assessments, a practice repetition was performed. After the repetition was completed, the weight was placed on the floor for one minute to answer any questions proposed by the participant. After the minute had passed the weight was again placed in the participant's hand to begin the test trial. On the words, "Ready go," the participant began performing as many bicep curl repetitions as possible within the allotted 30 second interval. The assessment was concluded when the 30 second interval elapsed. The participant received one trial and the number of repetitions was recorded.

Due to the effort this test requires, participants were reminded before and during the test to breathe normally, exercise in a controlled manner, and to stop the test if significant pain was experienced.

## **Grip Strength**

A Jamar grip strength dynamometer (model # 06920255) was used to assess grip strength. The dynamometer has an adjustable handle to fit the size of most hands and is capable of measuring forces between zero and 100 kilograms in one-kilogram increments.

In this investigation, grip strength was measured using both the dominant and nondominant hands. Appropriate grip size was determined by adjusting the dynamometer to a position that was comfortable for each individual. This procedure was conducted prior to the first trial. After grip size had been determined, the participants were given proper instructions on the assessment procedures. The researcher stated to the participants: (1) "Please sit erect." (2) "Place arms to the side and relax." (3) "Hold the dynamometer in the dominant hand and bend the elbow in a 45° angle keeping the elbow to your side." (4) "When you are ready, squeeze the dynamometer as hard as possible without moving the elbow from your side." (5) "After you have squeezed the dynamometer for approximately three seconds, continue holding the instrument until it is removed by the researcher."

After each trial was completed, all participants were given a 30 second rest before performing the next attempt. All participants were given three trials and an average score was calculated. This score (expressed in kilograms) determined overall grip strength for the dominant and nondominant hands.

## **Reliability for Functional Fitness Assessments**

The reliability of each test item was studied in multiple laboratories by the members of the appointed American Alliance for Health, Physical Education, Recreation, and Dance development committee. Reliability was established using the test-retest procedure, and all assessment were found to meet an acceptable level of reliability. The reliability studies differed in their comparisons of scores; some studies were single gender samples, others were combined gender samples. According to (Osness, 1992) agility/dynamic balance assessment showed reliability scores of 0.947-0.978 (women only n=260), 0.963-0.986 (men only n=72) and 0.99 (men and women combined). Also, (Osness, 1992) established reliability scores of 0.911 in (men only n=15) on the agility/dynamic balance assessment, and reliability scores of 0.853-0.911 in (women only n=30) on the same assessment.

The eye-hand coordination assessment reliability scores according to (Osness, 1992) ranged from 0.958-0.993 (men only n=75) and 0.929-0.955 (women only n=285). Additionally, reliability scores were calculated on 14 men and 14 women. The first administration was performed with all participants using their right hand and a reliability score of 0.93 was determined. The same participants were then administered the assessment using their left hand and a reliability score of 0.86 was proven.

The strength scores measured by the seated bicep curl reflected a reliability of 0.884-0.947 (men only n=42) and 0.807-0.931 (women only n=105). Additionally, (Osness, 1992) determined reliability scores in 36 men at 0.921 and 0.894 for 64 women.

This data is currently unpublished, however it can be collected by writing to (Wayne Osness, Fitness Evaluation Clinic, The University of Kansas).

### **Validity for Functional Fitness Assessments**

The agility/dynamic balance assessment did not have a clinical equivalent. The development committee used its “best judgment” to determine validity. The coordination assessment was validated using laboratory procedures assessing eye-hand coordination, reaction time and hand steadiness. The coefficients for these assessment were: 0.349 for eye-hand coordination, 0.59 for reaction time and 0.399 for hand steadiness. While these correlations may be considered relatively low, the values for this particular assessment (soda pop coordination test) were better than other alternative assessments investigated by the committee. The correlation for the strength measure was validated with an elbow curl on a Cybex machine and proved to be much higher (0.82). Notes of interest in the committee’s reporting of validity for the various assessments include: the strength assessment validation utilized a “much lower” number of subjects (n=7) than the coordination assessment (n=90).

Data relative to the assessment items included in The Functional Fitness Assessment for Adults Over 60 Years have been collected since 1990. Age and gender norms are currently being established utilizing over 2,000 participants. Despite the assessments weaknesses and relatively small number of applications, it is the only documented measure of functional fitness of older adults’ abilities within the context of “normal” older adults participating in “normal” activities (e.g. no prescribed level of

health or fitness was required by participants before being assessed, and tasks were neither stressful nor too difficult to discourage participation).

### **Special Consideration For All Functional Fitness Assessments**

All participants were required to have a physician's consent prior to engaging in the study. In addition, any orthopedic concerns, cardiac inadequacies, or other significant historical frailties were closely observed throughout the evaluation procedures. Also, prior to all functional fitness measurements a proper warm-up was conducted, and immediately following each assessment a cool-down was directed by the researcher to identify any physical or mental abnormalities.

### **Physical Self-Efficacy Scale**

Self-efficacy was measured using the Physical Self-Efficacy Scale (PSE) developed by Richard M. Ryckman, and associates (1982). The instrument consists of 22 items. The first 10 items form a subscale measuring Perceived Physical Ability (PPA). The remaining 12 items construct a subscale measuring Physical Self-Presentation Confidence (PSPC). All 22 items are arranged in a Likert scale format ranging from: agree strongly (1), agree somewhat (2), agree slightly (3), disagree slightly (4), disagree somewhat (5), and disagree strongly (6). The 10 item Perceived Physical Ability subscale has a possible range of scores from 10 to 60 and the twelve item Physical Self-Presentation Confidence subscale has a possible range of scores from 12 to 72. The higher score on the (PPA) indicates a higher perceived physical ability, while a higher



score on the (PSPC) represents greater confidence with the presentation of physical skills. A higher overall combined score signifies a stronger Physical Self-Efficacy. The Physical Self-Efficacy Scale can be seen in Appendix E.

In order to control acquiescence response set, reverse scoring was used for items 1, 3, 4, 9, 11, 14, 17, 19, 20, 21, and 22. For example, item one states, "I have excellent reflexes." A participant answering "agree strongly" would be given a score of (6) rather than a score of (1). Item two, "I am not agile and graceful," provides an example of normal scoring ranging from "agree strongly" (1) to "disagree strongly" (6).

The (PSE) survey was administered by the researcher in a written format. Participants were directed to answer all twenty-two items by checking the appropriate response that best indicated their opinion. The survey was administered in a laboratory. All participants were provided a duration of 30 minutes to complete the survey and extraneous noise was held to a minimum.

After each participant returned the completed survey to the researcher, a thorough review of the survey was done to make sure all items were answered. If an item was left unanswered, the researcher returned the instrument to the participant for completion. When all of the surveys were completed, they were analyzed using the SPSS statistical computation program.

### **Reliability for Physical Self-Efficacy Scale**

Test-retest reliabilities for a sample of 83 undergraduate participants in an introductory psychology class were performed before and after a six week interval. The

reliabilities for the entire sample proved highly satisfactory; .85 ( $p < .001$ ) for the PPA subscale, .69 ( $p < .001$ ) for the PSPC subscale, and .80 ( $p < .001$ ) for the composite PSE scale. The means and standard deviations for the first and second administrations were as follows: 44.54 (SD = 8.28) and 44.06 (SD = 9.82 for the PPA subscale; 54.00 (SD = 8.66) and 51.96 (SD = 8.38) for the PSPC subscale; and 98.54 (SD = 13.85) and 97.02 (SD = 14.44 for the PSE scale (Ryckman et al., 1982).

A test of internal consistencies yielded coefficient alphas very similar to those in another study involving 363 undergraduate students at the University of Maine (Ryckman et al., 1982). The reliability scores were as follows: .85 for the PPA subscale, .75 for the PSPC subscale, and .82 for the PSE scale (Ryckman et al., 1982).

### **Validity for Physical Self-Efficacy Scale**

To determine whether the PSE had satisfactory construct validity, two separate samples were drawn from different University of Maine undergraduate psychology classes and asked to complete the PSE scale, along with a battery of personality assessments. One sample ( $n = 90$ ) completed the Physical Self-Concept subscale of the Tennessee Self-Concept Scale (Fitts, 1965), the Self-Consciousness Scale (Fenigstein, Scheier & Buss, 1975) and the Texas Social Behavior Inventory (Helmreich, Stapp & Ervin, 1974). The second sample ( $n = 207$ ) completed the Internal External Locus of Control Scale (Collins, 1974; Rotter, 1966), the Sensation Seeking Scale (Zuckerman, Eysenck & Eysenck, 1978) and the Taylor Manifest Anxiety Scale (Taylor, 1953).

According to the results of this investigation, the convergent validity of PSE scale correlated more highly with the Tennessee Physical Self-Concept subscale ( $r = .58, p < .001$ ) than with any of the other personality assessments. Correlations between the Tennessee Physical Self-Concept subscale and the PPA and the PSPC subscales were .43 ( $p < .001$ ) and .52 ( $p < .001$ ), respectively (Ryckman et al., 1982).

### **Geriatric Depression Scale**

The Geriatric Depression Scale (GDS) is an easily administered self-rating depression scale that, as opposed to other instruments designed to assess depression, was developed to measure depression specifically in the elderly and was validated within this population.

The (GDS) consists of 30 items and can be administered written or orally. The items, each of which is a brief question answered “yes” or “no,” comprise mood quality, level of energy, motivation, hopelessness, social initiative, and subjective evaluation of various cognitive abilities and functions. In 20 of the 30 items, the answer “yes” indicates some form of depression; in the remaining 10 questions the answer “no” indicates some form of depression. The individual’s total (GDS) score consists of the sum of all items. A score of 0-10 indicates no/minimal depression, 11-20 asserts mild depression, and a score of 21-30 warrants moderate/severe depression. The scale can be seen in Appendix F.

In this study, the researcher administered the instrument in the written format. All subjects were given 30 minutes to answer the 30 items. If any items were left

incomplete, the researcher returned the instrument to the subject for immediate completion. After all assessments were returned to the researcher, the SPSS statistical computation program was again applied to analyze the data.

### **Reliability for Geriatric Depression Scale**

The reliability of the GDS was studied by comparing 40 “normal” elderly to 60 depressed elderly patients selected from a variety of clinical settings (Yesavage & Brink, 1983). The depressed subjects included 26 “mild” and 34 “severe” depressives as assessed by the Research Diagnostic Criteria (RDC). Several indices of internal consistency were calculated on the GDS scores. Both the Cronbach alpha and the split-half reliability coefficients were .94. The median correlation between the items was .56 (range = .32 to .83) while the mean interitem correlation was .36. These reliability measures were found to be comparable to the HRS-D and better than Zung’s SDS. Test-retest reliability coefficients were reported to be .85 over a span of one week (Yesavage & Brink, 1983) and .86 after a five minute delay (Brink, Curran, Door, Janson, McNulty & Messina, 1985).

### **Validity for Geriatric Depression Scale**

Several validity studies regarding the GDS have been conducted. Yesavage & Brink (1983) found that the GDS scores of nondepressed, mildly depressed, and severely depressed participants were significantly different. In addition, the GDS showed concurrent validity ( $r = .82$ ) with the measure used to classify the level of depression

(RDC). The GDS also had high convergent validity with the HRS-D ( $r = .83$ ) and with the SDS ( $r = .84$ ).

The validity of the GDS in comparison to other depression scales includes studies with the Beck Depression Inventory (BDI), the Depression Adjective Check list (DACL), and the Center of Epidemiological Studies Depression Scale (CES-D). Hyer and Blount (1984) found that the GDS and BDI scores were highly correlated ( $r = .73$ ) in a group of male psychiatric inpatients. In fact, the GDS was reported to be superior to the BDI in discriminant validity in this elderly psychiatric population. Best and his colleagues (1984) compared the GDS to the HRS-D, the DACL and the CES-D. Again the GDS and the HRS-D were found to be superior to the other in discriminating depression from non depression in the elderly. Thus, the studies of validity for the GDS suggest that this scale can identify depressed from non depressed elderly persons as well as the HRS-D and better than several commonly used depression scales.

### **Resistance Training Program**

Prior to the investigation, all participants were given a verbal explanation by the researcher of the requirements to be eligible for the study. The following explanations were presented to all participants during the initial mandatory group meeting held February 14, 1997. The requirements were that all participants must:

1. have a physician's approval to be eligible to participate.
2. sign the IRB consent form prior to being involved in the investigation.
3. agree to be randomly assigned to an experimental or control group.

4. remain in the experiment for the full 10 weeks.
5. maintain their present activity status with the exception of the experimental group during treatment.
6. consistently attend resistance training sessions (experimental participants only).
7. make up any resistance training sessions missed (experimental participants only).
8. abide by the resistance training protocol (experimental participants only).
9. abide by the resistance training techniques provided by the researcher (experimental participants only).
10. attend all assessment sessions.
11. cooperate by exerting maximum effort with concern to safety and technique during all training and assessment sessions.
12. strictly adhere to the established provisions.

A research schedule was provided to all participants to inform them on the structure of the study. The schedule included dates addressing group meetings, seminars, assessment sessions, intervention sessions, and closing ceremonies. A copy of the research schedule is shown in Appendix A. An overview of the schedule is provided below.

Week 1	Conducted the first group meeting to orientated participants with the researcher and discussed the investigation.
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- Week 2 Provided a seminar on resistance training for all participants to assured training safety, introduced proper exercise techniques and terminology, and taught exercise recording procedures.
- Week 3 Pre-assessed all participants for voluntary muscular strength, physical self-efficacy, functional fitness and depression.
- Week 4-7 Intervention program began (experimental group only).
- Week 8 Mid-assessed all participants for voluntary muscular strength, physical self-efficacy, functional fitness, and depression.
- Week 9-12 Intervention program resumed (experimental group only).
- Week 13 Post-assessed all participants for voluntary muscular strength, physical self-efficacy, functional fitness and depression.
- Week 14 Conducted second group meeting to award all participants and provide any necessary education to participants wanting to maintain a resistance training program. In addition, an Emeriti Faculty member provided a presentation on exercise, motivation and quality of life for older adults.

