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THE EFFECT OF A PHYSICAL ACTIVITY INTERVENTION BASED ON THE TRANSTHEORETICAL MODEL IN CHANGING PHYSICAL ACTIVITY RELATED BEHAVIOR IN LOW-INCOME ELDERLY VOLUNTEERS

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Janelle S. Braatz

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THE EFFECT OF A PHYSICAL ACTIVITY INTERVENTION BASED ON THE TRANSTHEORETICAL MODEL IN CHANGING PHYSICAL-ACTIVITY-RELATED BEHAVIOR ON LOW-INCOME ELDERLY VOLUNTEERS

By

Janelle S. Braatz

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ABSTRACT

THE EFFECT OF A PHYSICAL ACTIVITY INTERVENTION BASED ON THE TRANSTHEORETICAL MODEL IN CHANGING PHYSICAL-ACTIVITY-RELATED BEHAVIOR ON LOW-INCOME ELDERLY VOLUNTEERS

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Janelle S. Braatz

The national health goals and the surgeon general's report have recognized the need to increase physical activity in most Americans and particularly in the low-income and elderly populations. Physical activity programs consistent with this need and based on a theoretical framework are lacking. A 15-week physical activity intervention program was designed, in accordance with the transtheoretical model, and implemented at three low-income older adult housing sites. The program consisted of a health fair, educational lectures, and two physical activity programs. The purpose of the study was to document the short- and long-term effects of the intervention and the use of behavioral processes of change in a low-income elderly population. Volunteer subjects were recruited from three low-income older adult housing sites (mean age was 76.6 years and 93.5% female). Three instruments were used to collect data before, immediately after, and 2 months after the experimental treatment. Information obtained included: (a) activities of daily living, (b) stages of change, (c) demographic data, and (d) processes of change. A significant pretest-posttest effect ($t(16) = -2.38$, $p = .03$) was obtained. When compared to non-equivalent controls, a similar effect was found ($F(2, 35) = 12.59$, $p = .001$). The post intervention effect was not found to be significant (Wilcoxon matched-pairs signed rank

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test), but 91% of the subjects (n = 22) sustained or maintained their stage of change 2 months after the intervention. No significant difference was found between early (n = 13, mean = 2.55) and late (n = 28, mean = 2.90) stage-of-change groups' use of the behavioral processes of change. Although the small sample size limits the generalizations from this study, it appears that a physical activity intervention program based on the transtheoretical model can advance one's stage of change (increase physical activity) and that posttreatment stages of change remain for 2 months in low-income elderly volunteers. Also, the use of behavioral processes of change increases in late stage-of-change subjects but not at statistically significant levels. The findings were similar to those from previous research. Implications for future studies and for designing physical activity programs in low-income elderly populations are provided.

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Without the financial support of two funding agencies, the completion of this project would have been impossible. I would like to thank both the Michigan Fitness Foundation for sponsoring the Physical Activity mini-grants and the American College of Sports Medicine for sponsoring the Healthy People 2000 grant.

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To fellow graduate student, Jackie Lucid, a big thank-you for assisting me in the research project by distributing various forms, working at the health fairs, substituting in the chair exercise classes, and statistical analysis.

Last, a thank-you to all the older adults who volunteered for this study and the pilot study, or were participants in one of my exercise classes. You took the time to try something new and reaped the benefits of physical activity.

TABLE OF CONTENTS

Table

LIST OF TABLES

Figure
1 - Rese

LIST OF FIGURES

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Chapter I

INTRODUCTION

The Problem

Physical inactivity is recognized as a significant health risk (Chodzko-Zajko, 1997; International Scientific Consensus Conference, 1995; Pate et al., 1995; U.S. Department of Health and Human Services, 1995, 1996). The national health goals (Healthy People 2000) emphasize the need to increase the physical activity of all Americans (U.S. Department of Health and Human Services, 1991). Low-income and elderly populations have been identified as being at a higher health risk due to low levels of physical activity. Physical activity improves an elderly person's quality of life and decreases medical costs while helping maintain independence (Rooney, 1993; Shephard, 1993; Spirduso, 1995). The elderly are the largest consumers of health care (31%) and comprise 12% of the U.S. population (World Health Organization, 1990). Sedentary elderly people are at a higher risk of more severe chronic and acute illness, incur more medical expenses, and depend more on others to help maintain their lifestyle than those who are more active (Kligman & Pepin, 1992). Still, 38.5% of those above 65 years of age report no leisure-time physical activity (Centers for Disease Control, 1995).

Life expectancy is increasing and the number of elderly is growing (National Center for Health Statistics, 1995a). In 1992, the life expectancy for women was 79.1

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years and for men it was 72.3 years (National Center for Health Statistics, 1995a). By 2020, life expectancy will increase to 82.0 years for women and 74.2 years for men (Schneider & Guralski, 1990). Accordingly, longevity will cause independent living and quality of life to be of increasing importance.

Health care professionals face several problems when working to improve the health of the elderly. First, the elderly are the fastest growing segment of the U.S. population (Darnay, 1994; Kaye, Lawton, & Kaye, 1990; Spencer, 1989). In 1987, those 65 years old or older constituted 12% (30 million) of the total population (Schneider & Guralski, 1990). By 2020, those 65 years and older will constitute 20% (52 million) of the total population, and the number of people 85 years old and older will increase from 3 million to 6.7 million (Schneider & Guralski, 1990).

Second, medical care costs are rising. In 1987, 65 to 74 year olds spent $2,017 per year in medical costs, and those 85 and older spent $3,215. By the year 2020, the cost of medical care is predicted to double, at a minimum, and it may even triple (Schneider & Guralski, 1990). As more Americans live longer lives, medical costs will become a greater problem both for the older adult and for the U. S. economic system.

Third, research on health promotion programs for the elderly is limited. Hickey and Stilwell (1991) cited three factors contributing to the paucity of such research. One is the lack of epidemiological data collected on the elderly. Before 1990, most national surveys collected information on persons up to age 65. Data were not collected on persons older than 65 or persons in institutions, such as nursing homes. Two, few well-designed physical activity programs for the elderly have been designed, conducted, and

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evaluated. Prevention programs are hampered because guidelines for the ideal exercise program for an elderly population are lacking (McIntosh, Peterson, Bruce, & Larson, 1992). Three, limited knowledge of how risk factors change with age hinders the justification of health promotion programs. Risk-factor intervention programs are based on research collected on middle-aged adults. Whether these same risk factors remain in the older adult needs to be evaluated, and there should be an evaluation of the most appropriate intervention techniques (Berg & Cassells, 1990; Russell, 1993).

Fourth, adherence to physical activity programs is a problem. In organized physical activity programs, there is a 50% dropout rate during the first 3 to 6 months (Dishman, 1988). Similar dropout rates are seen in cardiac rehabilitation programs that serve an older population (Dishman, 1988).

There are many benefits of physical activity for the elderly. These benefits include (a) maintenance or improvement of flexibility, strength, and cardiovascular endurance; (b) prevention or reduction of symptoms of chronic diseases; (c) prevention of falls or fractures; (d) decrease or relief of anxiety, insomnia, and depression; (e) promotion of social contact; (f) facilitation of self-care and an independent lifestyle; and (g) improvement in the overall quality of life (Rooney, 1993; Spirduso, 1995). The ability to maintain independence is a critical component of an older adult's quality of life. Physical activity promotes an independent lifestyle, but most elderly persons remain inactive.

Physical activity should be a component of a comprehensive health promotion program for all ages (Centers for Disease Control, 1989; Fletcher et al., 1992; Pate et al., 1995). The older adult should be targeted for health promotion programs because of the

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prevalence of physical inactivity (Pate et al., 1995). Although there is a slight increase in light and moderate activity at retirement, the total time spent in physical activity decreases with age (Caspersen & Merritt, 1995). In adults over 74, one in three men is inactive, and one in two women is inactive (U.S. Department of Health and Human Services, 1996). Furthermore, the unfit elderly population has the most health benefits to gain by increasing physical activity (Centers for Disease Control, 1995).

Research is lacking on whether health benefits obtained through physical activity actually decrease morbidity or just delay the process. Gerontologists disagree about whether there can be a decrease in years of morbidity (Holzman, 1994; Spirduso, 1995). Fries (1980) found that education and health promotion programs decreased the morbidity span but did not raise the average age of death. Health promotion programs have improved the health of participants (Abdellah & Moore, 1988; Mayer et al., 1994; U.S. Department of Health, Education, and Welfare, 1979), and even small changes in health practices (e.g., increased physical activity) have compressed morbidity (Fries, Green, & Levine, 1989). Holzman (1994) stated that the gain of three decades of extra life during the 1900s has come with a modest increase in morbidity. At the same time that lifespan has increased, physical activity has decreased. This decrease in physical activity has the potential to extend the years of morbidity and makes physical activity programs even more important to older adults. A physically active lifestyle has been shown to decrease health risks and reduce the pain and symptoms of chronic diseases (U. S. Department of Health and Human Services, 1996), which are major causes of morbidity (Spirduso, 1995).

Several steps are commonly used to develop health promotion programs focused on individual behavior change (Berg & Cassells, 1990). First, the individual must be aware of the problem created by inactivity. Second, the individual needs motivation to increase physical activity. Third, the individual needs to know how to change physical activity levels safely. Finally, the individual needs encouragement to adopt and maintain new levels of physical activity. Program planners must determine which step the individual has achieved and then provide the appropriate intervention (Berg & Cassells, 1990).

Effective program development involves the use of a theoretical framework (Blair et al., 1996; Dishman, 1991, 1994; U. S. Department of Health and Human Services, 1996). Early researchers emphasized the dropout rate in physical activity programs (Dishman, 1991). It was later recognized that the decision-making process in the adoption of a physical activity program was ignored (Dishman, 1994). Only about 20% of the population typically is ready to take action and actually change behavior related to a risk factor (Prochaska, Norcross, & DiClemente, 1994). The majority of the population needs first to accept physical activity as an important component of a healthy life.

Although many theories of behavior change have been developed, most emphasize either self-efficacy (Bandura, 1977) or pros and cons (Janis & Mann, 1977). The transtheoretical model[1] (Prochaska & DiClemente, 1982) combines various concepts of behavior change into a single theory. By combining concepts, the transtheoretical model

[1] Originally, the Prochaska and DiClemente model of behavior change was called the transtheoretical theory. In recent literature, the theory is referred to as a model.

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is thought to accommodate the complexity involved in the design of effective physical activity programs.

The transtheoretical model is based on effecting an intentional change in a client's behavior. The model has two components: (a) stages of change (readiness to change behavior), and (b) processes of change (strategies to change behavior).

There are five stages of change: precontemplation, contemplation, preparation, action, and maintenance (Prochaska et al., 1992). The stages progress from precontemplation (when the person has no desire to change the behavior), to maintenance (when the behavior change has become stabilized and is a part of one's lifestyle).

