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# Fitness and the Elderly

David B. Mingo

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An abstract presented to the Faculty of the Graduate School of Lindenwood University in Partial Fulfillment of the Requirements for the Degree Master of Art

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## ABSTRACT

Statistics show the American population is aging at an explosive rate. The correlation between fitness and the aging process is once again becoming a ripe area for study. Previous studies show that fitness can improve quality of life and health for the elderly. A new defined category of seniors known as the young-old has emerged. This category is comprised of seniors that range in age from 55-65. This study focuses on the relationship between routine exercise and quality of life issues for the young-old. Subjects for this study were 15 retired military soldiers. Subjects were asked to complete a survey which measured frequency of exercise and overall status of health. The results revealed that as the frequency of exercise decreases among the young-old, the potential for health problems increase. A discussion of this study and its results are given.

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# CHAPTER I

## INTRODUCTION

Scheitel, Fleming, Schutka and Evans state that approximately 13% of the population will be over 65 years of age by the turn of the century (289). Medical advances and improvements in technology cannot predict a senior's quality of life. As the number of senior Americans continues to rise, quality of life issues become increasingly important. For those over the age of 65, incapacitation can rapidly decrease one's quality of life. The harsh reality is that many older Americans will become incapacitated as they age. According to Swart, Pollock, and Brechue, incapacitation is caused by several factors. Swart et. al. state, "Although many will reach old age maintaining a relatively high degree of functional capacity, many others will have to live with physical and functional restrictions. Many physical limitations to exercise associated with aging appear to be related to a self-imposed reduction in physical activity, a lack of consistent participation in an exercise program and the adoption of sedentary lifestyles" (10). The influence of exercise and its ability to delay or retard the aging process has been the focus of interesting research for years. While some investigators argue that there is a correlation between exercise and healthy aging, others argue the contrary (Blumenthal 352).

The terms exercise and physical activity are often used interchangeably in our society. Both are thought to be important and

essential keys for the promotion of health and physical fitness. For clarification, this chapter will include the definition of each term.

**Exercise and Physical Activity**

Exercise is defined as "an activity that requires physical or mental exertion especially when performed to develop or maintain fitness" (Stedman 548).

Webster's Comprehensive Dictionary defines exercise as "physical exertion for the sake of bodily health." The New Encyclopedia Britannica states exercise is a "component of physical activity that is planned and structured to develop and maintain physical fitness" (28). Over the years, health researchers have concluded on the basis of imperical data, participation in habitual exercise and training can significantly improve the aerobic capacity of elders (Swart et al 13). Also, enhanced muscle mass, bone mineral density, physical strength and improved physical functions are additional benefits (13).

Exercises can be active or passive with varying degrees of intensity. Active exercises are defined as "bodily exertion for the sake of restoring the organs and their functions to a healthy state or keeping them healthy" (Stedman Medical dictionary). Benefits acquired from active exercises include pain relief, increased independence, improved heart and lung functions, and maintenance of joints, muscle and bones (Elia 144). Moreover, active exercise can be classified as low, moderate or high intensity/impact. Passive exercises are defined as "motion of limbs

without effort by the patient" (Stedman Medical Dictionary). Passive exercises are rendered by someone other than the individual, while active exercises are performed by the individual with or without assistance. These exercises are used primarily in individuals suffering from a stroke or neurological deficits. Research shows that passive exercises aid in the maintenance of joint motion, prevent hypertrophy of the muscles and impedes further bone loss (Reichel 89).

Stedman defines 'intensity' as "marked tension, great activity or strength, often used simply to denote a measure of the degree or amount of some quality" (Stedman Medical Dictionary). Examples of low intensity exercises are swimming, walking and dancing. These activities avoid the muscle and joint pounding associated with activities such as jogging and jumping rope. Aerobics, jogging and jumping rope represent moderate and high intensity exercises. Combination activities include both active and passive exercises, such as calisthenics, isokinetic, resistance training, isometric, anaerobic, and range of motion activities.

Physical activity is an inclusive term that refers to any expenditure of energy caused by bodily movement by way of the skeletal muscles (Britannica Encyclopedia CD-ROM). This definition also includes a complete spectrum of activity from very low resting levels to maximal exertion (Britannica Encyclopedia CD-ROM). Tabers' Medical Dictionary further defines physical activity as the production of bodily energy or motion; the state of being active.

Physical activities contribute to the maintenance of aerobic endurance, strength, flexibility, coordination, agility and balance. These benefits can improve the individual's quality of life and aid in the prevention of falls and injuries (Swart et. al. 13). Dr. Elia Shepherd most recently noted that "physical activity has more potential for promoting healthy aging than anything else science or medicine has to offer today" (141).

**Fitness and Older Adults**

Habitual participation in exercise programs and physical activity is an important edge in maintaining good health and wellness as the body ages. However, statistics show that only one of four older adults participates in exercise training on a regular basis. In fact, most seniors continue sedentary lifestyles developed in earlier years (Swart et. al 12). The adoption of sedentary lifestyles by older adults, who live in economically developed countries, may be due to conveniences, such as advanced technology in the home and work environment (Cassel et. al. 555). Advances such as television, video, and computer technology have fostered a lifestyle that encourages less physical activity and exercise. In the past, physically active lifestyles included manual labor that was often performed by the lower socioeconomic classes. Walking verses driving, water carrying verses indoor plumbing and chopping firewood for cooking verses gas/electric range cooking are examples of manual labor (555).

Another source of physical activity was the unrelenting demand of rearing large families. Leisure time that included social and family

gatherings were for resting, while strenuous physical work was viewed as undesirable (555). Setting aside time for exercise was not only unthinkable but was questionable. Today, routine participation in exercise and physical activities are essential components of overall health promotion and the maintenance of physical fitness in the older adult.

The size of the geriatric population is rising and will continue to increase, due to improvements in medical care and technology. An increase in age related public health policies, amendments to laws affecting health care, improved medical care techniques such as implants, organ transplants, and the advancement of industrial technology have also contributed to the increase in longevity. Improved medical techniques have bestowed a notable decline in the mortality and morbidity rate from chronic and terminal illnesses seen among those elders' age 65 years and over . These significant medical and social improvements do not lessen the importance of exercise in our aging population. As Americans age, regular participation in exercise programs and physical activities continues to emerge as a critical necessity in the effort to delay age related changes.

In this era of rapid change, financing health care, delivery of health care services, and the effectiveness of specific wellness promotion measures are crucial to the maintenance of the elder's optimal level of functioning (Scheitel et. al. 289). Wellness promotion includes measures such as baseline screening and preventive programs, nutrition and health education counseling, regularly scheduled medical appointments and

follow-up visits. In addition, regular participation in physical activities and exercise programs encompasses important health promotion measures that are both meaningful and encouraging to our aging population. Research has uniformly documented that delivery of these services can enhance a senior's overall health and physical fitness (Scheitel et. al. 290).

## Statement of Purpose

The purpose of this paper is to investigate the relationship between the young-old's participation in habitual exercise and perceived level of fitness participation following retirement of 60-75 year olds. Finally, suggestive training programs will be offered with specific precautions and contraindications.

## Statement of Hypothesis

The majority of career Army personnel plan to maintain a fitness level comparable to the standard they were held to during their career.

## CHAPTER II

## LITERATURE REVIEW

Researchers often use the word "aging" to define and describe the physiological or biological, psychological and sociological changes that occur in individuals as they age. This paper includes a definition of each category, a review of some of these changes, and discussion of their potential impact on the aging process.

Biological Aging: Biological or physiological aging refers to the physical changes or gradual decline in the body's functional capacities and a reduction in the system's resistance to disease and stress (Elia 141). Notable changes include the whitening and thinning of hair, wrinkling and folding of skin, and loss of height due to a decrease in the size of the disks located between the vertebrae in the spine. Other changes include hearing loss and vision impairment (Feldman 452). Systems that are affected as a result of age related changes include the cardiovascular (heart), respiratory or pulmonary (lungs), metabolism, nervous and musculosketal (muscles, bones & joints). Researchers believe that a lack of exercise and participation in physical activities can cause the heart to become less functional. Problems in the heart and its ability to function can adversely impact one's metabolism. Impaired metabolism can result in illnesses such as diabetes, high blood pressure, kidney disease and osteoporosis. Imperical studies show routine participation in exercise programs and/or physical activities can delay many of the detrimental

physiological effects of aging (Swart et. al. 10-12).

Psychological Aging: Psychological aging refers to the role individuals assign to themselves as they reach a certain chronological age. Major risks experienced by the young-old include deterioration of 'self'concept that results from age related changes. Psychological changes that are age related and may contribute to the elder's lack of physical activity and participation are numerous. Illnesses such as depression can develop as a result of extensive and continual grief or as a result of incessant multiple losses of friends or relatives in the same age group. Such losses include the death of a spouse, friends, family members, relocation, loss of independence, self-esteem and financial instability. An onslaught of these experiences in a short period of time can dampen the young-old's enthusiasm for physical activities and exercise programs (Zozoc, Mehr, Ruffin, Klinkman, Peggs, Davies 326).

Sociogenic Aging: Factors include functional and cognitive limitations and alienation among seniors that can occur from friends, family members and the community (Feldman 457). These factors may contribute to loneliness and a decrease in socialization. In addition, the social stereotype of old age as a time for inactivity, physical or mental decline, and often lack of respect is quite troubling. This may be another factor that forces them into seclusion (457).

