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The Effect of Exercise on Late-Life Populations

Valerie G. Huffman Shaw
University of Northern Iowa

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Abstract

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The purposes of this paper were (1) to examine how exercise can help the late-life population maintain optimum functioning levels both physiologically and psychologically, and (2) to determine if exercise is a new prescription that the health care industry can utilize for preventing, treating, and rehabilitating certain health problems associated with the process of aging.

Because of the relative newness of this topic, information is still quite limited in scope. However, current information was drawn upon to assess the impact that exercise has in present society for the late-life populations.

THE EFFECT OF EXERCISE ON LATE-LIFE POPULATIONS

A Research Proposal
Submitted
In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

Valerie G. Huffman Shaw
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ABSTRACT

The extent to which aging can be a gradual and healthful process depends quite often on the type of exercises, both physical and mental, in which the late-life population engages. Major problems that the late-life population face are chronic degenerative diseases brought on quite often by unhealthy life-style. Traditional medical reactions to physical ailments in late-life seemed to depend largely on medications, bed rest, hospitalization, or institutionalization. Because of the inability of these treatments and processes to effectively combat and rehabilitate some conditions affecting this population, health restoring alternatives are being researched. Until now the range of treatments has been limited, but recent studies have indicated that exercise can have a substantially beneficial effect on aging.

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Research Project Approval Sheet

This Study by: Valerie G. Huffman Shaw

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has been approved as meeting the research paper requirements for the Degree of Masters of Arts

3/3/88	Dennis Cryer
Date	Chairperson, Research Committee
3-3-88	Jane E. Richards
Date	Reader, Research Committee
3-3-88	Larry D. Hensley
Date	Graduate Coordinator, School of HPER

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CHAPTER ONE

Introduction

Exercise is a frequently used medical prescription for the prevention and treatment of physiological and psychological ailments. These ailments include such physiological problems as cardiovascular disease, osteoporosis, and respiratory dysfunction; and psychological problems like low self-esteem, loneliness, and anxiety. Different types of activities can be used to treat different ailments. Exercise is addressing many of these problems and attempting to reduce the onset or recurrence of these and other ailments for individuals of all age groups, including late-life populations. Today, physical activity is recognized as a viable option in the treatment and rehabilitation of many life-style-related diseases which typically are undiagnosed until late-life.

The changing nature of illness which has been observed during the past century clearly demonstrates a transition from commmunicable to chronic diseases which are very commonly brought on by life-style choices. Life-style-related chronic illnesses in this century include: heart disease, cancer, stroke, cirrhosis of the liver, and diabetes (Dychtwald, 1986). These degenerative diseases have now become the primary obstacles to high

levels of health and even longer life-spans among the late-life population (Dychtwald, 1986).

With continued technology and advances in the understanding of the mind, body, and human aging process, average life expectancy will continue to rise. As the percentage of older Americans increases, a wide variety of health care will be needed, i.e., preventive health care, genetic engineering, organ transplants, and reconstructive surgery (Dychtwald, 1986). As medical technology expands and personal life-styles (including exercise) improve, age related physical degeneration and illnesses could very possibly be prevented or delayed to allow for a maximum life expectancy.

Degenerative diseases are not commonly thought of as affecting younger generations. However, this is where life-style-related illnesses start and progress. By advocating exercise as a prescriptive alternative, problems commonly associated with growing old can more often be prevented or effectively reduced. Late-life populations do not have to succumb to declines in physiological or psychological capabilities. Too often people view growing older as losing their capabilities to perform as they did when they were young. Many are afraid of becoming forgetful, forgotten by society,

diseased, feeble-minded, poor, or powerless to take care of themselves. These problems and/or perceptions of what might occur in the future are not new to older generations. But the response to the fear of aging can be changed as is evidenced by the exercise behaviors of today's older fitness-oriented population.

As stated previously, exercise is being advocated today for the late-life population as a form of prevention, treatment, and/or rehabilitation of physiological and psychological health problems. Along with preventing and/or treating problems, physiological and psychological productivity are enhanced by frequent and on-going physical activity (Barry, 1986). Through proper exercise, self-help, nutrition, and other appropriate behaviors for healthful living, the late-life population can add substantially to their physiological functioning and psychological well-being.