The 10 processes of change are broad strategies that guide the development of successful interventions (DiClemente, 1993; Marcus, Rossi, Selby, Niaura, & Abrams, 1992; Prochaska, DiClemente, & Norcross, 1992). The success of a behavior change depends on matching the appropriate intervention strategies with the individual's level of readiness to change.

Originally, the transtheoretical model was used in studies of change in addictive behavior, such as smoking (Prochaska & DiClemente, 1983; Prochaska, DiClemente, Velicer, Ginpil, & Norcross, 1985), obesity (O'Connell & Velicer, 1988), and alcoholism (DiClemente & Hughes, 1990). Recently, the model was successfully applied to exercise programs in the worksite (Marcus & Owen, 1992; Marcus, Pinto, Simkin, Audrian, & Taylor, 1994; Marcus, Rossi, et al., 1992; Marcus, Selby, Niaura, & Rossi, 1992; Marcus & Simkin, 1993, 1994) and promotion of physical activity by primary care physicians (Long et al., 1996). Barke and Nicholas (1990) used the stage-of-change model

(McConnaughy, Prochaska, & Velicer, 1983) to compare active and inactive groups of older adults. An intervention program based on the transtheoretical model has not been tested in the elderly population but may benefit this group as well.

In designing a health promotion program, relevancy is achieved by basing the program on participants' needs (McKenzie & Jurs, 1993). Identification of one's stage of change identifies the level of readiness to change a behavior. Accordingly, the health professional can provide stage-relevant health promotion programs for physical activity by knowing the elderly individual's stage of change.

If a person identifies his or her stage of change as contemplation, an appropriate intervention should emphasize education about the benefits of physical activity to improve the quality of life. This strategy would include consciousness raising, one of the processes of change. If a person identifies his or her stage of change as action, an appropriate intervention would emphasize actual participation in physical activity. The strategies would include a number of processes of change, such as helping relationships and counterconditioning (e.g., working with a buddy and placing a sign by the elevator to take the stairs). In each case, the person would be able to progress toward a more physically active life, the intended goal of most physical activity programs.

Need for the Study

This study is needed to evaluate the appropriateness of the transtheoretical model as a guide for the design of physical activity programs for the elderly. If appropriate, the model could benefit the design of programs to influence the health and independence of

the elderly. In addition, this model may be used as a template to increase physical activity in other populations to improve or maintain their health.

Purpose of the Study

The purpose of this study was to investigate the effects of a physical activity intervention, designed in accordance with the transtheoretical model, on changes in behavior toward higher levels of physical activity in a low-income elderly population. Through the intervention, it is intended that participants (a) become aware of the problem of inactivity and their health; (b) are provided information for weighing the pros and cons of participation in regular physical activity; and (c) may participate in a site-based, low-to-moderate- intensity physical activity program.

Research Questions

The following questions were posed to guide the study:

1. Do low-income elderly individuals exposed to a 15-week intervention designed in accordance with the transtheoretical model (a) sustain, advance, or regress in their stage of change toward a more active lifestyle, and (b) change more than a group of controls who do not receive the treatment condition?

2. Do low-income elderly individuals exposed to a 15-week physical activity intervention based on the transtheoretical model sustain, advance, or regress in their stage-of-change level 2 months after the intervention?

3. Do low-income elderly adults who identify their stage of change as action or maintenance use more behavioral processes of change than those who identify their stage of change as precontemplation, contemplation, or preparation?

Assumption

In conducting this study, the researcher made the following assumption. Instruments and methods based on the transtheoretical model but developed for populations other than low-income elderly can be applied to the low-income elderly.

Limitations

1. The characteristics and abilities of the program instructor may not be generalized to other populations, settings, or instructors.

2. The subjects were volunteers, and the study results may be generalized only to this population.

3. The participants, who lived in a low-income housing site, that provided accessibility and reduced barriers to participation in physical activity, may not be typical of older adults residing in other settings.

Delimitation

The sample was restricted to the service area of Mid-Michigan's Tri-County Office on Aging (Clinton, Eaton, and Ingham counties). The pool of sites (see Appendix A) was restricted to low-income housing sites with more than 100 residential units and a minimum age requirement of 62 years for head of household. There are nine such low-income housing sites in this area, providing a total of 1,568 residential units. From this pool, three

sites were randomly selected, providing 518 residential housing units with one or two residents per unit.

Definitions

The following terms are defined in the context in which they are used in this dissertation:

Education program. A program designed to increase one's knowledge and awareness of a problem, concept, or idea.

Elderly population. Persons at least 60 years old.

Exercise. Planned, structured, and repetitive body movements done to improve or maintain a component or components of physical fitness (Caspersen, Powell, & Christenson, 1985).

Health fair. A special event designed to bring together a range of screening and educational services at one place, at the same time, promoting the concept of good health (Michigan Health Council, 1986).

Independent lifestyle. The ability to live by oneself and perform tasks of daily living such as dressing, bathing, making meals, taking medications, and shopping.

Medication. Prescription and nonprescription pills and medications, excluding minerals and vitamins, taken by a person.

Minimum assistance. The ability to get to and participate in the educational programs, complete the written forms in the study and, if desired, participate in the

physical activity programs upon meeting the standards of the revised physical activity readiness questionnaire (rPAR-Q) or having physician approval.

Moderate physical activity. Activity that requires sustained, rhythmic muscular movements, at least equivalent to sustained walking, and performed at less than 60% of maximum heart rate for age (National Center for Health Statistics, 1995b).

Physical activity. Any large body movement produced by the skeletal muscles that results in energy expenditure (Caspersen et al., 1985).

Physical activity program. A program designed to engage individuals in physical activity sufficient to contribute to a health fitness benefit.

Processes of change. The 10 strategies (5 experiential and 5 behavioral) for changing behavior as outlined in the transtheoretical model (DiClemente, 1993; Marcus, Rossi, et al., 1992). Experiential processes of change are consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation. Behavioral processes are counterconditioning, helping relationship, reinforcement management, self-liberation, and stimulus control. (See Appendix B for definitions of the processes of change.)

Quality of life. A lifestyle that results in poor or good physical and mental health and affects one's ability to live independently within his or her genetic and environmental limitations.

Revised Physical Activity Readiness Questionnaire (rPAR-Q). (Canadian Society of Exercise Physiology, 1994). A short questionnaire used to assess an individual's relative risk for starting a physical activity program safely (see Appendix F).

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Stages of change. The five categories of physical-activity-related behavior defined in the transtheoretical model (Marcus, Rakowski, & Rossi, 1992; Prochaska et al., 1992). The five stages are precontemplation, contemplation, preparation, action, and maintenance. (See Appendix B for definitions of the stages of change.)

Transtheoretical model. A model describing how people change behavior based on their readiness to change behavior (stages of change) and the strategies (processes of change) used to change behavior. The model was originally developed by Prochaska and DiClemente (1982).

Vigorous physical activity. Activity that is rhythmic, repetitive, and uses large-muscle groups at 60% or more of the age-related maximum heart rate (National Center for Health Statistics, 1995b).

Chapter 2

REVIEW OF LITERATURE

Behavior Change Theories

Numerous theories about behavior change attempt to explain health-related practices. In recent years, the use of theories of behavior change in exercise and physical activity programs has become a primary focus (Brawley, 1993; Leith & Taylor, 1992). In this review, three main theories are discussed: (a) the self-efficacy theory (Bandura, 1977), (b) the conflict theory of decisional balance (Janis & Mann, 1977), and (c) the transtheoretical model (Prochaska & DiClemente, 1983). All three theories were developed for health-protective practices and behavior other than exercise or physical activity. The first two theories are briefly explained and discussed in relation to physical activity. The transtheoretical model is explained and discussed in more detail. In the discussion, an interrelation of the components of the three theories is presented.

Self-Efficacy

According to the self-efficacy theory (Bandura, 1977), behavior changes are initiated by a cognitive component called self-efficacy. Self-efficacy refers to one's perceived ability to perform the skill one desires to do. Such a perception determines whether a behavior change is initiated, how much effort is expended, and how long the new behavior is sustained.

In this theory, there are two sets of expectations: efficacy expectations and outcome expectations (Bandura, 1977). An efficacy expectation is the conviction that one can do the skill required to produce the outcome. In a physical activity change, efficacy expectation is the personal confidence that a specific type of physical activity can be done. An outcome expectation is an appraisal that certain behavior leads to a specific outcome. In physical activity change, the outcome expectation is that a particular type of physical activity will accomplish the desired goal. For example, if a personal goal is to increase muscular strength, the person must first possess confidence in his or her ability to do strength-training exercises with weight machines (efficacy expectation). Second, the person must believe that the exercises done on the weight machines will increase strength (outcome expectation).

The self-efficacy theory has been found to be effective in causing exercise-behavior change in several studies (Dishman, 1994; Poag-DuCharme & Brawley, 1993). Poag-DuCharme and Brawley (1993) found that the self-efficacy theory was effective in predicting the intention to exercise and the attendance at exercise sessions in both structured and less structured exercise programs. Several factors were used to analyze self-efficacy, including barriers to exercise, scheduling conflicts, type of exercise regime (structured/unstructured), and experience in exercise (beginning/experienced). Self-efficacy was influenced differently depending on the experience of the exerciser and the type of exercise regime. These factors must be considered in the design of programs and strategies used for desirable behavior change in exercise patterns.

Conflict Theory of Decisional Balance

The original conflict theory of decisional balance (Janis & Mann, 1977) was a five-stage model. The five stages were: (a) appraise the challenge, (b) survey the alternatives, (c) weigh alternatives, (d) deliberate about the commitment, and (e) adhere despite negative feedback. The theory was based on evidence from individuals who successfully made a difficult personal decision about smoking, weight loss, or medical treatment. Although the original theory was not based on behavior change in physical activity, the following examples demonstrate the theory's applicability to physical activity.

The first stage, appraising the challenge, includes a self-evaluation of the risk of physical inactivity. For example, how serious are the risks if I do not become more active? Surveying alternatives (second stage) involves decisions on potential ways to increase physical activity and to consider the available options. The third stage of weighing the alternatives is a review of the pros and cons to physical activity. Following this review, the individual decides which is the best alternative for making an appropriate decision about physical activity. In the fourth stage, deliberation about commitment, a decision is made to put the intention into action. The individual decides to become physically active by using the best alternative(s) available. In the last stage, adhering despite negative feedback, the individual makes a decision to be physically active even though the decision may cause some conflicts in his or her personal lifestyle.

The important aspect of the conflict theory of decisional balance is weighing the pros and cons to changing behavior. In attempting to balance negative and positive choices for change, four general categories are used to list the alternatives to consider

when deciding to change behavior (Janis & Mann, 1977): (a) tangible gains/losses for oneself, (b) tangible gains/losses for others, (c) self-approval or self-disapproval of the change, and (d) social approval or disapproval of the change.

Oxford (1986) cited the weighing of the pros and cons as the critical aspect to successful health changes in addictive behavior. The greater the loss involved for the individual, the greater the conflict in making and implementing the health promotion decision.