### **Treatment Procedures**

After the experimental participants had been orientated by the researcher, briefed on the investigation, and provided the appropriate seminars to begin the resistance training intervention, they were matched with a partner of similar pre-assessment

voluntary muscular strength for the duration of the investigation. Gender, age, body composition, and other factors were not considered while pairing subjects.

The resistance training program lasted 10 weeks, with training sessions scheduled three times per week for 50 minutes each session. The participants trained on Mondays, Wednesdays, and Fridays either from 8:30a.m. to 9:20a.m. or 2:30p.m. to 3:20p.m. In case of a missed class period, the participant reported on the following Saturday at 9:00a.m. to complete the unattended training session.

During the 10 week training period, the fifth and tenth weeks were designed to assess participants on all variables. On Monday of the fifth and tenth week voluntary muscular strength and physical self-efficacy were assessed. On Wednesday of the fifth and tenth week functional fitness and depression were assessed. And on Friday of the fifth and tenth week, the normal exercise intervention was conducted.

A Universal Hercules Gym Machine (model # 078086) was utilized for the intervention of all experimental participants. The apparatus is equipped with seven stations designed to provide numerous exercises. The primary exercises performed on this apparatus generally consist of the: bench press, seated shoulder press, bicep curl, tricep press, latissimus dorsi pull down, prone position leg curl, and seated leg extension.

After all experimental participants had been carefully assessed for their pre-intervention strength and appropriately matched with an exercise partner of similar strength, the resistance training protocol was administered. The experimental participants were prescribed two sets of 10 repetitions. The intervention protocol suggested four seconds for each repetition, two seconds throughout the concentric and



eccentric phases of the exercise. This exaggerated period of time allowed the participant to concentrate on proper breathing technique, controlled movement and safety.

Participants were provided approximately 60 second rest between sets and given 20 seconds to transfer from one station to another. For example, a participant performing the bench press took approximately 40 seconds to complete a set. The participant and his or her partner then switched position taking approximately 20 seconds. The partner then exercised for approximately 40 seconds and immediately following the set both participants transferred to another station. The transfer took approximately 20 seconds. This entire process was repeated for each exercise. The sequence of exercises performed by the participants consisted of: 1) seated leg extension, 2) bench press, 3) tricep extensions, 4) lunges, 5) abdominal curls, 7) seated leg press, 8) latissimus dorsi pull downs, and 9) standing bicep curls.

Participants were advised to begin the intervention with a comfortable weight. Typically, this low weight was used to help participants become accustomed to the apparatus, establish confidence within their ability to perform the exercises, and decrease unconditioned injuries. Progression in intensity increased throughout the intervention period, however there was no established protocol for the increase in intensity.

If a participant could not complete the appropriate set and repetitions within the exercise protocol, they were asked to perform as many repetitions as possible and build on their success. In addition, each participant recorded his or her own number of sets and repetitions on a "daily exercise chart" provided by the researcher. The daily exercise chart can be found in Appendix G. This in turn, reminded the participant during each

session of the number of repetitions successfully performed during the previous workout.

The researcher encouraged the participants not able to perform the appropriate number repetitions (8-12) during each set to strive to make repetition increases each session.

Most importantly, the researcher encouraged participants to exercise to fatigue with safety being of greatest concern.

## CHAPTER IV

### RESULTS

The primary objective of this study was to determine if a 10 week isotonic resistance training program would significantly affect voluntary muscular strength, functional fitness, physical self-efficacy, and depression in adults ages 65-85. More accurately, the intent was to compare mean scores of voluntary muscular strength and mean scores of functional fitness, physical self-efficacy, and depression at the pre-test, mid-test, and post-test data points to determine any significant differences between an experimental and a control group.

Each participant was measured for voluntary muscular strength for three exercises (bench press, latissimus dorsi pulldown, and seated leg press). Each participant's strength was carefully determined by evaluating the maximum number of repetitions performed at a pre-determined percentage of their body weight. On a Universal Multi-station exercise machine men were assessed at 40 % of their body weight on the bench press, 40% of their body weight on the latissimus dorsi pull-down and 100% of their weight on the leg press. On the same machine, women were assessed at 35%, 35% and 90% of their body weight on the identical exercises respectively.

The Functional Fitness Assessment For Adults Over 60 Years (A Field Based Assessment) was used to evaluate functional fitness. The instrument was developed by a

committee of the American Alliance For Health, Physical Education, Recreation and Dance appointed by the Council on Aging and Adult Development (Osness et al., 1996). The assessment is designed to measure functional performance of individuals and consists of six components. However, for this investigation only four of the components were utilized: body composition, agility/dynamic balance, eye-hand coordination, and upper arm strength. Additionally, grip strength was assessed as a measure of functional performance using a Jamar grip strength dynamometer (model # 06920255).

Body composition was represented as a "Ponderal Index," which was calculated for each participant by using their height and weight on a Detecto-Medic scale (model # 078091). This calculation was considered to be a relatively indirect measurement of functional fitness and therefore was not addressed in the stated research hypotheses. The remaining four components of functional fitness were applied to address the stated research hypotheses. It should be noted, that in this study, positive changes in functional fitness can be reflected by either increases or decreases in participants' scores. Increased scores in upper arm strength and grip strength reflect improvement. The agility/dynamic balance and eye-hand coordination scores are measured to the nearest 0.1 of a second, therefore lower times indicate improved scores.

Other research hypotheses examined included whether overall physical self-efficacy was significantly effected due an implemented 10 week resistance training program. The Physical Self-Efficacy Scale (PSE) was used to measure overall physical self-efficacy, also the two components of physical self-efficacy (perceived physical ability and perceived self-presentation confidence) were addressed by the stated research

hypotheses. The instrument's 22 items are arranged in a Likert scale format ranging from: agree strongly (1), agree somewhat (2), agree slightly (3), disagree slightly (4), disagree somewhat (5), and disagree strongly (6). The 10 item Perceived Physical Ability (PPA) subscale has a possible range of scores from 10 to 60 and the 12 item Physical Self-Presentation Confidence (PSPC) subscale has a possible range of scores from 12 to 72. The higher score on the (PPA) indicates a higher perceived physical ability, while a higher score on the (PSPC) represents greater confidence with the presentation of physical skills. A higher overall combined score signifies a stronger Physical Self-Efficacy. Lastly, the psychological variable of depression was evaluated. The Geriatric Depression Scale (GDS) was used to assess any changes in depression at the pre-test, mid-test, and post-test data points of the experiment. The (GDS) consists of 30 items and can be administered written or orally. The items, each of which is a brief question answered "yes" or "no," comprise mood quality, level of energy, motivation, hopelessness, social initiative, and subjective evaluation of various cognitive abilities and functions. In 20 of the 30 items, the answer "yes" indicates some form of depression; in the remaining 10 questions the answer "no" indicates some form of depression. The individual's total (GDS) score consists of the sum of all items. A score of 0-10 indicates no/minimal depression, 11-20 indicates mild depression, and a score of 21-30 indicates moderate/severe depression. A research hypotheses was stated to address a significant change in depression following the resistance training program.

The study was conducted with a sample of 39 participants. The control group included 13 persons and the experimental group accounted for 27 individuals. Data was

not collected on one of the experimental participants due to the diagnosis of Adult Onset Muscular Dystrophy. All statistical comparisons were conducted using the Statistical Package for the Social Sciences (SPSS).

### **Voluntary Muscular Strength**

The first three research hypotheses are associated with voluntary muscular strength and will be examined together.

1. There will be no significant difference between the experimental and control group on mean strength scores for the bench press before and after the treatment.
2. There will be no significant difference between the experimental and control group on mean strength scores for the latissimus dorsi pulldown before and after the treatment.
3. There will be no significant difference between the experimental and control group on mean strength scores for the seated leg press before and after the treatment.

A repeated measures Analysis of Variance (ANOVA) was performed to examine the data at the pre, mid, and post test data points. The results revealed a significant difference between the two groups at the post-test on all three variables at the ( $p < .01$ ) level. Additionally, a significant difference occurred at the mid-test data point for the latissimus dorsi pulldown variable. The Student Newman-Keuls range test post-hoc procedure was utilized to determine specifically where the differences existed. Table 1

illustrates the findings regarding significant differences on all three voluntary muscular strength variables. Table 2 summarizes the mean scores, standard deviations, and the number of participants in which data were collected for both groups at the pre, mid, and post-test data points.

**TABLE 1**

**SUMMARY OF SIGNIFICANT DIFFERENCES IN THE EXPERIMENTAL GROUP ON THE BENCH PRESS, LATISSIMUS DORSI PULLDOWN, AND SEATED LEG PRESS AT RESPECTIVE DATA POINTS**

<b>Measure</b>	<b>Significant Differences</b>	<b>Data Points</b>
Bench Press	Yes	Mid-Test, Post-Test
Seated Leg Press	Yes	Mid-Test, Post-Test
Latissimus Dorsi Pulldown	Yes	Mid-Test, Post-Test

**TABLE 2**

**SUMMARY OF MEAN SCORES (VOLUNTARY MUSCULAR STRENGTH) FOR  
THE CONTROL AND EXPERIMENTAL GROUPS: PRE, MID,  
AND POST-TEST DATA POINTS**

<b>Measure</b>	<b>Control (SD) (n)</b>	<b>Experimental (SD) (n)</b>
<b>Bench Press</b> (repetitions)	Pre (8.92 ± 4.92) (13)	Pre (6.25 ± 7.24) (24)
	Mid (9.15 ± 4.18) (13)	Mid (12.04 ± 10.99) (23)
	Post (9.91 ± 3.96) (12)	Post (18.54 ± 12.44) (24)**
<b>Lat Pulldown</b> (repetitions)	Pre (9.00 ± 4.34) (13)	Pre (8.12 ± 6.80) (25)
	Mid (9.91 ± 5.56) (12)	Mid (16.00 ± 8.98) (25)**
	Post (10.15 ± 4.96) (13)	Post (18.00 ± 9.45) (24)**
<b>Seated Leg Press</b> (repetitions)	Pre (21.53 ± 10.92) (13)	Pre (16.88 ± 9.58) (26)
	Mid (30.00 ± 10.23) (12)	Mid (41.61 ± 21.97) (26)
	Post (32.75 ± 11.65) (12)	Post (53.83 ± 36.98) (24)**

\*\*Significant at the ( $p < .01$ )  $\alpha$  level between groups.

In Tables 3, a synopsis of the repeated measures ANOVA results for the bench press is illustrated. The repeated measures ANOVA shows the Group x Time interaction



to be significant at the ( $p < .01$ )  $\alpha$  level. There is also a significant main effect of Time, however the time main effect was not the primary interest of the investigation. There were no other meaningful effects.

**TABLE 3**

**ANALYSIS OF VARIANCE: PRETEST-POSTTEST BENCH PRESS**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	219.83	1	219.83	1.06	.311
Error	6862.80	33	207.96		
<b><u>Within Subjects</u></b>					
Time	708.89	2	354.45	21.26	.000
Group x Time	514.65	2	257.32	15.43 **	.000 **
Error	1100.55	66	16.68		

\*\* Significant at the ( $p < .01$ )  $\alpha$  level.

The Student Newman-Keuls range test post-hoc procedure is illustrated in Table 4. The mean comparisons (repetitions) are provided. The asterisks (\*) indicates a significant difference between two means where the vertical and horizontal means intersect. The plotted (NS) represent no significant difference between the two intersecting means, and the plus sign (+) denotes a significant but meaningless difference between the intersecting means. Table 5 presents bench press means for the control and experimental groups at the three data points.

**TABLE 4**

**STUDENT NEWMAN-KEULS POST-HOC: BENCH PRESS**

**Mean Comparisons (repetitions)**

	Pre (Exp)	Pre (Cont)	Mid (Cont)	Post (Cont)	Mid (Exp)	Post (Exp)
	6.25	8.92	9.15	9.91	12.04	18.54
Pre (Exp) 6.25	NS					
Pre (Cont) 8.92	NS	NS				
Mid (Cont) 9.15	NS	NS	NS			
Post (Cont) 9.91	NS	NS	NS	NS		
Mid (Exp) 12.04	*	NS	NS	NS	NS	
Post (Exp) 18.54	*	+	NS	*	*	NS

**TABLE 5**

**BENCH PRESS MEANS (CONTROL AND EXPERIMENTAL) GROUPS**

	PRE-TEST	MID-TEST	POST-TEST
<b>CONTROL GROUP</b>	8.92	9.15	9.91 (d)
<b>EXPERIMENTAL GROUP</b>	6.25 (a,b)	12.04 (a,c)	18.54 (b,c,d)

The corresponding subscript represents a significant difference in mean scores. For example, a significant difference exists between 6.25<sub>(a)</sub> and 12.04<sub>(a)</sub>. Another example would include a significant difference between 6.25<sub>(b)</sub> and 18.54<sub>(b)</sub>.

The post-hoc comparisons shown in Table 4 indicate a significant mean difference between the pre-test experimental group (6.25 repetitions) and the mid-test experimental group (12.04 repetitions). Additionally, the mid-test experimental group (12.04 repetitions) and the post-test experimental group (18.54 repetitions) mean scores were found significantly different. The mean score comparison for the experimental group at the pre and post test also differed significantly. Lastly, the two groups (control and experimental) differed significantly at the post-test data point comparison.