## Theories of Aging

Several theories regarding the social patterns and behaviors of the elderly have been postulated. Two commonly accepted theories that explain the elderly social environment are the disengagement theory and the activity theory. The disengagement theory "suggests that aging is a gradual withdrawal from the world of physical, psychological and social levels" (457). Feldman explains that physically, the elder has decreased energy levels and is less active; psychologically, the focus shifts from others to self; and socially, there is decreased socialization and less participation in social activities (457). Some theorists view this hypothesis as positive while others suggest the elements of social withdrawal and self-introspection implies that negativity is prevalent among elders (457). Due to the many controversies surrounding the disengagement theory, an alternate approach to describing social adjustment to aging has emerged.

The activity theory suggests that "the elderly who age most successfully are those who maintain the interests and activities they had during middle age" (457). This theory also supports the belief that "subjective well-being in old age is closely tied to frequency and quality of socially meaningful activity" (Kovach and Henschel 36). In fact, the activity theory indicates that there is a strong relationship between successful aging and the ability to maintain activities and interests

acquired during middle age. As a result, they are more socially active and tend to participate in societal functions (Feldman 457).

In summary, both theories attempt to explain behavior and levels of satisfaction in a very diverse older population. However, these two theories do not explain a few of the vast differences in how individuals cope with the aging process. According to one author, "old age is a time of continued growth and development, as important as any other period of life" (457).

Throughout history, questions regarding the relationship between exercise and the aging process have been investigated. Clinical and empirical studies have revealed evidence that exercise and physical activities may have a positive impact on the aging process. In fact, Hippocrates, the Greek philosopher and father of medicine, is said to have been the first to comment on the possibility that regular exercise might delay the aging process. He concluded that all parts of the body which have a function, if used in moderation and exercised in labor to which each is accustomed, become thereby well-developed and age slowly; but if unused and left idled, they become liable to disease, defective in growth and age quickly (Dychtwald 165). Other physicians have postulated that participation in physical activities and exercise programs can postpone or impede the psychological, physiological and cognitive effects of aging by ten or more years. They also noted that "much of what is regarded as aging can be prevented by regular activity" (165). Jacques R. Caldwell in

his article "Exercise Programming for Older Adults" wrote an impressive summary about the effects of exercise and aging. Caldwell states,

> Age wastes us, slows us, debilitates us and eventually kills us. Ponce de Leon spent years rummaging through the Florida outback searching for the Fountain of Youth so that he could reverse the scourge of aged decline. His quest failed. However, physiologists have recently taught us that exercise can straighten many of the metabolic kinks in which age entwines us and can definitely slow the decline with which age afflicts us. Proper exercise can prolong our lives, help to prevent certain types of diseases such as cardiovascular illness, and certainly rejuvenate our flagging spirits. Yet the majority of people who reach retirement age shun exercise with the same fervor as the deceased gentleman whom I quoted above.

A review of current literature shows that participation in physical activities and routine exercise programs by elders plays an important role in maintaining wellness, health, and functional capacity. Additionally, clinical and epidemiological studies have repeatedly demonstrated how physical activities and exercise programs can significantly improve the young-old's cardiovascular, respiratory/pulmonary, nervous systems and metabolism. Furthermore, exercise and physical activities may increase physical fitness, protect joints from further breakdown and add more meaningful years to life.

The population of the young-old is the fastest growing segment in our country. This remarkable growth has forced aging to become an important health issue. As this population grows, a continuing need to promote and maintain health is vital for all elders who wish to sustain

optimal functioning. In 1990, statistics by the National Center for Health revealed 41% of adults in the 18-64 year age group reported participation in habitual exercises while 32% of adults over age 65 reported regular exercises or participation in physical sports (Encarta 97 CD ROM).

## Fitness Programs

Illness prevention, health maintenance, health protecting behavior and health promotion are terms frequently mentioned in literature when addressing the importance of the young-old's participation in habitual exercise and physical activity. Although each term appears to have a distinct definition, a review of the literature shows that they may be used interchangeably without loosing their implied meaning. Ken Dytchwald wrote that in 1880 roughly three percent of the US population was over age 65 years and by 1980 approximately eleven percent of the twenty-five million Americans were older than 65 (Dytchwald 3). These statistics represent a drastic increase of close to fifteen in just one hundred years. Dytchwald also noted that almost 3,400 older Americans die while 5,000 celebrate their 65th birthday on a daily basis. According to his calculations, this leaves a net increase of approximately 1,600 elders per day (3). Additionally he indicated that by the year 2020 almost every fourth American could be over 65 years old (3).

Today, according to the US Bureau of Census more than 31 million or 12.5% of the population is 65 years of age or older. This number represents the largest growth in our country's history. This significant increase of elders in the population, the need for health promotion, health protecting behaviors, illness prevention and health maintenance activities among this age group is inescapable. Studies show that an elder's participation in regular exercise and physical activities are positive

behaviors and preventive measures toward maintaining physical fitness and the prevention of diseases and disability (Pender, 5)

Reichel, in his work Clinical Aspects of Aging, explained that:

The problems associated with old age pose an unprecedented challenge to society and the medical profession. The potential contributions of preventative healthcare in improving the well-being of the elderly, in obtaining economic savings resulting from caring for a less disabled population, and in providing a more humane and less technological approach to medical care has roused considerable interest. Nevertheless, health maintenance of the elderly remains a complex, controversial and emotional topic. Fundamental to the successful application of preventive strategies for the elderly is a better understanding of the scope of prevention as it applies to the elderly (13).

This chapter will provide the reader with a comprehensive overview of the various ideas of health promotion, illness prevention, health maintenance and health protecting behaviors. Also, included is a brief synopsis of illness prevention and health maintenance programs over the years. In addition, a review of two related behavioral models, the Health Belief and the Health Promotion Model, will give insight into an individual's motivation or lack of motivation in health and wellness maintenance. This chapter will also examine the benefits of the young-elder's participation in regular exercises and physical activities and it's impact on the aging process.

Illness Prevention: According to Pender, illness prevention is a series of health protecting behaviors designed to prevent or retard disease processes while maintaining physical fitness (5).

Primary prevention consists of "activities directed towards decreasing the probability of specific illnesses or dysfunction in individuals, families and communities including active protection against unnecessary stressors" (Pender 5). Examples of primary preventive measures include health and nutrition counseling, changes to promote a healthy lifestyle, and adoption of specific health measures to retard or prevent illnesses such as lung cancer and heart disease (Pender 38). These conditions, although often seen in the older population, are generally problematic and catastrophic.

Secondary prevention stresses early diagnosis and prompt treatment to halt the course of a disease, thereby shortening its duration and severity. Consequently this enables the individual to regain normal functioning at the earliest possible point (Pender 5). Cooperation in health-related screening programs for diseases such as high blood pressure, diabetes, uterine, breast and prostate cancers are common types of secondary preventive measures (Pender 38). According to Nola Pender, early diagnosis can abate the terminal effects that may develop from advanced illness and minimize complications the elder and their family may experience (38-39).

Tertiary prevention is described as the stabilization, eradication or

correction of a disability or disease process. Goals of tertiary prevention include rehabilitation and restoration of the individual's optimum level of functioning within the constraints of the disability and cessation of the disease processes (Pender 5). Frequent follow-up health exams, passive and active exercises to prevent or retard disabilities, and the use of medications are some examples of tertiary prevention (Pender 39). Nola Pender, in her book Health Promotion in Nursing Practice, gave insight to the understanding of illness prevention. She wrote:

> Prevention, or health protecting behavior has been the focus of increasing interest among the general public and health professionals within the past decade. The chronic nature of health problems that are the leading causes of mortality and morbidity, the lack of curative therapies for chronic diseases, and the expense of long-term control measures for chronic problems make prevention an attractive alternative to traditional medical approaches focused on the relief of symptoms of chronic disease or minimization of resultant disability. The antecedents of chronic illnesses develop over a prolong period of time, starting in early childhood. Chronic illness appears to reflect not only the impact of heredity, but also an unhealthy environment and health-damaging behaviors. Since the interaction of heredity, behavior, and environment is a dynamic process that can be altered to some degree, prevention offers a promising approach for decreasing the prevalence of chronic illness, particularly in the middle and older adult years (37).

Finally, prevention is an important responsibility of the individual. It helps to minimize the occurrence or reoccurrence of diseases and their complications. In addition, prevention assists in the promotion of optimal restoration while enhancing the quality of life (Pender 40).

Health Protective Behavior: Harris and Guten coined the term 'health

protective behavior' in their writings in 1979. They described health protective behavior as a combination of preventive and health promoting measures assumed by an individual for wellness. In essence, health-protective behavior is "any behavior performed by a person, regardless of his or her perceived or actual health status, to maintain or promote his or her health, whether or not such behavior is objectively effective toward that end" (17). Health protecting behaviors described by Nola Pender are measures performed by an individual or group to guard or defend against specific illnesses or diseases (38). Prevention, she noted, is the essence of health protecting behavior with innumerable benefits. Furthermore, she wrote "prevention is a defensive posture or set of actions that wards off specific illness, conditions or their sequel that threatens the quality of life and longevity" (38). Finally, the Surgeon General's Report on Health Promotion and Disease Prevention discusses health protective behavior and defines it as "protective measures in the environment that can be used by governmental and other agencies, as well as by industries and communities to protect people from harm" (Pender 38). Health protective behavior is an important component of illness prevention and has a great impact on the aging process.