Oxford (1986) also compared several aspects of the conflict theory of decisional balance (Janis & Mann, 1977) to the four stages of change (precontemplation, contemplation, action, maintenance) of the early transtheoretical model (Prochaska & DiClemente, 1983). Janis and Mann (1977) referred to defensive avoidance, in which the individual has a high ego-involving characteristic resulting in a decision not to change the behavior. This type of individual can be selective in avoiding or not paying attention to relevant information about the health promotion decision or can exaggerate the unfavorable consequences and minimize the favorable consequences. This type of behavior would be similar to precontemplation. The decision-making process of surveying alternatives parallels the stage of contemplation. Weighing the pros and cons and then implementing the behavior parallels the stage of action. Adhering to the change parallels the stage of maintenance.

Transtheoretical Model

The transtheoretical model was developed for use in psychotherapy. It is feasible to use the model for people changing behavior on their own and for those participating in

behavior-change therapy (Prochaska & DiClemente, 1984). The name was derived after examining various theories of psychotherapy that cut across or transcend the concepts and processes of therapy. The focus is on intentional change, an individual decision to change behavior (DiClemente, 1993). Intentional change differs from societal change (the status quo accepted by a society), developmental change (biological maturation), or imposed change (forced change, as when a drug addict is required to attend a drug-treatment program).

The original model (Prochaska & DiClemente, 1982) was developed from a synthesis of 18 leading psychotherapy systems (Prochaska, 1979). In an attempt to identify and integrate the best components of the various systems, both self-changers and those participating in therapy were involved. The present transtheoretical model (Prochaska et al., 1992) has two components: the stages of change (readiness to change) and processes of change (strategies to use).

Stages of change. The stages of change are predictable, well-defined levels of behavior change that take place within a certain period of time. To progress to the next stage of change, a series of tasks need to be completed (Prochaska, Norcross, & DiClemente, 1994). A stage of change can last a short or long time. A stage of change can range from no intention to change through the actual change of the behavior (Marcus, Simkins, Rossi, & Pinto 1996).

In the original Prochaska and DiClemente transtheoretical model (1982), four stages of change were identified: (a) contemplation, (b) determination, (c) action, and (d) maintenance. The determination stage was renamed the decision stage (McConnaughy et

al., 1983). This version of the model was derived from studying smokers who quit on their own and smokers who changed through therapy.

The transtheoretical model was then tested on other outpatient groups with a wide range of clinical problems (McConnaughy et al., 1983). Subjects (N=155) volunteered to take a written stage-of-change test. The test included 125 questions, 25 in each of the four original stages of change (contemplation, decision, action, maintenance), and 25 in a precontemplation stage. The precontemplation stage was identified through clinical work with people who were resistant to change (e.g., those pressured by others to enter therapy but who were not serious about changing a behavior).

As a result of their research, McConnaughy et al. (1983) identified four stages of change: (a) precontemplation, (b) contemplation, (c) action, and (d) maintenance. The decision stage was not identified as an independent component but contained elements of the adjacent stages, contemplation or action.

The McConnaughy et al. (1983) four-stage model was used for 7 years (Prochaska et al., 1992). In reevaluating the McConnaughy et al. study (19832) and considering more recent research (DiClemente et al., 1991; Prochaska & DiClemente, 1992), a fifth stage was identified. Cluster analysis revealed a stage between contemplation and action; it was called preparation.

Marcus, Selby, et al. (1992) found similar results. In a three-phase study involving changes in worksite exercise behavior, a preparation stage was identified between contemplation and action. Furthermore, the stages-of-change instrument for exercise was developed. Reliability of the stages-of-change instrument (kappa index) was found to be

.78 (Flies, 1981). Self-efficacy was also measured and compared to the stages of change. Marcus, Selby, et al. compared total scores on the self-efficacy instrument with stage of change and found them to be reliable ($p < .001$).

Concurrent validity of the five-stage model was established with a worksite population (Marcus & Simkin, 1993). The stages-of-change instrument (Marcus, Selby, et al., 1992) and physical-activity-recall questionnaire (Blair, 1984) were completed to establish concurrent validity. The results indicated that both vigorous and moderate levels of self-reported physical activity differed significantly ($p < .001$) among three collapsed groups of the stages of change (precontemplation and contemplation, preparation, and action and maintenance).

In an exercise-behavior study, Marcus, Rakowski, and Rossi (1992) compared the stages of change and decisional balance (pros and cons). As had been found in smoking-cessation studies, pros increased from precontemplation to maintenance, and cons were higher in early stages of change. The pros equaled the cons during the preparation stage. These results provided evidence that stage of change in the transtheoretical model corresponds to the decisional balance of the pros and cons of exercise adoption.

All three instruments (stages of change, self-efficacy, and decisional balance) were tested in two worksites in the United States and in Australia (Marcus & Owen, 1992). The results of the study indicated that precontemplators were significantly different ($p > .05$) in self-efficacy and decisional balance from those in the preparation, action, and maintenance stages. Knowledge of the target populations, stage of change, self-efficacy,

and decisional balance suggests that relevant physical activity programs may be designed to increases exercise adoption and adherence by using the transtheoretical model.

The present transtheoretical model (Prochaska et al., 1992) has five stages: (a) precontemplation, (b) contemplation, (c) preparation, (d) action, and (e) maintenance. In precontemplation, the individual is unaware of having a problem or is not thinking about changing the behavior in the near future. The contemplation stage results in an awareness that there is a problem and the person is seriously thinking about changing the behavior but has taken no action. In contemplation, a person weighs the pros against the cons of the problem and solution. The preparation stage is a combination of being aware and intending to take action in the next month, or the person may have unsuccessfully taken some action in the past. However, the person has not met the criteria to be effective in changing the behavior. In the action stage, the person has met the criteria for the change for less than 6 months. In the final stage, maintenance, the change has been achieved for a prolonged time, usually a 6-month minimum. The change is accomplished without relapse for the established period.

The stages of change are viewed as sequential, but in most cases they involve a cyclical pattern (DiClemente, 1993; Prochaska, Norcross, & DiClemente, 1994). A person may cycle or recycle through these stages several times before achieving the desired behavior change.

Processes of change. The second component of the transtheoretical model is the processes of change. Defined as a group, the processes of change are any activity initiated to help someone modify his or her thinking, feelings, or behavior toward a given problem (Prochaska, Norcross, & DiClemente, 1994).

The processes of change were derived from synthesizing the various strategies used in the theories of psychotherapy (Prochaska, 1979). Through several years of study 10 independent processes of change have been identified (Prochaska & DiClemente, 1982, 1983; Prochaska, Velicer, DiClemente, & Fava, 1988). These 10 processes are consciousness raising, self-reevaluation, environmental reevaluation, self-liberation, counterconditioning, stimulus control, reinforcement management, dramatic relief, and helping relationships. These are defined below in accordance with Prochaska and DiClemente (1984) and Prochaska et al. (1992) and are discussed in reference to exercise (Marcus et al., 1996).

Consciousness raising refers to strategies that increase information about the behavior-change problem and about oneself. This can include both feedback and education. The information is used to aid the individual in making appropriate decisions in regard to the behavior change. This would include recalling and seeking new information related to the adoption of physical activity, such as benefits of physical activity.

Self-reevaluation uses strategies to assess how one feels and thinks about oneself with respect to the problem. It involves both an emotional and a cognitive appraisal of the pros and cons to the behavior change. The weighing of the barriers to exercise (time,

cost, transportation) versus the benefits of exercise (improved health status) is involved in one's reevaluation.

Environmental reevaluation uses strategies to assess how one's problem affects the physical environment. This person believes the world would be a better place if he or she makes a change in his or her behavior and goes along with the socially accepted norm. In physical activity, this involves the assessment of how exercise affects others in one's physical and social environment.

Self-liberation involves strategies to choose and commit to a new behavior or one's belief in the ability to change. The person realizes that being committed to this new behavior increases the chance of change but sets new limits on personal freedom and responsibility for one's behavior. The individual chooses and commits to becoming physically active, such as by making a New Year's resolution to exercise four times a week.

Social liberation uses strategies that involve changes in the society that lead to more opportunities to change behavior. Society recognizes that there is a problem and advocates for change. The federal government's and health agencies' promotion of physical activity through awareness campaigns, making facilities accessible, and society's acceptance of being physically active are strategies of social liberation.

Counterconditioning involves substituting a different behavior for the problem behavior. Strategies are learned for adapting and incorporating the new behavior into one's life instead of maintaining the problem. Fatigue, stress, and lack of energy are unpleasant emotions that can be countered by physical activity. Physically active behavior

is substituted for sedentary behavior--for example, riding a stationary bicycle while watching television instead of lying on the couch while watching television.

Stimulus control uses strategies to restructure the environment to decrease the probability that the problem behavior will occur. The restructuring involves avoiding an environment or changing an environment to promote the desired change. Triggers to be inactive are controlled by asking for a parking spot at work farther from the entrance or rescheduling family responsibilities to allow time for physical activity.

Reinforcement (contingency) management involves using a reward to help encourage new behavior or setting up small achievable steps. Rewarding oneself or being rewarded by others for appropriate behavior change would reinforce the new behavior. In physical activity, positive reinforcement and goal setting are used to encourage one to develop or maintain an active lifestyle.

Dramatic relief strategies involve the emotional reaction to environmental events that change people's problem behavior. This involves a real-life experience such as the death of a friend or a reaction to a movie representing the problem behavior. Experiencing and/or expressing feelings about the negative consequences of a sedentary lifestyle could lead to increasing physical activity and maintaining an active lifestyle.

Helping-relationships strategies involve the use of others (therapist, friend, spouse) to facilitate the behavior change. These relationships need to involve trust, understanding, acceptance, and openness to the change. In exercise, this strategy involves engaging the support of caring others to enhance or assist with physical activity.

Each of the 10 processes of change represents a multitude of strategies that can be used to help change. The process can be used individually or separated into two higher-order constructs: experiential and behavioral (DiClemente, 1993; Prochaska et al., 1988; Marcus et al., 1996). The experiential processes are consciousness raising, dramatic relief, environmental reevaluation, social liberation, and self-reevaluation. The behavioral processes are counterconditioning, helping relationships, reinforcement management, stimulus control, and self-liberation. Which of the processes of change are selected depends on an individual's characteristics and his or her stage of change.

Integration of components. The components of the transtheoretical model (stages of change and processes of change) have been found to be integrated (Prochaska & DiClemente, 1983,1984). The frequency with which a particular process is used depends on the stage. In general, the experiential processes are used more frequently in the early stages, and the behavioral processes are used more frequently in the later stages (Prochaska et al., 1992; Marcus et al., 1996). When an individual's stage of change is identified, appropriate strategies can be built into the intervention program.

Goodness of fit (the assessment of the observed response pattern's proportion to the response pattern predicted by the model; Kirk, 1982) was studied by Marcus, Eaton, Rossi, and Harlow (1994). Stages of change, self-efficacy, and decisional balance were the three constructs examined. An excellent fit between the model and the data was found. This provided strong support for the transtheoretical model as an integrative-construct framework derived from various theoretical approaches to behavior change.