Again a repeated measures ANOVA was conducted for the latissimus dorsi pulldown variable. The ANOVA results are presented in Table 6. In this analysis a Group x Time interaction was found to be significant at the ( $p < .01$ )  $\alpha$  level. There was also a significant main effect of Time, however this effect was not of primary interest.

**TABLE 6**

**ANALYSIS OF VARIANCE: PRETEST-POSTTEST LATISSIMUS DORSI PULL**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	436.34	1	436.34	2.82	.102
Error	5266.07	34	154.88		
<b><u>Within Subjects</u></b>					
Time	561.01	2	280.50	34.16	.000
Group x Time	281.12	2	140.56	17.12 **	.000 **
Error	558.31	68	8.21		

\*\* Significant at the ( $p < .01$ )  $\alpha$  level.

The Student Newman-Keuls range test post-hoc procedure can be seen in Table 7. The mean comparisons (repetitions) are provided. Again, the asterisks (\*) indicates a significant difference between two means where the vertical and horizontal means intersect. The plotted (NS) represent no significant difference between the two intersecting means, and the plus sign (+) denote a significant but meaningless difference between the intersecting means. Table 8 presents latissimus dorsi pulldown means for the control and experimental groups at the three data points.

**TABLE 7**

**STUDENT NEWMAN KEULS POST-HOC: LATISSIMUS DORSI PULL**

**Mean Comparisons (repetitions)**

	<b>Pre (Exp)</b> 8.12	<b>Pre (Cont)</b> 9.00	<b>Mid (Cont)</b> 9.91	<b>Post (Cont)</b> 10.15	<b>Mid (Exp)</b> 16.00	<b>Post (Exp)</b> 18.00
<b>Pre (Exp)</b> 8.12	NS					
<b>Pre (Cont)</b> 9.00	NS	NS				
<b>Mid (Cont)</b> 9.91	NS	NS	NS			
<b>Post (Cont)</b> 10.15	NS	NS	NS	NS		
<b>Mid (Exp)</b> 16.00	*	+	*	+	NS	
<b>Post (Exp)</b> 18.00	*	+	+	*	*	NS

**TABLE 8**

**LAT PULLDOWN MEANS (CONTROL AND EXPERIMENTAL) GROUPS**

	<b>PRE-TEST</b>	<b>MID-TEST</b>	<b>POST-TEST</b>
<b>CONTROL GROUP</b>	<b>9.00</b>	<b>9.91 (e)</b>	<b>10.15 (d)</b>
<b>EXPERIMENTAL GROUP</b>	<b>8.12 (a,b)</b>	<b>16.00 (a,c,e)</b>	<b>18.00 (b,c,d)</b>

The corresponding subscript represents a significant difference in mean scores. For example, a significant difference exists between 8.12<sup>(a)</sup> and 16.00<sup>(a)</sup>. Another example would include a significant difference between 10.15<sup>(e)</sup> and 18.00<sup>(e)</sup>.

Post-hoc comparisons made in Table 7 indicate a significant mean difference between the pre-test experimental group (8.12 repetitions) and the mid-test experimental group (16.00 repetitions). The mid-test experimental group (16.00 repetitions) was significantly different from the post-test experimental group (18.54 repetitions). The mean score comparison for the experimental group at the pre-test and post-test data points also differed significantly. The two groups (control and experimental) were significantly different at two data point comparisons, and the two groups were significantly different at the mid-assessment and the post-assessment data points.

Another repeated measures ANOVA shows the Group x Time interaction to be significant at the ( $p < .01$ )  $\alpha$  level for the seated leg press variable. There was also a significant main effect of Time which provides minimal interest to the investigation. The Group main effect was not found to be significant at the ( $p < .05$ ) or the ( $p < .01$ )  $\alpha$  levels. Table 9 provides a description of the ANOVA summary for the seated leg press.

**TABLE 9**

**ANALYSIS OF VARIANCE: PRETEST-POSTTEST SEATED LEG PRESS**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	1728.34	1	1728.34	1.72	.199
Error	34215.32	34	1006.33		
<b><u>Within Subjects</u></b>					
Time	9090.34	2	4545.17	20.67	.000
Group x Time	3170.45	2	1585.23	7.21 **	.001 **
Error	14950.31	68	219.86		

\*\* Significant at the (p<.01)  $\alpha$  level.

The Student Newman-Keuls range test post-hoc procedure is illustrated in Table 10. The mean comparisons (repetitions) are shown and again the asterisks (\*) indicates a significant difference between two means where the vertical and horizontal means intersect. The plotted (NS) represents no significant difference between the two intersecting means, and the plus sign (+) denotes a significant but meaningless difference between the intersecting means. Table 11 presents the seated leg press means for the control and experimental groups at the three data points.

**TABLE 10**

**STUDENT NEWMAN KEULS POST-HOC: SEATED LEG PRESS**

**Mean Comparisons (repetitions)**

	Pre (Exp)	Pre (Cont)	Mid (Cont)	Post (Cont)	Mid (Exp)	Post (Exp)
	16.88	21.53	30.00	32.75	41.61	53.83
Pre (Exp) 16.88	NS					
Pre (Cont) 21.53	NS	NS				
Mid (Cont) 30.00	+	NS	NS			
Post (Cont) 32.75	+	NS	NS	NS		
Mid (Exp) 41.61	*	+	NS	NS	NS	
Post (Exp) 53.83	*	+	+	*	*	NS

**TABLE 11**

**SEATED LEG PRESS MEANS (CONTROL AND EXPERIMENTAL) GROUPS**

	PRE-TEST	MID-TEST	POST-TEST
<b>CONTROL GROUP</b>	21.53	30.00	32.75 (d)
<b>EXPERIMENTAL GROUP</b>	16.88 (a,b)	41.61 (a,c)	53.83 (b,c,d)

The corresponding subscript represents a significant difference in mean scores. For example, a significant difference exists between 16.88<sub>(a)</sub> and 41.61<sub>(a)</sub>. Another example would include a significant difference between 41.61<sub>(c)</sub> and 53.83<sub>(c)</sub>.

The post-hoc comparisons illustrated in Table 10 indicate a significant mean difference between the pre-test experimental group (16.88 repetitions) and the mid-test experimental group (41.61 repetitions). The mid-test experimental group (41.61 repetitions) was also significantly different from the post-test experimental group (53.83 repetitions). The mean score comparison for the experimental group at the pre-test and post-test also differed significantly. The two groups (control and experimental) differed significantly only at the post-test data point comparison.

### **Functional Fitness**

This section examined the four stated hypotheses regarding functional fitness.

4. There will be no significant difference between the experimental and control group on mean agility/dynamic balance scores before and after the treatment.
5. There will be no significant difference between the experimental and control group on mean eye-hand coordination scores before and after the treatment.
6. There will be no significant difference between the experimental and control group on mean upper arm strength/endurance scores before and after the treatment.
7. There will be no significant difference between the experimental and control group on mean grip strength scores before and after the treatment.



A repeated measures ANOVA was performed to examine the data at the pre-test, mid-test, and post-test data points for functional fitness. The results revealed a significant difference between the two groups at the ( $p < .01$ ) significant  $\alpha$  level on the upper arm strength variable. The agility/dynamic balance, eye-hand coordination, and grip strength variables were not found to be significant. The Student Newman-Keuls range test post-hoc procedure was utilized to determine where the differences existed on the upper arm strength scores. Table 12 summarizes the findings regarding significant differences on all four functional fitness variables. Table 13 summarizes the mean scores, standard deviations, and the number participants in which data was collected for both groups at the pre-test, mid-test, and post-test data points on the four functional fitness variables.

**TABLE 12**

**SUMMARY OF SIGNIFICANT DIFFERENCES IN THE EXPERIMENTAL GROUP ON AGILITY/DYNAMIC BALANCE, EYE-HAND COORDINATION, UPPER ARM STRENGTH, AND GRIP STRENGTH AT RESPECTIVE DATA POINTS**

<b>Measure</b>	<b>Significant Differences</b>	<b>Data Points</b>
Agility/Dynamic Balance	No	
Eye-Hand Coordination	No	
Upper Arm Strength	Yes	Mid-Test, Post-Test
Grip Strength	No	

**TABLE 13**

**SUMMARY OF MEAN SCORES (FUNCTIONAL FITNESS) FOR THE  
CONTROL AND EXPERIMENTAL GROUPS: PRE, MID,  
AND POST-TEST DATA POINTS**

<b>Measure</b>	<b>Control (SD) (n)</b>	<b>Experimental (SD) (n)</b>
<b>Agility/Balance</b> (seconds)	Pre (30.26 ± 4.80) (13)	Pre (31.05 ± 5.37) (26)
	Mid (28.55 ± 4.27) (13)	Mid (28.31 ± 4.85) (26)
	Post (27.09 ± 4.33) (12)	Post (26.76 ± 4.86) (26)
<b>Eye-Hand Coordination</b> (seconds)	Pre (15.83 ± 2.83) (13)	Pre (15.20 ± 2.76) (26)
	Mid (15.59 ± 2.45) (13)	Mid (14.39 ± 3.75) (26)
	Post (14.46 ± 2.55) (13)	Post (13.04 ± 2.85) (26)
<b>Upper Arm Strength</b> (repetitions)	Pre (17.38 ± 3.47) (13)	Pre (18.11 ± 3.41) (25)
	Mid (18.00 ± 3.36) (12)	Mid (21.53 ± 3.07) (24)**
	Post (19.76 ± 2.86) (13)	Post (24.07 ± 3.93) (25)**
<b>Grip Strength</b> (kilograms)	Pre (54.86 ± 15.49) (13)	Pre (50.97 ± 20.56) (26)
	Mid (55.64 ± 14.91) (13)	Mid (52.42 ± 19.37) (26)
	Post (53.53 ± 17.25) (13)	Post (53.74 ± 18.94) (24)

\*\* Significant at the (p<.01) α level between groups.

Table 14 illustrates the repeated measures ANOVA results for the upper arm strength Group x Time interaction was significant at the ( $p < .01$ )  $\alpha$  level. There was also another significant main effect of Time which was not of primary interest. There were no other effects found to be significant. The ANOVA results for agility/dynamic balance, eye-hand coordination, and grip strength can be found in Appendix H, Tables (H1-H3).

**TABLE 14**

**ANALYSIS OF VARIANCE: PRETEST-POSTTEST UPPER ARM STRENGTH**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	212.52	1	212.52	7.67	.009
Error	1024.94	37	27.70		
<b><u>Within Subjects</u></b>					
Time	301.96	2	150.98	44.44	.000
Group x Time	61.44	2	30.72	9.04 **	.000 **
Error	251.41	74	3.40		

\*\* Significant at the ( $p < .01$ )  $\alpha$  level.

Table 15 illustrates the Student Newman-Keuls range test post-hoc procedure to determine where the significant differences existed on upper arm strength. Table 16 presents the means for the control and experimental groups at the three data points.

**TABLE 15**

**STUDENT NEWMAN KEULS POST-HOC: UPPER ARM STRENGTH**

**Mean Comparisons (repetitions)**

	Pre (Cont)	Mid (Cont)	Pre (Exp)	Post (Exp)	Mid (Exp)	Post (Exp)
	17.38	18.00	18.11	19.77	21.54	24.08
Pre (Cont) 17.38	NS					
Mid (Cont) 18.00	NS	NS				
Pre (Exp) 18.11	NS	NS	NS			
Post (Cont) 19.77	*	*	+	NS		
Mid (Exp) 21.54	+	*	*	+	NS	
Post (Exp) 24.08	+	+	*	*	*	NS

**TABLE 16**

**ARM STRENGTH MEANS (CONTROL AND EXPERIMENTAL) GROUPS**

	PRE-TEST	MID-TEST	POST-TEST
<b>CONTROL GROUP</b>	17.38 (g)	18.00 (e,f)	19.77 (d,f,g)
<b>EXPERIMENTAL GROUP</b>	18.11 (a,b)	21.54 (a,c,e)	24.08 (b,c,d)

The corresponding subscript represents a significant difference in mean scores. For example, a significant difference exists between 18.11<sub>(a)</sub> and 21.54<sub>(a)</sub>. Another example would include a significant difference between 18.00<sub>(e)</sub> and 21.54<sub>(e)</sub>.

The post-hoc comparisons shown in Table 15 indicate a significant mean difference between the pre-test experimental group (18.11 repetitions) and the mid-test experimental group (21.54 repetitions). The mid-test experimental group (21.54 repetitions) was also significantly different from the post-test experimental group (24.08 repetitions). The mean score comparison for the experimental group at the pre-test and post-test also differed significantly. The control group had mean score differences from the mid-test comparison (18.00 repetitions) to the post-test comparison (19.77 repetitions). Additionally, the pre-test control scores (17.38 repetitions) differed from the post-test control scores (19.77 repetitions). The two groups (control and experimental) differed significantly at two data point comparisons. A significant difference was examined between the two groups at the mid and post-test data points.

### **Physical Self-Efficacy**

This section examined the three stated hypotheses regarding Physical Self-Efficacy (Overall Physical Self-Efficacy, Perceived Physical Ability, and Physical Self-Presentation Confidence).

8. There will be no significant difference between the experimental and control group on overall Physical Self-Efficacy Scale scores before and after the treatment.
9. There will be no significant difference between the experimental and control group on Perceived Physical Ability scores before and after the treatment.

10. There will be no significant difference between the experimental and control group on Physical Self-Presentation Confidence scores before and after the treatment.

A repeated measures ANOVA was conducted to examine the data at the pre-test, mid-test, and post-test data points for physical self-efficacy. The results revealed no significant difference between the two groups at any data point. The two physical self-efficacy subcomponents were also found to be insignificant between groups and at the respective data points.

### **Geriatric Depression**

This section examined the one stated hypothesis regarding geriatric depression.

11. There will be no significant difference between the experimental and control group on Geriatric Depression Scale scores before and after the treatment.