Statement of the Problem

Exercise and how it affects the late-life population was analyzed through current related literature. The following questions were addressed:

1) Was there evidence available which documents that exercise improves physiological functioning in late-life?

2) Was there evidence available which documents that

exercise improves psychological functioning in late-life? 3) Was there evidence available which documents that exercise is effective in preventing, treating, and rehabilitating health problems associated with aging?

Significance of the Study

Serious health problems exist for the late-life population. Many of these problems are life-style-related chronic degenerative diseases. Cardiovascular changes which are associated with aging include declines in maximum cardiac output and maximum work capacity (Barry, 1986). Due to sedentary life-style, poor nutrition, etc., coronary vessels can become narrowed resulting in increased blood pressure. Additionally, and unfortunately, with these changes, the older individual's capacity to achieve and maintain maximal levels of aerobic fitness in the future is somewhat restricted. Because of these changes alternatives such as exercise are being utilized to prevent, treat, and rehabilitate these health problems that exist for the late-life population.

Throughout the aging process, musculoskeletal changes are occurring as well. The most serious musculoskeletal problem occurring in the late-life population is osteoporosis. Osteoporosis is one of the major causes of

morbidity and mortality for the late-life population (Barry, 1986). Disuse of muscles hastens the loss of muscle tissue resulting in reductions in flexibility or the range of motion in this age group.

Aging also brings about an overall reduction in sensory function within the central nervous system. Impairment of motor responses such as coordination and balance may occur which contribute to poor motivation to exercise and discouragement for the aged (Barry, 1986).

Changes in the body, including some caused by life-style-related chronic degenerative diseases, occur that can cause tremendous difficulties in coping. Physical activity programs tailored to specific needs of the late-life population can help in preventing or controlling these stress-related health problems associated with life-style and the aging process. All age groups should be made aware that exercise can add energy to the years remaining in late-life and act as a preventive and rehabilitative measure.

DEFINITIONS OF TERMS

For the purposes of this paper, the following terms were used and identified:

Late-life: the age group consisting of individuals 65 years or older.

Physical activity, Activity programs, or Exercise: any activity using large muscle groups which has a beneficial effect on one or more of the body's systems.

Maximum heart rate: "the ability of the heart to beat rapidly" (Hojancki, 1981, p. 19).

Maximum oxygen consumption: "is a measurement of the amount of oxygen metabolized by the body at a given workload" (Harvey & Harvey, 1981, p. 45).

Maximum cardiac output: "the maximum amount of blood pumped by the heart in one minute; the product of the stroke volume and the heart rate" (Fox & Mathews, 1981, p. 634).

Maximum heart rate reserve: "the difference between the resting heart rate and the maximal heart rate" (Fox & Mathews, 1981, p. 640).

Isometric capacity: "the ability of the muscle to contract in response to a fixed resistance" (Halfman & Hojancki, 1981, p. 2).

Maximum work capacity: "determined by measuring maximum MET (metabolic equivalent) levels which reflect work capacity and is calculated on the basis of exercise tolerance" (Barry, 1986, p. 159).

Osteoporosis: "a serious disease resulting in bone loss, loss of muscle mass, and overall decrease in

flexibility due to increased cross-linkages of the elastin component of connective tissue" (Barry, 1986, p. 156).

Initial target pulse rate: the heart rate that the individual strives to achieve during physical activity.

Workload intensity: "the level or intensity of physical activity based on exercise tolerance testing" (Barry, 1986, p. 159).

Dysfunction: disordered or impaired functioning of a bodily system or organ.

CHAPTER TWO

Review of the Literature

Exercise and Physiological Functioning

As people age a decline in physical and physiological functioning occurs which affects the ability of an individual to adapt to changes in his or her environment. Exercise is vitally important in the maintenance of health and the alleviation of diseases (Elkowitz & Elkowitz, 1986). By increasing blood flow, lung capacity, and mental stimulation, exercise is not only preventive for many illnesses, but seems to function as a treatment measure as well. Evidence suggests that exercise can delay some of the changes attributed to the aging process (Elkowitz & Elkowitz, 1986). Early adoption of an exercise program is crucial to enhance a healthful passage into late-life.