Similarly, goodness of fit between the stages of change and processes of change was examined by Prochaska et al. (1988) in a smoking-cessation study. The two-factor model of experiential processes of change and behavioral processes of change had the best goodness-of-fit index (GFI = .890). Marcus, Rossi, et al. (1992) found that the goodness-of-fit index for exercise and the two-factor model was .908 (.90 or above is considered an excellent fit).

Use of the Transtheoretical Model

Behavior-change researchers have used the transtheoretical model with a variety of problem behaviors and in a variety of age groups (DiClemente, 1993; Prochaska, Velicer, et al., 1994). The integration of the stages of change and processes of change has been demonstrated in a broad range of articles on behavior change. They include: (a) smoking cessation, (b) other nonexercise problems, (c) exercise, and (d) use of the model in an older adult population.

Smoking-Cessation Research

Most of the work completed to refine the transtheoretical model has been done with smokers, both self-changers and those participating in therapy or intervention programs. The following research studies dealing with smoking cessation involved both the original and the present transtheoretical model.

In smoking-cessation study, Prochaska et al. (1985) found that 30% of precontemplators (n = 104) switched to a different stage at the end of 6 months. Of contemplators (n = 172), 7% were able to quit smoking in 6 months. Of action-stage

subjects (n = 108) 33% relapsed, 18% showed no change, and 49% became long-term quitters. It was also learned that experiential processes of change were used in the earlier stages of change and behavioral processes were used in the later stages of change.

In a review article, Prochaska et al. (1992) discussed the spiral model of the stages of change. The path of progression through the stages was originally thought to be linear in addictive behaviors, but it was found to be spiral. Fifteen percent of smokers who relapsed to a previous stage regressed to precontemplation. About 85% of smokers relapsed to contemplation or preparation and said they would consider taking or attempt to take action again (Prochaska & DiClemente, 1984). Each recycling process provided an opportunity to learn from one's mistakes and to try again (DiClemente et al., 1991).

In smoking cessation, matching the stage of change to an appropriate treatment or processes of change is important (Prochaska et al., 1992). A person in the preparation or the action stage is more likely to succeed (stop smoking) in an action-oriented program. A person in precontemplation or contemplation does not respond well to an action-oriented program.

A precontemplator used the fewest processes of change and may not recognize smoking as a problem. Progression to a contemplation stage involved interventions using consciousness raising, dramatic relief, and environmental reevaluation. To advance to the preparation stage, the contemplator incorporated self-reevaluation and started to take small steps toward action. In the preparation stage, one used self-liberation to progress to the action stage and started to use counterconditioning and stimulus control. These three processes are also used in the action stage, along with reinforcement management and

helping relationships. The maintenance stage was characterized by a decrease in use of the processes of change. Identification of a person's stage of change allowed both the self-changers and an intervention designer to select appropriate processes to lead to a higher success rate in stopping smoking (Prochaska et al., 1992).

In trying to identify the best type of intervention programs, 756 smokers volunteered to test self-help materials (Prochaska, DiClemente, Velicer, & Rossi, 1993). All volunteers were smokers in the precontemplation (n = 93), contemplation (n = 435), or preparation (n = 228) stage of change. Subjects were randomly assigned by stage of change to each of four intervention groups: (a) standard intervention (three manuals produced by the American Lung Association or the American Cancer Society), (b) individualized manuals (five manuals based on the transtheoretical model), (c) individualized manuals/computer feedback (same five manuals used in b, plus three computer reports at 0, 1, & 6 months), and (d) individualized manuals/computer feedback/ counselor phone calls (same protocol as in c, plus three phone calls at 1, 3, & 6 months). The stage of change determined which individualized manuals were distributed to the subjects. A battery of measures was given at 1, 6, 12, and 18 months. Throughout the intervention, the group given individualized manuals plus computer feedback was the most successful. The standardized manuals were the least effective in stopping smoking.

The studies discussed above verified stages of change in both self-changers and those in therapy. They also suggested that the processes of change may be effective strategies for stopping smoking. Furthermore, the interrelation of the stages of change and processes of change may be helpful in designing successful interventions.

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Other Nonexercise Research

The transtheoretical model has been used in a variety of behavior-change areas, such as weight control, quitting cocaine, safer sex, adolescent delinquent behavior, and preventive health practices. The following studies indicate the model's capacity to be used in addressing a variety of behavior-change problems.

Two weight-loss studies were conducted to test the feasibility of using the four-stage transtheoretical model and the conflict-theory-decisional-balance model of Janis and Mann (O'Connell & Velicer, 1988). The purposes of the two studies were: (a) to develop a decisional-balance measure for weight control and (b) to relate the decisional-balance measure to the stages of change in intentional weight-loss behavior change. The weight-control decisional-balance tool, adapted from a smoking-cessation tool (Velicer, DiClemente, Prochaska, & Brandenburg, 1985), was found to be effective in identifying a person's movement through the stages of change. Similar results were found among the college students involved in the two weight-control studies. As subjects progressed from precontemplation to action, the cons (against change) decreased and the pros (for change) increased. In the action stage, the pros were much higher than the cons. In the maintenance stage, pros were still higher than cons but less than in the action stage. The use of the decisional-balance tool assisted in identifying the attitudes and the potential program strategies appropriate for losing weight.

Decisions about mammography screening were studied through a decisional-balance measure of the pro and cons in 142 women from three worksites (Rakowski et al., 1992). As with previous smoking-cessation and weight-control studies, decisional balance

and stages of change were found to be interrelated. Pro scores were lowest in precontemplation and highest for those in maintenance. Con scores were highest in precontemplation and lowest in maintenance. The use of this tool as a screening process, along with identification of the stage of change, assisted in promoting mammogram screening in relevant and appropriate health-promotion programs.

In a study to investigate the transtheoretical model across 12 problem behaviors, common relationships were found between the stages of change and the decisional-balance theory (Prochaska, Velicer, et al., 1994). The 12 behaviors were smoking cessation, quitting cocaine, weight control, high-fat diets, adolescent delinquent behavior, safer sex, condom use, sunscreen use, radon gas exposure, exercise acquisition, mammography screening, and physicians' preventive practices. In 7 of the 12 problem behaviors, the pros outscored the cons in the contemplation stage. In exercise, the higher pro score was during the preparation stage. For delinquent behaviors, sunscreen use, high-fat diets, and mammography, the higher pro score was in the action stage. In 10 of the studies, the research was conducted with the original four-stage model. If the present five-stage model had been used, the results may have been similar to the exercise distribution. In all 12 studies, the cons were lower in the action stage than in the contemplation stage.

Several generalizations can be made from the previous studies. The utility of the transtheoretical model has been supported in a number of different types of behavioral problems and populations (Prochaska, Velicer, et al., 1994). Regardless of the type of behavior, there is a systematic switch from cons to pros as one advances from

precontemplation to action. Before action is taken, the pros must outweigh the cons (O'Connell & Velicer, 1988; Rakowski et al., 1992; Velicer et al., 1985).

Three basic constructs of the transtheoretical model have been strongly supported: (a) the stage of change, (b) pros and cons, and (c) the integration between the stages of change and decisional balances. In designing intervention programs, identifying the stage of change assists in developing an appropriate strategy to influence a person to take action. Intervention programs for precontemplators should concentrate on increasing the pros to the behavior change. After increasing the pros, the next step is to decrease the cons to the behavior change and move to the stage of contemplation. This, in turn, is hypothesized to lead the contemplator to progress toward preparation and action.

Exercise Research

Exercise behavior-change studies have paralleled many of the smoking-cessation studies, in which the feasibility of using the transtheoretical model in understanding and predicting behavior change has been studied. In a community exercise-intervention study called "Imagine Action," participant stage of change was determined by a question on the registration form (Marcus, Banspach, et al., 1992). The subjects received written material to encourage participation in the 6-week program, as well as materials targeted for their stage of change. The results indicated that subjects were significantly more active after the 6-week intervention than before it. Of those who were contemplators at baseline 31.4% advanced to the preparation stage and 30.2% advanced to the action stage at follow-up. Of those who were in the preparation stage at baseline, 61.3% advanced to action at the follow-up. Although the follow-up findings were based on self-report and

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lacked validation of increased activity, the results were consistent with use of the transtheoretical model to influence and study behavior change.

In a longitudinal study, Marcus et al. (1996) examined worksite employees' adoption and maintenance of exercise patterns. The stages of change and processes of change were analyzed at baseline and at 6 months. No exercise program was conducted at the worksite, but a health-risk appraisal was completed at baseline. Subjects ($\underline{N}$ = 245) were placed in four groups: (a) stable-sedentary, (b) stable-active, (c) adopters, and (d) relapsers. When the two groups that were stable in their stage of change (stable-sedentary and stable-active) were compared, the stable-active reported using more processes of change. The adopters increased their use of all processes of change, and relapsers decreased their use of the five behavioral processes. The results showed the importance of maintaining behavioral processes of change for preparation, action, and maintenance exercises to help prevent relapse. Those who did relapse were more likely to attempt active behavior again as they regressed to contemplation rather than precontemplation.

The transtheoretical model was used as the basis for a physician-based assessment and counseling for exercise (PACE) program (Long et al., 1996). Doctors and staff were provided training on how to counsel patients in exercise. Patients identified their stage of change on a form they filled out in the waiting room. Based on the self-identified stage of change, the physician distributed counseling and exercise materials to the patients. Follow-up data indicated that most patients followed the physician's recommendations and found the materials useful. Although the PACE program is new and this project was a

multisite field test, the initial reports have indicated success in increasing the patients' awareness of and participation in physical activity.

Older Adults and Exercise Research

The use of the transtheoretical model with an elderly population has been limited. Most studies have dealt with the worksite population. There has been no exercise intervention for older adults developed and evaluated that was based on the transtheoretical model. The following studies dealt with groups of older adults (mean age 56 to 64.9 years) and exercise.

The first study, dealing with older adults, with a mean age 64.9 years, used the four-stage-of-change model (Barke & Nicholas, 1990). The results supported the model's applicability to older adults. Barke and Nicholas speculated that physical activity programs may be more effective if they are based on the stage of change, rather than assuming that all persons are ready to be physically active.

In two Australian studies (Gorely & Gordon, 1995; Lee, 1993), the stages of change and exercise were evaluated in older adults. Lee (1993) found precontemplators to be older, with little knowledge about exercise, and with little family support for exercise. They also expected fewer psychological benefits, and rated exercise as being less important than stopping smoking. Gorely and Gordon (1995) found that the processes of change were used the least in the precontemplation stage. Also, self-efficacy and the pros to exercise increased from precontemplation to maintenance. These studies supported the feasibility of the transtheoretical model across cultures and ages.

Benefits of Physical Activity

The national health goals (Healthy People 2000; U.S. Department of Health and Human Services, 1991) were initiated in an effort to reduce preventable death and disability for Americans. These goals emphasized three broad areas: (a) increasing the life span, (b) reducing health disparities, and (c) achieving access to preventive services (Haber, 1994; U.S. Department of Health and Human Services, 1991). The need to increase physical activity was recognized for most Americans and emphasized for low-income and elderly populations.

