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The Effects Of Exercise On Cognitive Function In The Elderly

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Abstract

In order to determine the effect of exercise upon cognition of institutionalized elderly a quasi-experimental research approach was used. A sample of 20 was selected from two long-term care nursing facilities to make an experimental and a control group. The experimental group had a prescribed exercise plan followed by a cognition test while the control group received only the cognition test.

The cognition test scores were analyzed using the *t* test statistic with a significance level of 0.05. Analysis of the data led the researcher to fail to reject the null hypothesis; however, a marginally significant trend for the experimental group to score slightly higher than the control group on the Thomas Test of Cognition was noted. Although not significant at the 0.05 level, the effect of exercise on cognition is significant enough that the researcher recommends institutionalized elderly have a program of regular exercise.

Table of Contents

List of Tables

List of Figure

Chapter I

Introduction

Since the beginning of time man has been searching for a solution to slow or halt the aging process. The seemingly endless quest for the legendary "Fountain of Youth" has influenced the design of several theories associated with genetic, cellular, and physiological aspects of aging. Questions that have been answered provide detailed explanations concerning the biopsychosocial imbalances sometimes associated with aging. The Geriatric Nurse Clinician (GNC) is concerned primarily with assessing these imbalances and initiating tasks and treatments to promote successful adaptation. This is important in order to provide the elderly health care consumer with a more healthful mental and physical life.

In the past, very little recognition has been given to the elderly as a health care consumer group. However, due to the significant rise in the percentage of people over 60 and to the increase in media representation, their voices are now being heard. Ebersole and Hess (1981) state that over 15% of the entire population is over 60. This age group increased 15% while the overall population increased only 6% in a seven-year period. They also estimate that

approximately 5% of this group or approximately 1.5 million people are institutionalized. These figures also indicate that there will be a drastic increase in all settings by the year 2000. According to statistics, the institutionalized health care consumer will be a larger part of the overall elderly population. These institutionalized elderly adults will require constant supervision, assessment, and revision of care plans and treatment measures in order to provide a more meaningful life for them. Therefore, the GNC's role must be expanded and intensified in order to meet the demands of the elderly health care consumer.

Exercise is an area which is often ignored in treatment measures and care plans of the institutionalized elderly. According to Riffle (1982), physical activity or regular exercise reduces the potentially deleterious effects of aging upon both physiological and psychological functioning. Therefore, exercise should be an intervention that the elderly can benefit from in their latter years.

Physical activity in the elderly increases the chance of a healthier old age. Exercise increases cardiac reserve, increases arterial diameter, lowers serum cholesterol, increases high density lipoproteins, aids in weight control, improves bowel function, adds bone and muscle strength, tightens ligaments, improves glucose utilization, and decreases stress levels (Fries & Crapo, 1981). Studies done by Reisberg (cited in Cooper, 1984) support these findings.

These studies are highly indicative that good health fosters a higher probability of keeping a majority of wit as the aging process continues. This research undermines the old notion that mental decline is a natural, inevitable feature of old age. His studies suggest that physically active elderly adults stay mentally alert, interested, and challenged by life.

At this particular time, institutions concerned with the care of the elderly adult allocate few measures to increasing physical or cognitive function through the use of physical activity as evidenced by the few prescribed exercise programs in these institutions. There is also a lack of research articles describing the physiological aspects as well as mental and emotional aspects of healthy aging. Researchers advocate the use of exercise for the elderly to increase self-esteem and ability to function at the highest level on the scale of activities of daily living (Karl, 1982; Riffle, 1982; Goldberg & Fitzpatrick, 1980).

This particular study of geriatric exercise collected data about the effect of physical activity by nursing home residents on cognitive functioning. The researcher became interested in this particular aspect of geriatric health care from observing elderly clients who were residents of a local facility. After taking a brief course in advanced exercise physiology, the researcher wished to investigate the possibility that exercise might help the elderly's

cognitive powers. Data would be important in establishing positive, progressive, health care by the GNC in the nursing home in the future.

Hopefully, this study may be used as a stepping stone to more extensive studies of exercise in the future. As a result of these investigations the GNC's ability to provide quality health care should be improved and the institutionalized client will reap the benefits by increasing the quality of life in "the golden years."

The purpose of this study was to observe and measure the effects of regular exercise on cognitive function in elderly health care consumers. The study was seeking to answer this question: Will a regular prescribed program of exercise increase cognitive functioning in residents of a nursing home?

Chapter II

Theoretical Basis for Study

The foundation and framework for this study of exercise in the elderly adult is the Roy Adaptation Model. This theoretical model advocates adaptation as a means of balancing concepts of health-illness utilizing a holistic approach. Since changes of physical aging are continuous struggles to adapt and cope with situations or crises, a theoretical model based upon adaptation seems to be an appropriate model for a study of the effects of geriatric exercise.

Roy (1976) defines man as a biopsychosocial being in constant interaction with a changing environment. This biopsychosocial being is the recipient of care and should be assisted in adapting to individual situations. Thus, to prescribe and assist an elderly individual in adapting to an exercise program, a nurse must examine, assess thoroughly, and evaluate the individual elderly client for physical agility, ability, and willingness to follow an exercise program. The exercise prescription must also be congruent with his personal life style.

Adaptation occurs in four modes. Roy (1974) defines these modes as physiologic needs, self-concept, role

function, and interdependence. In essence, the recipient of care must be the primary "doer" of action in order for adaptation to occur in any of these modes. Therefore, physiological benefits of exercise will only be promoted when and if the elderly exerciser adheres to the prescribed regimen.