A repeated measures ANOVA was performed to examine the data at the pre-test, mid-test, and post-test data points for the geriatric depression variable. The results revealed a significant difference between the two groups on this variable. Table 17 summarizes the findings regarding significant differences on the geriatric depression variable and the insignificant differences on the three physical self-efficacy variables. Table 18 profiles the mean scores, standard deviations, and the number of participants in which data were collected on the geriatric depression assessment. Also, the descriptives for the three physical self-efficacy variables at the three data points are shown.

**TABLE 17**

**SUMMARY OF SIGNIFICANT DIFFERENCES IN THE EXPERIMENTAL  
GROUP ON THE PHYSICAL SELF-EFFICACY SCALE AND  
THE GERIATRIC DEPRESSION SCALE  
AT RESPECTIVE DATA POINTS**

<b>Measure</b>	<b>Significant Differences</b>	<b>Data Points</b>
Overall Physical Self-Efficacy Scale	No	
Perceived Physical Ability	No	
Physical Self-Presentation Confidence	No	
Geriatric Depression Scale	Yes	Mid-Test

**TABLE 18**

**SUMMARY OF MEAN SCORES (PSYCHOLOGICAL VARIABLES) FOR THE  
CONTROL AND EXPERIMENTAL GROUPS: PRE, MID,  
AND POST-TEST DATA POINTS**

<b>Measure</b>	<b>Control</b>	<b>(SD)</b>	<b>(n)</b>	<b>Experimental</b>	<b>(SD)</b>	<b>(n)</b>
<b>Physical Self-Efficacy</b> (PSE)	Pre	(94.33 ± 19.93)	(12)	Pre	(86.88 ± 12.83)	(24)
	Mid	(93.08 ± 14.58)	(13)	Mid	(88.08 ± 12.57)	(24)
	Post	(96.92 ± 18.41)	(13)	Post	(91.88 ± 16.69)	(24)
<b>Physical Ability</b> (PPA)	Pre	(40.25 ± 12.55)	(12)	Pre	(36.69 ± 10.65)	(26)
	Mid	(38.69 ± 8.46)	(13)	Mid	(36.31 ± 8.90)	(26)
	Post	(40.54 ± 10.77)	(13)	Post	(38.96 ± 11.01)	(24)
<b>Physical Presentation</b> (PSPC)	Pre	(54.08 ± 9.58)	(12)	Pre	(50.54 ± 5.32)	(24)
	Mid	(54.38 ± 8.53)	(13)	Mid	(50.75 ± 6.82)	(24)
	Post	(56.38 ± 9.25)	(13)	Post	(53.36 ± 8.94)	(25)
<b>Geriatric Depression</b>	Pre	(3.15 ± 2.82)	(13)	Pre	(6.16 ± 5.97)	(25)**
	Mid	(4.00 ± 4.20)	(12)	Mid	(4.58 ± 3.92)	(24)
	Post	(4.00 ± 3.74)	(13)	Post	(3.840 ± 4.11)	(25)

\*\* Significant at the (p<.01) α level between groups.



As seen in Table 19 an illustration of the repeated measures Analysis ANOVA results for the geriatric depression scores are provided.

**TABLE 19**

**ANALYSIS OF VARIANCE: PRETEST-POSTTEST GERIATRIC DEPRESSION**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	17.17	1	17.17	.36	.553
Error	1528.83	32	47.78		
<b><u>Within Subjects</u></b>					
Time	1.53	2	.77	.22	.800
Group x Time	36.95	2	18.47	5.38 **	.007 **
Error	219.70	64	3.43		

\*\* Significant at the ( $p < .01$ )  $\alpha$  level.

The repeated measures ANOVA again shows the Group x Time interaction to be significant at the ( $p < .01$ )  $\alpha$  level. There were no other effects found to be statistically significant. However, it must be noted that the control and experimental groups differed significantly during the pre-assessment. The control group was less depressed (3.15 scale score) than the experimental group (6.16 scale score). Also, it is important to remember that a scale score of (0-10) is considered "normal" for older adults in regard to depression. A scale score of (11-20) is determined mildly depressed and a score of (21-30) is moderately/severely depressed. The participants in this study were all self-selected

and this may have contributed to low scores on the depression scale. However, at pre-assessment, of the 26 experimental participants five fell into the mildly depressed category with a scale score (mean = 16). After five weeks of the intervention their scale score mean was reduced into the “normal” range for older adults with a scale score (mean = 9). This shows a significant reduction in depression for that group. Table 20 illustrates the Student Newman-Keuls range test post-hoc procedure to determine where the significant differences existed on the geriatric depression variable. Table 21 presents geriatric depression scale means for both groups at all data points.

**TABLE 20**

**STUDENT NEWMAN KEULS POST-HOC: GERIATRIC DEPRESSION**

**Mean Comparisons (Scale of Depression)**

	<b>Pre (Cont)</b> 3.15	<b>Post (Exp)</b> 3.84	<b>Mid (Cont)</b> 4.00	<b>Post (Cont)</b> 4.00	<b>Mid (Exp)</b> 4.58	<b>Pre (Exp)</b> 6.16
<b>Pre (Cont)</b> 3.15	NS					
<b>Post (Exp)</b> 3.84	NS	NS				
<b>Mid (Cont)</b> 4.00	NS	NS	NS			
<b>Post (Cont)</b> 4.00	NS	NS	NS	NS		
<b>Mid (Exp)</b> 4.58	NS	NS	NS	NS	NS	
<b>Pre (Exp)</b> 6.16	*	+	+	+	*	NS

**TABLE 21**

**GERIATRIC DEPRESSION SCALE MEANS (CONTROL AND EXPERIMENTAL) GROUPS**

	<b>PRE-TEST</b>	<b>MID-TEST</b>	<b>POST-TEST</b>
<b>CONTROL GROUP</b>	<b>3.15 (a)</b>	<b>4.00</b>	<b>4.00</b>
<b>EXPERIMENTAL GROUP</b>	<b>6.16 (a,b)</b>	<b>4.58 (b)</b>	<b>3.84</b>

The corresponding subscript represents a significant difference in mean scores. For example, a significant difference exists between 6.16<sup>(b)</sup> and 4.58<sup>(b)</sup>. Another example would include a significant difference between 6.16<sup>(a)</sup> and 3.15<sup>(a)</sup>.

The post-hoc comparisons shown in Table 21 indicate a significant mean difference between the pre-test experimental group (6.16 scale score) and the pre-test control group (3.15 scale score). The mean score comparison for the experimental group at the pre-test (6.16 scale score) and mid-test (4.58 scale score) data points also differed significantly. As can be seen, the control group increased slightly in depression from the pre-test (3.15) to the mid-test (4.00) and then remained steady at post-test (4.00).

**Discussion**

The hypotheses tested, and the decisions indicated by the results of this study are summarized as follows:

Hypothesis #1      There will be no significant difference between the experimental and control group on mean strength scores for the bench press before and after the treatment.

- Rejected #1 This hypothesis was rejected due to the existence of post-test differences between the two groups.
- Hypothesis #2 There will be no significant difference between the experimental and control group on mean strength scores for the latissimus dorsi pulldown before and after the treatment.
- Rejected #2 This hypothesis was rejected due to the existence of post-test differences between the two groups.
- Hypothesis #3 There will be no significant difference between the experimental and control group on mean strength scores for the seated leg press before and after the treatment.
- Rejected #3 This hypothesis was rejected due to the existence of post-test differences between the two groups.
- Hypothesis #4 There will be no significant difference between the experimental and control group on mean agility/dynamic balance scores before and after the treatment.
- Accepted #4 This hypothesis was not rejected due to the lack of a statistical difference between the two groups at mid or post-test data points.
- Hypothesis #5 There will be no significant difference between the experimental and control group on mean eye-hand coordination scores before and after the treatment.
- Accepted #5 This hypothesis was not rejected due to the lack of a statistical difference between the two groups at mid or post-test data points.

- Hypothesis #6      There will be no significant difference between the experimental and control group on mean upper arm strength/endurance scores before and after the treatment.
- Rejected #6      This hypothesis was rejected due to the existence of post-test differences between the two groups.
- Hypothesis #7      There will be no significant difference between the experimental and control group on mean grip strength scores before and after the treatment.
- Accepted #7      This hypothesis was not rejected due to the lack of a statistical difference between the two groups at mid or post-test data points.
- Hypothesis #8      There will be no significant difference between the experimental and control group on overall Physical Self-Efficacy Scale scores before and after the treatment.
- Accepted #8      This hypothesis was not rejected due to the lack of a statistical difference between the two groups at mid or post-test data points.
- Hypothesis #9      There will be no significant difference between the experimental and control group on Perceived Physical Ability scores before and after the treatment.
- Accepted #9      This hypothesis was not rejected due to the lack of a statistical difference between the two groups at mid or post-test data points.

Hypothesis #10      There will be no significant difference between the experimental and control group on Physical Self-Presentation Confidence scores before and after the treatment.

Accepted #10      This hypothesis was not rejected due to the lack of a statistical difference between the two groups at mid or post-test data points.

Hypothesis #11      There will be no significant difference between the experimental and control group on Geriatric Depression Scale scores before and after the treatment.

Rejected #11      This hypothesis was rejected due to the existence of post-test differences between the two groups.

It is shown in this investigation that the experimental group gained significant strength on the three voluntary muscular strength variables. It is also evident that the experimental group improved significantly on upper arm strength and decreased significantly in depression. In the control group, change on any of the research variables was very minimal. The time of year the study was conducted may have contributed to the very minimal changes in the control group. Also, the learning curve for both groups may have granted some changes in the results. Additionally, the control group was allowed to participate in their regular daily activities (except for resistance training) and this could have contributed to the minimal improvements.

The experimental group showed no statistically significant change on three of the functional fitness variables: agility and dynamic balance, eye-hand coordination, and grip strength. However, all of these components consistently improved over the course of the

experiment. It is suggested that these components did not improve significantly because the resistance training intervention did not specifically focus on these particular movements. The control group also consistently improved on agility and dynamic balance, eye-hand coordination, and upper arm strength. However, grip strength in the control group did show consistent improvement throughout the intervention.

Additionally, physical self-efficacy in experimental participants did not improve significantly statistically over the course of the experiment. There was a consistent positive increase in overall physical self-efficacy and self-presentation confidence throughout the experiment, but there was no consistent increase in perceived physical ability. The control group showed no consistent improvement in overall physical self-efficacy or perceived physical ability, however, there was a consistent improvement in perceived self-presentation confidence.

Depression in the experimental group significantly decreased from the pre-test to the mid-test, however showed no reduction throughout the remainder of the investigation. In the control group, depression levels increased from the pre-test data point to the mid-test data point and remained steady until the experiment concluded.

## **CHAPTER V**

### **SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS**

#### **Summary**

This study explored the effect isotonic resistance training had on specific physical, psychological, and functional characteristic in older adults. The primary objective was to investigate whether increases in voluntary muscular strength due to the implementation of a ten week isotonic resistance training program significantly effected functional fitness, physical self-efficacy, and depression in adults ages 65-85.

The literature makes evident the advantages of quality resistance training programs for our older population. Additionally, the literature indicates the benefits both physically and mentally as a result of resistance training, however, there is limited information regarding the results of resistance training on physical self-efficacy, functional fitness, and depression in our older adult cohort. Since the literature suggests a relationship between exercise and specific physical, psychological, and functional characteristics in older adults, this study seemed conceivable.

The participants in this investigation comprised a convenient sample of older adults from a midwestern town of approximately 60,000 citizens. They were volunteers



from the community and University Emeriti Faculty. The (39) participants ranged in age from 65 to 85 years, had little or no previous resistance training experience, and were willing to abide by the provisions of the experiment.

The study consisted of pre, mid, and post-testing sessions for voluntary muscular strength, functional fitness, physical self-efficacy, and depression. These sessions were separated equally throughout 10 weeks of resistance training. The experimental group received the treatment (isotonic resistance training) and the control group received no exercise intervention, but were allowed to participate in their daily activities. The instruments used to evaluate participant performance were the: Universal Multi-Station Resistance Training Machine (bench press, latissimus dorsi pulldowns, and seated leg press); Functional Fitness Assessment for Adults Over 60 Years (agility/dynamic balance, eye-hand coordination, upper arm strength, and grip strength); Physical Self-Efficacy Scale, and the Geriatric Depression Scale.

The results of this study indicated:

1. The experimental group demonstrated significant differences on the three voluntary muscular strength variables due to the intervention (resistance training). Significant differences were found between groups at the mid-test (latissimus dorsi pulldown) and post-test data points (all three variables).
2. Significant differences between groups were apparent on one component of functional fitness: upper arm strength. The experimental

group demonstrated significant positive changes at the mid and post-test data points.

3. There were no demonstrated differences between groups regarding physical self-efficacy. Both components of physical self-efficacy (perceived physical ability and perceived physical self-concept) did not change significantly from the pre-test to the post-test data point.
4. There were demonstrated significant differences between groups regarding depression. The experimental group displayed a significant decrease in depression, however this decrease in depression was only significant up to the mid-test data point. From the mid-test data point to the post test-data point depression continued to decrease in the experimental group but not significantly statistically.

Therefore it may be concluded that:

1. Voluntary muscular strength positively affected the experimental group after 5 weeks and up to 10 weeks of isotonic resistance training.
2. For functional fitness, upper arm strength was the only component significantly affected in the experimental group after 5 weeks and up to 10 weeks of isotonic resistance training.
3. Physical self-efficacy was unaffected by experimental participants after 10 weeks of isotonic resistance training.
4. Depression was positively affected by decreasing significantly in the experimental group after 5 weeks of isotonic resistance training.