In 1996, the U.S. Department of Health and Human Services compiled a report entitled Physical Activity and Health: A Report of the Surgeon General. The report stated that people of all ages can reduce health risks and improve their quality of life through participating in moderate-intensity physical activity. To achieve a health benefit, a person must accumulate at least 30 minutes of endurance activities at a moderate intensity or higher, on most days of the week. More health and functional benefits are achieved by adding more time or going to a more vigorous intensity.

The health benefits of maintaining an active lifestyle were substantiated through the joint statement on appropriate levels and types of physical activity from the Centers for Disease Control and the American College of Sports Medicine (Pate et al., 1995). The committee consisted of 20 expert scientists and researchers from throughout the country. After reviewing the pertinent physiological, epidemiological, and clinical evidence, the experts identified the benefits of physical activity and developed a concise public health statement. The public health statement was: Each U.S. adult needs to accumulate 30

minutes of a moderate level of physical activity for most, preferably all, days of the week. The prescription included older adults, and the evidence demonstrated that older adults, persons with disabilities, and/or persons with chronic diseases improved their physiological and performance capacities by engaging in regular physical activity.

The International Scientific Consensus Conference on Physical Activity, Health and Well-Being (1995) brought together leading scientists from 10 countries to develop a consensus statement on physical activity. The statement emphasized the importance of physical activity throughout the life cycle and the positive influence of physical activity on physical and psychosocial health. The statement attributed a substantial amount of the age-related decline in functional capacity to decreased and insufficient physical activity rather than to aging per se. Engaging in physical activity promotion throughout the life cycle is one of the most effective means to improving health and enhancing the function and quality of life.

In 1996, the World Health Organization (WHO) developed guidelines to promote physical activity in older persons (50 years old and above) (Chodzko-Zajko, 1997). The purpose of the guidelines was to develop strategies, policies, and interventions to maintain and/or increase physical activity in older persons. The recommendations allowed for great variety in programs to encompass the diversity of this population. Some of the WHO recommendations included: (a) programs should focus on simple and moderate forms of physical activity; (b) programs should be fun and relaxing; (c) programs can range from individual to group, structured to unstructured; (d) a variety of modes of activity should be incorporated to cover all components of fitness; and (e) physical activity should be

regular, daily if possible. Benefits were recognized for the individual (physiological, psychological, and social) and for society (cost, productivity, and positive image).

The recent development of reports and guidelines on physical activity, at both the national and international levels, exemplify the great concern about the effect of inactive lifestyles on human health. The health benefits of physical activity encompass a broad range, including physiological, psychological, and cognitive benefits. High-quality research studies dealing with physical activity and the elderly population are limited in number and scope. Many studies lacked controls, were based on self-reported data, and limited the population sample, with the result that they were not generalizable to the diverse elderly population (Spirduso, 1995).

The benefits of physical activity will be reviewed in five broad categories: (a) health-fitness components, (b) acute and chronic diseases or injuries, (c) psychosociological aspects, (d) medical costs, and (e) independence and quality of life. These five categories are not mutually exclusive and are often interdependent. As an example, if a person achieves benefits in the health-fitness components, he or she may gain a higher level of self-esteem. Both benefits provide the opportunity to have an independent lifestyle and increase the quality of life.

Health-Fitness Components

The benefits associated with health fitness are the most recognized benefits from participating in various physical activity modes. These four components of health-related fitness are cardiorespiratory endurance, muscular strength and endurance, flexibility, and body composition.

Cardiorespiratory endurance. Cardiorespiratory endurance is defined as the ability to perform large-muscle, dynamic, moderate- to high-intensity exercise for sustained periods (ACSM, 1995). It involves the ability of the cardiac, respiratory, and skeletal systems to work efficiently in delivering blood and oxygen to the muscle, which then uses the oxygen and substrates to perform work (Spirduso, 1995).

Epidemiological studies have shown that persons with low cardiorespiratory fitness have an increased risk of premature death from all causes and specifically from cardiovascular disease (ACSM, 1995; Blair et al., 1989; Blair et al., 1995; Kaplan, Seeman, Cohen, Knudsen, & Guralnik, 1987; Paffenbarger, Hyde, Wing, & Hsieh, 1986; Paffenbarger et al., 1993; U. S. Department of Health and Human Services, 1996). Furthermore, the percentage of gain in health benefits was greatest in individuals who went from sedentary to low physical activity levels (Blair et al., 1989).

Sedentary middle-aged and older adults achieved training benefits and increased their cardiorespiratory function by 10% to 25% (Blumenthal, Emery, Madden, Coleman, et al., 1991; Shephard, 1987). Even 70 to 79 year olds (N = 16) who never exercised before were able to increase their cardiorespiratory endurance and functional capacity through a progressive training protocol, from 50% maximal oxygen capacity to 75% to 85% maximal oxygen capacity (Hagberg et al., 1989).

In a review article on the response of cardiac muscle to physical activity and old age, Tate, Hyek, and Taffet (1994) stated that sedentary older mammals enhanced cardiac function through exercise training. The diastolic relaxation time was decreased because of an increase in speed of calcium regulation needed in muscle contraction. Similar results

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were noted by Lakatta (1990). The limiting factors in cardiovascular function with aging appeared to be due to peripheral rather than central circulatory factors. These factors included a decrease in muscle mass, the ability to direct blood to the muscle, and the ability of the muscle to use oxygen. Levy, Cerqueira, Abrass, Schwartz, and Stratton (1993) found that the hearts of older men had a lower diastolic filling rate than did those of younger men. Slower filling limited the maximal aerobic capacity, but endurance exercise enhanced the heart's ability to function. All these factors limit the aging body's maximal aerobic capacity. In many healthy elderly persons, the main reason for decreased cardiac functions is physical deconditioning, not the aging process.

Foster, Hume, Byrnes, Dickinson, and Chatfield (1989) studied 16 older women (mean age 78.4 years) with low aerobic capacity. The results showed that low-intensity physical activity programs provided adequate training stimulus to improve the aerobic capacity of sedentary older women and reduce the women's potential risk of injury.

In a study by Naso, Carner, Blankfort-Doyle, and Coughey (1990), 15 subjects, ages 64 to 97 years, with low aerobic capacity completed an endurance training program. The researchers found an increased training effect in the arms but not in the legs. The authors commented that the training protocol of 15 minutes of continuous exercise was rarely achieved. It appears that the exercise protocol was at too high a level for the subjects, and that better results might have been achieved if a more appropriate training program had been used.

These studies are evidence of the cardiorespiratory benefit of maintaining physical activity throughout one's life. Endurance exercise at a low to moderate level improves the

cardiorespiratory health fitness level while minimizing injury. Exercise prescription, however, needs to be appropriate to achieve a training effect. Individual physical limitations need to be considered in prescribing both the intensity and the type of exercise to be used.

Muscular strength and endurance. Muscular strength and endurance are important at any age but become more important as one ages (Spirduso, 1995). The decline in functional capabilities associated with aging is due primarily to a decrease in or insufficient physical activity to develop the musculoskeletal system (International Scientific Consensus Conference, 1995). Muscular strength is the maximal force of a muscle or muscle groups that can be produced in a one-time effort (ACSM, 1995). Muscular endurance is the ability of a muscle group to contract repeatedly during a sustained period of time until fatigue (ACSM, 1995).

Muscular strength and endurance are important components in maintaining one's health. Some researchers (Booth, Weeden, & Tseng, 1994; Buchner & de Lateur, 1991) have thought that the decline in skeletal muscle mass plays a more critical role in loss of mobility in the elderly than does the decrease of maximal oxygen capacity.

Musculoskeletal exercise studies have indicated that people of all ages, even those in their nineties, can increase strength through exercise training, (Fiatarone & Evans, 1993; Frontera, Meredith, O'Reilly, Knuttgen, & Evans, 1988; International Scientific Consensus Conference, 1995). The amount of improvement in muscular strength was dependent on the intensity of the stimulus in both young and old (Fiatarone & Evans, 1993).

Fiatarone et al. (1990) conducted a strength-training study with 10 frail nursing-home residents, 86 to 90 years old. After 8 weeks of high-intensity resistance training, 9 subjects averaged a 174% gain in muscle strength and a 48% improvement in tandem gait strength.

In a later study, Fiatarone et al. (1994) conducted an exercise-training and nutrition-supplement study with physically frail elderly people (N = 100; 63 women, 37 men; mean age 87.1 years). Significant increases were observed in the exercise-training groups in both muscle strength and muscle cross-sectional area. The exercise also improved habitual gait velocity, stair-climbing ability, and overall level of physical activity. The study supported evidence that low muscle mass and strength are strongly related to impaired mobility. Furthermore, the subjects muscular skeletal system responded to progressive resistance training and significantly improved functional mobility and overall activity. These results were also confirmed in other studies (Rantanen, Era, & Heikkinen, 1994; Skelton, Greig, Davies, & Young, 1994).

In weight-training studies with older adults, increases in dynamic muscle strength were found to parallel strength increases in younger adults (A. B. Brown, McCartney, & Sale, 1990) and to be attainable with a 2-day-per-week training program (Morganti et al., 1995). Also long-term strength training was found to be feasible and well tolerated, and it helped to maintain functional capacity in older adults (McCartney, Hicks, Martin, & Webber, 1995). McMurdo and Johnstone (1995) found no increase in strength following a home exercise program for older adults with limited mobility (mean age 82). Poor compliance and cognitive impairment were indicated as reasons for lack of effect. In an

earlier study (McMurdo & Rennie, 1993), a supervised exercise program using similar exercises resulted in functional improvements.

In a review article on muscular skeletal health, Vuori (1995) concluded that the scientific evidence clearly indicated that the decline in muscular fitness was not attributable to the aging process alone. All components of muscular fitness were improved through safe and appropriate muscular-strength physical activity programs in all age groups. An increase in muscular fitness contributed to improvement in functional capacities.

Flexibility. The ability to move through a complete range of movement is flexibility (ACSM, 1995). A muscle that is not used tends to shorten, thus reducing the range of motion. Flexibility is crucial to maintaining effective movement in people of all ages, but particularly in older adults (Spirduso, 1995).

The back is one of the first areas of the body to decline in range of motion. Part of this decline may be due to a lack of daily activities that put the back into an extended position (Spirduso, 1995). Disuse atrophy is suspected to be the major reason for the decrease in flexibility with age and not the body's aging process (Spirduso, 1995).

Vandervoort et al. (1992) examined the loss of ankle flexibility in men and women ages 55 to 85 years. Women lost about 50% and men about 35% of their range of motion in the ankle joint during this timespan. Decreased ankle flexibility may increase the chance of a fall.

Flexibility exercises are the basis for most rehabilitation and physical therapy programs. In a study conducted by Chapman, deVries, and Swezey (1972), old (63 to 88 years) and young (15 to 19 years) men participated in a progressive-resistance exercise

program. Both groups gained the same percentage of improvement in the range of motion, but the older men's joints were stiffer than those of the younger men.

