1994

Older adults' level of perceived exertion after a walking program

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DOI: <https://doi.org/10.31979/etd.kbep-kr9>
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OLDER ADULTS' LEVEL OF PERCEIVED EXERTION
AFTER A WALKING PROGRAM

A Thesis

Presented to

The Faculty of the Division of Health Professions

San Jose State University

In Partial fulfillment

of the Requirements for the Degree

Master of Science

By

Jane Tran

November, 1994

UMI Number: 1361221

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ABSTRACT

OLDER ADULTS' LEVEL OF PERCEIVED EXERTION
AFTER A WALKING PROGRAM

by Jane T. Tran

This study examined the difference of the level of perceived exertion in older adults in a walking exercise program. The subjects were asked to ambulate 500 feet indoors three times a week for 4-week period, and to rate their level of perceived exertion after the first time they walked and after the last time they walked using the Borg Scale for Rating Perceived Exertion (RPE).

There was a statistically significant difference between the pre and post median scores, with $p = .0077$. Thus, it appeared that as the older adults exercised regularly, the lesser they perceived the exercise activity to be tiring. Also, as they felt less tired, it seemed that they increased their daily activity level. Consequently, the older adults can physically counteract old age frailty through increased mobility and regular exercise.

ACKNOWLEDGMENTS

To my husband, Cuong, who has always been the "wind beneath my wings" throughout my professional career and my academic achievement.

To Dr. Parsons, Dr. Sullivan, and Ms. Cave, whose guidance and encouragement have made this thesis process "bearable and achievable."

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Chapter 1

INTRODUCTION

The United States of America is aging. In 1990, the 65-74 age group (18.1 million) was eight times larger than in 1900, but the 75-84 group (10.1 million) was 13 times larger and the 85+ group (3.1 million) was 24 times larger (Longino, Soldo, & Manton, 1990). By the year 2000, according to the U.S. Bureau of the Census, persons 65+ are expected to represent 13.0% of the population, and this percentage may climb to 21.8% by 2030. Of the 1990 population, a large proportion (44.3%) reported some degree of physical inactivity and disability that required nursing care (Longino et al., 1990).

Physical frailty--severely impaired strength, mobility, balance, and endurance--poses problems in everyday living. Frailty not only increases long-term care needs by curtailing the ability to live independently, it also greatly raises the risk of falls, the most prevalent cause of injury in older persons (Ory et al., 1993). Numerous studies have demonstrated that muscle weakness is a common feature of elderly fallers. The four major contributors to muscle weakness in old age are senescent musculoskeletal changes, the accumulation of chronic diseases and medications used to treat them, disuse atrophy, and undernutrition (Fiatarone & Evans, 1993). Inactivity and undernutrition are potentially at least partially reversible with appropriate interventions (Fiatarone & Evans, 1993).

Physical training has been shown to increase the muscle strength of older subjects, and a lower level of physical activity contributes to the decline of strength (Kallman, Plato, & Tobin, 1990). Maintaining mobility among the geriatric population is key to preventing unnecessary nursing home placement. Exercise programs help to prevent the physiologic impact of muscular deconditioning, cardiorespiratory fragility, bone mass loss, glucose

intolerance, immune dysfunction, psychological and behavioral instability in the older clients (Kligman & Pepin, 1992). Often, an older individual's level of perceived exertion of an exercise activity is a barrier to exercising, which in turn will lead to muscular weakness due to disuse atrophy syndrome. Thus, the purpose of this study is to focus on the older clients' level of perceived exertion after walking the first time and after walking the last time as part of an exercise program.

Statement of the Problem

This study seeks to answer the question whether there is a difference between the level of perceived exertion of the elderly persons after walking the first time and after walking the last time in an exercise program. The ultimate goal is to emphasize the importance of regular exercise as an effective nonpharmacologic therapy for stress, sleep disorders, depression, and anxiety, as well as the chronic medical conditions of aging, such as hypertension, obesity, diabetes mellitus, coronary artery disease, hyperlipidemia, and constipation.

An individual's own perception of work tolerance frequently does not agree with the work capacity measured (Borg, 1973). Problems of perceived exertion are a part of larger problems concerning the need for quantitative measurements of subjective symptoms of various kinds: (a) exertion, (b) fatigue, (c) discomfort, (d) pain, and so forth (Borg, 1982). Quantitative measurements of such factors are desirable for clinical diagnosis, for therapy and exercise prescription, and for evaluations of performance capacity (Skinner, Hustler, Bergsteinova, & Buskirk, 1973).

Exercise helps a person look better and feel better. Physical activity is necessary to maintain normal joint mobility and muscle tone. Preventing problems with mobility is easier than trying to overcome the problems when they develop. Each individual should

be encouraged to be as active and as independent as possible. Existing medical conditions may restrict activity. Nurses should be aware of any problems that may affect an individual's ability to participate in activities. The elderly person should be assisted to do as much as is permitted (Wold, 1993).

Hypotheses

The two hypotheses for this study are:

1. The level of perceived exertion will decrease as the older adults increase energy expenditure in a walking program.
2. As the level of perceived exertion decreases, the older adults will increase the frequency and intensity of regular exercise.

Research Question

The research question for this study is: What is the level of perceived exertion of a group of elderly clients in a retirement complex after walking the first time and after walking the last time as part of an exercise program?