Cardiovascular changes that occur with aging include declines in maximum cardiac output and maximum work capacity (Barry, 1986). Maximal heart rates are affected by aging as well (Posner, Gorman, Klein, & Woldow, 1986). Physical changes associated with aging inevitably decrease the body's capacity for exercise (Elkowitz & Elkowitz, 1986). Cardiovascular benefits associated with regular exercise include:

1) increases in aerobic capacity

2) reductions in the risk of cardiovascular disease

3) improved maximal 02 pulse

4) increased levels of high density lipoproteins (HDL) and decreased triglycerides

5) reductions in heart rate

6) increased myocardial vascularity and efficiency

7) decreases both in systolic and diastolic blood pressure

8) improved systemic circulation by limiting lower extremity edema, mechanically stimulating the flow of lymphatic channels and venous return, thus improving capillary flow and increasing collateral circulation

9) preventions in complications of aging and playing a vital role in rehabilitation programs, particularly in stroke, myocardial infarction, and amputation (Elkowitz & Elkowitz, 1986, p. 91).

10) improved physical work capacity (Posner, et. al., 1986, p. 55C).

The functioning of organs, such as the heart, lungs, and muscles, declines by the age of 70 (Elkowitz & Elkowitz, 1986). The rate of decline is influenced by exercise; if muscles are not routinely exercised, they lose strength. Muscles which are not contracted to at

least 20% of their maximum isometric capacity three times a week, will become weaker (Elkowitz & Elkowitz, 1986). Connective tissues in muscles and ligaments also need constant regular stretching. Inactivity and lack of exercise will cause shortening of the connective tissues and result in dysmobility (Elkowitz & Elkowitz, 1986).

The most serious musculoskeletal problem the late-life population is faced with is osteoporosis. Factors believed to contribute to osteoporosis include:

1) calcium loss
2) calcium deficiency
3) hormonal deficiency
4) changes in protein nutrition
5) decreased physical activity (Rossman, 1986, p. 523-525).

Calcium loss may occur via the bones, kidneys, or intestines, and could lead to osteoporosis if this loss is sustained (Rossman, 1986).

An important stimulus for bone formation is muscular stress. A decrease in or lack of physical activity in any age group results in urinary calcium loss and could possibly be a contributory or even causative factor in osteoporosis. Studies have shown a 25% to 45% calcium loss in healthy adults restricted to bed rest for 30-36

weeks. A cyclical problem is created because the lack of exercise and physical inactivity in the late-life population are significant contributory factors to the high incidence of osteoporosis, and subsequently, the osteoporosis greatly impairs the ability of the individual to be involved in future physical activity. Musculoskeletal problems of this age group could be reduced with properly supervised exercise programs and nutritional counseling prior to the development of osteoporosis. Musculoskeletal benefits achieved through regular exercise include:

1) increases in agility

2) increases in muscular endurance

3) decreases in body fat composition

4) increases in lean body mass

5) stimulation of bone growth to combat osteoporosis (Elkowitz & Elkowitz, 1986, p. 91).

Additional metabolic processes that are enhanced through regular exercise include an increased glucose utilization and insulin sensitivity, acting as an adjunct to dieting by increasing caloric expenditure, and improvement in gastric motility, thereby lessening the likelihood of constipation - a general problem in the elderly (Elkowitz & Elkowitz, 1986, p. 91-92).

The respiratory system is also impaired as aging takes place. With advancing age, the rate of maximum oxygen consumption declines. Physical conditioning may delay this decline. Decreases in maximum cardiac output are primarily related to this decline in maximum oxygen consumption (Rossman, 1986).

Even though these changes in the respiratory system occur, older individuals can still obtain benefits from physical conditioning. Maximum oxygen consumption, work capacity, and pulmonary function can increase for sedentary elders as they start and maintain regular exercise.

Growing older is a natural part of life. What is not natural are the many illnesses that the late-life population are susceptible to due in part to life-style-related chronic degenerative diseases. Exercise, resulting in the previously identified improvements in the body's physiological functioning, provides an option for late-life individuals who want to retard the progress of degenerative diseases within their bodies.

Exercise and Psychological Functioning

Along with the enhancement of physiological health in the late-life population, exercise also improves psychological well-being (Shisslak & Utic, 1985). The

psychological benefits of regular exercise include:

1) a sense of accomplishment

2) an improved sense of well-being

3) alleviation of anxiety and depression (Shisslak & Utic, 1985, p. 241).