In a 25-week exercise program (Raab, Agre, McAdam, & Smith, 1988), flexibility improved in ankle plantar flexion, shoulder flexion, shoulder abduction, and left neck rotation but not in hip flexion in older adults. In a 5-day-a-week, 3-month exercise program that included stretching exercises (Brown & Holloszy, 1991), a 35% increase in hip flexion was observed in 60 to 71 year olds. These two studies indicated that gains in flexibility were possible in older adults but were joint specific. A gain in flexibility was obtained only if the exercises caused the joint to be used in the desired range of motion.

Brill, Drimmer, Morgan, and Gordon, (1995) conducted an 11-week strength and flexibility program with 10 patients with dementia. A limited number of exercises and a short duration of time per session were used to facilitate learning by these patients. Subjects made gains in both strength and flexibility from the three times per week, 20-minutes-per-session exercise protocol.

Flexibility is an important fitness component for the elderly person. Disuse of the muscular skeletal system decreases range of motion. Physical activity has been shown to improve flexibility but that flexibility is very specific to the joint being stretched. Flexibility is very important in many chronic diseases and will be further discussed in that section.

Body composition. Body composition is the make-up of one's body weight in fat and fat-free body tissues (ACSM, 1995). Although body composition is strongly influenced by genetics, an individual's physical activity also influences body composition

(Spirduso, 1995). The normal aging process results in a decrease in muscular mass, a decrease in bone density, and an increase in internal fat deposits (Posner, 1992). These processes have been minimized through effective exercise programs (Laforest, St-Pierre, Cyr, & Gayton, 1990; Posner, 1992; Spirduso, 1995; Wagner, LaCroix, Buchner, & Larson, 1992).

The recommended weight-loss technique includes restricting caloric intake while maintaining nutrient requirements, and participating in regular exercise (ACSM, 1995). This technique allows a person to lose fat weight and slows the rate of fat-free weight loss. Weight loss and body composition will also be discussed in the section on diabetes and obesity.

Acute and Chronic Diseases

As one ages, the prevalence of acute and chronic diseases increases. Of the non-institutionalized elderly population, 80% have a chronic condition, and 40% have some type of activity limitation due to a chronic condition (Pope & Tarlov, 1991). In 1990, the leading chronic diseases of older adults were arthritis, hypertension, heart disease, diabetes, and orthopedic impairments (Haber, 1994). Falls, which can result from a number of chronic and acute conditions, are prevalent among the elderly. In typical community-living environments, 25 to 33 falls occur per year for every 100 older adults. In nursing homes, where patients often have poor mobility or dementia, 1,600 falls occur per year for every 1,000 patients (Berg & Cassells, 1990).

Older adults with acute and chronic diseases can benefit from physical activity. Evidence of the benefits of physical activity in (a) arthritis, (b) diabetes and obesity, (c)

cardiovascular diseases, (d) osteoporosis and falls, and (e) cancer is examined in the following review of literature.

Arthritis. Arthritis is the most prevalent chronic disease in people 65 years old and older (Haber, 1994, Minor, 1991). About 80% of these individuals are affected by some form of arthritis (Spirduso, 1995). Arthritis is a disease affecting a joint, or joints, of the body, resulting in inflammation and/or degeneration of the joint. The most common form is osteoarthritis, which causes degeneration of cartilage and new bone growth around the joint. Osteoarthritis is the leading cause of mobility limitations in older adults (U. S. Department of Health and Human Services, 1996).

Many older adults with arthritis face a vicious cycle of joint pain, leading to inactivity, leading to more degeneration of the joint, leading to more pain (Spirduso, 1995; Vuori, 1995). During periods of acute pain and swelling, medication and rest are the recommended treatment. If inactivity is maintained during nonacute stages, muscular atrophy, decreased flexibility, cardiovascular deficits, poor endurance, depression, and a low pain threshold are problems that can develop (Ettinger & Afable, 1994; Minor, 1991). These problems often lead to low mobility and 45% to 75% less muscular strength than that of age-matched healthy individuals (Ekdahl & Broman, 1992). Furthermore, aerobic capacity has been shown to decrease from 15% to 40% in persons with arthritis (Minor, 1991). In a summary of arthritis exercise-intervention studies (Minor, 1991), health improvements included (a) increased aerobic capacity (12% to 21%), (b) increased muscular strength (0% to 55 %), (c) a significant increase in flexibility, and (d) decreased number and severity of painful or swollen joints (0% to 41%).

Appropriate physical activity can benefit a person with arthritis in several ways (Ettinger & Afable, 1994; Spirduso, 1995; U. S. Department of Health and Human Services, 1996; Vuori, 1995). An increase in strength and flexibility assists in reducing pain and increasing movement. An increase in aerobic capacity improves the cardiovascular system and assists in maintaining proper weight, which reduces the force on the joints (Messier, 1994). The sense of well-being is improved by decreasing depression and decreasing joint pain (Minor & Brown, 1993).

Researchers found that physical activity programs can benefit persons with arthritis during nonacute pain periods. The International Scientific Consensus Statement (1995) and review article by Vuori (1995) recommended moderate, individualized physical activity as part of a secondary preventive program for persons with inactive chronic degenerative or inflammatory diseases.

Diabetes and obesity. Diabetes is a disease associated with the body's ability to control blood glucose levels (ACSM, 1995). There are two major types of diabetes: (a) insulin dependent and (b) non-insulin-dependent. Non-insulin-dependent diabetes is more prevalent in older adults. It is estimated to affect one out of five persons over age 65, but many cases are undiagnosed (Harris, 1990). Poorly controlled diabetes can lead to cardiovascular disease, in both large and small vessels, which may result in heart disease, skin ulcers, and blindness (Laws & Reaven, 1991). Other effects of uncontrolled diabetes include pain and numbness in the extremities, abnormalities in blood pressure and heart rate, and increased chance of infection (Laws & Reaven).

In a longitudinal study (Kohl, Gordon, Villegas, & Blair, 1992) involving 715 men (mean age 42 years), the risk of death increased with a high glycemic level and a low level of cardiovascular fitness. No matter what the glycemic level, physically fit men had lower age-adjusted all-cause death rates than did physically unfit men. In a longitudinal study (Manson et al., 1991) involving 87,253 women (ages 34 to 59 years), physical activity and incidences of diabetes were examined. The incidence of non-insulin-dependent diabetes was lower in physically active women. The association of higher levels of physical activity and decrease in diabetes (or glucose intolerance) also has been observed in several other studies (Helmrich, Ragland, Leung, & Paffenbarger, 1991; Horton, 1991; Reaven, Chen, Hollenbeck, & Chen, 1989; Wang et al., 1989). Furthermore, improvements in glucose tolerance were observed in men with mild non-insulin-dependent diabetes after 1 week of prolonged exercise (Rogers et al., 1988).

In a review of studies dealing with physical activity, glucose tolerance, and diabetes in older adults, Laws and Reaven (1991) found that when researchers controlled for obesity, physical activity level and general health, age was not found to be a cause of glucose intolerance.

An exercise program is recommended as a part of every elderly diabetic's individualized treatment plan (Henry & Edelman, 1992). Physical activity needs to be regular to sustain a benefit and to control glucose levels (Laws & Reaven, 1991). Both epidemiological and clinical trial studies have indicated that physical activity decreased the risk of developing diabetes and benefited the person with diabetes, particularly the non-insulin dependent (U. S. Department of Health and Human Services, 1996).

Obesity is often a coexisting factor in non-insulin-dependent diabetes (Spirduso, 1995). In women with diabetes, aged 65 to 74, 25% are obese, whereas in the same age group without diabetes, 15% are obese (Henry & Edelman, 1992). In men with diabetes, aged 65 to 74, 6% are obese, whereas in the same age group without diabetes, 1.5% are obese (Henry & Edelman, 1992). Obesity refers to percentage of body fat at which disease risk increases (ACSM, 1995), often defined as a body mass index of above 30% for women and above 25% for men (Spirduso, 1995).

Exercise is beneficial to increasing energy expenditure and slowing down the rate of fat-free-mass loss that occurs with diet alone (U. S. Department of Health and Human Services, 1996). Exercise assists in maintaining the resting metabolic rate and maintaining the rate of weight loss (ACSM, 1990). These factors are important in providing safe weight-loss programs for the obese.

Gillett, White, and Caserta (1996) conducted a randomized fitness education and exercise study with sedentary, obese women ($N = 182$), 60 to 70 years old. Significant improvement in aerobic power ($p > .001$), percentage of body fat ($p > .05$), and dominant-hand grip strength ($p > .001$) was found in the aerobic exercise group. Written comments by the subjects indicated improvements in function such as range of motion, mobility, and strength, as well as improved sleep, increased energy, better posture, and enhanced stress management. This study supported conducting health education and exercise programs for older obese adults to improve health.

Although obesity is not common in the elderly population (Henry and Edelman, 1992), the high prevalence among people with diabetes presents a health concern. Older

obese persons can participate safely in an exercise program. In mild cases of non-insulin-dependent diabetes, weight loss and increased physical activity levels often are enough to control the disease (Berger & Berchtold, 1982; Henry & Edelman, 1992).

Cardiovascular disease. Cardiovascular disease is any disease that affects the heart or blood vessels of the body. Among the elderly, both hypertension (37%) and heart disease (29%) are prevalent chronic ailments (Haber, 1994). In the United States, cardiovascular disease is the leading cause of death, and more than 80% of those deaths occur in the elderly (National Center for Health Statistics, 1995a).

There is strong epidemiological evidence that regular exercise, of moderate intensity, reduces the risk of cardiovascular disease (Blair et al., 1989; Donahue, Abbott, Reed, & Yano, 1988; Elward & Larson, 1992; Fletcher et al., 1992; Pate et al., 1995). In a meta-analysis of 27 studies, Berlin and Colditz (1990) analyzed physical activity and coronary heart disease. They found an association between lack of physical activity and increased risk of coronary heart disease. When the highly active and the sedentary were compared, a dose-response relationship between physical activity and protection from coronary heart disease was supported. Those who exercised more had lower risk of coronary disease.

After an acute aerobic workout, elderly men and women were found to have a lower systolic blood pressure for up to 5 hours post exercise compared to a no-exercise group (Rejeski, Neal, Wurst, Brubaker, & Ettinger, 1995). In the same study, a weight-lifting group was found not to have lower systolic blood pressure after exercise. Aerobic exercise was beneficial in lowering blood pressure post exercise.

The treatment of hypertension is very individualized, and responses to particular treatments vary (Bouchard & Despres, 1995). Not every person with hypertension decreases his or her blood pressure through a physical activity program. Endurance-training studies dealing with subjects over 60 years of age have shown decreases in blood pressure readings similar to those of younger persons (Hagberg, 1989). Thus, physical activity would appear to be a nonpharmacological approach to treating mild to moderate cases of hypertension in the elderly.