Definitions of Terms

For the purpose of this study, the following definitions apply:

1. Elderly refers to men and women who are 65 years of age or older.
2. Walking program refers to walking indoors a distance of 500 feet three times each week for a 4-week period.
3. Resident refers to the elderly persons residing in a retirement complex.
4. Retirement complex refers to a retirement community where retired elderly rent their apartments, usually eat their meals in a central dining room, participate with planned social activities as desired, and may use cleaning services as needed.
5. Perceived exertion refers to a subjective experience of level of exertion as

measured by the Borg Scale for Rating of Perceived Exertion (RPE) (Borg, 1973).

Summary

Although exercise might not extend the longevity of older adults, it still plays an important role in enhancing the quality of life in this particular population. One of the most obvious benefits of exercise is an immediate elevation of mood, particularly in those older people who are prone to anxiety and depression (Sime, 1990). By elevating mood and thus improving perceived health, an exercise program allows the older person to live with minor aches and pains, thereby reducing demand for medical services and increasing the level of independence (Shephard, 1993). Possibly the most important outcome of physical activity is stress reduction, because it is linked to other benefits such as better sleep, muscle relaxation, positive mood states, and improved self-image and self-concept (Berger, 1989).

A more dramatic form of disuse atrophy occurs when immobilization takes place in an already sedentary person due to enforced bed rest, acute or chronic illnesses, casting, or wheelchair dependence, all scenarios common in the elderly. The physiologic sequels of disuse include loss of muscle weight, reduction of sarcomere number, increase in subcutaneous fat, atrophy of Type II fibers, and disintegration of myofibrillar architecture (Fiatarone & Evans, 1993). Therefore, interventions designed to increase skeletal muscle size and function through increased physical activity levels will likely have a major potential for clinically important consequences in this population of frail clients (Fiatarone & Evans, 1993).

Chapter 2

CONCEPTUAL FRAMEWORK AND REVIEW OF LITERATURE

As muscle strength increases, there is a concurrent increase in endurance. The reciprocal clinical relationship among (a) maintaining muscle strength in the elderly, (b) falls, fractures, dependence in activities of daily living, and (c) need for institutional care cannot be overstated. The consequences of immobility affect health, well-being, and quality of life, but negative effects can be prevented and avoided with astute and vigilant nursing management (Mobily & Kelley, 1991). Therefore, exercise is considered an intervention that will help maintain and enhance functional ability as chronological age increases (Schilke, 1991).

Conceptual Framework

This research is based on the Newman Systems Model. The model links the four essential concepts of person, environment, health, and nursing process format through primary, secondary, and tertiary prevention. Newman's model depicts the nurse as an active participant with the client in all stages of prevention and as "concerned with all the variables affecting an individual's response to stressors" (Harris, Hermic, Meininger, & Steinkeler, 1989, p. 366).

The major concepts identified in the Newman Systems Model are the wholistic client approach, open system, basic structure, environment, stressors, lines of defense and resistance, degree of reaction, prevention as intervention, and reconstitution (Harris et al., 1989). In the wholistic client approach, the clients are viewed as the central focus with continual interactions with the environment, family, group, community, or issue affecting their physiological, psychological, sociocultural, developmental, and spiritual states. In an open system, the basic components are stress and reaction to stress where

these elements exchange information energy as they are being affected by the internal and external forces of the surrounding environment.

The basic structure represents the basic survival factors or energy resources of the clients, i.e., normal temperature range, genetic structure, response pattern, organ strength, weakness, ego structure, and knowns or commonalities (Harris et al., 1989). To maintain the system stability, the basic structure is protected by the normal line of defense, flexible lines of defense, and lines of resistance. The normal line of defense represents a state of equilibrium or a state of adaptation the clients have maintained over time that is considered normal for them. The flexible lines of defense are perceived as protective buffers for preventing stressors from breaking through the normal line of defense. The relationship of individuals' physiological, psychological, sociocultural, developmental, and spiritual variables can affect the degree to which clients are able to use their flexible line of defense against possible reaction to a stressor or stressors. The flexible lines of resistance represent the internal factors that help the clients defend against a stressor, such as the body's immune response system. The Newman Systems Model emphasizes the importance of strengthening these flexible lines of defense and resistance to prevent a possible reaction; otherwise, a reaction might result in a system instability and disharmony among the parts of the system.

The degree of reaction is the amount of system instability resulting from stressor invasion of the normal line of defense, and prevention as intervention can effectively help to reduce the degree of reaction. Newman defines interventions as purposeful actions that help clients retain and/or maintain system stability. Interventions can occur before or after resistance lines are penetrated, and they are based on the possible or actual degree of reaction, resources, goals, and anticipated outcomes. The three levels of intervention

are primary, secondary, and tertiary prevention.

During primary prevention, the nurse aims at reducing the client's possibility of encounter with stressors and at strengthening his/her flexible line of defense. During secondary prevention, the nurse focuses on managing the client's situation through assessment and treatment of symptoms or diseases. During tertiary prevention, the nurse directs his/her attention toward client's readaptation to the new situation/disease state, providing health education to prevent future occurrences and assurance of stability to prevent further deterioration (Harris et al., 1989).

The last major concept of the Newman Systems Model is reconstitution. In this phase, clients learn to adapt to stressors in the internal and external environment. Reconstitution can begin at any degree or level of reaction and may progress beyond, or stabilize somewhat below, clients' previous normal line of defense (Harris et al., 1989).