Health Promotion: Health promotion defined as "any combination of health education and related organizational, political and economic interventions designed to facilitate behavioral and environmental changes conducive to health" (Dytchwald 52). Health promotion can be simply

viewed as participating in preventive activities directed towards increasing the level of well being thereby actualizing the health potential of individuals, families and communities (Pender 4). Nola Pender noted that unlike prevention, health promotion is not disease or health-problem-specific; it is approach behavior while prevention is avoidance behavior (38). Morton described health promotion as "actions taken to develop resources that improve or maintain well-being and self-actualization, or actions taken to protect against health problems" (21). Her views on major components of health promotion measures include the individual's health beliefs, personal habits, exercise and activity patterns, socioeconomic status, nutritional habits, environmental and occupational health (36). In fact, over the years, health promotion among the elderly has been problematic and somewhat ignored. This is especially true because American society is youth oriented in its health focus. However, in recent years the field of health promotion and illness prevention in the elderly population has gained increasing support and has emerged as a prominent program for education (Dytchwald 27).

Health Maintenance: "Maintenance of health enables a person to perform activities of daily living in such a manner that a useful satisfying, productive and happy life results" (Pender 7). Health maintenance, the various levels of illness prevention and health protecting behaviors are measures used to support wellness for the individual and the environment. These factors ultimately help to reduce morbidity and mortality rates,

decrease healthcare costs, prevent disabilities and provide a more meaningful life for the individual. The measurable saving in lives and wellness has inspired many successful health maintenance programs and health related projects.

**Historical Summary of Health Promotion Behaviors / Measures:**

The rapid growth of the young-old population within the past century has caused an increase in support and interest in health promotion, illness prevention and health maintenance programs for this group. Accordingly, several educational programs and training projects were developed to aid the older population in the maintenance of physical fitness and disease prevention. Federal and local governments, many individual states and private organizations are continuing to provide funding for these various programs.

1970's: In 1974, a Canadian, Marc La Londe, published a report called A New Perspective on the Health of Canadians. The report included a 'health field concept' that identified four extensive ambient factors that impact illness and death. A breakdown of the then predisposing elements and their fatalities were:

❶ Human biology accounted for 20% of all moralities;

❷ The environment accounted for 20% of all deaths;

❸ Lifestyle accounted for 50% of the nation's demise; and

- Health care organizations claimed 10% of all moralities (Dytchwald 71).

The 'health field concept' created by La londe was instrumental in the development of many training programs and services. These services and programs were used to fulfill and preserve health needs of the nation. However, according to Dychtwald, La Londe's failure to specify health goals for the various age groups was one shortcoming identified in the report (71).

Five years later (1979), a report entitled Healthy People published by the Surgeon General of the United States reconstructed the La Londe's report. The Surgeon General's Report on Health Promotion and Disease Prevention provided a set of specific measurable health goals for all age groups. Also, provided were national objectives for the healthy elder (Dychtwald 72). But, unlike the La Londe's report, maintenance of independence, self- sufficiency and quality of life rather than longevity were major areas of emphasis in the Surgeon General's report (Dytchwald 72). The report stated that health surveillance and health maintenance for the elderly was most effective when incorporated into a comprehensive and integrated system of geriatric services. In fact, measures recommended by the Surgeon General's report include influenza and pneumococcal immunizations, nutrition counseling, exercise, safe and affordable housing, in-home services, easy access to health services, and health information (Dytchwald 71).

1980's: In 1980, the US Public Health Service published a report entitled Health Promotion-Disease Prevention: Objectives for the Nation. Three major areas of concern identified in this report were health promotion, health protection, and preventive health services (Pender 2). Each identified area contained five critical objectives designed to support behaviors that were conducive to health promotion. In addition, these objectives were structured to protect people from harm and maintain wellness. According to the report, healthcare workers were tasked with aiding society in accomplishing and maintaining these objectives (Pender 2).

In 1981, the White House Conference on Aging assigned one of its sub-committees to develop health promotion and health maintenance activities for the elderly (Dytchwald 72). Recommendations made by The Committee on Promotion and Maintenance of Wellness included:

❶ Healthcare training programs consisting of geriatrics and health promotion measures. The main focus was appropriate lifestyle modifications and preventive behaviors;

❷ A National health policy to improve the health of all Americans especially the elderly. The subcommittee reasoned a national health policy would ultimately reduce healthcare costs and increase society's awareness of health promotion and disease prevention measures;

❸ Developing and disseminating educational materials for the elderly. This venue was a major component for health promotion efforts

utilized by the Federal, State, and local governments as well as private sectors; and

❹ A comprehensive program review with emphasis on screening procedures and preventive measures for the elderly to determine their medical effacy.

The author of the sub-committee report stated "these recommendations formed an excellent framework for future development of training, research, and service programs in the field of health promotion for the elderly"(Dytchwald 73). In addition, disease prevention for the elderly was included as one of the major recommendations made by the White House Conference in the final report (Dytchwald 73).

A subsequent report entitled Strategies for the US Public Health Service published Promoting Health for Specific Populations followed in 1981. This document focused on the priorities and approaches for health promoting behaviors among Asian-Pacific, African-Americans, Hispanics, older Americans and American Indians (Pender 5). A supplemental report to this document was published in 1983. The new report contained implementation plans for the Public Health Service regarding health promotion, health protection and disease prevention for the remainder of the 1980s (Pender 3, Reichel 15-17).

1990's: The Centers for Disease Control began working with state, and local governments to stimulate the use of the national objectives as their framework for prevention and health promotion activities. To date,

several health-promoting programs were and are being developed by utilizing federal, state and local funding for the elderly. The primary focus of these programs is prevention and maintenance of optimal functioning. In light of current proposals for healthcare reform, included possible cutbacks to Medicaid and Medicare benefits, health-promoting programs are essential to health and longevity.

**Theories about Health Protecting Behaviors:**

Over the years, several theories and models regarding lifestyles and health protecting habits were postulated. For decades many theorists focused on the development of theoretical models and conceptual frameworks (Pender 42). Those models explained and/or argued reasons why some individuals engaged in preventive behaviors while others failed to participate in them (Pender 42). One theorist explained "understanding the determinant of preventive behaviors is critical for the development of effective interventions" (Pender 43). She further explained that healthcare professionals could utilize those factors to assist individuals in altering those behaviors that could increase the risks for diseases and illnesses (Pender 43). As a result, several health-protecting behavioral models were developed which explain the relationships between compliant and non-compliant behaviors.

The Health Belief Model: The Health Belief Model (HBM) was developed in 1950 by Rosenstock, Hochbaum and Kegels and derived

from the writings of Lewin's social-psychological theory (Pender 43). At the time, Lewin stated that the life space in which an individual exists is comprised of three regions. Those regions were known as positive, negative and neutral valances. Lewin explained illnesses and diseases were negative valances because they exerted forces that moved the individual away from the positive and neutral regions (Pender 44). Interestingly, like Lewin's social-psychological theory, the HBM is comprised of three components. The components are:

❶ The individual's perception;

❷ The likelihood to initiate action; and

❸ Modifying factors.

Consequently, the HBM is a conceptual framework which integrates psychological theories of goal setting, decision-making and social learning as they relate to an individual's health protecting habits (Pender 44).

Individual's perception: In the HBM, the individual's perception is defined as the manner in which a person views a situation or threat. Components of an individual's perceptions include perceived susceptibility and perceived severity/seriousness. Perceived susceptibility refers to the individual's exposure to environmental toxins and their predisposition to diseases and illnesses (Pender 46). Perceived seriousness/severity refers to the manner in which the individual views a potential health problem and the serious social or organic implications on their lifestyle (46).

Pender noted, during the 1970s Becker, (who redefined the HBM), conducted a study using the HBM in two groups of young people who were potential carriers of a genetic abnormality. The two sample groups of approximately 500 Jewish participants and 500 non-Jewish participants were from the Baltimore-Washington DC area. The population was selected at random for the screening of Tay-Sachs disease. According to the study, severity/ seriousness was measured by the reported impact of learning about being a carrier and family planning. Findings revealed a high rate of avoidance and noncompliance by participants of the screening program. This was partially due to the overwhelming threat of perceived severity among participants in the group. Pender concluded that perceived severity became an inhibiting factor rather than a facilitating factor for action (47). She added that findings from Becker's study were consistent with other low levels of seriousness that were not sufficiently motivating while high levels of perceived seriousness hindered constructive actions (Pender 47). Furthermore, she postulated that individuals participated in preventive actions when the susceptibility and seriousness of illnesses are high while others argued there was no relationship, or a negative relationship, between susceptibility and preventive actions (Pender 46-49).

Likelihood to action: This component of the HBM refers to the initiative or action that a person takes to prevent or correct a situation or problem. Perceived benefits, perceived barriers and motivation were identified as

components affecting an individual's likelihood to action. Perceived benefits refer to the individual's belief that a given or recommended treatment will cure the illness or help prevent it, whereas perceived barriers refer to the complexity, duration, and accessibility of the treatment (Pender 51). Examples of perceived barriers are cost, inconvenience, unpleasantness, discomfort, and lifestyle changes. Motivation includes the individual's desire to comply with a treatment, willingness to seek and accept health care, engagement in positive health activities, and belief in health maintenance (Pender 60). Pender noted a significant number of studies reveal positive relationships between perceived benefits and preventive behavior. However, a small number of studies she stated did not achieve the same data (60).