Osteoporosis and falls. Osteoporosis is a disease of the bones caused by a decrease in bone mass (Spirduso, 1995). Low bone mass makes the bone susceptible to fracture risk, and fracture risk is increased with a fall (Spirduso, 1995). Osteoporosis is more prevalent in women than in men because women have an initial lower bone mass, their bone loss proceeds at a greater rate, and occurs earlier (Smith & Gilligan, 1989; U.S. Department of Health and Human Services, 1996; Vuori, 1995).

In an assessment of the risk of hip fracture in women, several factors were found that increased the chance of such fractures (Cummings et al, 1995). Risk factors were a maternal history of fractures, self-rated poor or fair health, fewer than 4 hours per day spent on their feet, and the inability to get out of a chair without using their arms. Suggestions for decreasing the risk of hip fracture included maintaining body weight, walking for exercise, and treating impaired vision.

In a study of sedentary, 5-year postmenopausal women, age 50 to 70, high-intensity strength training was found to decrease risk factors for osteoporotic fractures (Nelson et al., 1994). High-intensity strength training preserved bone density while

improving bone mass, strength, and balance. It also was observed that the women increased their physical activity. It may be that when the women's strength increased, they were more capable or motivated to be physically active. This study supported the hypothesis that increased strength may lead to a more active lifestyle in older women.

Province et al. (1995) studied the effect of a variety of short-term exercise programs on the reduction of falls and related injuries in subjects 60 to 75 years old. Results indicated that benefits of exercise in reducing falls persisted after the supervised exercise intervention. Balance-training exercise significantly reduced falls.

Physical activity benefits the skeletal system and maintains the fitness components important to reducing falls. Exercise benefits not only the bone but also muscular strength, flexibility, reaction time, and balance, which are other risk factors associated with falls (Smith & Tommerup, 1995; U. S. Department of Health and Human Services, 1996). Thus, a twofold effect is achieved by decreasing the incidence and severity of falls, and improving or maintaining bone health. Improving the musculoskeletal system of older adults also seems to instill in them more confidence in their functional capacity and independence (International Scientific Consensus Conference, 1995).

Cancer. Cancer is a disease of uncontrolled growth of malignant cells and/or tumors that can spread to various sites of the body. In 1994, the United States had an estimated 1.21 million new cases of cancer, and .54 million people died from the disease (Boring, Squires, Tong, & Montgomery, 1994). Several epidemiological studies have suggested a link between inactivity and increased risk of cancer (Blair et al., 1989; Lee, Paffenbarger, & Hsieh, 1991; Rakowski & Mor, 1992).

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In a review article on exercise, cancer, and immune function, Lee (1995) stated that it appears that moderate physical activity can enhance the immune system and thus the biological potential to decrease the risk of cancer. The International Consensus Statement on Physical Activity, Health and Well-Being stated that physical activity decreased the risk of colon cancer and may reduce the risk of developing breast cancer (International Scientific Consensus Conference, 1995). Further, the U.S. Department of Health and Human Services (1996) found that physical activity was associated with a decreased risk of colon cancer, but other cancer research has been too limited to support forming a conclusion.

Other studies dealing with male reproductive cancers, female reproductive cancers, and rectal cancers have been inconclusive about the effect of physical activity and getting cancer (Lee, 1995). In a recent review of estrogen-dependent cancers in women, evidence supported the use of physical activity, at low-to-moderate levels, as a preventative technique (Kramer & Wells, 1996). Exercise also may have a positive psychological effect on the patient with cancer and may improve the patient's quality of life (Peters, Lotzerich, Niemeier, Schule, & Uhlenbruck, 1994).

There has been limited research on physical activity and the patient with cancer, especially the older adult (Lee, 1995). Although some trends have been noted, the evidence is inconclusive and further research needs to be conducted.

Psychosociological Aspects

Psychological and social aspects of health do not have one accepted definition, but they include such factors as feeling good, high self-esteem, positive mood, reduced

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depression, reduced anxiety, and good cognitive functioning (Biddle, 1995). The statement of the International Scientific Consensus Conference (1995) affirmed that exercise has a beneficial effect on mood, anxiety, depression, psychological stress, and psychological well-being, and it also may enhance cognitive functioning.

In a British study (Emery, Huppert, & Schein, 1995) the relationships among age, exercise, health, and cognitive function were examined in 6,979 men and women age 18 to 94 years. The results indicated that physical activity had a high association with maintaining or enhancing cognitive performance among older adults. Also, there was an interaction between physical health and exercise that was important in cognitive functioning, but the mechanism was unclear.

In a 14-month study dealing with aerobic exercise training, Blumenthal, Emery, Madden, Schniebolk, et al., (1991) found few improvements in cognitive performance with an increase in aerobic capacity. The subjects were functioning at high levels of cognition and health. Thus the small gains seen in cognitive performance may have been due to the initial high levels. The authors commented that exercise training may produce greater improvements among elderly adults with a lower level of health or elderly adults with emotional impairments. Similar results were found by Emery and Blumenthal (1991). A possible reason for the apparent lack of improvement was an insufficiently sensitive instrument. Subjective data from the older adults indicated a perceived significant change in cognition after regular exercise, but objective measures indicated no significant change.

Brassington and Hicks (1995) studied 79 healthy Caucasian men and women, age 60 to 83 years, to determine the effect of exercise on sleep quality and psychological

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factors. The exercise group was found to sleep significantly longer at night and to take fewer naps during the day. The exercise group also reported significantly fewer symptoms of anxiety, depression, stress, and minor physical stress-related symptoms than did the sedentary controls.

King, Taylor, and Haskell (1993) found that the format or intensity level of the exercise program did not matter in attaining psychological benefits. Regardless of the format or intensity, greater participation in exercise significantly reduced anxiety, perceived stress, and symptoms of depression. These benefits were acquired even if fitness or body weight were unchanged. Other researchers (Brown & Wang, 1992; Martinsen & Stephens, 1994) also have found that increases in cardiovascular fitness were not necessary to gain psychological benefits from physical activity.

Research on physical activity and psychosociological benefits in the older adult population has been limited. The lack of a consistent definition of physical activity and a lack of sensitivity in the measuring instruments pose problems in this area of research (Dishman, 1994).

Medical Costs

The research on cost-effectiveness of older-adult exercise programs as preventive measures to improve health and well-being has been limited. Although physical activity has been recognized to improve both the quality and the length of life (Vogt, 1994), cost-effectiveness has not been proven. Fries et al. (1993) stated that health care costs need to be contained through health promotion and preventive cures. Education about health decisions increases individuals confidence and has been shown to decrease long-term

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health care costs. According to Fries et al., about 18% ($7,200) of life-time health care costs ($40,000) are incurred during the last year of life.

Schneider and Guralnik (1990) stated that the average Medicare outlay increased with age, and they expected that Medicare costs will triple by the year 2020. The success of containing health care costs in the older population depends on the ability to prevent and/or cure those age-dependent diseases and disorders that produce the greatest needs for long-term care. In 1991, a person who reported excellent health had an average of $1,181 in Medicare costs, whereas a person in poor health had an average of $7,143 in Medicare costs (National Center for Health Statistics, 1995a). If older adults are kept healthy through prevention programs such as physical activity, medical costs will be reduced.

The rapid growth of the 65-plus population does not necessarily mean increased health care costs. The United States spends the highest percentage of gross national product on health care of any country, but it does not have the greatest life expectancy. In U.S. dollars (1992 per capita health expenditures), the United States averaged $3,086; Canada, $1,949; Germany, $1,775; and Japan, $1,376 (National Center for Health Statistics, 1995a). Yet a male's life expectancy in the United States lags behind that in Japan by 4.4 years, in Canada by 2.4 years, and in Germany by 0.7 years. This demonstrates a lack of relationship between health care cost and life expectancy. Furthermore, the increase in the elderly population between 1980 and 1990 was 30% for Japan and 10% for the United States. Yet, health care cost rose 1.6% of the gross

domestic product in Japan, whereas in the United States health care cost rose 31.5% of the gross domestic product (Marwick, 1995).

As part of the Manitoba Longitudinal Study of Aging, Roos and Havens (1991) estimated the total health care costs of individuals according to their health status. The study involved 3,573 individuals aged 65 to 84 in 1971. Over a 14-year period (1970-1983), health care costs were recorded for the subjects. Those who aged successfully, that is maintained their independence, used less than $10,000 for the 14-year period ($736/year). Subjects who were dependent used $53,906 for the 14-year period ($3,850/ year), proof of cost savings through maintaining independence as one ages.

Benefits of regular physical activity programs include improvements in the cardiorespiratory system, muscle tone, and bone integrity, as well as reduced insomnia. These benefits are viewed as cost-effective in nursing homes in that they decrease surgical procedures and medications and increase the ability of residents to perform activities of daily living (Lilley & Jackson, 1993).

The expense of preexercise screening often has been a concern in starting an exercise program. Medical screening has been recommended for older individuals pursuing a vigorous exercise program. A symptom-free older adult who wishes to start low-intensity physical activity such as gentle walking or light gardening would not need an extensive and costly screening (Shephard, 1993). Such a person should start low-intensity exercise with gradual increases in intensity, frequency, or duration.

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Independence and Quality of Life

Independence is the ability to take care of oneself. Maintaining independence is a high priority for the older adult in achieving a quality life. Shephard (1993) emphasized the need to incorporate physical activity into the older adult's life to enhance the quality of life by improving physiological and psychological functions that assist in maintaining independence. Furthermore, physical activity reduces the risk of chronic disease and minimizes the symptoms of acute and chronic disease and the demand for health care for these diseases.

In a review article, Stewart and King (1991) evaluated the influence of physical activity on the quality of life of older adults. Few studies were found to review these various concepts and attest to a need for research in these areas. The studies that were found were promising in supporting a positive relationship between physical activity and quality of life. As one ages, positive changes in functioning and well-being contribute to independence and provide a higher quality of life.

Stewart, King, and Haskell (1993) studied the effect of exercise on the quality of life through a 12-month exercise program with 194 healthy sedentary men and women (ages 50 to 65). Physical health scores were greater with higher levels of physical activity, regardless of the type or intensity of exercise done. Psychological well-being was not found to be related to levels of activity, but this may have been due to the instrument's lack of sensitivity for healthy, motivated subjects. The results showed that exercise increased quality of life. It should be noted, however, that no baseline measures were taken on the quality-of-life measurements, nor was a control used to compare the results.

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The benefits of physical activity should be evaluated in terms of the values and needs that are specific to a given age group. For the elderly, being able to spend more or better time with grandchildren and loved ones, to function at a higher level on a day-to-day basis, and/or to recover from illnesses and injury more quickly are prime concerns when considering elements of the quality of life (Elward & Larson, 1992).

Determinants of Participation in Physical Activity by Older Adults

Certain personal and sociodemographic characteristics have been recognized in predicting physical activity habits in the older adult. These characteristics are referred to as determinants of participation in physical activity. Although determinants for older adults have not been as well researched as determinants in other age groups (Dishman, 1994), certain characteristics have been commonly observed. The following section contains a discussion of determinants in three areas: (a) general determinants of physical activity, (b) determinants of participation for older adults, and (c) barriers to physical activity.