The application of the Newman Systems Model to the indoor walking program for the elderly is as follows:

1. Primary prevention: Gait assessment is done to determine the clients' ambulation ability and to ensure that the clients can achieve the full distance of 500 feet walking program without adding additional stressors in relation to the clients' direct system. Information is provided on how to maintain proper body alignment while walking, how to walk safely with emphasis on proper foot wear and assistive devices, and how to gradually increase level of endurance without experiencing severe shortness of breath, rapid heartbeat, nausea, lack of zest, or severe fatigue.

Walking offers several advantages over other forms of exercise. It requires no previous instruction, can be done almost anywhere, can be done at almost any time, costs nothing, and has the lowest rate of injury of any form of exercise. Reassurance is

given to the clients that walking takes a little longer to achieve conditioning results as compared to other strenuous activities. Reviewing proper nutrition and group participation will enhance the enjoyment of the exercise program for these residents.

2. Secondary prevention: Following the stress invasion, the nurse assists older clients to evaluate the prognosis of their disabilities more accurately. The clients are then encouraged to walk at a tolerable level according to their condition. The nurse educates, motivates, and allows the clients to take active responsibility for their health care goals and functional ability even with existing physical disabilities.

3. Tertiary prevention: The nurse encourages the clients to attain or to maintain maximum level of wellness and stability in following an exercise reconditioning program designed for them. The nurse educates, reeducates, and/or reorients as needed to help keep clients focused on the set goals. The outcome in the health reeducation is to prevent recurrence of reaction and to avoid the stressors known to be hazardous to the clients. By encouraging the older clients to increase their physical activity, they will be able to prolong their personal independence and reduce demands for acute and chronic care services.

Review of Literature

Exercise protocols should be individualized according to the different types of involved clients. The subjective rating of the intensity of exertion perceived by the person exercising is a good indicator of relative fatigue (Fletcher, Froelicher, Hartley, Haskell, & Pollock, 1990). Fatigue is a universally recognized human experience and is more prevalent among frail older adults. The management of fatigue is central to all efforts related to health promotion and restoration. Thus, addressing the problem of fatigue is essentially important when designing a plan for health care of the elderly population

(Gueldner & Spradley, 1988).

It is especially important to evaluate the effects of exercise on elderly persons, because aging is associated with declines in physical and mental functioning that may be modifiable by exercise. Not only the clients' physical performances and physiological responses to the activity should be studied, but also the subjective "costs " behind these performances and responses. Borg (1973) asked various questions of his subjects: (a) what was the psychological effort and strain involved in the work task?, (b) what did the individual perceive?, and (c) how hard and how difficult was the task for the individual?

Through a series of psychological tests involving the interaction of perceived exertion, extroverts tended to underrate work intensity at heavier loads, and their stated work preference was higher for prolonged work than it was for introverted subjects (Morgan, 1973). Various psychological states and traits seemed to play a role in the perceptual processing of information relating to muscular work (Morgan, 1973).

About one-sixth of all Americans who could exercise regularly choose not to. Each person who chooses to lead a sedentary life costs other Americans an estimated \$1,900 over the course of his or her lifetime, according to a recent study (1989) sponsored by the National Center for Health Services Research and Health Care Technology Assessment. Rakowski and Mor (1992) analyzed data on self-reported physical activity and exercise to determine effects on mortality among 6,000 persons at a median age of 70 years from the Longitudinal Study of Aging (LSOA) from 1984 to 1988. They found that for the LSOA sample as a whole, there was a higher number of deaths among persons who reported lower activity or exercise levels. Self-assessments of being less active than peers, not getting enough exercise, not having a regular exercise routine, and walking a mile less than once a week demonstrated statistically significant

associations with mortality (Rakowski & Mor, 1992).

Although the physiologic rationale for aerobic exercise training in chronic obstructive pulmonary disease (COPD) patients remains controversial, it is generally accepted that even older incapacitated COPD sufferers who participate in an individualized training program show significant reductions in breathlessness, increased exercise capacity, and enhanced psychosocial function (O'Donnell, Webb, & McGuire, 1993). The positive effects of exercise in the elderly were found, through research and study, to be characterized by strength and endurance, fat loss from the muscle, and maintenance of an active independent lifestyle (Sullivan, 1987). Aerobic activity decreases cholesterol levels by burning the fat for energy purposes. Regular exercise appears to decrease the chances of developing cancer and heart disease (Bortz, 1991).

Mobilizing the aged person is necessary to maximize breathing efficiency and to optimize respiratory ventilation perfusion (Blocker, 1992). Mobilizing the older patient, in some cases, not only improves the emptying of the bladder but also forestalls complicating kidney diseases, such as urinary stones and urinary tract infections (Blocker, 1992). Exercise increases physical capacity at any age, helps minimize the number and severity of acute problems, reduces debilitation caused by acute or chronic illness and maintains a sense of well-being (Johnson-Pawlson & Koshes, 1985).

Physical activity is consistently identified as one of the most significant health interventions in the lives of the elderly. Whether she has been active all her life, or is a recent convert to exercise, the physically active woman is likely to be physiologically one or two decades younger than her sedentary contemporary (Drinkwater, 1988; Gueldner & Spradley, 1988). Among the more significant short-term benefits for the older woman is the potential to gain same-day improvement in joint mobility (Hartley-O'Brien, 1980).