Modifying Factors: This refers to preventive measures that affect the individual's predisposition to take preventive action. Components of modifying factors include demographic factors, cues to action, socio-psychological variables, and structural variables. Age, race, sex, income, education and ethnicity are examples of demographic factors. According to Pender, studies of these factors and their involvement in relation to the use of preventive behaviors and services are still being researched (50).

Socio-psychological variables such as environmental pressures and societal influence support appropriate health actions when low levels of individual motivation exist. Structural Variables represent the individual's knowledge about the health problem and exposure to the pathogen. This

information provides a predictable understanding of the individual's influence of preventive actions (Pender 51). Cues to action are behaviors or measures the individual undertakes in preventing illness and promoting health. Cues can be either internal or external. Internal cues are uncomfortable symptoms such as pain, feelings of fatigue, or apprehension. External cues are radio, television, books, articles, advertisements, or advice from others (Pender 51).

To conclude, Pender noted the HBM was widely critiqued by Wallston and Wallston. She wrote, "They proposed that the model is essentially a catalog of variables rather than a well articulated model specifying the nature of the relationship between variables" (Pender 52). However, this model is most frequently cited in the literature as an explanatory framework for preventive behavior. Although the HBM was refined and tested by Becker in the 1970s, newer models were proposed to explain preventive health behavior. One such model is The Health Promotion Model (HPM).

The Health Promotion Model: The Health Promotion Model (HPM) is a spin-off from the Health Belief Model (HBM). The HPM, derived also from Lewin's social learning theory, emphasized the importance of cognitive mediating processes in behavioral regulation (Pender 55). This conceptual framework focused on health promotion activities and positive behaviors directed towards illness prevention. These activities and behaviors assist the individual in maintaining or enhancing their well-being

through available resources (Pender 57). Three important functions of the HPM are:

❶ Organization of various concepts that explained an individual's participation in health promoting behaviors;

❷ Empirical testing of a catalogue of hypothesis; and

❸ Integration of findings into a coherent pattern.

The structure of the HPM is quite similar to the Health Belief Model and encompasses two phases, the decision making, and action phases.

Decision-Making: The decision making phase of the HPM model accentuates seven cognitive-perceptual and five modifying factors. These factors, according to Pender are primary motivational tools for acquisition and maintenance of health promoting behaviors (Pender 60-65). The seven components of the cognitive-perceptual phase are:

❶ Importance of health- the individual's health perception and his/her ability to seek health-promoting measures;

❷ Perceived control of health-the individual's insight and its effect on positive health behaviors;

❸ Perceived self-effacy-the individual's belief that he can successfully attain the required behavior necessary to produce a desired outcome;

❹ Definition of health-the individual's definition of health as it relates to his/her participation in health promoting measures;

❺ Perceived health status- the level, frequency and intensity in

which the individual seeks and participates in health promoting behaviors;

❻ Perceived benefits of health promoting behavior-the individual's level of participation in health promoting behaviors and the perceived personal benefits to be gained; and

❼ Perceived barriers to health promoting behaviors-refers to obstacles such as the unavailability or inconvenience to health promoting behaviors that maybe imagined or real.

Like the HBM, modifying factors in the HPM refer to obstacles or barriers an individual may encounter when seeking health promotion activities. There are of five components. These components are:

❶ Demographic factors. Characteristics such as age, sex, race, ethnicity, education and income represent demographic factors. These factors indirectly affect patterns of health promoting behaviors through their impact on cognitive-perceptual measure (Pender 66). She noted in a study conducted by Sidney and Shepherd, findings revealed that women identified psychological wellbeing as an important outcome of exercise. However, both males and females believed that improved physical fitness was a major benefit. In another study, older adults were compared to middle aged adults on perceived values of exercise. Older adults valued exercise as an aesthetic experience more than the other age group (66).

❷ Biological characteristics. Several biological characteristics identified by Pender and Pender included genetics and their relationship to exercise adherence. They noted overweight individuals were the least

likely to participate in exercise programs (Pender 67).

❸ Interpersonal Influences. These influences involve expectations of significant others, family members, health patterns, and interaction with health care professionals. In a survey by Pender and Pender, individuals responded that their participation in regular exercise was influenced by family members and significant others (67).

❹ Situational Factors. Situational factors refer to the availability of health promoting options and access to health promoting alternatives. The availability of numerous behavioral options increases the opportunity to make informed responsible choices.

❺ Behavioral Factors. Behavioral factors refer to previous experiences with health promoting actions that increase the ability to carry out various behaviors to promote wellbeing (Pender 67).

Action Phase: The action phase refers to measurements and/or behaviors that individuals participate in to promote health and wellness. This phase is comprised of barriers and cues to action. Like the HBM, barriers within the HPM refer to obstacles while cues to action refer to ingenuity. Cues to action can be internal and or external. Research reveals both barriers and cues to action play a significant role in the individual's quest for health promotion (Pender 69). For example, 'feeling good' as a result of habitual exercise and physical activity can serve as a cue for continued participation in health promoting behaviors (69).

## The Human Body and Age-related Changes

The decline in functional capacity due to age related changes are well documented. Participation in a habitual exercise program and physical activities can delay the aging process to a significant degree. The following is a discussion of some notable age-related changes in major organs of the body.

Cardiovascular: Age related changes in the cardiovascular system have been widely documented. The blood vessel system that is composed of smooth muscle tends to loose elasticity due to calcium, plaque, and fibrous deposits. Research shows these changes lead to increase aortic and arterial blood pressures within the cardiovascular system (Elia 141). A condition called hypertrophy or enlargement of the heart structures develops due to the increased blood pressure and decreased blood flow (141). A reduction in the cardiac output or the amount of blood pumped from the heart each minute occurs as the body continues to age. The ejection fraction or the difference in the amount of blood in the heart before and after each beat also decreases as a result of atrophy and/or hypertrophy of the chambers of the heart (Swart et. al. 11).

Additional documented changes that occur with aging include a rise in the systolic pressure or the period of the cardiac cycle when the heart contracts. The diastolic pressure (the period of the cardiac cycle when the heart is relaxed between beats) also decreases. These changes can lead to a reduction in the passage of blood throughout the body causing the

young-old to become weak and frail (Elia 141). Another age related change in the cardiovascular system is the reduction of maximum oxygen consumption also known as $Vo_2$ max. $Vo_2$ max represents the amount of oxygen that is consumed by an individual at the peak of exercise or physical effort. A number of studies have shown a great capacity of the elderly to respond to aerobic exercise. One study demonstarted 60-70 year olds can increase Vo2 Max by 30% (Evans 147). In other words, the greater an individual's $Vo_2$ max, the easier it will be for the person to cover longer distances of running, swimming or cycling (Swart et. al. 12-13).

Respiratory: Age related changes that occur in the respiratory system result from loss of tissue elasticity surrounding the alveoli and alveolar ducts of the lungs (Swart et al 11). Changes in the diameter of the chest due to rib and vertebral calcification are also documented age-related changes (Elia 140).

Other age-related changes include decreased lung capacity, decreases in size and structures, tissue changes, and weakening of the respiratory muscles (Swart et. al. 11). In addition, vital capacity (the maximum amount of air that is expelled from the lungs after forcefully breathing out and following a deep inspiration) is reduced by 40% to 50% (Elia 142). Residual volume (the amount of air remaining in the lungs after exhalation) is increased by 30% to 50% (142). Tidal volume, the volume of each breath, (normal is 7 to 8 ml per kilogram of body weight) also decreases with age (142). Overall, age-related changes in the respiratory

system can lead to a fall in respiratory muscle strength, endurance and to an increase in the work of breathing" (Swart et. al. 11).

Musculosketal: By age 65, an individual loses close to 20% of their muscular strength and mass (Swart et. al. 15). Sarcopenia (age-related loss of skeletal muscle) directly contributes to the decrease of muscular strength (Evans 726). A lack of exercise as we age causes the muscles to become weak and atrophic. In addition joints become stiff and inflexible. Sedentary lifestyles, diseases, and the lack of exercise are contributing factors in muscular atrophy. Some skeletal changes include progressive bone loss and degeneration of the joints, especially the spine and lining surrounding the joints. Diseases such as arthritis, diabetes and renal impairment are all age-related skeletal changes (Swart et. al. 15).

Nervous System: Reaction times are longer and nerve conduction velocity is decreased by 10% to 15% in the aged adult (Cassel et al 556). As a result of these changes, there is an increased incidence of falls in the young-old (556). These changes may affect the elder's ability to safely participate in physical activities and regular exercise programs. Clinical research also indicates that the threshold for sensory deficits and perception are most likely increased with advancing age (Cassel et. al. 557).

Metabolism: Age related metabolic changes can include a decline in basal metabolic rate and maximal oxygen uptake. Glucose intolerance, cholesterol and low-density lipoprotein diminutions are also considered to

be age-related changes (Caldwell 6). These changes, coupled with the decline in muscle glycogen and fat-free body mass are responsible for the reduced energy level experienced by the young-old (Poehlman et. al. 253). A lack of exercises and physical activity increases the inactive elder's risk of developing such illnesses as diabetes, coronary artery disease and obesity.

Immune System: The immune system is vulnerable to the aging process. Age-related changes to the immune system include deterioration and a decrease of the resting immune function. This causes an increase risk of infections, tumor development, and autoimmune diseases. A decline in total T cell counts and the production of interleukin-2 cells are significant age-related changes seen in the young old (Shephard & Shek, 1-6). Mazzeo noted that this dramatic reduction is most likely a result of degeneration of the thymus gland, a natural occurrence of age-related changes.