Geriatric exercise assists the elderly to physiologically adapt to changes brought upon body systems by aging. When an exercise regimen is established and followed, exercise tolerance, maximal breathing rate, cardiac reserve, reaction time, physical strength, and ambulatory abilities can be maintained if not improved.

After an exercise pattern has been established and adaptation occurs, aging changes are reduced or alleviated; therefore, the elderly exerciser is better prepared physically which should promote better cognitive function. This concept of adaptation utilizing exercise to increase cognitive function should facilitate the self-concept, role function, and interdependence modes advocated in Roy's theory (Roy, 1976).

The overall nursing goal of the Roy Model is to promote adaptation in the four adaptive modes. This is accomplished by assessing client behaviors and factors which influence adaptation. Intervention is usually accomplished by manipulating influencing factors classified as stimuli (Roy, 1974). Therefore, exercise should promote equilibrium

between the biopsychosocial aspects of aging by providing a means of adaptation to changes of physiological aging.

A thorough assessment of holistic functions should be included in the implementation portion of the care giver's plan of care. With this in mind, specific criteria have been utilized for the selection of participants in this study.

A prescribed exercise regimen (intervention) is successful when follow-up evaluations are employed as a means for changing or re-prescribing physical activity. When the care giver offers support, encouragement and psychological paychecks (manipulation of stimuli), the success rate increases. The evidence provided by this rate increase confirms that adaptation has occurred and that nursing intervention has successfully resulted in the nursing goal.

In conclusion, a strategy of geriatric exercise should test the Roy Model. The model's view of man, method of intervention, and method of implementation are congruent with those of the systematic concept of exercise. Each aspect of the model increases the possibility of adaptation and, therefore, promotes the type of life style that the elderly adult can and will enjoy.

Chapter III

Hypothesis

Theoretical Null Hypothesis

When elderly subjects who participate in an exercise program are administered a test on cognition and the results are compared to those of elderly subjects not participating in an exercise program, there will be no significant difference.

Definitions

1. Elderly subjects: ages 60 and above, who reside in a nursing home and have no severe mental and physical impairment.

2. Participate: attend at least 75% of exercise sessions and perform a prescribed regimen.

3. Exercise program: a researcher-designed exercise schedule consisting of 45 minutes/week for four consecutive weeks in conjunction with daily ambulation.

4. Test on cognition: a researcher-designed tool entitled "Thomas Test of Cognition."

5. Compared: Scores will be analyzed utilizing the *t* test.

6. Significant: the 0.05 level of significance.

Operational Hypothesis

When elderly clients 60 years of age and above, who are residents of nursing homes and have no severe mental/physical impairment and who have participated in a prescribed four-week exercise program by attending and performing at least 75% of the time, are administered the researcher-designed Thomas Test of Cognition and the results are compared utilizing the *t* test to the results of cognitive testing from elderly clients not participating in the exercise program, there will be no significance at the .05 level.

Chapter IV

Review of Literature

The process and eventuality of aging has as many theories and declarations as does any other topic of objectivity within the realm of research. A review of lay literature provides the reader with numerous illustrations of stereotypes, myths, and misconceptions refuted by many of these theories. Examples of these myths of aging include the belief of many that the aged are senile, disabled, and passive. The senile, disabled, and passive myths are evident in the public's views of exercise for the elderly. Another myth attracting much attention is the one that states the elderly are unable to follow a regimen without physical harm or further disability. The material presented is a compendious review of the physiological changes, bio-psychosocial needs, and the benefits of geriatric exercise.

The myths concerning exercise in the elderly are acknowledged and refuted in professional media. According to published results by well known gerontologists, ideas of senility, disability, passiveness, and an inability to follow a regimen without physical harm or further disability are totally untrue and virtually uncalled-for. The number of journal and magazine articles published in the past few

years debating the issues of healthfulness and helpfulness of exercise indicate the public's concern as well as controversies over the subject of geriatric exercise. The elderly as well as their families can abolish any concerns arising from myths by obtaining a thorough checkup and selecting the proper exercise program.

Exercise is defined by Barnhart (1970) as bodily or mental exertion, especially for the sake of training or improvement. Geriatric exercise can be defined as any physical and/or mental activity in persons 60 years of age and above which promotes a sense of being vital and vigorous. Activities of geriatric exercise include, but are not limited to, jogging, walking, rocking, activities of daily living, and passive and active range of motion exercise. The physical activities in which a geriatric client participates depend upon his physical condition.

Many authors address functional aging changes and their outcomes. These functional aging changes are applicable to geriatric exercise physiology.

Functional changes in the heart which reduce cardiac output are a combination of a slower heart rate and a decrease in stroke volume. The maximum cardiac output declines 30% in the first seven decades of life and 50% by the eighth decade of life. Calcification changes and alterations in myocardial tissue which render the heart less well equipped to handle stress include a decrease in the

myocardial area to utilize O_2, a decrease in coronary artery blood flow, and a decrease in contractile ability of the left ventricle which is usually linked with lack of exercise and possible heart disease. This disuse atrophy and a progressive decline in myocardial vigor is seen in the lower cardiac reserve of the older adult; therefore, upon demand such as stress or exercise, the elderly heart is less efficient, and takes much longer to return to pre-demand status (Boss, 1982; Forbes & Fitzsimons, 1981; Shephard, 1981; Smith, 1981a).