Research found that post-menopausal women experienced a reduction of vasomotor symptoms and that estrogen levels increased in the pre-menopausal and post-menopausal women after an aerobic conditioning program (Wallace, Lovell, Talano, Webb, & Hodgson, 1982). Hammar, Berg, and Lindgren (1990) found that hot flashes and sweating were only half as common in physically active post-menopausal women when compared with inactive controls. Evidence also suggests that physical activity and exercise may alleviate some symptoms associated with mild to moderate depression (Taylor, Sallis, & Needle, 1985).

Little is known regarding the effect of regular participation in physical exercise on the metabolic rate in aging man. Resting metabolic rate (RMR) declines with age due to the reduction in energy needs with age and a propensity to gain fat mass (Poehlman, Melby, & Badylak, 1991). The age effect was strongly influenced by the lower RMR in sedentary older men relative to sedentary older men who displayed a physically active lifestyle (Poehlman et al., 1991). The higher RMR in active older men relative to sedentary older men suggests that regular participation in aerobic exercise may attenuate the age-related decline in RMR (Fukagawa, Bandini, & Young, 1990). Thus, regular physical exercise may attenuate the loss of skeletal mass in older men as evidenced by the higher RMR in active older men (Poehlman et al., 1991).

Aging is associated with decrements in muscular strength and alterations in body composition that may be related, at least in part, to a decrease in physical activity (Schwartz, Shuman, & Bradbury, 1990). Lack of physical activity, loss of proximal muscle strength shown particularly with difficulty in getting up from a chair, and loss of stability when standing were all strongly associated with an increased risk of falling (Campbell, Borrie, & Spears, 1989). Thirty percent of persons over the age of 65 living in

the community fell each year. The rate of falling of persons over 75 years of age was over 30%. The falling rate increased to 40% among those over the age of 80 (Tinetti, Speechley, & Ginter, 1988). Programs to increase physical activity and improve muscle strength may decrease falls both in the individual at risk and also in the elderly population as a whole (Campbell et al., 1989). Physical training programs to increase physical activity is an important factor in increasing the density of the proximal femur bone (Pocock, Eisman, Yeates, Sambrook, & Erberl, 1986). Maintenance of physical activity may be particularly important in fracture prevention through its effects on both the bones and the risk of falling (Nevitt, Cummings, & Hudes, 1991). Both occupational and leisure time activity decline with age in industrialized countries (Bortz, 1982). The 1986 National Health Interview Survey indicated that only about 10% of the adult population in the United States is habitually active in a manner known to induce beneficial physiological adaptations (Blair, Brill, Kohl, 1989).

The opportunity exercise provides to socialize, to play and have fun with peers, to form new friendships, and to develop a community spirit with other elderly people is clearly an important support to psychological health (Eckert, 1986). Participating in physical activities within a group setting promotes mental stimulation, reality orientation, and maintenance of interaction skills. General mental health and the participants' sense of belonging, morale, purpose, and social gratification are also fostered through group activities (Riffle, 1982). Williamson and Schulz (1992) revealed that pain and depression in the elderly may increase with restrictions of physical mobility and independence. Elders who participate in aerobic exercise show a decrease in depression and anxiety, develop higher self-esteem, show less agitation, have more positive attitudes, and experience less loneliness (Sullivan, 1987; Webster, 1988).

Summary

In sum, research on aging continues to document the potential health benefits when older persons maintain volitional activity in their life styles. Life satisfaction and its determinants have received considerable attention over the past several decades, particularly in the gerontological literature (Larson, 1978; Lohmann, 1980). Among the most consistent and important relationships identified is that of physical health status and life satisfaction. Individuals in poor health are less satisfied with their lives than are those in good health (Lohr, Essex, & Klein, 1988).

The Newman Systems Model supports prevention as beginning intervention when a stressor is either suspected or identified in the individual's normal line of defense. A walking program, as an intervention to protect the individual state of equilibrium, buffers stressors from breaking through the normal line of defense, helps the individual to defend against a stressor, and reduces the degree of reaction to the system instability resulting from stressor invasion of the normal line of defense.

The literature supports the assumption that health promotion efforts positively correlate with improved physical functioning for older adults. Numerous studies have demonstrated that exercise has many benefits for the aging body. A walking program, as an intervention to reduce disuse atrophy of old age, slows the decline in functional capacity, improves personal health, enhances enjoyment of life, improves productivity, and maintains self-esteem.

Chapter 3
METHODOLOGY
Research Design

This descriptive study used a pretest and posttest methodology to measure the difference between the level of perceived exertion of a group of elderly persons after walking 500 feet the first time and after walking the same distance the last time. A similar walking program for the elderly done by Ann Morton (1992) served as a guide for the current study. The function of this study was to evaluate the hypothesis that as the older adults increase their energy expenditure in a walking program, their level of perceived exertion will decrease. The second hypothesis was, as the older adults' perception of exertion decreases, they will increase the frequency and intensity of regular exercise.

Sample and Setting

The convenience sample consisted of 15 well older adults from a community retirement complex located in northern California. The participants included 13 Caucasian women and 2 Caucasian men with age ranging from 74 to 92 years old. The retirement complex is situated in a quiet and affluent section of a residential area close to a large shopping mall and local businesses. This living facility offered a variety of services to its residents, such as housekeeping assistance, transportation to and from medical appointments and trips, recreational activities, and a full-service dining room.