**Understanding the Association between Exercise and Aging:**

There is strong evidence regarding the impact of exercises on age-related physiologic, sociologic and psychological changes. The mechanisms by which these changes are reversed or delayed is not well understood. This is due, in part, to the complexity of the interaction among the various body systems, psychological and environmental factors. Researchers theorized that habitual participation in exercises and

physical activities may increase the elder's physiological, psychological, and sociological abilities, thereby aiding longevity (Dytchwald 167). Benefits derived from regular participation in exercise and physical activities are plentiful. Empirical studies indicate these benefits integrate better lifetime fitness, enhance performance, maintain range of motion, and improve flexibility (Dytchwald and Reichel). A discussion regarding benefits associated with exercise and aging and the impact on the elders' physiological, psychological and sociogenic follows.

Physiological: As mentioned earlier, the young-old individual is more vulnerable to disease, has a less flexible respiratory and circulatory system, and has decreased defense mechanisms. Other common conditions among the aged are heart disease, cancer, and cerebrovascular disease such as dementia, and Alzheimer's. Physiologic benefits derived from physical activities and exercise programs are innumerable. Such benefits include prevention of heart disease, prevention or control of adult onset diabetes and prevention of intestinal problems. Scheitel et al noted that physical activities may lower the risk of severe intestinal bleeding by approximately 50% in old age (289).

Epidemiological studies demonstrate that the risk of developing heart disease could be reduced by approximately 50% if the young-old participated in physical activities, nutrition counseling and regular exercise programs (Reichel 86). Consistent participation in an exercise program improves oxygenation and function of areas within the heart, improving

glucose intolerance, and improved serum lipid patterns (Reichel 86-87).

Furthermore, exercises and physical activities may increase physical fitness, protect joints from further breakdown, improve health related compliance measures and add more meaningful years to life (Caldwell 4). Physical fitness may also compensate for the decline in maximum oxygen uptake capacity by increasing heart rate and lung functions. This counters the increase in body fat content resulting in the reversal of obesity (Caldwell 6).

Finally, Reichel cites that moderate physical exercise and proper nutrition provide the physiological basis for a healthier aging process and improvement in the physical capacity, health and skills of older individuals (88). In addition, further research indicates that improved muscular strength, balance, and endurance as a result of habitual exercises may reduce the damage and disability of associated cardiovascular, musculosketal and other organ systems of people of the same chronological age (Dytchwald 168).

Psychological: As noted by Hill et al., the impact of physical activities and exercise programs on cognitive and psychological age related decline needs further exploration (16). In a study conducted by the group, results revealed normal age-related memory decline was decreased or delayed with the use of exercise and activity programs (Hill et al. 16). This, the authors felt, was an unusual finding that was consistent with previous studies.

Other psychological benefits include stimulation of the brain to release hormones that can alleviate pain and produce a sense of well being (Caldwell 4). The release of these hormones has the potential to relieve depression, reduce fatigue and correct sleep disorders such as insomnia. Research has shown that participation in physical activities and regular exercise programs play an important role in the maintenance of wellness, health and functional capacities (Elia 147).

Sociologic: Sociologic benefits of habitual exercise and physical activities include meaningful socialization for the elderly, more personal enjoyment and life satisfaction. Other benefits are greater self-confidence, better social relationships, more self-awareness and improved sexual relationships (Elia 147). As a result the active, older individual can expect to remain in good health for a longer time, and experience shorter periods of illness and disability before their demise (Reichel 87-88).

To obtain these benefits, active participation in physical activities or an exercise program is of paramount importance. The above mentioned benefits of physical activities and exercise participation will provide tools to function at a more optimal level and prevent life-threatening illness, slow disease processes and improve medical care (Dychtwald, 170).

**Physiology of Exercises**

Exercises are activities that result in the contraction of skeletal muscles. Although muscular contractions are the most common element of forms of exercise, other bodily organs and systems (heart, respiratory)

are affected. Muscular contractions are the primary physiologic event of exercise. Structurally, skeletal muscles are arranged in opposing pairs causing them to contract and expand during an exercise event. As one muscle shortens, another extends. An example of such a pair of muscles can be observed in the upper arm where the biceps and triceps have opposite actions. The biceps contract while the triceps expands, when the arm is bent or flexed at the elbow. On the other hand, the triceps contract while the biceps lengthens, when the forearm is extended.

As a muscle contracts, a number of cellular changes occur. Proteins known as actin and myosin work together causing the muscle fibers to shorten. A molecule called adenosine triphosphate (ATP) plays a role in the contraction and relaxation of skeletal muscles. ATP is a high-energy molecule that is formed during the breakdown of glucose. Glucose is a simple sugar that is stored in muscles as glycogen and is released during exercise. Glycogen is metabolized to provide energy for exercise in one of two manners aerobically or anaeorbically. The process selected is dependent on the amount of available oxygen in the muscles and the type of exercise being performed. The aerobic pathway occurs when there is oxygen in the muscle and the event being performed requires a repetitive, long duration type exercise such as cycling, or jogging. Consequently, when oxygen is readily available, glucose reacts with the oxygen to produce water and carbon dioxide causing a portion of the released energy to produce ATP. Aerobic exercise uses oxygen to keep large

muscle groups moving, and there is great demand on the cardiovascular and respiraratory system.

During anaerobic activity, exercises are short in duration and exhaust the muscle quickly like sprinting or weight lifting, lactic acid is produced because the breakdown of glucose stops at an early point. As a result,two molecules of ATP are produced. This type of exchange is termed oxygen debt. This debt is repaid at a later time when oxygen is available. Acute soreness or a burning sensation in the muscle during anaerobic activity results due to a buildup of lactic acid.

**Classification of Exercises**

♦Aerobic exercise is commonly defined as the repetitive use of large muscle masses (upper legs and buttock) for pleasure or to improve fitness and stamina" (Cassel et al 557). These exercises are activity driven for prolonged periods of time with a minimum time span of twenty or more minutes. The activity should be conducted at a pace that does not rapidly exhaust the individual, and should increase the heartbeat to approximately 55-75% of the individual maximal heart rate. Maximum heart rate is measured by subtracting the persons age from 220 (Caldwell 5). For example, the maximum heart rate of a 70 year old individual is 150 beats per minute (220-70=150). One goal of aerobic exercise known as endurance exercise is to increase heart and lung efficiency while maintaining muscular tone throughout the body. Aerobic exercises are effective not only in the prevention of but also the rehabilitation of

individuals diagnosed with cardiovascular disease. Furthermore, aerobic exercise improves functional capability, increases vitality, improves self-esteem and promotes socialization. Jogging, brisk walking, cycling, dancing, swimming, walking in chest high water, using a treadmill or rowing machine and performing brisk calisthenics in a pool are examples of aerobic exercises (Elia 149).

♦ Isometric exercises provide mild to moderate muscle strength while isokenetic exercise involves joint motion. Examples of these are kegel, push-ups, and sit-ups.

♦ Calisthenics like aerobic exercise are brisk activity driven. The goals and functions are similar to those of aerobics. Jumping jacks, and rope jumping are examples of calisthenics.

♦ Ranges of motion exercises are passive exercises that are performed on individuals who are immobile and/or bedridden. These exercises maintain joint mobility and prevent permanent shortening of tendons.

♦ The goal of anaerobic exercise is to achieve exhaustion of a muscle group. These exercises are done with relatively small numbers of repetitions for short periods of time. Sprinting a short distance and weight lifting are examples of anaerobic exercises.

♦ Resistance training exercise involves the utilization of the large muscles. Significant increases in energy requirements and insulin have been noted in individuals participating in resistance training. In addition, resistance-

training increases muscle strength, size, and has a positive effect on risk factors associated with bone fractures in post-menopausal women.

**Pre-Exercise Assessment**

In today's changing health care system, many physicians and healthcare professionals are actively recommending and prescribing physical activities and exercise programs as treatment. Before exercise is prescribed, a thorough history and physical exam must be performed to assess and identify the elder's level of fitness, the extent of seriousness of their aging process, hypokenetic changes, and significant cardiac, vascular, muscular, orthopedic or other factors that may affect their ability to exercise and participate in physical activities (Reichel 88).

Due to the high incidence of heart disease and other chronic illness often associated with old age, clinical and diagnostic assessment of the elder's physical and mental health is an extremely important part of the pre-exercise examination. In assessing the young-old for physical activities and exercise programs, the clinician should obtain a detailed medical history including familial and social history (Reichel 89). A complete physical examination including mental status, diagnostic and laboratory testing is strongly encouraged by exercise experts (Reichel 89).

The medical history should include health related concerns such as pre-existing illness and disease, past and present medications taken (prescribed or over the counter), and tolerance to physical activities and exercise. Familial history of diseases and mental illness, lifestyle and

social activities such as smoking and drinking is very relevant in the pre-exercise assessment (Elia 145). The presence of one or more of these factors may contribute to the young-old's lack of physical activities and exercise participation (Elia 145).