The most frequent change noted in blood vessels is decreased vascular elasticity caused by smooth muscle which is replaced by fibrous and hyaline tissue. This change causes an increased pulse pressure and an increased systolic blood pressure. Systolic pressure usually increases 10 to 15 mm of mercury while diastolic pressure increases 5 to 10 mm of mercury. These elevations in pressure indicate an inability of the vessels to stretch and is usually caused by arteriosclerosis. Literature states that the elderly vessel has a 30% increase in stretching ability while the young vessel is able to tolerate a 60% stretch (Boss, 1982; Forbes & Fitzsimons, 1981; Shephard, 1981; Smith, 1981a).

Changes in the lung include a reduction in vital capacity and an increase in residual volume. Reduction of pulmonary diffusion, loss of lung recoil, maldistribution of pulmonary ventilation/perfusion ratio generally follow. All

of these changes are related to the types or quantity of fibrous proteins, collagen, and elastin in the lung matrix. These variations create a decrease in arterial oxygen tension precipitating a decline in respiratory reserve while a progressive weakening of respiratory muscle causes a reduced negative and positive intrathoracic pressure on forced inspiration and expiration. This reduced pressure coupled with reduced expiratory flow rates account for the decrease in the maximum breathing capacity (Boss, 1982; Reddan, 1981).

The major changes noted in the musculoskeletal system are decreases in number and bulk of muscle fiber. These muscle fibers are replaced with nonmuscular fibrous tissue which causes a sharp decline in muscular strength, endurance, and agility. Because of this structural difference in muscle fiber, work capacity declines 30% between the third and seventh decade of life. It is estimated that muscular strength and mass decline 25 to 30% in both men and women. This loss of muscular strength directly affects posture, gait, balance, flexibility, rapid gross motor and fine motor movements. These concepts form the basic process for all daily living tasks and other vital functions necessary for an independent life style (Adrian, 1981; Boss, 1982; Fitts, 1981; Forbes & Fitzsimons, 1981; Smith, 1981a; Verwoerdt, 1969).

Another change mentioned that occurs mainly in women is a sharp decline in bone density which may be directly related to estrogen deficiency, insufficient dietary intake, and possible abnormalities in calcium, protein, and amino acid metabolism. These changes cause osteoporosis and/or osteoarthritis. Bone mass decline associated with osteoporosis and/or osteoarthritis equals approximately 1% each year. Females start this process in the third decade of life while males exhibit deterioration in the fifth decade. The deterioration accompanied by a reduction of 10% in the basal metabolic rate and 15 to 20% in cell hydration (associated with an increase in body fat) physiologically explain spontaneous fractures and the increased risk of fractures. This deterioration's etiology can be associated with chronic disease processes, hypodynamic states, and/or vitamin deficiencies (Boss, 1982; Smith, 1981a; Smith, Sempos & Purvis, 1981; Verwoerdt, 1969).

The change in the hematological system which causes a deficiency in iron and folate is directly related to the ability to exercise. This hematological change causes a decrease in the oxygen-carrying capacity of the blood and is usually precipitated by malnutrition, malabsorption, chronic disease, and/or lack of exercise (Boss, 1982).

Physical changes are noted in the brain as aging advances. However, Diamond (cited in Cooper, 1984) insists

that the deterioration does not necessarily affect mental sharpness. Anyone who is in good health will have a chance of keeping his/her wit as well.

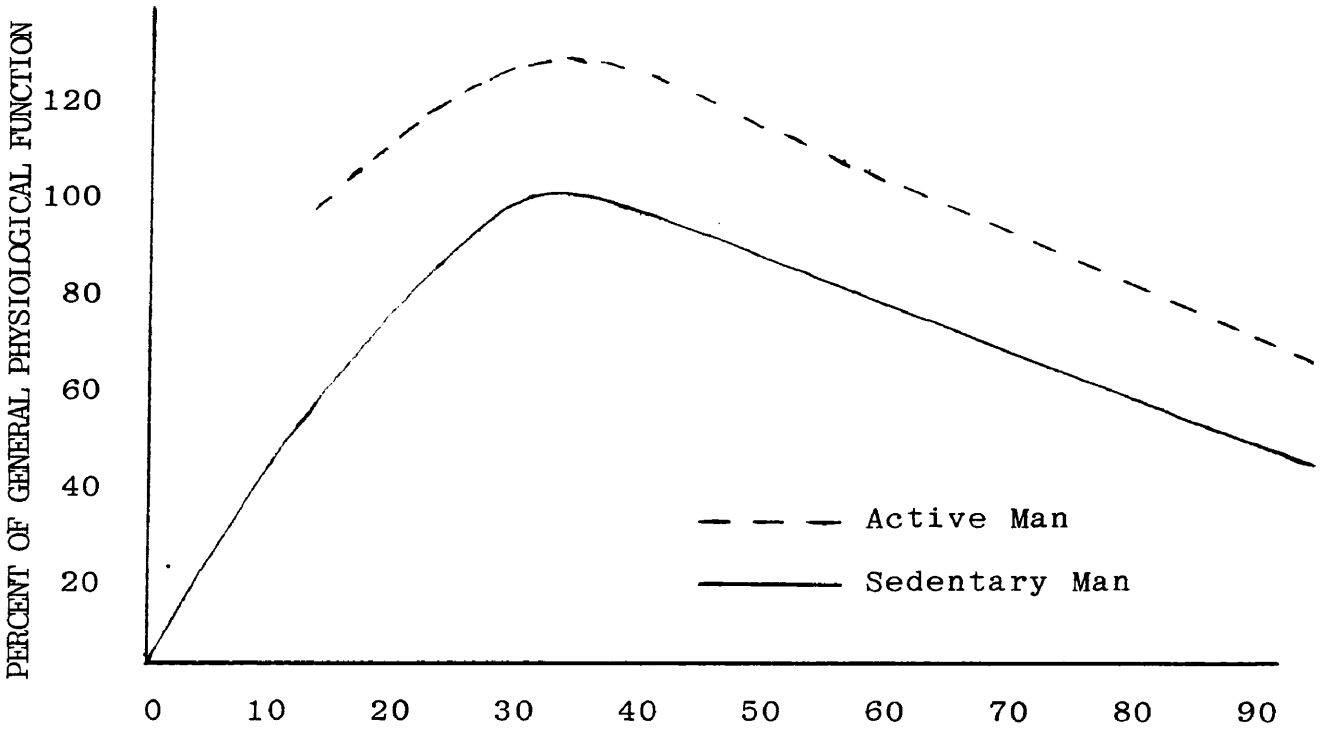
Physical changes associated with the aging brain are loss of brain weight (approximately three ounces by the seventh decade of life), plaques, and neurofibrillary tangles in the cerebral cortex. A reduction in neurotransmitters which convey messages from one nerve cell to another constituted the major chemical change. According to Schaie (cited in Cooper, 1984), these physical and chemical changes do not necessarily affect brain function. A proper balance of diet, exercise, rest, and health care increase the probability of the majority of elderly clients' ability to retain or to increase their intellectual powers in their latter years.