Human Subjects Approval

Permission to conduct this study was obtained from the retirement complex manager (Appendix A) and from the San Jose University Human Subjects-Institutional Review Board (IRB). Participation in the study was voluntary, and anonymity was preserved through use of identification number coding instead of names. The subjects

were screened to ensure that they could ambulate the full 500 feet in steady gait with or without assistive walking devices and with no obvious signs and symptoms of cardiorespiratory distress. Once the screening was completed, a letter was sent to each selected subject's primary physician seeking medical approval (Appendix B). The walking program was started once the researcher received the participants' medical approval. Before beginning the walking program, the subjects were asked to sign a consent form (Appendix C) stating of the risks and benefits to the participants, the duration of the study, and the methodology of the research. The researcher was present at all walks to monitor and to intervene as needed to ensure the well-being of the subjects.

Instrument

The subjects' perceived level of exertion with the walking program was measured by the Borg Scale for Rating Perceived Exertion (RPE) (Appendix D). Perceived exertion was defined as one's subjective rating of the intensity of work being performed (Morgan, 1973). The RPE scale assigns a numeral value to represent the subjective human performance of an exercise task. The main and important consideration of the RPE is frequently not "what the individual is doing," but rather, "what the individual thinks he/she is doing." To be more specific, the continuation of work, as well as the intensity at which one elects to work, is dependent in part upon the processing of perceptual information, e.g., pain and fatigue (Morgan, 1973).

The original scale has a 15-grade point scale ranging from 6 to 20, with a descriptive verbal anchor such as no exertion at all (6) to maximal exertion (20). The Borg 15-point scale has been found not to be linear in relation to equal increments of increased intensity after approximately 30 years of use in exercise testing laboratories. Many participants do not discriminate well at the lower end of the scale from 6 through

14. Above 15 on the scale, very little added intensity will increase RPE rating. (Pollock & Wilmore, 1990). Many researchers have suggested that the 15-grade point RPE is accurate to use in exercise prescription at running speed or at a heart rate above 150 beats/minute, but was inaccurate and unreliable at slower speeds, such as in walking programs.

In 1982, Borg published a new 10-grade point scale for differential use that has the positive attributes of a general-ratio scale. This scale uses different terminology for describing the various anchor points from nothing at all (0) to very, very strong (10), is linear in relation to categories and increased intensity, and has the advantage of expressing relative fatigue according to the anchor point quantitative meaning (Pollock & Wilmore, 1990). Borg (1982) suggested that the newer category scale may be more suitable for use when other subjective symptoms needed to be assessed and monitored, such as aches, pain, and breathing difficulties.

Validity was estimated using a two-way analysis variance technique, and Pearson r between mean data for correlation of 15-grade RPE ratings and heart rates were found from 0.77 to 0.90 (Skinner et al., 1973). Similar statistical analysis yielded correlation coefficients from 0.80 to 0.90 with the 10-grade RPE ratings and the heart rates (Borg, 1982). Reliability coefficients for between trials of subjective ratings and cardiorespiratory fitness for both the 15 and 10-grade scales were computed using the Pearson product-moment correlation formula, with results of 0.80 and 0.85, respectively (Skinner et al., 1973; Pollock & Wilmore, 1990).

Data Collection

The subjects were recruited with the researcher explaining the study at a residents' monthly meeting. Posters advertising the study were posted at various locations

throughout the facility. The subjects were given a packet of materials including (a) a brief description of the research project; (b) a consent form; (c) a Borg Scale for Rating Perceived Exertion (RPE); (d) a booklet titled "Pep up your life: A fitness book for seniors," from the President's Council on Physical Fitness and Sports and the American Association of Retired Persons; (e) a booklet, "Walking for exercise and pleasure," from the President's Council on Physical Fitness and Sports; (f) an article, "Feet: Dressing for distress," published monthly by the Harvard Women's Health Watch in volume 1, number 7, March 1994; and (g) nutrition update articles, "Fitness and well-being in older adults," "Fighting frailty as you age," and "Nutrients deficiencies in older adults."

The data collection process involved two phases. In the first phase, the subjects were asked to rate their perceived level of exertion immediately after the first walk of 500 feet indoors at the retirement complex using the 10-grade RPE scale (pretest). In the second phase of the study, the researcher and the participants met three times a week for a 4-week period to walk the same length. Immediately after the last 500 feet, the subjects were asked to rate their perceived level of exertion using the same tool (posttest). The researcher was the only rater involved with the beginning and ending ratings.

The SPSS statistical tests were used to analyze the data. The normality and homogeneity variable assumptions present in this study were tested to determine if they met the criteria of either parametric or nonparametric statistics. The findings and interpretation are presented in Chapter 4.

Chapter 4

FINDINGS AND INTERPRETATION

Data Analysis

There were 15 subjects at the beginning of the study, but only 9 older adults completed the program at the end of 4-week period. The attrition rate was due to medical conditions the participants encountered. None of these conditions was related to the study.

Due to the small sample size ($n = 9$), the normality requirement was not met. In addition, the variables were ordinal making the standard arithmetic parametric operations non-applicable. Consequently, only nonparametric statistical tests were valid for this study. The nonparametric statistics make no assumption about the shape of a population distribution, i.e., distribution-free. In doing this, no assumptions were made about the distribution of the collected data, and the hypotheses did not involve suppositions about parameters.

The numerical values of the matched-pairs, the level of perceived exertion after the first 500 feet walk indoors and the level of perceived exertion after the last 500 feet walk indoors, were the main focus of this study. A statistical test that considers both the direction and the magnitude of the differences between matched sample pairs is the Wilcoxon Signed-rank test. This test utilizes data from dependent samples of before and after observations, the median between the two groups, and is a nonparametric statistic.