Physical assessment includes evaluation of the heart, respiratory and musculosketal systems. In assessing the young-old's cardiopulmonary status, the clinician must assess the individual for irregular heartbeats and/or heart rate, chest pain, palpitations, complaints of dizziness, and development of shortness of breath (Elia 145-6). Moreover, any complaints of undue stress after mild exercises or moderate physical activities should be investigated (Elia 146). Some cardiologists theorize a resting pulse rate greater than eighty beats per minute is a clinical marker of poor physical fitness (Elia 146). Heart rate increases with physical activity or exercise demand. Heart rate is measured by wrist or the carotid (neck) artery and taking a 15-second count then multiplying that number by 4; e.g. a pulse rate of 20 for 15 seconds will be 80 beats per minute (Swart et al 18).

Clinical assessment of the musculosketal system includes utilization of a test. This test evaluates muscular fitness and strength. It also aids the clinician in prescribing remedial exercises that may strengthen the musculosketal system. In addition, the Balke, Naughton and Bruce treadmill stress tests can be used to assess the elder's walking ability and can detect orthopedic conditions such as painful feet, coordination, gait,

back, legs and muscle problems (Elia 145-147). Arm-leg, leg cycle ergometers are additional standardized protocols that are useful in evaluating the young-old's musculosketal status (Swart et al 14).

Diagnostic tests used to evaluate the elder's cardiopulmonary status for pre-exercise assessment include an electrocardiogram or ECG and cardiac stress tests (Hagberg 30). An electrocardiogram reveals any pre-existing or presenting heart abnormalities that may be detrimental or fatal to the young-old if not appropriately treated (Hagberg 30). Cardiac stress test measures the heart's response to undue stress and the individual's ability to safely participate in exercise programs and physical activities (Hagberg 30). The Bruce treadmill stress test is commonly used to determine cardiovascular fitness and physical condition (Panush S76). Pulmonary function tests are multiple tests using several machines and various gasses (carbon monoxide, room air, helium) to test lung function such as tidal volume, peak flow, and functional capacity (Hagberg 31). These tests are used to evaluate the condition of the young-old's respiratory status and the effects of exercise tolerance (Hagberg 31). Laboratory or blood testing includes cardiac enzymes, blood gas analysis, cholesterol and lipids profiles and glucose tolerance tests (Elia 141).

After obtaining medical clearance by a physician, the experts recommend referral to a qualified exercise specialist or physiologist before engaging in any form of strenuous activity (Dytchwald 172). The appropriate degree for an exercise program should be formulated

incorporating the medical history, physical exam and knowledge of past and present exercise regimen. Physiological and psychological limitations, current medications, emotional, mental and social needs must be considered before implementing an exercise program. Precise written and demonstrated instructions of the exercises and/or physical activities program along with written restrictions and warnings should be given to the young-old and family members (Hagberg 31). Also, follow-up evaluations and frequent program re-evaluation are important to ensure safe exercise pattern and monitor compliance (Reichel 90). Frequent evaluations provide the young-old with proper assistance, reassurance and a sense of security (90). Additionally, exercise participation should be individualized and include specific recommendations for frequency, intensity, duration and mode of training, based on the results of exercise testing and any limitations that may be imposed by the cardiovascular, respiratory, and musculosketal systems (Dychtwald 172).

**The Exercise Program**

Cardiovascular, respiratory and/or orthopedic problems often associated with age decline, dictate a slow start with gradual increase when starting an exercise/fitness program for the young-old. Recommended components of any exercise program for the young-old include frequency, intensity, and duration. Guidelines suggested by The American College of Sports Medicine for quality, quantity and frequency

include, a training frequency of 3-5 days per week, an intensity of 55-90% of maximal heart rate or 40-85% of $VO_2$ max, and an exercise duration of 15-60 minutes of continuous aerobic activity (Swart et al 19). Any mode of continuous activity utilizing large muscle groups, which is rhythmic and aerobic in nature, will do.

Recommendations made by the American Heart Association consists of a minimum of three days per week for frequency, 50-60% of $Vo_2$ max for intensity, and a minimum of thirty minutes for duration (Swart et al 19). Guidelines recently recommended by the Center of Disease Control and the American College of Sports Medicine include daily activities such as walking, stair climbing and gardening for health promotion and disease prevention. Emphasis is on the 'accumulation of exercise' through short duration and/or moderate intensity bouts with activity, total daily energy expenditure and physical activity that may lead to changes in lifestyle approach (Swart et al 19-20). Their belief is that any lifestyle modification that increases physical activity is better than a sedentary lifestyle. The American College of Sports Medicine strongly suggests the presence of a physician during exercise testing.

**Exercise Measurement Tools**

The rationale for exercise testing is to determine a safe and effective level of exercise for the healthy young-old and those with disease (Swart et. al. 15). Consequently, several tools for the pre-exercise assessment have been developed. The tools are largely used to measure intensity.

Intensity measures endurance and the young-old's ability to safely participate in an exercise program. Tools that are most widely recommended and used include:

❶ Symptom Limited Graded Exercise Test (SL-GXT).

❷ Borg's rating of perceived exertion scale and

❸ training intensity and designed heart range (THR).

The Symptom Limited Graded Exercise Test (SL-GXT) also known as the $VO_2$ max test is a tool used in the identification process for the young-old with diseases and illnesses (Swart et. al. 19). The test provides information about the level of supervision that the young-old would require during exercise training. It is usually performed on a treadmill or cycle ergometer and is considered the standard basis of aerobic exercise prescription (19).

Borg's rating of perceived exertion scale is a subjective guide of the elder's response to exercise or fatigue (18). The tool is a fifteen-grade scale with levels of exertion and numbers ranging from 6 to 20. This scale gives the user the approximate indication for exercise prescription. A rating of 12-14 "somewhat hard" is an appropriate recommendation for improving physical fitness and health in young-old participants (Swart et al 18).

Table 1. Borg's Scale For Rating Perceived Exertion.

| 15- Grade Scale | |
|---|---|
| 6 | |
| 7 | very, very light |
| 8 | |

| | |
|---|---|
| 9 | very light |
| 10 | |
| 11 | fairly light |
| 12 | |
| 13 | somewhat hard |
| 14 | |
| 15 | hard |
| 16 | |
| 17 | very hard |
| 18 | |
| 19 | very, very hard |
| 20 | |

*Adapted from Swart et. al., 1996*

Training intensity and desired Heart Rate range (THR) is also used for pre-exercise testing. This tool measures the cardiovascular response to exercise intensity and endurance. Based on Heart Rate (HR) max, several methods are used to determine THR (Swart et. al. 17). "Exercise intensity can be calculated by taking the appropriate percentage of HRmax obtained from SL-GXT or submaximal exercise testing (THR + % intensity x HRmax)" (17). For example, an individual who has a HR max of 160 beats/min, and a THR of 60% intensity, would have a HR of 96 beats per min. (96=0.60 x 160)" (15). This formula is believed to be the most accurate measurement of exercise intensity for the young-old.

In addition to the above mentioned exercise tools, a Physical Activity Readiness Questionnaire (PAR-Q) along with an updated version of the Cornell Medical Index can be used. These questionnaires are helpful in identifying bodily systems that need a through clinical examination before starting an exercise program (Elia 145).

**Phases of the Exercise Program**

Exercise experts recommend three phrases for exercise and physical activity training programs.

❶ warm-up,

❷ aerobic activity, and

❸ cool-down.

The warm-up period, also known as the muscle strengthening stage, includes stretching and low intensity dynamic activities with emphasis being placed on the muscles to be used during exercise. Stretching promotes flexibility of the joints while low intensity exercises generate a gradual increase in blood flow, muscle temperature and metabolic function (Swart et. al. 19). The young-old may need a longer warm-up period to allow physiologic adjustments such as heart rate, blood pressure and respiration (Dychtwald 172-174).

The second period or the activity phrase is the gradual introduction to various aerobic events. Exercise experts suggest a slow beginning with a gradual increase as adaptation occurs. This period allows the young-old to choose aerobic exercises that will be meaningful to them (19).

The cool-down phrase consists of light physical activities such as walking, stretching or calisthenics. This is known as the safety consideration period due to the risk of orthostatic hypotension and impaired heat dissipation associated with aging (19). A cool-down also helps to remove lactic acid from muscles that have been working beyond

their anaerobic threshold decreasing the chance of stiffness and muscle pain (Elia 149).

**Stages of Progression**

Exercise progression has three stages; starting, slow moderate progression, and maintenance.

Recommendations for starting an exercise program include low intensity events for a duration of 2-6 weeks. This introduces the young-old to the mechanics of the program and allows meaningful time for progression. There is a low incidence of injuries and muscle soreness during this period (Swart et. al. 20).

The progression stage involves a gradual systematic increase in duration and intensity over a measured period of time. As the young-old adapts, duration should be increased by five minutes increments every two weeks. This should be done over a three to six month period (20). " The general rule of thumb is to allow at least a 40% increase in the time allotted for training adaptation for each decade over thirty years" (20).

The maintenance stage is twofold. It is based on the achievement of the young-old's desired level of fitness or health and their reasons for starting an exercise program. Emphasis is placed on long-term continued training and compliance.

**Safety Considerations**

Safety is the rule of thumb and should always be the first consideration when selecting exercise protocols, modalities, equipment and supplies. Since impaired balance among the young-old maybe prevalent and can reduce their sense of comfort and security, the use of guard rails safety belts and other accouterments are highly recommended (Swart et. al. 21). Floors should be skid free and free from clutter and obstacles to prevent slips and falls.