The overall general physiological function of ages 0-120 years can be viewed in Figure 1. This graph compares active man with sendentary man (Smith, 1981a).

Professional views concerning the changes related to aging and what effects exercise has upon these changes are multiple in situation and number. However, most of the professional literature indicates positive findings.

A pioneer study provided by Dill, Horvath, and Craig (1958) followed one man for 28 years measuring heart rate, oxygen consumption, maximal oxygen intake, and body weight

Figure 1. The Euro-American Curve.



in an effort to examine the effects of exercise in changes associated with aging. Results confirmed that as age increased, maximal O_2 intake, oxygen consumption, and maximal attainable heart rate decreased. However, body weight had increased 10%. This weight factor combined with age could have had a major influence on the variables and the outcome of the study.

A study by Munns (1981), which lasted for 12 weeks, demonstrated the effect of exercise using range of motion exercise on elderly subjects. Daily life practices and comfort in movement were improved due to improvement in range of motion provided through a properly designed program.

Smith (1981b) has shown through studies that physical activity as a stimulus clearly produces bone mineral accretion in young and old as a result of the increased stress and strain placed on living bone tissue. Physical exercise increased circulation in the bone, improved subject nutrition, and/or an increased gravitational and muscular stress affecting bone cellular activity.

Reddan (1981) insists that elderly who can sustain sufficient exercise intensity can increase aerobic capacity with physical training. As a result of the increase in aerobic capacity, cardiopulmonary and respiratory function can be maintained or improved.

Conclusive material has been provided to support the fact that stimulating environments develop bigger and possibly better brains. Diamond (cited in Cooper, 1984) used lab animals with a "playground" environment to demonstrate this concept. The creatures who were equal in age with humans in their sixth to ninth decade of life remained spry and highly inquisitive.

Davies and White (1983) in a 1982 study examined the effect of exercise upon contraction time, weakness, and loss of force in certain muscles of elderly men. Elderly males showed greater muscle impairment following dynamic exercise because of their inability to sustain exercise at maximum capacity. The authors concluded that this inability to sustain exercise could keep elderly men from maintaining the function necessary for independent living.

To substantiate the findings of the 1982 study, Davies and White (1983) implemented a similar study the following year. Eight elderly men between the ages of 67 and 71 years were observed. The hypotheses for the study were that prolonged dynamic exercise affects the decrease in twitch and tetanic tensions in the immediate postexercise period of elderly exercisers and that elderly men show greater muscle impairment following dynamic exercise than young men. Healthy elderly men were found to have minimal impairment in the force generating capacity of the lower leg muscles and were not as prone to fatigue from exercise as predicted.

The results of the 1983 study did not substantiate the 1982 conclusion about the capacity for independent living.

The major problem area encountered with the subjects in Davies and White's experiment was cardiorespiratory in nature. This conclusion could indicate that if cardio-respiratory performance can be improved, then dynamic endurance will increase as a matter of course (Davies & White, 1983).

Benested (cited in Davies & White, 1983) and de Vries (cited in Davies & White, 1983), pioneers in the field of geriatric exercise physiology, produced evidence suggesting improvements in cardiorespiratory fitness can be produced by correct endurance training in the elderly. However, the limitations of exercise related to the loss of short term muscle function have not been established.

Moritani (1981) supports findings from the previous studies and adds strong evidence of the possibility of trainability of the elderly adult. If compared on a percentage basis, the trainability of an elderly person does not differ greatly from young or middle-aged persons. The increased level of fitness reflected by this percentage comparison could very well be the ticket for independent living in the older adult.

Researchers interested in geriatric exercise physiology investigated whether a holistic nursing intervention could improve levels of morale or self-esteem within the aged

institutionalized population. The nursing intervention-movement therapy was based on the premise of body-mind unity. Movement therapy, the use of body motion and language, was instituted in a group led by a professional nurse. The subjects who participated in the group demonstrated an improvement in total morale and attitude toward their own aging. Most researchers assert that any relationship between institutionalization, morale, or self-esteem is mediated by variables such as level of activity, intimacy, and interaction (Goldberg & Fitzpatrick, 1980).