Interpretation of Data

The Borg Scale for Rating Perceived Exertion yielded one score for the beginning and one score for the end of the walking program. The scores measured each subject's perceived exertion after walking 500 feet indoors. The difference of the two scores are

shown in Table 1. The mean, median, standard deviation, minimum score, and maximum score for the matched sample pairs are shown in Table 2.

The Wilcoxon Matched-pairs Signed-ranks test is shown in Table 3. The median of the level of perceived exertion after a 4-week walking period was significantly different when compared with the median of the level of perceived exertion initially, resulting with $p = .0077$. That is, as the older adults increased energy expenditure and maintained the consistent weekly walking regimen, their level of perceived exertion decreased. Also, as the older adults' level of perceived exertion decreased, they seemed to increase the frequency and intensity of regular exercise. Several subjects reported to have walked on their own time a longer distance than the 500 feet walking program in addition to the regular 3 days a week group walks.

All subjects reported that physical symptoms associated with activity, such as shortness of breath, rapid heart rate, and lethargy they experienced at the beginning of the walking program, were minimally felt at the end of the study. Almost all of the participants were not able to chat with one another while walking at the beginning due to shortness of breath, but by the end of the third week, all of the subjects were able to carry on a lively conversation while walking without experiencing any shortness of breath.

Several subjects complained of lower back pain at the screening walking session. By the fourth week and after several reminders about good posture, correct foot wear, proper use of the walking assistive devices, and proper body alignment while walking, these older adults stated that they were beginning to feel less lower back discomfort. One subject was at high risk for falling due to her not picking up her legs, not bending her knees, and shuffling gait while walking. This subject was encouraged to walk slower but surer by picking her entire foot off the ground, and by consciously thinking of bending the

Table 1

Difference between the Pretest and Posttest Scores of the Level of Perceived Exertion

(n = 9)

Subject number	Exertion first time	Exertion last time	Difference
01	5	3	2
02	3	2	1
03	2	0	2
04	7	2	5
05	4	2	2
06	4	2	2
07	3	2	1
08	1	0	1
09	5	3	2

Note. Difference = Difference score (Exertion first time minus Exertion last time).

Table 2

Mean, Median, Standard deviation, Low score, and High score of the Matched-pairs
(exertion first time and exertion last time)

n	Variable	Mean	Median	Std Dev.	Low score	High score
9	First time	3.78	4.00	1.79	1	7
9	Last time	1.78	2.00	1.09	0	3

Table 3

Wilcoxon Matched-pairs Signed-ranks Test Exertion First Time with Exertion Last time

Mean Rank	Cases	
5.00	9	- Ranks (last time Lt first time)
.00	0	+ Ranks (last time Gt first time)
	0	Ties (last time Eq first time)
	<hr/>	
	9	Total
$Z = -2.6656$		2-tailed $p = .0077$

knee at the joint with each step that she took. At the end of the fourth week, she needed less reminding from the facilitator, and her shuffling gait was less apparent.

The subjects who had to abort the program mid-way, actually asked to be allowed to come back to walk with the group as their medical condition allowed them to do day by day. Their stated reasons for this request included that the group walk was fun, therapeutic and resulted in their getting attention from someone outside of their families. Other older adults wanted to join the group, but did not meet the study criteria or had no medical waiver.

Summary

Although the sample size was too small for any generalization of the findings, it seems clear that as the older adults remained active, the more likely that they perceived their level of exertion to be less. Also, with the general feeling of not being tired all the time and fewer physical symptoms as barriers to exercise, such as pain in the shoulder joints preventing them from walking, too tired to get out of bed due to insomnia the previous night, status-post knee surgeries making them stiff, shortness of breath, and generalized pain all over the body, it is possible that the older adults will exercise more often to maintain their muscular strength, joint flexibility, and endurance. Hence, the fighting of old age frailty will become a more realistic and reachable goal.

Chapter 5

DISCUSSION

Summary of Study

The purpose of this study was to explore the question whether there is a difference between the level of perceived exertion of elderly persons after walking the first time and after walking the last time in an exercise program. The research question was: What is the level of perceived exertion of a group of elderly clients in a retirement complex after walking the first time and after walking the last time as part of an exercise program?

With the alpha level of significance of the test being less than .05, there was a statistically significant difference between the pre and post median scores, with $p = .0077$. Thus, this study supported the hypothesis that, after a 4-week program of regular walking, the older adults perceived their level of exertion to be less than when they first started to exercise regularly.

Also, 5 out of 9 participants reported they had increased the frequency of the exercise program by walking more on their own time, at a longer distance than 500 feet. In spite of the increased walking length, these older adults felt no more adverse physical symptoms than when they walked 500 feet. Thus, the self-reported increased activity from the participants supported this study second hypothesis that, as the level of perceived exertion decreased, the frequency and intensity of regular exercise increased.

Scope and Limitations

As stated previously, no generalization to a larger population is possible due to the small sample size. This study was restricted to the medically stable older adults. It is very possible that the decrease in physical symptoms would be even greater had the study looked at older adults with more serious health problems. The length of the walking

program was also a limiting factor, because endurance was not measured due to the short time line. This study focused on fairly affluent older adults residing in a retirement complex, and these subjects were Caucasian; thus, those living in their own homes or homes of relatives and older adults from different ethnic backgrounds were excluded. Perhaps, these are the older adults for whom preventive health care can have a greater benefit.