Excessively hot showers and prolonged standing in hot and humid areas during the cool-down period or following the exercise program should be avoided (Elia 149). The use of timers should be considered to prevent overexertion. Finally, a through orientation with repeat demonstration is recommended for the young-old and family members (Swart et. al. 21).

**Choosing an Exercise Program**

Primary objectives for starting an exercise program for the young-old are far-reaching. These include enhanced functional capacity, improved performance of activities of daily living (ADLs) and a better quality of life. Consequently, the need for medications, supervision, and institutionalization for young-olds will be reduced (22).

Exercise experts recommend when designing a physical activity or exercise program for the young-old, that their reduced exercise capacities, increased prevalence of cardiovascular disease and the reasons for

participating in the program should be taken into consideration (Reichel 89). The important key to remember is to start slowly and gradually increase on a continual basis. Examples of exercises that can be beneficial to the elderly include low intensity aerobics such as walking, swimming, dancing, calisthenics, strength or resistance training, weight lifting, and jogging (Singh et. al. M32).

# CHAPTER III

# METHOD OF RESULTS

## Population Description

For the purpose of this project, a survey of a population consisting of fifteen participants ranging in age from 58 through 63 was conducted. All participants have retired from the Army with 20 to 22 years of service. There is one female. The participants spent a minimum of 20 years in a structured environment where it was mandatory to perform certain times physical activities OF which measured abdominal, pectoral strength, and cardiovascular endurance. The Army's structured physical exam requires that soldiers maintain a minimum level of fitness. If this level is not maintained, administrative separation actions based on non-performance of combat duties are initiated. These actions could result in the removal of a soldier from the service.

All subjects retired during the 5-event physical fitness test. The exam consisted of the run dodge and jump, the overhead parallel bars, inverted crawl, two mile run, and the straight leg sit-up.

The run dodge and jump measured agility and speed. The event required soldiers to negotiate four waist high barriers, two of which were across a fifty-inch pit. The other two were on the starting side of the obstacle. Soldiers needed to run two "figure eights" within a specified time to receive a passing grade for their age group.

The overhead parallel bars measured a soldier's bicep, grip, and shoulder endurance. This event required soldiers to hang from one end of a 16 rung overhead ladder, and make as many round trips as possible within a specified time for your age group.

The inverted crawl was performed in a 10-yard saw dust pit Soldiers would sit with their backs to the start line, supporting their weight on their hands and feet. On the command, "GO!" soldiers would race ten yards and return within a specified time.

The push up for male soldiers required the soldier to lay face down on the ground place his entire body weight on his hands, which were spaced at shoulders width, arms extended and locked, with his feet which were 12" apart or less.

The straight leg sit up required soldiers to sit with their legs extended in front of them, while another soldier held their legs the tested soldier would lay flat on their back and sit up as many times as possible within a specific time.

The two-mile run measured a soldier's endurance. This distance was supposed to be run as quickly as a soldier could.

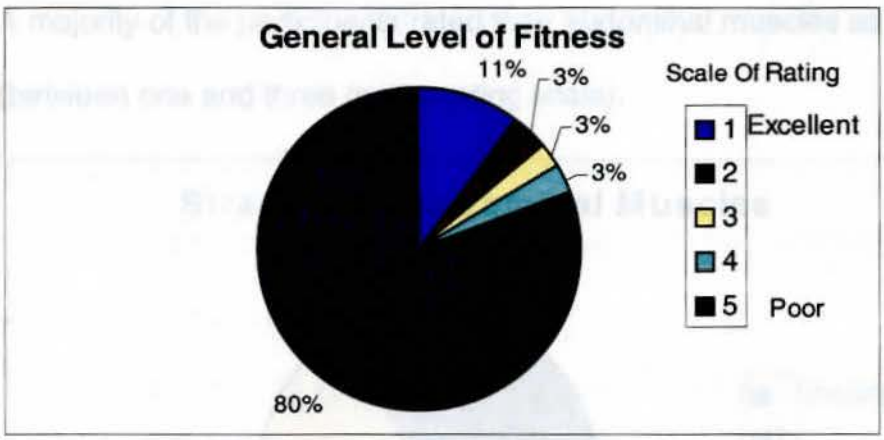
As is true when dealing with human endeavors, each participant puts forth his or her personal effort; sometimes that is just enough to pass the test.

# CHAPTER IV

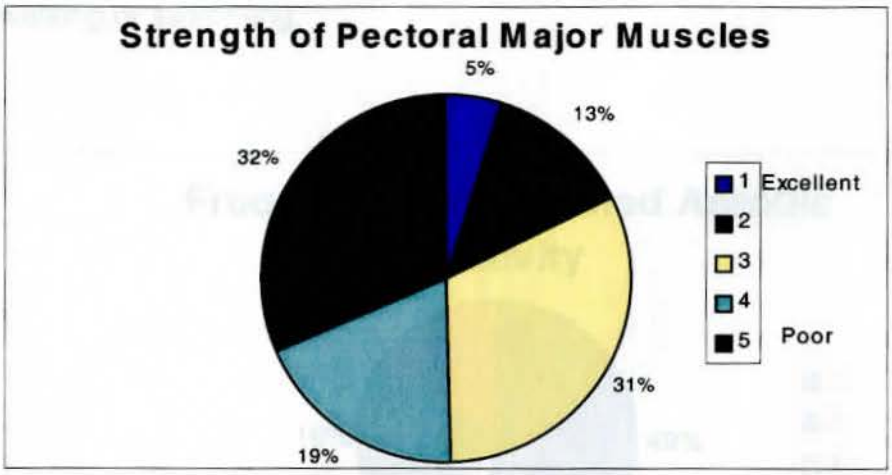
## SURVEY RESULTS

Each population group was asked to answer the following questions and rank their answers on a scale of one (excellent) to five (poor). The data is reflected in the following charts.

1. What is your general level of fitness? Over 50% of those questioned rated their level of fitness as good. An additional 13% rated their level of fitness as excellent.

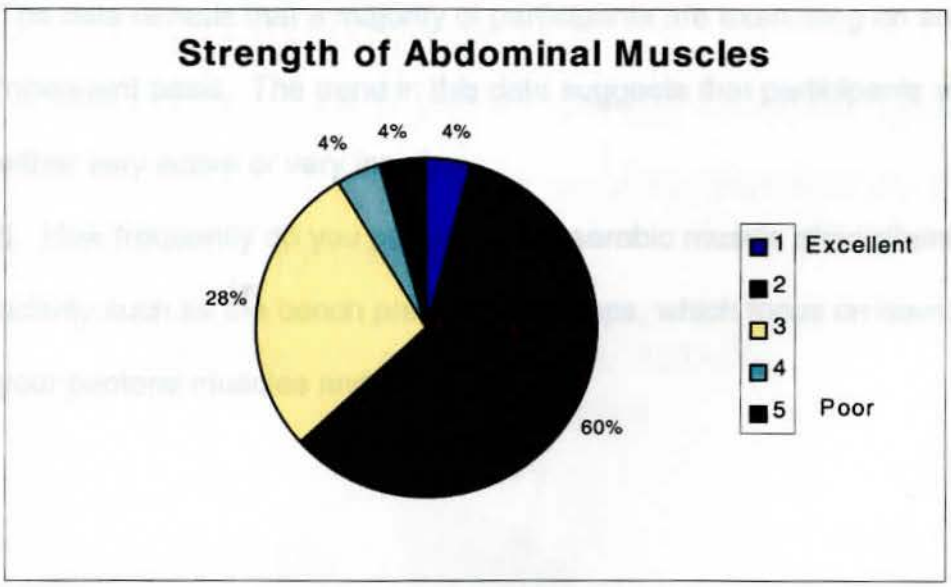



2. What is the strength of your pectorals (Chest muscle used to do push-ups)? Although 50% of respondents rate their fitness level as good, only 4% rated the strength of their pectoral muscles as excellent. 13% rated the strength of their pectoral muscles as poor.




3. What is the strength of your abdominal muscles?

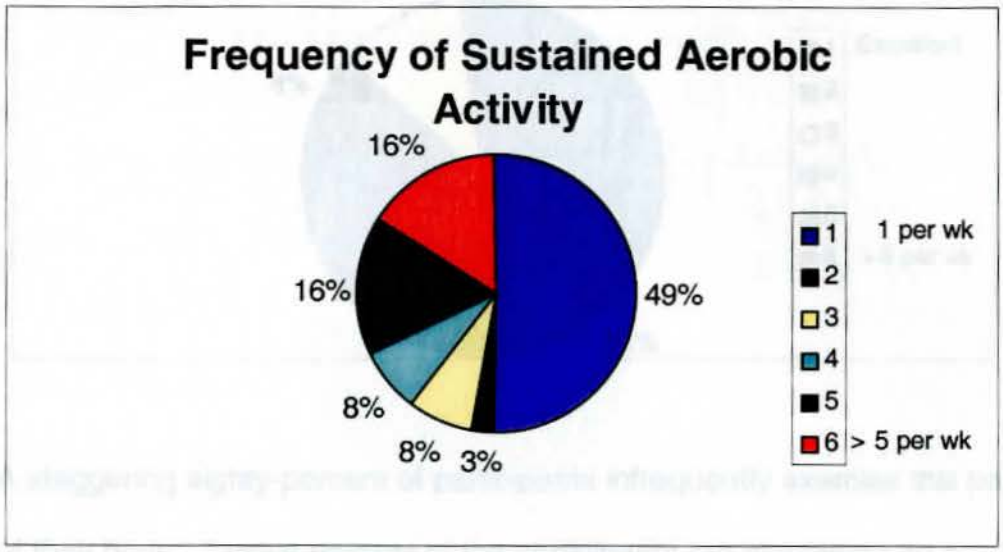
A majority of the participants rated their abdominal muscles as good to fair (between one and three on the rating scale).