It is important to understand that physical activity does not have to be strenuous or high intensity to be beneficial. Wiswell promoted the idea that low-intensity exercise can have as dramatic effect on mental health as aerobic conditioning in late-life populations (Shisslak & Utic, 1985). Physical activity at low-intensity may also reduce specific factors contributing to accelerated physical declines as well as to add to psychological well-being.

A study by Sidney and Shepard (1976) evaluated attitudes of men and women toward health and physical activity before and after three months of supervised endurance training. Emphasis was placed on evaluating psychological responses to physical training. A total of 14 men and 28 women participated in the study. The average age of the participants was 66.2 years of age for men and 65.7 years of age for women. The physical training classes lasted one hour, four days a week, for 14 weeks. The physical training consisted of fast

walking, jogging, and other forms of endurance aerobic exercise. An initial target pulse rate of 120-130 beats per minute was established. As physical conditioning improved, pulse rates of 140-150 beats per minute were encouraged. In addition to a general information and health habit questionnaire, a variety of psychological questionnaires were completed by the subjects when they first were recruited and again after the training program. Instruments used were:

1) The Cornell Medical Index Health Questionnaire

2) The Taylor Manifest Anxiety Scale

3) The Kenyon Attitude Inventory

4) An Inventory of Attitudes toward Physical Activity

For analysis of data, a 2 X 2 factorial analysis of variance table was designed to evaluate sex, frequency of training, and intensity of training as independent variables. No significant sex differences were seen. Sidney and Shepard (1976) concluded that the late-life study population had a positive attitude toward health and fitness. All participants believed that a moderate amount of activity was necessary for optimal health. Changes associated with training in this population were:

1) improvements in physical performances, i.e., decreased fatigue

2) increased perception of well-being, i.e., increased self-concept and decreased alterations in mood, personality, and attitude adjustments

3) gains in cognition

4) improvements in tests of general health knowledge (p.248)

Sidney and Shepard (1976) concluded this population would adhere to an exercise program if gains in health and mood were shown. Sidney and Shepard (1976) also recommended that feedback should be provided through periodic repetition of simple fitness tests and psychological assessments.

Perri and Templer (1985) also assessed the psychological effects of exercise in the late-life population. They studied the effects of a 14 week aerobic activity program on self-concept, depression, anxiety, and short-term memory in older adults.

Nine males and 14 females participated in the experimental exercise group. Their mean age was 65.6 years of age. The exercise program they participated in consisted of three basic phases:

1) a physical fitness testing and warm-up phase;

2) an aerobic exercise phase of stretching for flexibility, calesthentics, fast walking and jogging;

3) a cool-down phase.

Workload intensity was 40-50% of the maximum possible individual effort. Instruments used for the assessment were:

1) The Zung Self-Rating Depression Scale

2) The Anxiety Scale of Zuckerman's Multiple Affect Adjective Checklist

3) The Fitt Tennessee Self-Concept Scale

4) The Rotter Locus of Control Scale

5) The Rey Auditory Verbal Training Test

A one-way analysis of variance was used to determine differences for all the dependent variables among the research groups. The exercise group's scores on Zung's Self-Rating Depression Scale improved significantly more than the control group or the exercise drop-out group. Significant increases were also cited in self-concept and locus of control. This would indicate that the exercise participants felt increased self-esteem and sense of control over their environment. The individuals participating in the exercise group developed a sense of accomplishment and success from being involved in physical activity. Participants in the exercise group also reported that changes from a sedentary life-style improved their physical health and perceptions of their

appearance as well. Also, a general feeling of well-being was reported by the participants in the exercise group.

Many of the above results have been cited in studies done with younger subjects. Exercise does yield positive results. Offering programs of physical activity to the late-life population helps retard the aging process both physiologically and psychologically. These benefits from exercise help to establish physical activity as an alternative to physical health problems and an activity providing psychological benefits as well.

Exercise as Preventive and Treatment Health Care

Exercise has always been recommended as an activity to improve and maintain general body function, with special emphasis on the cardiovascular-pulmonary system (Lewis, 1985). But can this approach be used to prevent and/or treat illnesses in late-life adults?