Recommendations

The following recommendations are made for future studies:

1. This study should be replicated with a sample size of at least 20 subjects so that parametric statistics can be used and generalization of the results to a larger population will be possible.
2. The study should be expanded to include home-bound older adults and those who live in a less adequate retirement setting.
3. The walking program should include older adults with more severe health problems.
4. The sample should include elders from different ethnic/cultural groups.
5. The time line should be extended to greater than 4 weeks.
6. The social interaction benefit should be measured since previous research has documented that socialization has a great influence on the outcome of participants in any group exercise or group activity.

Conclusion

Older adults who walk regularly say they feel refreshed, alert, less anxious, and overall, "in a better mood." Walking is well documented as the best exercise, especially for the older adults because of its low impact, low cost, and easy accessibility. Also,

almost anyone can do this task even if they need walking assistive devices.

As the Newman Systems Model depicts, the nurse should be an active participant with clients in all stages of prevention, and it is imperative that nurses encourage older adults to remain physically active. One way to achieve this goal is to prescribe a form of exercise that is compatible with each client's health status and self-perceived exertion level. A challenge to the nursing profession is to keep clients as independent and mobile as possible by maintaining their functional ability, enhancing their endurance, and physically counteracting frailty through regular exercise.

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APPENDIX A
Permission Letters

May 10, 1994

To Whom it May Concern:

Jan Tran has consulted with me for her research project studying perceived effort in senior exercise programs. I expect that out of the 180 residents at Chateau Cupertino, all aged 65-90, Jane will find a suitable sample for her trials.

Jane has explained to me the nutrition, health and footwear instruction she plans to give. She has discussed finding a suitable 500 yards indoor course for her participants.

If you have any questions, please feel free to call me at the above number Tuesday - Saturday.

Sincerely,

Christi Cross
Manager

April 4, 1994

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W. B. SAUNDERS COMPANY
Harcourt Brace Jovanovich, Inc.
The Curtis Center
Independence Square West
Philadelphia, PA 19106

APR 13 1994
PERMISSIONS

Attention: Permissions Department

Dear Sir/Madam:

I am writing for permission to reprint the BORG SCALE FOR RATING PERCEIVED EXERTION. This scale appeared in the book titled EXERCISE IN HEALTH AND DISEASE: EVALUATION AND PRESCRIPTION FOR PREVENTION AND REHABILITATION, Second Edition, authored by M. L. POLLOCK and J. H. WILMORE, pages 290-292.

I am a graduate student completing a Master of Science Degree in Nursing at San Jose State University. A research component including a thesis is required for the degree.

The Borg Scale for Rating Perceived Exertion is ideal for the walking program focusing on the geriatric population with the age of 65 years and over. The program is designed to support the hypotheses that as the older adults increase energy expenditure in a walking program, their level of perceived exertion will decrease; and, as the level of perceived exertion decreases, the older adults will increase the frequency and intensity of regular exercise.

I understand that full credit be given to the publication of the material listed by publisher, editor, author, publication title, date and page. I also understand that there will be no modifications of the instrument unless otherwise approved by your company and/or authors.

Thank you for your assistance. I look forward in hearing from you soon.

Sincerely yours,

Jane Tran, R.N., B.S.N.
967-B La Mesa Terrace
Sunnyvale, CA 94086

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4/27/94
W. B. Saunders Company Date

APPENDIX B
Medical Approval

July 5, 1994

Dr.

Dear Dr. _____ :

The purpose of this letter is to seek your approval to allow your patient, Mr./Mrs. _____ to participate in a study focusing on intervention to reduce disuse atrophy of old age by comparing the level of perceived exertion of the elderly in a retirement complex after walking the first time and after walking the last time as part of an exercise program. The Borg Scale for Rating Perceived Exertion (RPE) will be used in this study.

The subject will be asked to rate his/her level of perceived exertion immediately after walking 500 feet indoor the first time. The subject will be asked to walk (with or without assistive walking devices) same distance three times a week for a 4-week period. The subject will be asked to rate his/her level of perceived exertion immediately after walking 500 feet indoor the last time

The subject's participation is voluntary. There will be no costs or compensation for his/her participation in this research study. There are no control group or manipulation involved in this study. Enjoyment of the activity will be emphasized. The research protocol was approved by the San Jose State University Human Subjects-Institutional Review Board.

I will review with Mr./Mrs. _____ information on proper body alignment while walking, how to walk safely with emphasis on proper foot wear, how to gradually increase level of endurance without experiencing severe shortness of breath, rapid heartbeat, nausea, lack of zest, or severe fatigue, and proper nutrition.

There is a minimal potential risk of falling while walking. In case of such event, I will be available immediately to give Mr./Mrs. _____ first-aid, and either you or 911 will be contacted as needed. I am certified to provide CPR in accordance with the American Heart Association curriculum.

Please check the appropriate box, sign, and date as below:

Complete Physical Examination Date: _____

Medical Approval: ☐ Yes ☐ No

Signature: _____ **Date:** _____

Enclosed is a pre-addressed and stamped envelope for your convenience. Please feel free to contact me if you have any questions. Your prompt response will be greatly appreciated.

Sincerely yours,

Jane Tran, R.N., B.S.N.
967-B La Mesa Terrace
Sunnyvale, CA 94086
408-749-9754

APPENDIX C

Consent Letter

AGREEMENT TO PARTICIPATE IN RESEARCH
AT SAN JOSE STATE UNIVERSITY

RESPONSIBLE INVESTIGATOR: JANE T. TRAN, R.N., B.S.N.