The next series of questions required respondents to answer each question regarding the frequency of exercises.

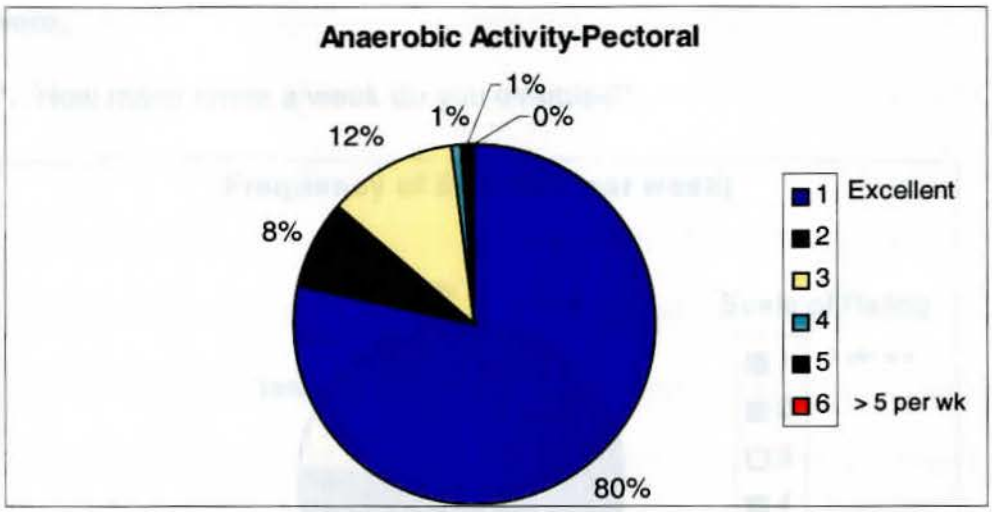
4. How frequently do you spend 20 minutes or more performing sustained aerobic activities, which focus on developing your cardiovascular system? Consider activities such as jogging, biking,

walking or swimming.



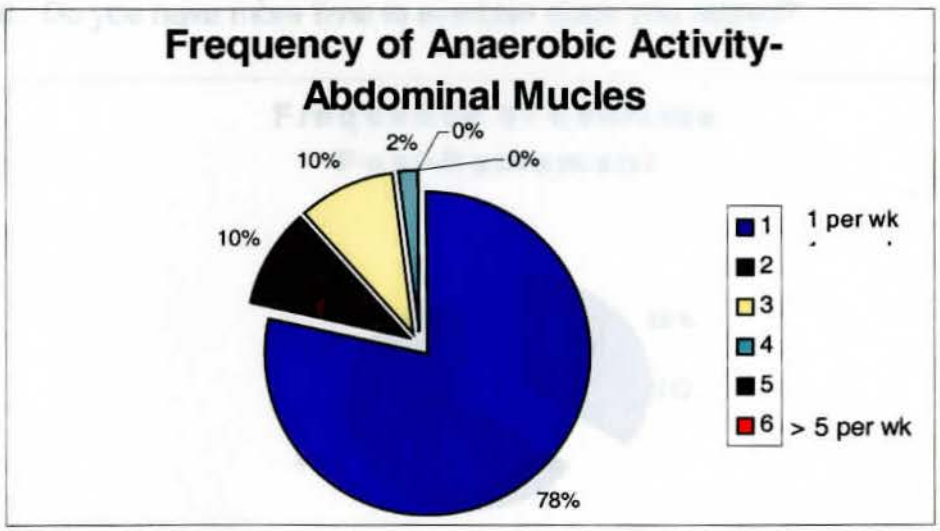

The data reveals that a majority of participants are exercising on an infrequent basis. The trend in this data suggests that participants are either very active or very inactive.

5. How frequently do you perform an anaerobic muscle strengthening activity such as the bench press, or push-ups, which focus on developing your pectoral muscles and triceps?




A staggering eighty-percent of participants infrequently exercise this part of their body. Twelve percent of the participants are exercising on a regular basis (three times per week).

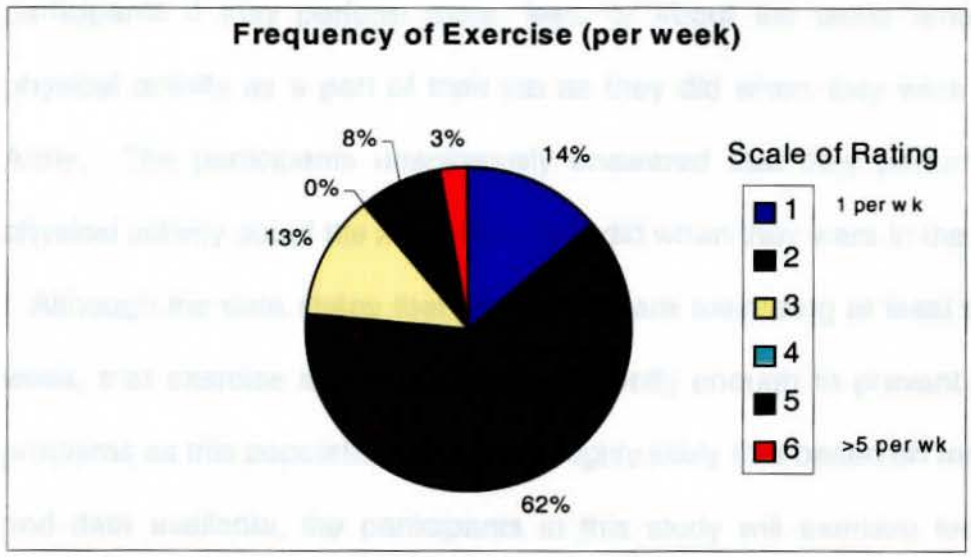
6. How frequently do you perform an anaerobic, muscle strengthening activity such as stomach crunches, sit-ups or leg raises which focus on developing your abdominal muscles?




Again, participants are exercising but the majority are doing so once a

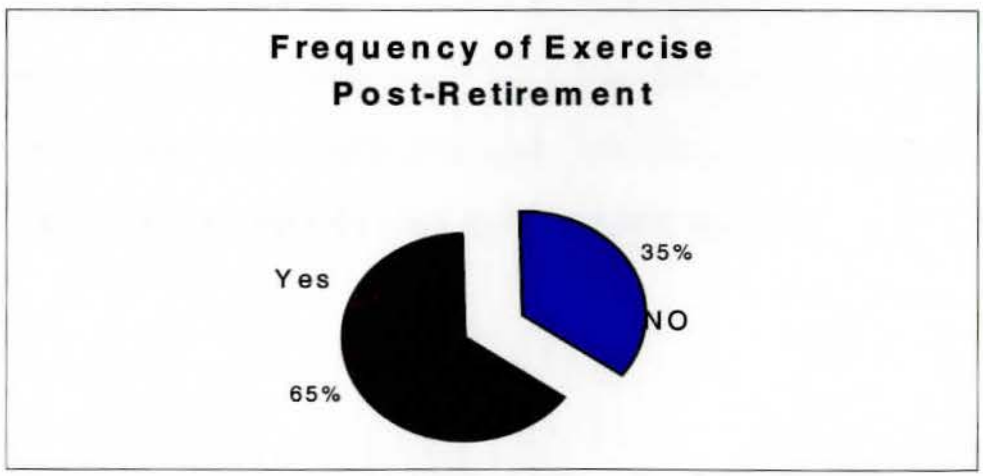
week.

7. How many times a week do you exercise?




The data in this chart is more favorable and shows that participants are exercising on an average of twice a week. Compiled with the data gathered in questions five and six, the data suggests that participants are somewhat active on a fairly regular basis.

8. Do you have more time to exercise since you retired?



Answers from the participants state that more than half feel retirement allows them more time to work out. Question 9 simply asks the participants if they perform more, less, or about the same amount of physical activity as a part of their job as they did when they were in the Army. The participants unanimously answered that they perform less physical activity out of the Army than they did when they were in the Army.

Although the data states that participants are exercising at least once a week, that exercise is not occurring frequently enough to prevent health problems as this population ages. It is highly likely that based on research and data available, the participants in this study will exercise less and less. As the frequency of exercise decreases, the potential for health problems increases.

# CHAPTER V

## Discussion

In summary, the young old are among many Americans who suffer from heart disease, high blood pressure, diabetes, and respiratory problems. Many health professionals are recommending and prescribing habitual participation in physical activities and exercise programs as a treatment as well as a preventative measure. As medical costs and longevity increase preventive measures are attaining greater importance.

Appropriately prescribed and designed exercise programs can improve physical, psychologic and cognitive functioning in the young old. This encourages living an independent lifestyle, a delay in the decline in physical and physiological changes, and an improved quality of life.

Before recommending and prescribing physical activities and exercise programs, pre-exercise evaluation and testing is strongly recommended. A detailed medical history, physical examination, exercise stress test, and appropriate laboratory tests are also recommended. Exercise testing, helps identify elderly patients with heart, respiratory or musculosketal diseases who warrant added therapies. This information guide can assist in recommending safe and meaningful exercise regimens.

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