## Findings

The implications of this study suggest that older adults can benefit significantly from a 10 week resistance training program. While the variables in this study determined statistically significant were obvious, the “personal benefits” reported by the participants are just as valuable. Individual testimonials made by the experimental group during, and after the program grants evidence that the intervention improved voluntary muscular strength, functional fitness, and psychological self-improvement. The evaluation items and a verbatim summary of the responses are included in Appendices J, Tables J1-J4.

On a daily basis, participants described how much better they felt physically and psychologically. As an example, after a couple of weeks of the resistance training intervention, several participants commented on how much easier it was to climb stairs, perform housework, and physically function daily. Some participants reported improved energy levels and better sleeping patterns. Additionally, participants expressed enhanced emotional characteristics toward family members, and friends. It should be noted that one participant confirmed mowing her yard for the first time in six years during the eighth week of the program. She stated, “it is the first time in six years, I have felt strong enough to mow my yard?”. The anecdotal comments made by the experimental participants were convincing and varied from a gamut of health and personal improvements, thus providing evidence the intervention was successful. In contrast, the control participants indicated little to no self-reported improvements from a physical, psychological, or functional perspective.

The results of this study impressively illustrate the positive affects of a properly implemented isotonic resistance training program on voluntary muscular strength in older adults. The significant changes in upper arm strength, and depression in the experimental group were also a beneficial aspect of the program. However, with these significant findings, limitations are apparent. For example, a larger sample size may have reflected a more suitable representation of the population. Also, the experimental and control groups could have been more evenly randomly distributed to their respective groups. The experimental group (n = 26) was two times larger than the control group (n = 13). This sampling method was performed to maximize the number of participants in the experimental group. The participants in this study were all volunteers and all of them wanted to be assigned to the experimental group. In addition, several participants were ex-faculty members and were knowledgeable about scientific research. This reality, may have influenced their desire for significant findings. Another discrepancy is the possibility this particular sample may have been more active than a representative population prior to the experiment. Also, the experiment did not control for socialization during or after exercise sessions, evaluations or seminars. In other words, participants were allowed to communicate during all meetings. Some participants even met after meetings to socialize. This factor may have contributed to a significant reduction in depressive symptoms within the experimental group.

The number of weeks the experimental group spent exercising could have influenced the findings. The 10 week intervention period was consistent with numerous

research studies cited in the literature. However, it is possible a longer intervention period would have yielded additional statistically significant results.

The measurements for voluntary muscular strength could have been performed with a more accurate instrument. The measurements were executed using the Universal Hercules Gym Machine (model # 078086) which was also used throughout the 10 week intervention period. It is suggested that a goniometer would have been beneficial for measuring individuals performing the seated leg press. The goniometer would have provided for a more consistent and accurate adjustment of the leg press seat prior to the participant performing repetitions.

Lastly, the experimental and control groups were assessed for physical self-efficacy and depression in their respective groups. A more accurate measurement of these two variables may have been made if the participants were assessed individually rather than in a group format. The group format did not control well for socialization and interaction of participants prior to the evaluations.

The attendance rate for the experimental group was extremely high. Each session participants completed a “daily exercise sheet” for the three measured strength variables: bench press, latissimus dorsi pull-down, and seated leg press. This “daily exercise sheet” used to monitor participant performance, also assisted in managing participant attendance. The “daily exercise sheet” may have also assisted in motivating participants to maintain or exceed strength gains from the previous exercise session. The “daily exercise sheet is shown in Appendix G.

## **Conclusion**

Exercise and physical activity have been demonstrated to have a wide range of positive effects on a host of physical, psychological, and functional characteristics in human beings. Moreover, these effects have been witnessed throughout the age spectrum from children to older adults. Resistance training, a form of exercise has been shown to contribute to strength gains in older adults, however, investigations regarding resistance training related to psychological and functional capacities are limited.

Gerontological research is currently a developing area of interest for many social scientist, exercise physiologist and health promotion specialist. This analyses, could provide significant importance to these professionals as well as others associated with the field of gerontology. Finally, from this investigation it can be concluded that a resistance training program of moderate to strenuous intensity three times a week for ten weeks increases voluntary muscular strength and decreases depression in community dwelling adults between the ages of 65 and 85. Because older adults are at a greater risk for institutionalization, it can be suggested that resistance training in this cohort has the potential to prolong physical independence and reduce depression by increasing physical strength as well as ameliorating mental health.

## **Recommendations**

With the results of this study, there are several recommendations that may be

practical. First, participants in the experiment were all volunteers. It would be more representative of a true older adult population to randomly select participants from an available community. It is also suggested that the two psychological assessments used throughout the experiment (Physical Self-Efficacy Scale and Geriatric Depression Scale) may not have been sensitive enough to detect changes in the participants. Additionally, the (PSE) was difficult for some participants to answer due to the reverse scoring method. Participants answered the (GDS) questionnaire by circling a response of yes or no. This questionnaire did not allow much variability in scores, thus change was also difficult to detect. Other depression scales may have provided a more accurate measurement of depression.

Lastly, throughout evaluations sessions, and seminars it is recommended that socialization be eliminated. Socialization immediately prior to these assessment periods may have contributed to an increase in motivation, elevated self-worth, and decreased feelings of depression. It is suggested that participants be monitored before and after these measurement periods to better control this extraneous factor. Likewise, experimental participants socialized during exercise sessions and control participants did not have an opportunity to meet regularly with an organized group. This may have also contributed to an increase in motivation, elevated self-worth, and decreased feelings of depression.

## SELECTED BIBLIOGRAPHY

- Adams, T., Bezner, J., & Steinhardt, M. (1995). Principlecenteredness: a values clarification approach to wellness. Measurement Evaluation Counseling Development, (3): 139-147.
- Adams, T., Bezner, J., & Steinhardt, M. (1997). The conceptualization and measurement of perceived wellness: Integrating balance across and within dimensions. American Journal of Health Promotion, 11(3): 208-218.
- Allen, T.E., Byrd, R.J., & Smith, D.P. (1976). Hemodynamic consequences of circuit weight training. Research Quarterly, 47, 229-306.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84.
- Bandura, A., Adams, N.E., Hardy, A.B., & Howells, G.N. (1980). Tests of the generality of self-efficacy theory. Cognitive Therapy and Research, 4, 39-66.
- Bandura, A., & Schunk, D.H., (1981). Cultivating competence, self-efficacy, intrinsic interests through proximal self-motivation. Journal of Personality and Social Psychology, 41, 586-598.
- Bandura, A. (1982). Self-efficacy in human agency. American Psychologist, 44, 1175-1184.
- Bandura, A. (1986). Social foundations of thought and action. Englewood Cliffs, NJ: Prentice Hall.
- Barrow, G.M., & Smith, P.A. (1983). Aging: The individual and society. (2nd ed.). St. Paul, MN: West.



- Beck, A.T., & Beamesderfer, A. (1974). Assessment of depression: The Depression Inventory. In P. Pichot (Ed.), Psychological measurement in psychopharmacology (pp. 1-10). Basel: Karger
- Bennett, J., Carmack, M.A., & Gardner, V.J. (1982). The effect of a program of physical exercise on depression in older adults. Physical Educator, *39*, 21-24.
- Blair, S.N., Kohl, H.W., III, Paffenbarger, R.S, Jr., Clark, D.G., Cooper, K.H., & Gibbons, L. W. (1989). Physical fitness and all-causes of mortality: A prospective study of healthy men and women. Journal of the American Medical Association, *262*, 2395-2401.
- Blazer, D., Hughes, D., & George, L. (1987). The epidemiology of depression in an elderly community population. The Gerontologist, *27*, 281-287.
- Blazer, D. (1990). Emotional problems in later life. New York: Springer Publishing Company.
- Bloesch, D., Schultz, Y., Breitenstein, E., Jequier, E., & Felber, J.P. (1988). Thermogenic response to an oral glucose load in man: Comparison between young and elderly subjects. Journal of American College Nutrition, *7*, 471-483.
- Bouchard, C., Shephard, R.J., Stephens, T., Sutton, J.R., & McPherson, B.D. (Eds.). (1990). Exercise, fitness, & health: A consensus of current knowledge. Champaign, IL: Human Kinetics Publisher.
- Brink, T.L., Curran, P., Dorr, M.L., Janson, E., McNulty, U., & Messina, M.(1985). Geriatric Depression Scale reliability: Order, examiner and reminiscence effects. Clinical Gerontology, *3*, (4), 57-59.
- Brown, A.B., McCartney, N., & Sale, D.G. (1990). Positive adaptations to weight-lifting in the elderly. Journal of Applied Physiology, *69*, 1725-1733.
- Camacho, T.C., Roberts, R.E., Lazarus, N.B, Kaplan, G.A., & Cohen, R.D. (1991). Physical activity and depression: Evidence from the Alameda County Study. American Journal of Epidemiology, *134*, 220-231.

- Carlson, N.R. (1990). Psychology: The science of behavior. (3rd ed.). Boston: Allyn & Bacon.
- Carter, J.S., Williams, H.G., & Macera. (1993). Relationships between physical activity habits and functional neuromuscular capacities in older healthy adults. The Journal of Applied Gerontology, 2, 283-293.
- Charette, S.L., McEvoy, L., Pyka, G., Snow-Harter, C., Guido, D., Wiswell, R.A., & Marcus, R. (1991). Muscle hypertrophy response to resistance training in older women. Journal of Applied Physiology, 70, 1912-1916.
- Chodzko-Zajko, W.J., & Ismail, A.H. (1986). The discrimination power of the MMPI and selected physiological and biomechanical variables to differentiate between high-and low-fit adult males. In J.H. Humphrey & C.O. Dotson (Eds.). Exercise Physiology, 2, 99-107.
- Clarkson, P.M., Kroll, W., & Melchionda, A.M. (1981). Age, isometric strength, rate of tension development and fiber type composition. Journal of Gerontology, 36, 643-648.
- Cohen, G. (1990). Psychopathology and mental health in the mature and elderly adult. In J. Birren & K.W. Schaie (Eds.). Handbook of the Psychology of Aging. (3rd ed.), San Diego, CA: Academic Press.
- Collins, B.E. (1974). Four components of the Rotter internal-external scale: Belief in a difficult world, a just world, a predictable world, and a politically responsive world. Journal of Personality and Social Psychology, 29, 381-391.
- Corbin, C.B., & Lindsey, R. (1991). Concepts of physical fitness with laboratories. (7th ed.), Dubuque, IA: Brown.
- Dannefer, D. (1988) What's in a name? An account of the neglect of variability in the study of aging. In J.E. Birren & V.L. Bengston (Eds.), Emergent theories of aging. New York: Springer Publishing Company.

- Desmond, S.M., & Price, J.H. (1988). Self-efficacy and weight control. Health Education, 12-18.
- DiCicco, L., & Apple, D. (1968). Health needs and opinions of older adults. Public Health Reports, 8, 479-487.
- DiPietro, L., Caspersen, C.J., Ostfeld, A.M., & Nadel, A. (1993). A survey for assessing physical activity among older adults. Medicine and Science in Sports and Exercise, 25, 628-642.
- DiPietro, L. (1996). The epidemiology of physical activity and function in older people. Medicine and Science in Sports and Exercise, 28, (5), 596-600.
- Doyne, E.J., Ossip-Klein, D.J., Bowman, E. D., Osborn, K.M., McDougall-Wilson, I.B., & Neimayer, R.A. (1987). Running versus weight lifting in the treatment of depression. Journal of Consulting and Clinical Psychology, 55, 748-754.
- Fenigstein, A., Scheier, M.F., & Buss, A. (1975). Public and private self-consciousness: Assessment and theory. Journal of Consulting and Clinical Psychology, 43, 522-527.
- Fiatarone, M.A., Marks, E.C., Ryan, N.D., Meredith, C.N., Lipsitz, L.A., & Evans, W.J. (1990). High-intensity strength training in nonagenarians. The Journal of the American Medical Association, 263, 3029-3034.
- Fiatarone, M.A., O'Neill, E.F., Ryan, N.D., Clements, K.M., Solares, G.R., Nelson, M.E., Roberts, S.B., Kehayias, J.J., Lipsitz, L.A., & Evans, W.J. (1994). Exercise training and nutritional supplementation for physical frailty in very elderly people. New England Journal of Medicine, 330, 1769-1775.
- Fitts, W.H. (1965). Tennessee Self-Concept Scale Manual. Nashville, Tenn.: Counselor Recordings and Tests.
- Fleg, J.L., & Lakatta, E.G. (1991). Role of muscle loss in age associated reduction of VO2 max. Journal of Applied Physiology, 65, 1147-1151.