Sonne and Davis (1983) studied six patients with chronic obstructive pulmonary disease and supported the idea of improvement in exercise performance after inspiratory resistive training (IRT). After a six weeks program of IRT, the subjects exhibited a 13 to 50% functional improvement in respiratory mechanics. A small percentage of increase in muscle function can translate into marked functional improvement.

According to Larosa et al. (1983), regularly performed physical activity does increase fitness in postmyocardial infarction patients. If this is true, it stands to reason that fitness can be maintained or increased by a regimented exercise program.

Karl (1982) decided to determine the effect of an exercise program on self-care activities for the institutionalized elderly. Limitation in physical activities also

limited their ability to care for themselves. The research question for this study was: Does an exercise program geared to the range of motion (ROM) increase self-care in the personal hygiene and eating activities of the institutionalized elderly? Ten elderly, institutionalized residents were evaluated after a four-week program of ROM exercises. Only 2 of the 10 participants improved significantly. In addition, socialization was increased slightly, and an improvement in the task of self-feeding was seen. The low percentage of population to show improvement was influenced by uncontrollable variables within the sample. For example, a declined physical and mental ability at the beginning of the experiment and the very short time span did not allow sufficient time to show improvement. The four-week period proved inadequate to measure more than an initiation of improvement in self-care.

The concept of vitality and vigorousness is strengthened by Ubell (1984). He indicates that regular exercise and/or athletics help the elderly keep a healthy body and an alert and happy mind.

Fries and Crapo (1981) insist that exercise performed regularly, aerobically, without pain, and relatively safely, as with walking rapidly, jogging, bicycling, or swimming is one of the most important and positive health influences known. Such exercise increases cardiac reserve, improves pulmonary reserve, increases arterial diameter, lowers serum

cholesterol, increases high density lipoproteins, aids in weight control, improves bowel function, adds bone and muscle strength, tightens ligaments, improves glucose utilization, and decreases stress levels.

Exercise in proper balance with diet and a modest life style increases the chances of having fewer episodes of chronic disease stemming from "unnatural" life styles. In addition, Fries and Crapo (1981) predict when a regimen of exercise is established and followed, exercise tolerance, maximal breathing rate, cardiac reserve, reaction time, physical strength, short-term memory, intelligence, ambulatory abilities, and social abilities can be maintained or even improved with advancing age.

Irwin (1970), Dickman (1981), and Stonecypher (1980) agree with Fries and Crapo (1981). Literature provided by these authors suggest that exercise is a sort of miracle drug. It helps the elderly body to adjust to reduced circulation imposed by arteriosclerosis as well as encourages the skeletal muscles to use oxygen more effectively. The heart grows larger and more contractile so that it delivers a greater volume of blood per stroke, yet enjoys a longer recovery period between beats, and the nerve regulation becomes more stable. Exercise also increases the amount of hemoglobin and red cells, thereby increasing the oxygen-carrying capacity of the blood. The bellows-like action of the chest is improved as well as the skeletal muscle tone.

Exercise also stimulates mineralization of the bones, reduces fat deposits, and enhances liver and kidney function. Stonecypher (1980) states that under the Law of Aging if an individual wishes to remain vigorous, he must keep his body exercised.

Riffle (1982), Price and Luther (1980), and Bassett, McClamrock, and Schmelzer (1982) also concur that exercise is an important aspect of obtaining and maintaining optimal health in the elderly adult. In this literature, exercise helped to increase the ability to perform self-care activities. By promoting optimal health and self-care, exercise facilitates adaptation to aging changes.

In addition to physiological benefits, physical activity also heightens the individual's ability to relax, to control tension, and to tolerate fatigue (Stonecypher, 1980). In essence, exercise provides the elderly with a diversionary activity that is not only enjoyable but also helpful for maintaining or improving cognitive functions (Confrey & Goldstein, 1960).

Like all medicines, exercise must be handled knowledgeably. Over-exertion and strain must be avoided. Physical activity is indicated as a personal health practice important to longevity and the mental and physical functions of good health (Stonecypher, 1980).

Professional literature confirmed that of inactivity, obesity, and smoking, inactivity was by far the most

damaging to the health of older adults. However, exercise or physical factors alone cannot account for longevity. It is a combination of physical exercise and social and cultural factors which show incidences of extreme longevity, especially in the Caucasus of the USSR, the Masai Tribesmen of East Africa, the Moslem Azerbaijanians, and a small group in South America (Benet, 1976).

It has also been demonstrated that the elderly can make significant gains in cardiovascular adaptations and in cardiorespiratory fitness in the form of maximal oxygen consumption improvement. A few articles have suggested that there is some strength gain in the older individual which may be the result of learning to recruit a larger number of motor units. Regardless of the social and cultural factors mentioned by Benet (1976) and the mechanisms involved through proper training and exercise, it appears that the elderly can make improvements in muscular strength and endurance which will substantially improve their functional capacity and add to or go beyond their expected activities of daily living. These adaptations and gains in cardio-respiratory fitness are affected by personal factors such as motivation, attitude, initial health and fitness status, and by program factors such as the type, duration, frequency, and intensity of the exercise employed (Serfass, 1981; Sidney, 1981).

Through a review of the pertinent literature, it has been established that exercise is important. It is also considered a must to attain maximal and optimal levels of health. Most researchers have dealt primarily with the physiological changes produced by aging and exercise. A few have insisted that the mental aspects are directly related to the physiological changes; however, these studies have not been conclusive. Therefore, the purpose of this inquiry was to examine the effect of exercise upon the cognitive function of institutionalized clients.