Expenditures for health care by the population of older adults accounted for 29% of the nation's total health care costs (Lewis, 1985). However, accompanying this sizable utilization of the health care system by older people, is an alarming decrease in the actual number of people who provide health care and other health-related services (Lewis, 1985). Lewis (1985) also

stated that the health care system must look at the demand placed on it and find appropriate avenues of prevention and alternative treatments for the chronic degenerative diseases that more commonly strike the older population. The availability and effectiveness of health promotion programs dealing with specific problems of the late-life population needs to be assessed.

In 1986, about one-third of the hospitals in the United States offered a health promotion program for people 65-74 years of age, and about 24% provided programs for those over the age of 74 (McCormick, 1986). Evidence suggests there is an eagerness among senior citizens for health promotion programs. Older adults have been found to be flexible and willing to try new educational programs (McCormick, 1986). According to Barry (1986) the most important consideration in providing this age group with appropriate programs is to analyze their specific health needs so relevant and beneficial programs can be developed. Needs assessments would pinpoint specific areas of importance for this population.

Physical illnesses, immobility, poor mental health, and social maladjustments may be prevented or effectively treated through adherence to regular exercise programs.

Pre-exercise medical exams are recommended to prescribe the boundaries of potential exercise as well as to encourage the older individual to exercise. Physical activity can be used for preventing, treating, and rehabilitating health problems which are common to the late-life population.

CHAPTER THREE

Summary, Model Program, and Recomendations

The primary benefits of routine physical activity for the late-life population are the retardation of the aging process and the alteration of the effects of the self-destructive life-styles frequently practiced today (Halfman & Hojancki, 1981). Physiological functioning, while reduced in later years, can stabilize and even increase in some cases when regular physical activity is sustained. Current literature suggests there is a correlation between exercise and improved physiological functioning. Exercise used as therapy helps in decreasing the problems associated with hypokinetic degenerative states, such as osteoporosis, muscle atrophy, loss of flexibility, and bladder and bowel dysfunction (Halfman & Hojancki, 1981). Physical training promotes increased strength of muscles, bones, ligaments, and connective tissues which leads to fewer injuries. Decreased body fat and increased lean body mass are also a bonus for an individual who exercises regularly. While not a cure-all for every illness that is related to late-life, physical activity is a beneficial component to everyone's life-style. As a preventive health care measure, exercise is viewed

positively by reducing the incidence or delaying the onset of certain illnesses associated with late-life.

Also, exercise has been shown to have beneficial results psychologically, thus increasing its appeal as a preventive and treatment measure the mental health care system can utilize more effectively. Exercise seems to have a positive influence on alleviating discouragement and depression. The beneficial effect of physical activity is evidenced by an individual's improved ability to handle stress.

An exercise program for the late-life population can help in the prevention, treatment, and rehabilitation of physiological and psychological health problems associated with this age group. According to Barry (1986) an exercise program's main purposes are to:

1) improve movement (strength, flexibility, balance, and coordination);

2) provide fitness in a safe manner;

3) reduce the risk of injury (p. 158).

In order for a program to achieve these goals, exercise should be performed three to five times a week.

Intensity of exercise is important for the development of physiological well-being. A certain amount of stress on the body's systems is necessary for aerobic

or cardiovascular fitness to occur. The American College of Sports Medicine (ACSM) recommends an intensity between 60% and 90% of maximum heart rate reserve or between 50% and 85% of the maximum oxygen uptake (Barry, 1986).

The type of activity used should be tailored to individual preferences and needs. The activity should utilize large muscle groups in a continuous rhythmic and aerobic movement. Activity programs for the late-life population must be designed after the participant's current level of fitness is determined.

Activity programs for the late-life population must also be readily available and accessible to the population. Community buildings, hospitals, or commercial sites should be evaluated for their accessibility to the population. Persuading members of the late-life population to adopt a program might be difficult. In order to facilitate the process of adoption, education emphasizing the physiological and psychological benefits of exercise will prove helpful. A sample program follows illustrating an activity program for the late-life population.

The activity program will be located at the most centralized hospital within the community. The duration of the program will be 10 weeks, meeting three times a

week for a total of 30 sessions. The program will be comprised of three segments with Part One and Part Two meeting three times each for the first two weeks of the program.

Part One will consist of introductory comments including a statement about the purpose of the program as well as identification of the program leader or leaders. The introduction will be followed by a presentation of information about the physiological and psychological health problems faced by the late-life population living in a youth-oriented culture. This brief lecture will be employed to help participants understand the process of aging and become more comfortable with the concept of physical activity during late-life. The program is not meant to be coercive in nature. It is simply a program providing an alternative for those who want to try to prevent or alleviate physiological and psychological symptoms commonly associated with the aging process.