- Frontera, W.R., Meredith, C.N., O'Reilly, K.P., Knuttgen, H. G., & Evans, W.J. (1988). Strength conditioning in older men: skeletal muscle hypertrophy and improved function. Journal of Applied Physiology, 63, 1038-1044.
- Fylkesnes, K., & Forde, O. (1991). The Tromso study: predictors of self-evaluated health-has society adopted the expanded health concept? Social Science Medicine, 32(2): 141-146.
- Gilford, D.M. (Ed.) (1988). The aging population in the twenty-first century: Statistics. (Panel on statistics for an aging population, Sam Shapiro, Chair) National Research Council, Washington, D.C.: National Academy Press.
- Gorman, K.M., & Posner, J.D. (1988). Benefits of exercise in old age. Clinical Geriatric Medicine, 4, 181-192.
- Griest, J.H., Klein, M.H., Eischens, R.B., Faris, J., Gurman, A.S., & Morgan, W.P. (1979). Running as treatment for depression. Comprehensive Psychiatry, 20, 41-54.
- Grimby, G., Aniansson, A., Hedberg, M., Henning, G.B., Grangard, U., & Kvist, H. (1992). Training can improve muscle strength and endurance in 78-to 84-year old men. Journal of Applied Physiology, 73, 2517-2523.
- Gutman, E., & Hanzlíkova, V. (1976). Fast and Slow Motor Units in Aging. Gerontology, 22, 280-300.
- Hamdorf, P.A., Withers, R.T., Penhall, R.K., & Haslam, M.V. (1992). Physical training effects on the fitness and habitual activity patterns of elderly women. Archives of Physical Medicine and Rehabilitation, 73, 603-608.
- Haskell, W.L. (1985). Physical activity and health: need to define the required stimulus. American Journal of Cardiology, 55, 4D-9D.
- Helmreich, R., Stapp, J., & Ervin, C. (1974). The Texas Social Behavior Inventory (TSBI): An objective measure of self-esteem or social competence. JASA Catalog of Selected Documents in Psychology, 4, 79. (Ms. No.681)

- Hyer, L., & Blount, J. (1984). Concurrent and discriminant validities of the GDS with older psychiatric patients. Psychological Reports, 54, 611-616.
- Jette, A.M., & Branch, L.G. (1981). The Framingham Disability Study: II Physical disability among the aging. American Journal of Public Health, 71, 1211-1216.
- Kallman, O.A., Plato, C., & Tobin, J. (1990). The role of muscle loss in age related decline in grip strength: a cross-sectional and longitudinal analysis. Journal of Gerontology, 45, M82-M88.
- Kane, R.A., & Kane, R.L. (1987). Assessing the elderly: A practical guide to measurement. Lexington, MA: Lexington Books.
- Katz, S. (1987). The science of quality of life. Journal of Chronic Disease, 40, 459-463.
- Larsson, L., & Karlsson, J. (1978). Isometric and dynamic endurance as a function of age and skeletal muscle characteristics. Acta. Physiology Scandinavia, 104, 129-136.
- Larsson, L., Sjodin, B. & Karlsson, J. (1978). Histochemical and biomechanical changes in human skeletal muscle with age in sedentary males, age 22-65 years. Acta. Physiology Scandinavia, 103, 31-39.
- Manning, F. & Fullerton, T. (1988). Health and wellbeing in highly cohesive units of the US army. Journal of applied Social Psychology, 18(6): 503-519.
- McAuley, E. (1993). Understanding exercise behavior: A self-efficacy perspective. In G.C. Roberts (Ed.), Motivation in sport and exercise (pp. 107-128). Champaign, IL: Human Kinetics.
- McCann, I.L., & Holmes, D. (1984). The influence of aerobic exercise on depression. Journal of Personality and Social Psychology, 46, 1142-1147.
- McNeil, J.K., LeBlanc, E.M., & Joyner, M. (1991). The effect of exercise on depressive symptoms in the moderately depressed elderly. Psychology and Aging, 6(2), 487-488.

- Nelson, M.E., Fiatarone, M.A., Morganti, C.M., Trice, I., Greenberg, R.A., & Evans, W.J. (1994). Effects of high-intensity strength training on multiple risk factors for osteoporotic fractures. A randomized controlled trial. Journal of the American Medical Association, 272, 1909-1914.
- Nichols, J.F., Omizo, D.K., Peterson, K.K., & Nelson, K.P. (1993). Efficacy of heavy-resistance training for active women over sixty. Journal of the American Geriatric Society, 41, 205-210.
- O'Donnell, M.P., & Harris, J.S. (1994). Health Promotion in the Workplace. (2nd ed.), Albany, NY: Del Mar Publishers Inc.
- O'Leary, A. (1985). Self-efficacy and Health. Behavior and Research Therapy, 23, 437-451.
- Osness, W.H. (1986). Physical assessment procedures: The use of functional profiles. Journal of Physical Education, Health, Recreation, and Dance, 57, 35-38.
- Osness, W.H. (1989). The AAHPERD fitness task force. Journal of Physical Education, Health Recreation, and Dance, 64-65.
- Osness, W.H. (1992) Fitness Evaluation Clinic, The University of Kansas. (Unpublished)
- Parmelee, P.A., Katz, I.R., & Lawton, M.P. (1989). Depression among institutionalized aged: assessment and prevalence estimation. Journal of Gerontology: Medical Sciences, 44, M22-M29.
- Pate, R.R. (1989). The evolving definition of physical fitness. Quest, 40, 174-179.
- Patrick, D., Bush, J., & Chen, M. (1973). Toward an operational definition of health. Journal of Health & Social Behavior, 14, 6-22.
- Perri, S., & Templer, D.J. (1984). The effects of an aerobic exercise program on psychological variables in older adults. International Journal of Aging and Human Development, 20, 167-171.

- Petruzzello, S.J., Landers, D.M., Hatfield, B.D., Kubitz, K.A., & Salazar, W. (1991). A meta-analysis on the anxiety-reducing effects of acute and chronic exercise. Sports Medicine, 11, 143-182.
- Pyka, G., Lindenberger, E., Charette, S., & Marcus, R. (1994). Muscle strength and fiber adaptations to a year-long resistance training program in elderly men and women. Journal of Gerontology, 49, M22-M27.
- Rasch, P.J., & Burke, R.K. (1978). Kinesiology and applied anatomy. (6th ed.). Philadelphia: Lea and Febiger.
- Rocca, C. (1991). Exercise isn't just fun. Aging, 362, 37-40.
- Rogers, C.R. (1959). A theory of therapy, personality, and interpersonal relationships, as developed in the client-centered framework. In S. Koch (Ed.), Psychology: A study of a science (Vol. 3). New York: McGraw-Hill.
- Rogers, M.A., & Evans, W.J. (1993). Changes in skeletal muscle with aging: Effects of exercise training. Exercise and Sports Sciences Reviews, 21, 65-102.
- Roman, W.J., Fleckenstein, J., Stray-Gunderson, J., Alway, S.E., Peshock, R., & Rousseau, P. (1989). Exercise in the elderly. Postgraduate Medicine, 85(6), 113-116.
- Ryckman, R.M., Robbins, M.A., Thornton, B., & Cantrell, P. (1982). Development and validation of a physical self-efficacy scale. Journal of Personality and Social Psychology, 42, 891-900.
- Seiger, L., Vanderpool, K., & Barnes, D. (1995). Fitness and Wellness Strategies. Dubuque, IA: Wm. C. Brown Communications, Inc.
- Shephard, R.J. (1981). Physical activity and aging. Chicago, IL: Year Book Medical Publishing.
- Shephard, R.J. (1990). The scientific basis of prescribing exercise for the very old. Journal of the American Geriatrics Society, 38, 62-70.

- Sipila, S., & Syominen, H. (1995). Effects of strength and endurance training on thigh and leg muscle mass and composition in elderly women. Journal of Applied Physiology, 78, 334-340.
- Smith, E.L., & Zook, S.K. (1975). The aging process: Benefits of physical activity. Journal of Physical Education, Health, Recreation, & Dance, 57(1), 32-34.
- Spirduso, W.W. (1975). Reaction and movement time as a function of age and physical activity level. Journal of Gerontology, 30, 435-440.
- Spirduso, W.W. (1980). Physical fitness, aging, and psychomotor speed: A review. Journal of Gerontology, 35, 850-865.
- Spirduso, W.W. (1995). Physical Dimensions of Aging. Champaign, IL: Human Kinetics Publishing.
- Stamford, B.A. (1973). Effects of chronic institutionalization on the physical working capacity and trainability of geriatric men. Journal of Gerontology, 28, 441-446.
- Taylor, J.A. (1953). A personality scale of manifest anxiety. Journal of Abnormal and Social Psychology, 48, 285-290.
- Thompson, R.E., Crist, D.M., Marsh, M., & Rosenthal, M. (1988). Effects of physical exercise for elderly patients with physical impairments. Journal of the American Geriatric Society, 36, 130-135.
- Tzankoff, S.P., & Norris, A.H. (1977). Effect of muscle mass decrease on age-related BMR changes. Journal of Applied Physiology, 43, 1001-1006.
- Uson, P.P., & Larrosa, V.R. (1989). Physical activities in retirement age. In J. Partington, T. Orlick, & J. Samela (Eds.), Sport in Perspective (pp. 149-151). Ottawa, ON: Coaching Association of Canada.
- Vanfraechem, J. & Vanfraechem, R. (1977). Studies of the effect of a short training period on aged subjects. Journal of Sports Medicine, 17, 337-339.



- Wagner, E.H., LaCroix, A.Z, Buchner, D.M., & Larson, E.B. (1992). Effects of physical activity on health status in older adults: I: Observational studies. Annual Review of Public Health, 13, 451-468.
- Walter, E.C. (1958). Scientific foundations of the overload principle. Scholastic Coach, 27, (8), 34-35.
- Wylie, R.C. (1974). The self-concept. (Vol.1). Lincoln: University of Nebraska Press.
- Yesavage, J., & Brink, T.L. (1983). Development and validation of a geriatric depression screening scale: A preliminary report. Journal of Psychiatric Research, 17, 37-49.
- Zarit, S.H., & Zarit, J.M. (1991). Depression in later life: Theory and assessment. In J. P. Abrahams & V.J.Crooks (Eds.), Geriatric mental health. Orlando, FL: Grune & Stratton.
- Zedlewski, S.R., Barnes, R.O., Burt, M.R., McBride, T.D., & Meyer, J.A. (1992). The needs of the elderly in the 21st century. Washington, DC: Urban Institute Press.
- Zuckerman, M., Eysenck, S., & Eysenck,H.J. (1978). Sensation seeking in England and America: Cross-cultural, age and sex comparisons. Journal of Consulting and Clinical Psychology, 46, 139-149.

**APPENDIX A**

**INTRODUCTORY PROGRAM SCHEDULE FOR PARTICIPANTS**

# Isotonic Resistance Training Related to Functional Fitness, Physical Self-Efficacy and Depression in Adults Ages 65-85

Boo Collier, M.H.E. & Bert Jacobson, Ed.D.

Thank you for your interest in our health promotion research study. We want to provide you with a program that promotes a well-rounded approach to health education. To achieve this we have designed a study emphasizing physical health through resistance training (weight lifting). We will also assess some of your emotional, social and psychological characteristics. We are committed to providing you a weight lifting program meeting your personal capabilities. We will emphasize safety, improvement and FUN! Our philosophy is based on:

## **Education**

- ◆ promoting the importance of weight lifting
- ◆ teaching proper lifting techniques, exercise terminology and safety

## **Application**

- ◆ teaching concepts to help improve physical health
- ◆ providing an opportunity to improve activities of daily living

## **Evaluation**

- ◆ collecting data to measure present participants health status
- ◆ suggesting means to measure future participants health status

## **Support**

- ◆ providing individuals a means to continue learning, and growing
- ◆ helping to establish motivation, desire and commitment to exercise

**Oklahoma State University  
Health Promotion Research Project**

**Title:** Isotonic Resistance Training (strength) Related to Functional Fitness, Physical Self-Efficacy, and Depression in Adults Ages 65-85

- I. Participants** - males and females between ages 65-85
- II. Assessments** -
1. muscular strength
  2. functional fitness (AAHPERD)
  3. perceived physical self-efficacy
  4. depression
- III. Program** -
1. **No Cost!**
  2. **10 weeks** / 30 exercise sessions
  3. meet **3 times a week** (M, W, F)
  4. **45-50 minute** exercise sessions
  5. **meets at OSU Colvin Center**
- IV. Timeline** -
1. pilot test instruments - January
  2. 1st. group meeting - February
  3. seminar "strength" - February
  4. pre-testing - Feb. "late"
  5. intervention - Feb.- May
  6. mid-testing - March 30
  7. post-testing - May 5,7,9
  8. 2nd. group meeting - May 12
- V. Personnel** 1. Boo Collier (Dept. HPEL) (w) 744-7447 372-6774

## Program Schedule

1. February 3rd or 5th (Monday) or (Wednesday) 8-9am or 2-3pm

### **Distribute Folders Containing:**

- \* Philosophy Statement
- \* Physician's Consent (**Must be Approved by February 24th**)
- \* Participant Consent (**Must be Completed by 3rd or 5th**)
- \* Demographic Information Sheet (**Completed by 3rd or 5th**)
- \* 65 + Exercise Survey (**Completed by Feb. 19th or 21st**)
- \* Select an Exercise Time (**8:00-8:50am**) or (**2:00-2:50pm**)
- \* Sign-up for an **Exercise Seminar Time**
- \* Pilot Study Resistance Training Protocol

### **Pre-Assessments and Pilot Strength:**

- \* General Depression Scale
- \* Physical Self-Efficacy Scale

2. February 19th or 21st (Wednesday or Friday) 8-9am or 2-3pm

### **Exercise Seminars:**

- \* Become Familiar with Equipment
- \* Learn Technique, Terminology, Monitoring
- \* Questions, Comments, Concerns
- \* Return 65 + Exercise Survey
- \* Sign-up for Assessments (list for 24th and 28th)

3. February 24th and 28th (Monday and Friday) TBA

### **Pre-Assessments:**

- \* Functional Fitness (Monday)
- \* Strength - Bench Press, Lat Pulls, Leg Extensions (Friday)

4. March 3rd (Monday) Group Times

**Intervention Begins:**

- \* Group I 8:00 - 8:50am
- \* Group II 2:00 - 2:50pm
- \* (3) Days a Week (Monday, Wednesday and Friday)

5. March 31st and April 4th (Monday and Friday) TBA

**Mid-Assessments:**

- \* Functional Fitness, GDS and PSE (Monday)
- \* Strength (Friday)
- \*\*\*\* **Control Participants Required to Attend** \*\*\*\*

6. April 7th (Monday) Group Times

**Intervention Resumes:**

- \* Group I 8:00 - 8:50am
- \* Group II 2:00 - 2:50pm
- \* (3) Days a Week (Monday, Wednesday and Friday)

7. May 5th and 9th Monday and Friday TBA

**Post-Assessments:**

- \* Functional Fitness, GDS and PSE (Monday)
- \* Strength (Friday)
- \*\*\*\* **Control Participants Required to Attend** \*\*\*\*

8. Date to be Determined (Last Gathering)

- \* Conclusion Meeting (Closing Ceremony)
- \* Refreshments
- \* Awards/Certificates
- \* Guest Speaker (on a selected topic)

## Control Group Information

A **Control Group** will be utilized in this study. A random selection will determine who will receive the treatment (weight lifting) and who will receive the control. If you are selected to the control group, we ask you follow these guidelines:

1. Continue your regular daily activities!
2. **DO NOT PARTICIPATE** in any weight training activities or program.
3. Participate in the **pre, mid and post assessments** within this study.
4. Participate in a Closing Ceremony.
5. Have an option to participate in a (4) week program immediately following the study. (May 12th - June 6th)

### **DATES TO REMEMBER!**

#### **Pre-assessments**

- |                 |                    |
|-----------------|--------------------|
| * February 24th | Functional Fitness |
| * February 28th | Strength           |

#### **Mid-Assessments**

- |              |                                 |
|--------------|---------------------------------|
| * March 31st | Functional Fitness, GDS and PSE |
| * April 4th  | Strength                        |

#### **Post-Assessments**

- |           |                                 |
|-----------|---------------------------------|
| * May 5th | Functional Fitness, GDS and PSE |
| * May 7th | Strength                        |

## Seminar Reminder Form

Weight lifting seminars will be provided for individuals who are interested in participating in the study. You will have (4) opportunities to attend a project seminar (YOU **MUST** ATTEND ONLY ONE OF THEM).