Chapter V

Research Design and Methodology

Research Design

In order to seek answers relating to the effectiveness of exercise upon cognition, the quasi-experimental research approach was used. Polit and Hungler (1978a) describe this type of research as a scientific investigation in which observations are made and data are collected according to a set of well defined criteria. This type of design involves some type of treatment and manipulation of the independent variable. There was a control group in this study, but randomization was not possible. The experimental group exercised for one month and then were tested for cognitive function. The control group did not follow a prescribed exercise plan but were tested for cognitive function.

Variables

The independent variable in this study was regular exercise. The dependent variable was cognition. Controlled variables were place of residence, the time of day, and the physical and mental state of each group member. Intervening variables may have been medications and physical and mental status at the time of testing.

Setting

The setting for the proposed study was a county located in East Central Mississippi. During the time of this study two nursing homes, serving approximately 20,000 residents, provided subjects. Nursing Home A is dependent upon county and state officials for operational management and funds. Nursing Home B functions as a private institution. Both nursing homes are certified for skilled and intermediate care patients. Facility A has a 42-bed capacity. Sixty-two percent are intermediate care while the remaining 38% require skilled care. Nineteen percent are male while the remaining 81% are female. Approximately 12% are black with 88% white. Ages range from 53 to 101 years of age.

Facility B has a 60-bed capacity. Thirty percent of the population is classified as intermediate care while the remaining 70% requires skilled care. Eighteen percent are male leaving 82% female. Approximately 0.03% are black with 99.97% white. Ages range from 45 to 100 years of age.

The age group seen most frequently in both facilities is 75 to 80 years. Prior to residing in the nursing home the majority of Facilities A and B's residents were farmers, housewives, and teachers. Most were classified as middle class.

Both nursing homes are adequately staffed in the administrative, nursing, dietary, cosmotology, social/activities,

and housekeeping departments. Volunteer auxiliary members round out a full force of health care providers.

Schedules for activities of daily living are comparable in both facilities. These schedules are flexible to accommodate patient needs, yet structured to provide optimum health care.

Upon arising each morning the residents are served breakfast. Immediately following breakfast, daily hygiene and personal grooming needs are done by the nursing staff. After bath time, the Activities Director provides and directs activities, i.e., bingo, checkers, chess, or card games. Lunch is served around noon. Most residents take afternoon naps which last until 2:00 p.m. Around 3:00 p.m. every afternoon a program of music, movies, slides, or gospel singing occurs. These programs usually last until 4:00 p.m. Supper is served around 5:00 p.m. and bedtime is at 7:00 p.m. During "free time" the residents wander about, watch t.v., converse with other residents/staff, crochet, listen to talking books, or read.

Neither facility initiates or utilizes a regular prescribed exercise program in their care plan regimen; however, both facilities have access to a qualified physical therapy department. Regardless of this situation, both facilities strive to upgrade institutionalized health care in the county.

Population/Sample

For the purpose of this study, Facility B provided subjects for the experimental group and Facility A provided subjects for the control group. All efforts were made to stratify both groups in regards to sex and race. For this particular study 10 residents from each facility were selected by the goldfish bowl technique. Only the names of clients who did not have severe cognitive impairment or severe unpredictable physical ailments, and were able to ambulate were included in the random drawing of names.

Data Gathering Process

The director of both centers were contacted to obtain clearance for the study (see Appendix A). The purpose and the nature of the study were provided to each director and a signed consent (see Appendix B) was obtained prior to initiating the study. Residents' records were reviewed in order to make certain that they met the criteria for selection. The entire list of names were put into a bowl and 10 names from each facility were selected. Each subject selected was approached and the study was explained to him/her and a consent form was signed (see Appendices C and D). If by chance a subject did not wish to participate, another name was drawn from the bowl. This procedure was utilized until 10 subjects from each facility had agreed to participate.

One month after the consent form was signed, the control group was given a simple verbal test (see Appendix E) that measured cognitive function. This group was not subjected to any type of treatment. The experimental group walked one half to one mile daily and participated in a programmed exercise period three times per week. This exercise program is outlined in Appendix F. At the end of the month, the experimental group took the test to measure cognitive function. A record of participation in activity was kept. Each participant attended 50% of the program or they were removed from the group. Data were collected May through June, 1985.

Procedure

A tool entitled "Thomas Test of Cognition" (see Appendix E) developed by the researcher was used. This tool had 22 items scored two points each. The test was given verbally and required a verbal response. The maximum score is 44 indicating optimal cognitive functioning while the lowest score is 0.

Validity and reliability of this tool have not been established. The content for this tool was derived from the mental and cognitive function assessment outlined by Bates (1983). The test was administered to 20 elderly adults who met the selection criteria but did not participate in the study.

Data Analysis

Test scores of the experimental group were compared to those of the control group using the *t* test to determine if subjects who exercised had a significant increase in cognitive function over those who did not exercise. The *t* test was used because the research sample was small and the research situation was a comparison of two groups (Polit & Hungler, 1978b).

Assumptions

1. Geriatric Nurse Clinicians will use this study to improve health care for the elderly health care consumer.

2. The current trend is to exercise in order to stay healthy.

3. The tool is reliable and valid within the confines of this study.

4. The elderly would participate in exercise programs in the nursing home if these programs were available.

Limitations

1. Limiting the sample to the institutionalized elderly prevents generalization to the community.

2. Limiting the sample to a rural southern county limits generalization to metropolitan areas in other portions of the country.