TITLE: OLDER ADULTS' LEVEL OF PERCEIVED EXERTION AFTER A WALKING PROGRAM.

I have been asked to participate in a research study that is investigating the older adults' level of perceived exertion after a walking program. The purpose of this study is to help me validate the importance of regular exercise as an effective nonpharmacologic therapy for stress, sleep disorders, depression, and anxiety, as well as the chronic medical conditions of aging, such as hypertension, obesity, diabetes mellitus, coronary artery disease, high blood cholesterol, and constipation. The results of this study should further my understanding of the benefits of walking as a way to keep me in good mental and physical health status.

I understand that:

1. The nurse researcher will accompany me with the indoor walks three times a week for a 4-week period. The length of the walk will be 500 feet on the first floor hallways of Chateau Cupertino. Each walk should involve about one half hour. I may use any assistive walking devices like all types of canes or walkers as needed.
2. The nurse researcher will review with me information on proper body alignment while walking, how to walk safely with emphasis on proper foot wear and assistive devices, how to gradually increase level of endurance without experiencing severe shortness of breath, rapid heartbeat, nausea, lack of zest, or severe fatigue, and proper nutrition. Enjoyment of the activity will be emphasized.
3. There is a minimal potential risk of falling while walking, even when I follow the above instructions. In case of such event, the nurse researcher will be available immediately to give me first-aid, and my primary physician or 911 will be contacted as needed. I am aware that the nurse researcher is certified to provide basic cardiac life support in accordance with the American Heart Association curriculum.
4. Immediately after the first walk, I will be asked to rate the level of my perceived exertion. I will continue to walk the same distance three times a week for a 4-week period. Immediately after the last walk, I will be asked to rate the level of my perceived exertion.

5. No alternative procedures will be initiated in this study.
6. The results from this study may be published, but any information from this study that can be identified with me will remain confidential and will be disclosed only with my permission.
7. I will not receive any compensation for my participation in this research study.
8. Any questions about my participation in this research will be answered by the investigator, Jane T. Tran, B.S.N, R.N., at 408-749-9754. Complaints about the research may be presented to Coleen Saylor, Ph.D., R.N., Advisor for Graduate Students, at 408-924-1321. Questions or complaints about research, subjects' rights, or research-related injury may be presented to Serena Stanford, Ph.D., Associate Academic Vice President for Graduate Studies and Research, at 408-924-2480.
9. My consent is given voluntarily without being coerced. I may refuse to participate in this study, and I may withdraw at any time, without prejudice to my relations with San Jose State University or Chateau Cupertino.
10. I have received a copy of this consent form for my file.

I HAVE MADE A DECISION WHETHER OR NOT TO PARTICIPATE. MY SIGNATURE INDICATES THAT I HAVE READ THE INFORMATION PROVIDED ABOVE AND THAT I HAVE DECIDED TO PARTICIPATE.

DATE

SUBJECT'S SIGNATURE

DATE

INVESTIGATOR'S SIGNATURE

APPENDIX D

Borg Scale for Rating Perceived Exertion (RPE)

BORG SCALE FOR RATING PERCEIVED EXERTION (RPE)

15-Grade Scale		10-Grade Scale	
A	B		C
6	(No exertion at all)	0	Nothing at all
7	Very, very light: (Extremely light)	0.5	Very, very weak (just noticeable)
8		1	Very weak
9	Very light (Very light)	2	Weak (light)
10		3	Moderate
11	Fairly light (Light)	4	Somewhat strong
12		5	Strong (heavy)
13	Somewhat hard (Somewhat hard)	6	
14		7	Very strong
15	Hard (Hard-heavy)	8	
16		9	
17	Very hard (Very hard)	10	Very, very strong (almost max)
18			
19	Very, very hard (Extremely hard)		Maximal
20	(Maximal exertion)		

Figure 6-13. The rating of perceived exertion (RPE) scales developed by Borg.¹⁴⁴⁻¹⁴⁶ Columns A and B refer to the anchor points for the original 15-grade category scale of RPE. Column C refers to the anchor points for the newer 10-grade category scale with ratio properties. Anchor points shown in column B are Borg's latest terminology used for describing the 15-grade scale.¹⁴⁶

Borg offers the following set of instructions to be read to or explained to the participant:

"During the exercise we want you to rate your perception of exertion. We want you to use this rating scale where 0 means no exertion at all and 10 means very, very strong exertion. 2 is a weak (light) exercise, like walking slowly for some minutes (for healthy people). 5 on the scale is a strong heavy exercise but it still feels fine, and you should not have any problems to continue exercising. When you come to 7, "very strong", it is really

very strenuous; you can still go on, but you have to push yourself very much. 10 on the scale is a very, very strong (almost max) exercise. For most people this is an exercise as strenuous as they have ever experienced before.

Try to appraise your feeling of exertion as honestly as possible. Don't underestimate it, but don't overestimate it either. Some people are a bit insensitive or want to be "brave" and rate too low. Don't do that but try to feel your exertion as you perceive it. Don't bother about how heavy the load is physically or what the exercise objectively might be. We are only interested in your own feeling of effort and exertion. Look at the scale and the wordings and then give us a number. You can equally well give us an even as an odd number."

Pollock, M. L., & Wilmore, J. H. (1990). Exercise in health and disease: Evaluation and prescription for prevention and rehabilitation. Reprints with permission from W.B. Saunders. Philadelphia: Saunders, pp. 290-292.