These seminars will include information regarding exercise technique, safety procedures and monitoring methods. All seminars will take place on the lower level of the Colvin Center in the Biomechanics Room. Room 119 will provide you with directions to the Biomechanics Room if necessary.

### **DATES AND TIMES OF THE SEMINARS!**

- |                        |                  |               |
|------------------------|------------------|---------------|
| * February 19th (Wed.) | 8:00am to 9:00am | Colvin Center |
| * February 19th (Wed.) | 2:00pm to 3:00pm | Colvin Center |
| * February 21st (Fri.) | 8:00am to 9:00am | Colvin Center |
| * February 21st (Fri.) | 2:00pm to 3:00pm | Colvin Center |

A sign-up list will be provided after the Orientation Meeting.



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Weight lifting seminars will be provided for individuals who are interested in participating in the study. You will have (4) opportunities to attend a project seminar (YOU **MUST** ATTEND ONLY ONE OF THEM).

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| * February 21st (Fri.) | 2:00pm to 3:00pm | Colvin Center |

A sign-up list will be provided after the Orientation Meeting.

## Parking Information

# Parking!

Following the orientation meetings February 3 or 5, parking will be allowed only in the south parking lot located on the south side of the Colvin Center. There is metered parking at the rate of:

\* \$ 0.10 an hour

\* \$ 0.25 every 2.5 hours

Following the orientation meeting, if you park anywhere other than the South Parking Lot you are liable to get a parking ticket \$20.00.

## Demographic Information

Instructions: Carefully read each of the following questions and give the appropriate answer. **Be sure to answer all questions.**

1. **Print your Full Name:** \_\_\_\_\_ **Tel.#** \_\_\_\_\_

2. **Circle your Gender:**                      Male                      Female

3. **Circle the number below which represents your Current Age:**

65    66    67    68    69    70    71    72    73    74    75

76    77    78    79    80    81    82    83    84    85

4. **Rate your current Physical Health:**    Excellent    Good    Fair    Poor

5. Have you **participated** in a resistance training (weight lifting) program within the last (6) months? **Circle your response:**

Yes

No

6. How long has it been since you **last participated** in a resistance training (weight lifting) program. **Circle the letter that best represents your response.**

- A. Less than 1 year ago
- B. 1 to 10 years ago
- C. 11 to 20 years ago
- D. 21 to 30 years ago
- E. more than 30 years ago
- F. Never

7. Are you **currently** exercising (involved in activities such as walking, jogging, swimming, water aerobics, bicycling, dancing, ect.) at least (3) times a week? **Circle your response.**

Yes

No

8. Are you **currently** taking any medication(s) that may affect your ability to exercise. **List any medication(s) that may cause (nausea, dizziness, rapid heart beat, ect.) while participating in exercise.**

Medication

Symptom(s)

_____	_____
_____	_____
_____	_____
_____	_____

9. **List any Physical Health** problems you **currently** have or have encountered in the **past** that may affect your ability to exercise.

Current

Past

_____	_____
_____	_____
_____	_____

10. Exercise sessions will be held Monday, Wednesday and Friday for ten weeks with each session lasting about (50) minutes. **Circle the time period you prefer to workout.**

8:00am - 8:50am

2:00pm - 2:50pm

## Participant Informed Consent

I, \_\_\_\_\_, hereby authorize Boo Collier, or associates/assistants of his, to perform the following strength training treatment.

- \* A (10) week weight lifting program consisting of exercise designed to meet personal capabilities.
- \* The program will take place in the Colvin Center on the Oklahoma State University campus.
- \* The treatment (strength training) group will meet (3) times a week Monday, Wednesday and Friday between the hours of (8:00-9:00) or (2:00-3:00).
- \* The activities will be progressive in nature. They will begin slowly and increase gradually in intensity.
- \* A series of assessment will be administered (3) times throughout the project (pre-assessment, mid-assessment and post-assessment). The assessment consist of: General Depression Scale, Physical Self-Efficacy Scale, Functional Fitness Assessment and Strength.
- \* The assessment will include commonly utilized functions such as coordination, agility/balance, grip strength and body strength. In addition, several written assessments will be utilized to measure emotional, social and psychological factors.
- \* The scores of the assessments will be kept confidential. If, at the end of the program, participants would like to know their scores, they will be made available on an individual basis. **At no time will participants' names/scores be made public.**
- \* If selected to the **Control Group**, participants will engage in regular daily activities. **They will not participate in any form of weight lifting or strength training program.**

This will be done as part of an investigation titled: "Isotonic Resistance Training Related to Functional Fitness, Physical Self-Efficacy, and Depression in Adults Ages 65-85".

The purpose of this study is to investigate the effects isotonic resistance training (strength) has on functional fitness, physical self-efficacy and depression in adults ages 65-85.

I understand that participating in this study is voluntary. I further understand that I must submit a signed release from my personal physician prior to participating. I am aware that there is no penalty for refusal to participate, and that I am free to withdraw my consent to participate at any time during the investigation, upon notification of the director (Boo Collier).

For additional information, I may contact Boo Collier, at 744-7447 or 372-6774. In addition, I may contact Dr. Bert Jacobson at 744-5500 or Gay Clarkson, Institutional Board Executive Secretary, at 744-5700.

I have read, and fully understand the Informed Consent Form. I sign it freely and voluntarily. A copy will be given to me prior to the investigation.

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Signed: \_\_\_\_\_

Participant

## Physician's Consent and Release Form

The program in which your patient, \_\_\_\_\_, would like to participate is a resistance training (strength) program for normally aging individuals between the ages 65-85. This program will entail (7) different exercises utilizing a Universal strength training machine. If selected to the treatment group, your patient will be exercising (3) times a week for approximately (50) minutes each session. Within that time period, (20) minutes will be allotted for warm-up and cool-down. Participants of the study will exercise at an intensity based on their physical capabilities. In addition, the exercises will allow for normal breathing, conversation and a brief periods of rest throughout. The control participants will be asked to engage in their regular daily activities, and will not receive the treatment.

Pre, mid and post-testing will also be required of your patient which entails simple functional tasks such as coordination, agility/balance, grip strength and upper arm strength. In addition, (3) strength training assessments will be performed, as well as (2) written psychological assessments. Participants in this study will be closely supervised at all times during assessment and exercise periods.

If there are any medical conditions or considerations pertaining to this patient's ability to participate in this program, please list them:

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---

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Thank you for your assistance.

---

Physician's Signature

---

Date

**APPENDIX B**  
**IRB APPROVAL**



OKLAHOMA STATE UNIVERSITY  
INSTITUTIONAL REVIEW BOARD  
HUMAN SUBJECTS REVIEW

Date: 01-03-97

IRB#: ED-97-051

Proposal Title: EFFECTS OF ISOTONIC RESISTANCE TRAINING ON  
FUNCTIONAL FITNESS, PHYSICAL SELF-EFFICACY, AND  
DEPRESSION IN ADULTS 65-85

Principal Investigator(s): Bert Jacobson, Christopher D. "Boo" Collier

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD  
AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING  
THE APPROVAL PERIOD.

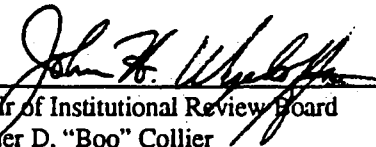
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A  
CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD  
APPROVAL.

ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR  
APPROVAL.

---

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval  
are as follows:

Signature:

  
Chair of Institutional Review Board

Date: January 7, 1997

cc: Christopher D. "Boo" Collier

**APPENDIX C**  
**PARTICIPANT DATA SHEET**

# DATA SHEET

NAME: \_\_\_\_\_ TESTING DATE: \_\_\_\_\_

GENDER: M F AGE: \_\_\_\_\_ LOCATION: \_\_\_\_\_

TEST TECHNICIAN: \_\_\_\_\_

**PONDERAL INDEX**

HEIGHT [ ][ ][ ] . [ ][ ]  
 WEIGHT [ ][ ][ ][ ] . [ ][ ]  
 INDEX [ ][ ][ ][ ] . [ ][ ]

TEST ITEM	TEST TRIALS SCORES			FINAL
TEST ITEMS	TRIAL 1	TRIAL 2	TRIAL 3	FINAL
1. AGILITY/BALANCE				
2. COORDINATION				
3. UPPER ARM STRENGTH				
4. GRIP STRENGTH				
5. BENCH PRESS				
6. LATISSIMUS PULL				
7. SEATED LEG PRESS				

**APPENDIX D**  
**EVALUATION SCHEDULE**

## EVALUATION SCHEDULE

<b>TIME</b>	<b>NAME</b>	<b>NAME</b>
<b>6:00 AM</b>		
<b>6:30 AM</b>		
<b>7:00 AM</b>		
<b>7:30 AM</b>		
<b>8:00 AM</b>		
<b>8:30 AM</b>		
<b>9:00 AM</b>		
<b>9:30 AM</b>		
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<b>12:00 PM</b>		
<b>12:30 PM</b>		
<b>1:00 PM</b>		
<b>1:30 PM</b>		
<b>2:00 PM</b>		
<b>2:30 PM</b>		
<b>3:00 PM</b>		
<b>3:30 PM</b>		
<b>4:00 PM</b>		
<b>4:30 PM</b>		

**APPENDIX E**

**PHYSICAL SELF-EFFICACY SCALE**

## Physical Self-Efficacy Scale

Please read each statement carefully. Then indicate the extent to which you agree or disagree by **checking** (✓) the box that **best** corresponds to your opinion.

	Strongly Agree	Somewhat Agree	Slightly Agree	Slightly Disagree	Somewhat Disagree	Strongly Disagree
1. I have excellent reflexes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
2. I am <b>not</b> agile and graceful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
3. I am <b>rarely</b> embarrassed by my voice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. My physique is rather strong.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
5. Sometimes I <b>don't</b> hold up well under stress.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I can run fast.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
7. I have physical defects that sometimes bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I <b>don't</b> feel in control when I take tests involving physical dexterity. (skill in using hands, body, or mind)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
9. I am never intimidated by the thought of a sexual encounter.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. People think negative things about me because of my posture.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I am <b>not</b> hesitant about disagreeing with people bigger than me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I have poor muscle tone.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
13. I take little pride in my ability in sports.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
14. Athletic people usually <b>do not</b> receive more attention than me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. I am sometimes envious of those better looking than myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Sometimes my laugh embarrasses me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I am <b>not</b> concerned with the impression my physique makes on others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Sometimes I feel uncomfortable shaking hands because my hands are clammy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. My speed has helped me out of some tight spots.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
20. I find that I am <b>not</b> accident prone.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
21. I have a strong grip.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *
22. Because of my agility I have been able to do things which many others could not do.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> *

\* Denotes Perceived Physical Ability subscale (PPA)

**End of Assessment**

**APPENDIX F**

**GERIATRIC DEPRESSION SCALE**



## Geriatric Depression Scale

Please **circle** either "Yes" or "No" to the following (30) questions. Answer all (30) items.