3. The small sample size may affect the findings of this study.

Chapter VI

Analysis of Data

The purpose of this study was to observe and measure the effects of regular exercise on cognitive function in elderly nursing home residents. Data were collected from two groups of subjects in two certified long-term nursing care facilities. Each subject completed a researcher-designed verbal cognitive function test.

A total of 20 subjects met the criteria for this study. The experimental group consisted of 9 (90%) Caucasian females and 1 (10%) Caucasian male. Ages of the subjects ranged from 69 to 96 with an average age of 79.4 years.

Regular exercise for the experimental group consisted of regularly scheduled group exercise and daily independent ambulation. All 10 subjects in the experimental group participated 100% of the time in the group exercise program. All except three subjects ambulated 100% of the recommended distance daily. Two subjects ambulated 97% of the distances recommended while one ambulated 87% of the distances. Cognition scores for the experimental group ranged from 33 to 44 with a mean of 40.9.

The control group consisted of 9 (90%) Caucasian females and 1 (10%) Caucasian male. Ages of the participants ranged from 64 to 95 with an average age of 79 years. Cognition scores for the control group ranged from 22 to 44 with a mean score of 35.8. These data are found in Table 1.

Hypothesis

The researcher hypothesized that when elderly subjects who participated in an exercise program were administered a test on cognition and the results were compared to those of elderly subjects not participating in the exercise program, there would be no significant difference. To test this hypothesis, data were subjected to the *t* test. The obtained *t* value was 2.066 indicating no significant difference at the 0.05 level. However, there was a marginally significant trend for scores to be higher in the experimental group than in the control group. The researcher failed to reject the null hypothesis. These data are presented in Table 2.

Additional Findings

The researcher observed several findings not related to the hypothesis, but of interest. The experimental group showed some changes over time. The group members smiled more and laughed aloud appropriately, exhibiting an air of increased contentment. They seemed more agreeable and more flexible to changes in schedules or routine activities. The group members appeared more amiable. This was evidenced by

Table 1

Demographic Data, Cognition Scores, and Participation Percentage

Subject	Age	Sex	CS	EPA%	AA%
E_1	88	F	38	100	100
E_2	83	F	42	100	100
E_3	77	F	44	100	100
E_4	83	M	33	100	100
E_5	96	F	40	100	87
E_6	85	F	44	100	97
E_7	71	F	44	100	97
E_8	70	F	44	100	100
E_9	69	F	40	100	100
E_{10}	72	F	40	100	100
C_1	85	F	30	NA	NA
C_2	76	F	34	NA	NA
C_3	74	M	34	NA	NA
C_4	82	F	40	NA	NA
C_5	91	F	36	NA	NA
C_6	80	F	32	NA	NA
C_7	95	F	22	NA	NA
C_8	67	F	42	NA	NA
C_9	76	F	44	NA	NA
C_{10}	64	F	44	NA	NA

Note. CS = cognition scores. EPA% = exercise program attendance percentage. AA% = ambulation attendance percentage. NA = not applicable.

Table 2

t Test Results of Cognition Scores

Group	N	$\bar{M}$	SD	t
Experimental	10	40.9	3.5418	2.066
Control	10	35.8	6.957	

a decrease in moodiness and personality clashes among the members.

The participation of the subjects in the exercise program indicated an above average interest in exercise. During these programs, several group members exhibited a tendency to be highly competitive. These clients did remarkably well with the program considering that regular exercise had not been a part of their ADL (activities of daily living) pattern in a very long time.

Another observation made by the researcher concerned selection criteria. The strictness of the criteria for subject selection limited the sample size. Very few institutionalized elderly were able to meet the initial mental/physical requirements to participate in the study.

Chapter VII

Summary, Conclusions, Implications, and Recommendations

Summary

In order to determine the effect of exercise upon cognition of institutionalized elderly a quasi-experimental research approach was used. A sample of 20 was selected from two long-term care nursing facilities to make an experimental and a control group. The experimental group had a prescribed exercise plan followed by a cognition test while the control group received only the cognition test.

The cognition test scores were analyzed using the *t* test statistic with a significance level of 0.05. Analysis of the data led the researcher to fail to reject the null hypothesis; however, a marginally significant trend for the experimental group to score slightly higher than the control group on the Thomas Test of Cognition was noted. Although not significant at the 0.05 level, the effect of exercise on cognition is significant enough that the researcher recommends institutionalized elderly have a program of regular exercise.

Conclusions and Implications

The data collected by this researcher failed to show a significant increase in the institutionalized elderly's cognition after exercise. This finding does not support other studies (Cooper, 1984; Dickman, 1981; Stonecypher, 1980) which indicate cognitive function in the elderly is directly related to exercise. However, the marginally significant trend for higher cognitive scores in the elderly exerciser indicates to this researcher that exercise definitely has a place in the health care regimen of elderly adults. It is the Geriatric Nurse Clinician's (GNC) duty to prescribe a well-designed exercise plan to meet the elderly clients' needs and improve cognition. Also because of the conflict in the literature, the researcher believes that exercise should be incorporated into elderly health care regimens until sufficient data is collected to support that exercise is not beneficial to the elderly.

The researcher did observe an increase in socialization and morale among the subjects of the experimental group. These observations support other researchers (Fries & Crapo, 1981; Karl, 1982; Riffler, 1982) who have observed institutionalized elderly subjects in exercise studies. These studies indicated less biophysical changes and more emotional/socialization changes in treatment groups. Thus, the researcher concludes that exercise for institutionalized elderly does indeed play a significant role in increasing

morale and socialization. The GNC should use exercise as a part of the plan of care for elderly clients.