Another major component of Part One will be a panel discussion. Panel members will assist the participants in gaining some perspective on aging as it relates to physiological and psychological functioning. The panel could include persons with expertise in the areas of aging, exercise, and physiological and psychological

disorders in late-life populations. Some questions that might be considered in the panel discussion are:

1) How do we define late-life?

2) As aging occurs, what happens physiologically?

3) As aging occurs, what happens psychologically?

4) How can exercise prevent or limit functional problems both physiologically and psychologically?

Part Two of the program consists of three lecture, demonstration, and supervised trial participation sessions designed (1) to allow for more efficient use of subsequent time in the activity sessions; (2) to improve awareness of muscle groups that will be used in the activity program, describe why emphasis is placed on these muscle groups, and clarify expected benefits to be achieved; and (3) to prevent injuries that might occur as a consequence of poor exercise form. In order to facilitate the simulation of good posture and form for each exercise, in addition to the actual demonstration, transparencies and handouts will be used.

Part Three is the activity program. It will consist of 24 class sessions, 45 minutes in length, providing additional information, but focused primarily on physical activity. Each exercise is performed by the participants after the instructor has explained its significance and

once again demonstrated it for the participants. Once the exercises have been learned by the participants, music will be incorporated to facilitate a more enjoyable environment with consistent activity. It will be important for leaders to evaluate the music chosen to facilitate cardiovascular conditioning for this age group. The music should be appropriate for this age group with a tempo consistent with levels of fitness present in the class. Each session concludes with a short discussion about the exercises performed and provides for a question/answer period between the participants and instructors regarding these various exercises. Additionally, at the conclusion of Part III, pamphlets will be provided to reinforce what the participants learned throughout the program.

The late-life population tends to be more vulnerable to stress due to physiological and psychological losses associated with old age (Molinari & Niederhe, 1984). Because of this stress, many become dependent on others for daily needs and in so doing, promote their own learned helplessness. When others are no longer there to help them cope, loneliness and anxiety set in. Factors that produce loneliness and anxiety include:

1) retirement related difficulties

2) physical illness

3) economic problems

4) social isolation

5) negative societal attitudes (McIntosh, 1985).

As people age, the social base of family and friendships sometimes deteriorates. This process leaves many in the late-life population lonely and frustrated. Because of these factors, elements of relaxation, fun, and socialization should be made a part of the activity program. Emphasis on socialization would be an intergral part of the program, and socialization skills could be re-learned. Lack of physical activity would be alleviated and increased levels of physical fitness would help increase vitality and lessen stressful symptoms. Many socially isolated individuals within the late-life population would benefit from this type of physical fitness program.

Because of the age group targeted, certain special considerations must be made. Programs must take into account the decreased mobility and flexibility of the participants. This group might take longer periods of time to adapt to a training program or to show any sign of improvement in these areas. Incorporating demonstrations into the activity program that

specifically show what exercise is being performed before the exercise is done by the participant will prove helpful in the adoption of an exercise routine.

Following a program of this type, the older adult will feel healthier and younger. Mobility, functional state, cardiovascular fitness, and outlook are bound to improve (Barry, 1986). As Hippocrates once wrote, "Speaking generally, all parts of the body which have a function, if used in moderation and exercised in labors to which each is accustomed, become thereby healthy and well developed, and age slowly; but if unused and left idle, they become liable to disease, defective in growth, and age quickly." (Barry, 1986, p. 161). This philosophical statement holds much truth for present day society.

Physical activity is a key factor in the improvement and maintenance of physiological and psychological health. Regular physical activity is taking the role of a prevention, treatment, and rehabilitation measure which can be utilized by the late-life population. Physical activity, performed correctly and supervised properly, is an option over traditional treatments for specific health problems of the late-life population.

Although studies cannot state conclusively that

participating in regular exercise will increase life expectancy, it is generally agreed that exercising during late-life has the potential to alter the aging process and decrease the incidence of life-style-related chronic degenerative disease. It is also generally agreed that exercise improves the psychological functioning of the late-life population. These benefits should not go unnoticed in the medical or private sector.

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