- |  |     |    |
|--|-----|----|
| 1. Are you basically satisfied with your life?                                   | Yes | No |
| 2. Have you dropped many of your activities and interests?                       | Yes | No |
| 3. Do you feel that your life is empty?  | Yes | No |
| 4. Do you often get bored?   | Yes | No |
| 5. Are you hopeful about the future?   | Yes | No |
| 6. Are you bothered by thoughts you just cannot get out of your head?            | Yes | No |
| 7. Are you in good spirits most of the time?                                     | Yes | No |
| 8. Are you afraid that something bad is going to happen to you?                  | Yes | No |
| 9. Do you feel happy most of the time?   | Yes | No |
| 10. Do you often feel helpless?  | Yes | No |
| 11. Do you often get restless and fidgety?                                       | Yes | No |
| 12. Do you prefer to stay at home at night rather than go out and do new things? | Yes | No |
| 13. Do you frequently worry about the future?                                    | Yes | No |
| 14. Do you feel that you have more problems with memory than most?               | Yes | No |
| 15. Do you think it is wonderful to be alive now?                                | Yes | No |
| 16. Do you often feel downhearted and blue?                                      | Yes | No |
| 17. Do you feel pretty worthless the way you are now?                            | Yes | No |
| 18. Do you worry a lot about the past?   | Yes | No |
| 19. Do you find life very exciting?  | Yes | No |
| 20. Is it hard to get started on new projects?                                   | Yes | No |
| 21. Do you feel full of energy?  | Yes | No |
| 22. Do you feel that your situation is hopeless?                                 | Yes | No |
| 23. Do you think that most people are better off than you are?                   | Yes | No |
| 24. Do you frequently get upset over little things?                              | Yes | No |
| 25. Do you frequently feel like crying?  | Yes | No |
| 26. Do you have trouble concentrating?   | Yes | No |
| 27. Do you enjoy getting up in the morning?                                      | Yes | No |
| 28. Do you prefer to avoid social gatherings?                                    | Yes | No |
| 29. Is it easy for you to make decisions?  | Yes | No |
| 30. Is your mind as clear as it used to be?                                      | Yes | No |

**End of Assessment**

**APPENDIX G**  
**DAILY EXERCISE CHART**

## DAILY EXERCISE SHEET

NAME	DATE	SET 1	SET 1	SET 2	SET 2
		REPS	WGT	REPS	WGT
	MAR 3				
	MAR 5				
	MAR 7				
	MAR 10				
	MAR 12				
	MAR 14				
	MAR 17				
	MAR 19				
	MAR 21				
	MAR 24				
	MAR 26				
	MAR 28				
	MAR 31	ASSESS	ASSESS	ASSESS	ASSESS
	APR 4	ASSESS	ASSESS	ASSESS	ASSESS
	APR 7				
	APR 9				
	APR 11				
	APR 14				
	APR 16				
	APR 18				
	APR 21				
	APR 23				
	APR 25				
	APR 28				
	APR 30				
	MAY 2				
	MAY 5	ASSESS	ASSESS	ASSESS	ASSESS
	MAY 7	ASSESS	ASSESS	ASSESS	ASSESS

**APPENDIX H**

**ANALYSIS OF VARIANCE PRETEST-POSTTEST FOR: AGILITY/BALANCE,  
EYE-HAND COORDINATION, AND GRIP STRENGTH**

**TABLE H1****ANOVA: PRETEST-POSTTEST AGILITY/BALANCE**

---

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	.08	1	.08	.00	.972
Error	2418.05	36	67.17		
<b><u>Within Subjects</u></b>					
Time	243.58	2	121.79	48.85	.000
Group x Time	4.08	2	2.04	.82	.445
Error	179.50	72	2.49		

---

These results indicate a significance across Time within subjects at the ( $p < .01$ ) level. However, the Group x Time effect was not found significant so a post hoc was not performed. The significance of this assessment was not of primary interest to the researcher.

**TABLE H2****ANOVA: PRETEST-POSTTEST EYE-HAND COORDINATION**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	30.52	1	30.52	1.28	2.65
Error	881.65	37	23.83		
<b><u>Within Subjects</u></b>					
Time	56.71	2	28.35	18.83	.000
Group x Time	2.92	2	1.46	.97	.384
Error	111.44	74	1.51		

These results indicate a significance across Time within subjects at the ( $p < .01$ ) level. However, the Group x Time effect was not found significant so a post hoc was not performed. The significance of this assessment was not of primary interest to the researcher.

**TABLE H2****ANOVA: PRETEST-POSTTEST EYE-HAND COORDINATION**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	30.52	1	30.52	1.28	2.65
Error	881.65	37	23.83		
<b><u>Within Subjects</u></b>					
Time	56.71	2	28.35	18.83	.000
Group x Time	2.92	2	1.46	.97	.384
Error	111.44	74	1.51		

These results indicate a significance across Time within subjects at the ( $p < .01$ ) level. However, the Group x Time effect was not found significant so a post hoc was not performed. The significance of this assessment was not of primary interest to the researcher.

**TABLE H2****ANOVA: PRETEST-POSTTEST EYE-HAND COORDINATION**

---

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	30.52	1	30.52	1.28	2.65
Error	881.65	37	23.83		
<b><u>Within Subjects</u></b>					
Time	56.71	2	28.35	18.83	.000
Group x Time	2.92	2	1.46	.97	.384
Error	111.44	74	1.51		

---

These results indicate a significance across Time within subjects at the ( $p < .01$ ) level. However, the Group x Time effect was not found significant so a post hoc was not performed. The significance of this assessment was not of primary interest to the researcher.



**APPENDIX I**

**ANALYSIS OF VARIANCE PRETEST-POSTTEST FOR: PHYSICAL SELF-EFFICACY, PERCEIVED PHYSICAL ABILITY, AND PERCEIVED PHYSICAL SELF-PRESENTATION CONFIDENCE**

**TABLE B1**

**ANOVA: PRETEST-POSTTEST PHYSICAL SELF-EFFICACY**

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	861.80	1	861.80	1.34	.256
Error	19246.16	30	641.54		
<b><u>Within Subjects</u></b>					
Time	239.90	2	119.95	3.58	.034*
Group x Time	5.51	2	2.58	.08	.926
Error	2012.08	60	33.53		

These results indicate a significance across Time within subjects at the ( $p < .05$ ) level. However, the Group x Time effect was not found significant so a post hoc was not performed. The significance of this assessment was not of primary interest to the researcher.

**TABLE B2**

**ANOVA: PRETEST-POSTTEST PERCEIVED PHYSICAL ABILITY**

---

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	216.00	1	216.00	.71	.407
Error	10397.00	34	305.79		
<b><u>Within Subjects</u></b>					
Time	86.01	2	43.00	3.04	.054
Group x Time	4.08	2	2.04	.14	.866
Error	961.92	68	14.15		

---

These results indicate neither a significance across Time or a Group x Time interaction at the ( $p < .05$ ) level.

**TABLE B3****ANOVA: PRETEST-POSTTEST PERCEIVED SELF-PRESENTATION**

---

<b>Source</b>	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig. F</b>
<b><u>Between Subjects</u></b>					
Group	302.69	1	302.69	1.93	.174
Error	4852.60	31	156.54		
<b><u>Within Subjects</u></b>					
Time	84.68	2	42.34	2.35	.104
Group x Time	2.62	2	1.31	.07	.930
Error	1116.09	62	18.00		

---

These results indicate neither a significance across Time or a Group x Time interaction at the ( $p < .05$ ) level.

**APPENDIX J**  
**VERBATIM PARTICIPANT RESPONSES**

*These verbatim responses were randomly selected from the experimental group. The person identified as (1.) is the same individual throughout the four item survey.*

**1. Since being pre-assessed for functional fitness on February 24, 1997 have you noticed any changes in your ability to physically function within your normal activities of daily living? (PLEASE EXPLAIN)**

1. Yes - My arms are stronger, and I am hitting the golf ball longer.
2. Yes - More endurance. Feel stronger in general. Lasting strength throughout the day. Not really tired at bed time.
3. Yes, am stronger. My sense of balance is still bad. Maybe not as bad as before.
4. At present (Mar 31) I can go up and down stairs placing one foot on a step in contrast to (Feb. 24) it was necessary to place both feet on each step. It is easier to get up from a chair.
5. Feel more agile & happier with every day life.
6. I seem to have more strength to do certain activities in my normal daily routine and do not tire as easily.
7. Not too much, but I routinely do some physical work and have had a rather regular exercise program (flexibility, back and bicycle)
8. Not really but I am more attentive to functional fitness since February 24. I know M W F I must be present at our activity and committed to it.
9. I have limited use of my right arm and shoulder because of arthritis ect. Since this program started I have had more flexibility and better use of this shoulder and arm.
10. Definitely - more energy - less stiffness - greater flexibility
11. Believe I have more pep than before the program - even have the feeling of standing taller. Used to have soreness in my neck and shoulders which does not bother as much. Have an overall feeling of well being.
12. Yes! - I have more energy throughout the day - I feel better, breathe better, better stamina, although I still tire by late afternoon(not to unusual I guess).
13. (A) More energy - easier to get up in the morning  
(B) More back agility. Easier to bend over and pick up items.  
(C) Walking is easier - knees improving  
(D) Painted ceiling and walls of room with no discomfort or tiring.  
(E) Stay more awake and alert.  
(F) Sleep better.
14. Not a great degree my walking seems to be easier.
15. Yes, the walking (warm up) and leg press have given me less water retention in my legs and less numbness in my lower legs and toes. I also have less pain in elbow from shoulder separation about two years ago. Overall, strength has improved. Walking has improved my balance.
16. Changes: I seem to have more energy. Even my husband has noticed this. I'm feeling better overall, Sleeping well.

**2. Since being pre-assessed for muscular strength on February 28, 1997 have you noticed any changes in your physically strength? (PLEASE EXPLAIN)**

1. Yes - I do not get as tired playing golf - my legs are stronger.
2. Yes - can lift and bend with more agility. Easier to get up and down from a sitting position - no assistance. Can climb to do dusting at highest places. Easy to use my step ladder.
3. Yes, I can see my right bicep to be larger and stronger, compared to my left one which is still flat. (Left side is stroked). Also notice the left side is becoming more in time with the right side.
4. I am stronger now! I lifted a cedar log for my fireplace that I could not lift. I can now work longer periods of time in my yard.
5. The whole body seem s stronger, especially the legs.
6. I believe I have more strength in my legs and arms to do work on my 20 acre homestead.
7. Yes, I do feel stronger than when I started.
8. Not really but I give it all I have- to work in the yard. lift an do greater & bigger things. I expect & want a lot of beauty all around me - yard and horses.
9. I have not noticed any change in my physical strength in my normal activity. I believe the records on the weight lifting equipment shows some increased strength.
10. Stronger in the upper body especially.
11. I am sure I can hit a golf ball further because I get on the green far more "birdie" attempts! Believe lifting groceries, ect. seems easier.
12. I can "sit" and "stand" far longer periods without twisting and turning. My back seems in better shape - on the breathing and whatever, I notice a definite improvement.
13. (A) It is much easier to pick up and move loads.  
(B) Easier to pick up grandkids.
14. I've watched the charts & kept track of other exercises other than the three that are charted. I've been pleased at the improvement of most of the equipment we have used!!
15. Shoulder separation has prevented and limited my progress in bench press however I have some progress in arm strength and good progress in leg strength. My balance has not progressed to my satisfaction I feel that I have made some progress.
16. No not really.

**3. Since being pre-assessed for functional fitness and muscular strength in late February have you noticed any changes regarding your personal attitude (i.e., self-concept, self-confidence, self-esteem). (PLEASE EXPLAIN)**

1. Yes - I feel more self-confidence
2. Definately - Proud that I feel more confident about my general health. I worry less - what I don't get done today I can accomplish tomorrow.
3. Seem to be more willing to work - but it is also spring.
4. I have more self-confidence using stairs.
5. It has built my self-confidence thus easier to tackle daily routine.
6. I am pleased with the progress I am making in increasing the level of strength in most of the eight exercise categories we perform each day.
7. Yes, regarding all of the above. There is self-satisfaction in participating in a regular program, with discipline it requires. The "tired feeling" after a workout seems to be self-satisfying.
8. I appreciate being part of the Colvin Center at OSU. I am so pleased to have an acquaintance with "Boo" I think he is great, wonderful & fantastic - and I appreciate him so much & wish the most for him.
9. No change
10. I feel more "upbeat" both physically and mentally
11. Believe there is a spring in my step that wasn't there before. Will be wishing the program was not half over!!
12. When I can sit in church without twisting and turning - and a lecture or a banquet, I feel I have more control of my body- also better posture makes anyone feel better.
13. (A) I think I just feel better, more alert, more energetic.  
(B) Walking is easier, less painful, and more fun.
14. My attitude has improved as to taking care of daily routine- Had a tendency to doodle!! Now I go from one chore to another & take care of it instead of being side tracked.
15. My self-concept and self-esteem are increasing - my attitude toward exercising regularly has improved.
16. I've had a good outlook on "life". in general, after being so depressed, and in therapy for so many years.



**4. Would you suggest any changes to improve the overall program? These changes may include anything from program development to organization.**

1. No the program is very well organized - I felt very relaxed working out.
2. No changes just wish the program could continue.
3. None, except a little more in balance and coordination.
4. I think it is a good program. I would like to have morning sessions but I am very glad to learn and use the weight lifting equipment.
5. I think it is a great program the way it is.
6. I am pleased with the way the program is being conducted and have no suggestions at this time.
7. No changes suggested. Good job in all respects.
8. Changes I am not sure how much a young person knows how a 70 year old feels aches and functions. You only know when you live to it.
9. No It is very well structured, well run and really a pleasant experience.
10. Overall it has been great - some are a little slower than others which holds up rotation but us seniors get used to that.
11. Believe the program is very well organized. Can not think of any improvements.
12. The program and the (instructor) have been better than anticipated. It's great wish I could continue until my upper body gets really strong!
13. (A) would like to work more on improving the knees.  
(B) some are (me included) asking where are we going after this? I think most would like to continue on some type of program.
14. none
15. You have developed a good strength training program an I have enjoyed it and expect to profit from it by continuing on a regular program after this program is completed - other in the program have stated they want to continue after this portion of the training is completed.
16. I feel this young man is doing an outstanding job. He is most generally well organized.

VITA

Christopher Dwyane Collier

Candidate for the Degree of

Doctor of Education

**Thesis: ISOTONIC RESISTANCE TRAINING RELATED TO FUNCTIONAL FITNESS, PHYSICAL SELF-EFFICACY AND DEPRESSION IN ADULTS AGES 65-85.**

**Major Field: Applied Educational Studies**

**Biographical:**

**Personal Data:** Born in Houston, Texas, On May 26, 1969, the son of Conrad W. Collier and Mary M. Perkins.

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