The short duration of the study may have influenced the data collected. It was impossible to judge long-term effects of exercise. The small sample size may have also affected the results. A longitudinal study with several moderate size groups might produce more comprehensive and accurate data. Also, research conducted into the effects of regular exercise on cognition as people age may offer guidance in exercise prescriptions. The researcher suggests redefining sample criteria so the elderly with physical or mental impairment could participate. Future research should also include representation from all races and sexes. This would increase sample size and be more representative.

Recommendations

The following recommendations are made, based upon findings of this study:

Research

1. Replicate this study utilizing a larger sample size.
2. Redefine sample criteria to include those with physical or mental impairment.
3. Conduct a study with a longer treatment period.
4. Conduct a study with representation from all races and sexes.

Nursing

1. Incorporate exercise regimens as part of nursing care in the long-term care facility.

2. Develop an exercise regimen to meet the needs of all clients. This plan should be employed on an individual basis.

Appendix A

Letter to Directors of Nursing Homes A and B

Dear Sir:

I am currently studying for a master's degree as a geriatric nurse clinician at Mississippi University for Women. As a part of the requirements for completion of the degree, I am conducting a research study examining whether or not exercise affects cognitive function. Results of this study would enhance health care of the elderly and provide a basis for improving the physical and mental status of your clients. Because I believe your "home" to be one where the study would be mutually beneficial, I would like to conduct the study at this facility.

I would appreciate the opportunity of conducting the study with your residents if at all possible. Definite details will be provided to you and the group selected to participate. Data collection will begin in May, 1985. I would like to meet with you at the earliest possible time to discuss the possibility of using your facility for my study.

Thank you for your time.

Sincerely,

Pamela D. Thomas

Appendix B

Consent Form

Institution

The Effects of Exercise on Cognitive Function in the Elderly

_____
(Institution)

_____
(Representative)

This institution grants permission to Pamela D. Thomas to study the effects of exercise on cognition. The nature and purpose of this study have been defined. I understand that all information will be anonymous and confidential and that this institution can withdraw at any time during the study.

Name: _____ Date: _____

Witness: _____ Date: _____

Appendix C

Consent Form

Control Group

The Effects of Exercise on Cognitive Function in the Elderly

Explanation of Research:

I am Pamela D. Thomas, a registered nurse and a graduate student at Mississippi University for Women. I am conducting a research study on the effects of exercise on the mind. The results of this study will help health care providers give better care to older adults. If you participate in this study you will take a simple verbal test in one month. All information will be anonymous and confidential. You can withdraw from the study at any time.

I understand the explanation given to me.

Name: _____ Date: _____

Witness: _____ Date: _____

Appendix D

Consent Form

Experimental Group

The Effects of Exercise on Cognitive Function in the Elderly

Explanation of Research:

I am Pamela D. Thomas, a registered nurse and a graduate student at Mississippi University for Women. I am conducting a research study on the effects of exercise on the mind. The results of this study will help health care providers give better care to older adults. If you participate in this study you will be asked to walk every day and attend a short exercise program three times a week. You will also take a simple verbal test at the end of the month. All information will be anonymous and confidential. You must attend 50% of the sessions. You can withdraw from the study at any time.

I understand the explanation given to me.

Name: _____ Date: _____

Witness: _____ Date: _____

Appendix E

#_____

Thomas Test of Cognition

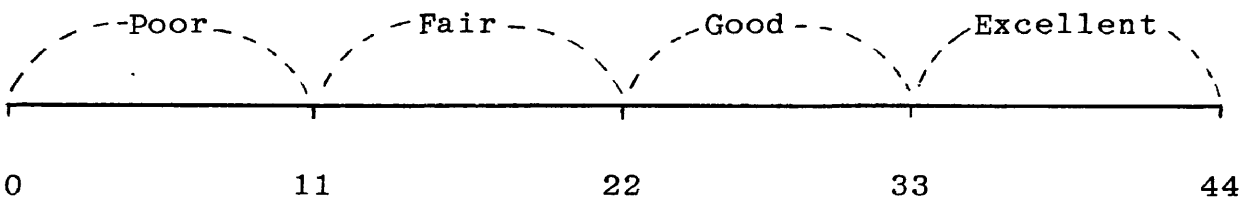
Correctly identifies:

1. Time of day
2. Day of week
3. Month
4. Date
5. Year
6. Place of residence
7. City
8. State
9. Person

Is able to:

1. Count to 12 by 3's.
2. Identify the president.
3. Identify meat served that day at lunch.
4. Tell number of days in a week.
5. Tell where the sun sets.
6. Define apple.
7. Define shoe.
8. Define bedroom.
9. Decipher "Don't count your chickens before they hatch."
10. Tell similarities of "orange and apple."
11. Tell similarities of "cat and mouse."
12. Tell why criminals are put in prison.
13. Tell why coats are worn in the winter.

44 = Optimal Score
0 = Lowest Score



Appendix F

Exercise Program for

Experimental Group

Walk 1/2 to 1 mile per day in the halls.

Instructions will be given as to number of laps equivalent to these distances.

Exercise program held at 10:30 a.m. in the living room on Tuesdays, Thursdays, and Saturdays for 15 minutes each session.

Sitting

1. Head roll - 5 revolutions
2. Six count arm movement - 5 times
3. Arm circles - 5 times
4. Shoulder shrug - 5 times
5. Back exercise - 5 times

Standing

1. Breathe deeply - 5 times
2. March in place - 20 steps
3. Shallow knee bend - 5 times
4. Breathe deeply - 5 times

Repeat regimen for 15 minutes.

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