General Determinants of Physical Activity

King et al. (1992) reviewed the determinants of physical activity patterns of adults. In that review of literature, King et al. emphasized several determinant categories, including demographics, knowledge/beliefs, psychological/behavior, program/regimen, and environmental determinants. General demographic factors were as follows: (a) men were more active than women, (b) physical activity decreased with age, (c) Black women were less active than White women, (d) adherence levels of persons with blue-collar

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The knowledge/beliefs determinants (King et al., 1992) included knowledge of benefits and perception of barriers. Knowledge of the health benefits of physical activity was associated with the initial adoption of physical activity but not with maintenance of physical activity. Low participation in exercise and high program dropout were found in persons who believed exercise had little value for health (Dishman, 1991). Believing that one's health was poor was associated with less physical activity. Intention to exercise was not predictive of actual participation in physical activity, but self-efficacy was related to the adoption of physical activity and maintenance of moderate levels of physical activity. The perception of physical activity facilities affects physical activity level, particularly among the elderly population (Shephard, 1987). Lack of time was the reason most frequently given for a lack of physical activity (Dishman, 1991). In many cases, a lack of interest in or commitment to being active was the real reason for inactivity. The enjoyment and satisfaction perceived in physical activity predicted higher levels of activity or adherence to a monitored exercise program (Dishman, 1991).

Psychological/behavioral attributes relate to individual variables that are generally stable over time and across situations (Dishman, 1991; King et al., 1992). High self-motivation has been found to correlate with higher activity levels. Self-motivation has

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been attributed to the ability of the participant to set goals, monitor progress, and reinforce participation in physical activity.

Program and regimen factors, monetary costs, convenience of the program site, and transportation problems influence physical activity (U.S. Department of Health and Human Services, 1996). Gender differences in preferences regarding the type of program offered have not been researched sufficiently, and few researchers have looked at racial, ethnic, or older adults' preferences regarding physical activity programs (U.S. Department of Health and Human Services, 1996).

Environmental factors, both social and physical, have been found to be associated with participation in physical activity (King et al., 1992). Family support has been shown to increase women's participation. Staff support of participants has been shown to increase participation during the program and has some long-term effects. King et al. also found that physical factors related to increased participation included the closeness of the exercise facility, weather, and neighborhood safety.

Determinants of Participation for Older Adults

Determinants of participation in physical activity for older adults are similar to those for younger adults. Wolinsky, Stump, and Clark (1995) found increased levels of physical activity in participants who had (a) more nonkin support, (b) a better sense of controlling their health, (c) a higher level of education, and (d) a lower body mass. Men were found to be more likely than women to get enough and regular exercise. Low levels of physical activity were found in persons with lower-body limitations, poor health, and

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worries about their health. Physical activity was found to be associated with better health outcomes.

Clark (1995) used the Longitudinal Study on Aging to compare racial and educational differences in physical activity levels in adults aged 70 and older. White and African Americans had low levels of physical activity as compared to younger adults. The African Americans were less physically active than the Whites, but the majority of racial difference was accounted for by differences in education. Persons with 8 or fewer years of education were found to be less active than those with 9 or more years. Clark indicated that lower education may have factored into low self-efficacy. Low self-efficacy resulted in less confidence in the ability to perform physical activity.

Seeman et al. (1994) looked at baseline determinant changes over a 3-year period in a high-functioning elderly cohort (70 to 79 years). At baseline, individuals with higher physical performance levels were characterized as male, White, with higher income, higher education, and fewer chronic diseases. After 3 years, individuals with a decrease in performance were older, with lower income (under $10,000), higher education, high relative weight, high blood pressure, low peak expiratory flow, diabetes, a number of health problems, and a number of hospitalizations during the 3-year period. These characteristics were consistent with those cited in previous reports, except for education level. Although the performance of participants with higher education did decrease, their performance was still higher than the mean performance of the whole group. The study supported the belief that declines in physical performance can be predicted through sociodemographic and health characteristics. Also, the researchers found improvement in

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some physical performances, indicating that aging was not associated with a uniform decrease in physical performance.

Fitzgerald, Singleton, Neale, Prasad, and Hess (1994) compared activity level, fitness status, exercise knowledge, and exercise beliefs in older women. White women had higher fitness status than African American women and were more physically active, but not significantly so. In regard to exercise knowledge, responses to two statements differed significantly by race. On one statement, "Older people should avoid vigorous exercise," White women disagreed with the statement significantly more than did African American women. On the second statement, African American women indicated it was hard to stick to a regular schedule of physical activity significantly more than did White women. All women tended to overestimate the amount of exercise needed to maintain aerobic fitness. This may be a barrier to getting women to become active. Furthermore, both groups indicated it was important to exercise, but 58% of the African American women and 43% of the White women said they had been inactive during the previous week. This finding supported previous studies-- that intention to exercise or value of exercise did not lead to participation.

In examining the determinants of functional health in 179 older adults (65 to 99 years), Duffy and MacDonald (1990) found that the oldest old-age group (85-plus) exercised the most. Although this group had the lowest Activities of Daily Living scores, they exercised the most, which supported the idea that regular activity was an important factor in living longer.

In Canadian studies on older adults, Shephard (1994a) reported several determinants that influence levels of physical activity. As subjects aged, their physical activity decreased, except right around the time of retirement, when there was a slight increase. In the 65-plus age group, reasons to exercise were similar in men and women. Higher socioeconomic status was associated with higher activity. Possible reasons for this relationship were greater education, a greater awareness of benefits from exercise, stronger social norms for active leisure, greater access to transportation, and greater access to physical activity environments. Older adults who perceived little control over the choice to be active were less active. The sense of control seemed to decrease as physical disabilities developed. Persons with physical disabilities were found to be less active. Physicians had the greatest influence in encouraging older adults to have a regular aerobic exercise routine but were slack in promoting exercise to their patients.

Barriers to Physical Activity

Barriers to physical activity may be actual or perceived and are interrelated with determinants of physical activity. Common barriers for older adults include transportation, finances, safety and access to facilities, and myths.

The World Health Organization (Chodzko-Zajko, 1997) compiled a list of barriers to participation in physical activity among older persons. Lack of information about physical activity and aging is a barrier not only for the individual but also for family members, care givers, and society. Low social support and low social norms toward a healthy lifestyle are not supportive of a physically active lifestyle for older adults. Inadequate resources--transportation, facilities, access to facilities, and unsafe

environments--limit older persons' ability to be physically active. Negative attitudes or bad experiences in sport or physical activity also are barriers to increased physical activity.

Lack of transportation to physical activity sites is a barrier for older adults (Carter, Elward, Malmgren, Martin, & Larson, 1991; Dodge, Clark, Janz, Liang, & Schork, 1993; Flatten, Wilhite, & Reyes-Watson, 1988; Kimble & Longe, 1989; Shephard, 1994a). Many older adults no longer drive because of declining eyesight, other disability, or vehicle-upkeep cost. Public transportation either is not available or is inaccessible because of high steps onto buses.

Lack of sufficient funds to participate in physical activity often is given as a reason for inactivity (Flatten et al., 1988; Kimble & Longe, 1989; Shephard, 1994a). Before retirement, company-sponsored physical activity programs are available or are partially funded through the worksite. At retirement, these opportunities no longer are available. Living on a fixed budget further limits retirees' ability to spend money on high-priced athletic shoes, equipment, or membership fees when more basic needs (food, shelter, medications) must be covered first. To minimize costs, older adults use more self-initiated physical activity programs, such as walking and gardening.

Safety and access to facilities are major concerns of the older adult (Kimble & Longe, 1989; Shephard, 1994a). Physical limitations and chronic disease often cause older adults to feel vulnerable. The fear of injury and chance of a heart attack are reasons some older adults give for no or low physical activity (Weinstein, 1988). Unsafe neighborhoods or facilities with poor accessibility for a person with a disability also are concerns. The reluctance of older women to exercise alone, and the dislike of public

changing facilities, were found to be barriers in an Australian study (Lee, 1993). Parking lots close to facility entrances, well-lit entrances and physical activity rooms, nonglare surfaces, slip-resistant flooring, and nearness of rest rooms made for user-friendly facilities for older adults.

Myths about aging and physical activity are another barrier. Much of the public views retirement as a time of rest and less need for exercise (Weinstein, 1988). Although the situation has improved, the medical profession has not emphasized the importance of keeping physically active as one ages (Shephard, 1994a; Weinstein, 1988). Too often, health care professionals emphasize medical treatment of disease and not prevention techniques (Hickey & Stilwell, 1991).

Acknowledging the determinants of physical activity in older adults is important in developing a program that is relevant to the participant. Older adults need to believe that a program is accessible and safe, and to understand the potential benefits of physical activity. Gender, race, education, income, knowledge, beliefs, and attitudes affect physical activity and maintenance of an active lifestyle. These determinants need to be taken into consideration in designing programs. The transtheoretical model uses a self-identified readiness to change behavior that is an accumulation of the individual's determinants. When an individual's personal demographics and readiness to increase physical activity are identified, appropriate strategies can be incorporated into the physical activity program so that the individual can progress toward a more active lifestyle.

Chapter 3

METHODS

Physical inactivity has been recognized as a health risk factor in the United States and is a major concern of health professionals (U.S. Department of Health and Human Services, 1991). Low-income and elderly populations have been identified as "at risk" because they lack appropriate physical activity levels.

The transtheoretical model provides a testable framework for systematically developing, testing, and refining behavior-change programs in the area of physical activity. The model has been used in behavior-change programs, including physical activity programs, but it has not been used with low-income elderly populations. This researcher investigated the effect of a physical activity program designed in accordance with the transtheoretical model on the physical activity levels of low-income elderly adults.

The transtheoretical model has two components: stages of change (readiness to change a behavior) and processes of change (strategies to change a behavior). A successful intervention would advance a person's stage of change toward a more active level. It was hypothesized that subjects who received a physical activity program based on the transtheoretical model would advance their stage of change and sustain that stage of change for at least 2 months postintervention. It also was hypothesized that subjects in the later two stages of change (action and maintenance) would use more behavioral

processes of change than the subjects in the first three stages of change (precontemplation, contemplation, and preparation). The research questions for this study were:

1. Do low-income elderly individuals exposed to a 15-week intervention designed in accordance with the transtheoretical model (a) sustain, advance, or regress in their stage of change toward a more active lifestyle, and (b) change more than a group of controls who do not receive the treatment condition?

2. Do low-income elderly individuals exposed to a 15-week physical activity intervention based on the transtheoretical model sustain, advance, or regress in their stage-of-change level 2 months after the intervention?

3. Do low-income elderly adults who identify their stage of change as action or maintenance use more behavioral processes of change than those who identify their stage of change as precontemplation, contemplation, or preparation?

Research Design and Variables

Research Design

A pretest-posttest and nonequivalent control group with a delayed treatment were used to answer the research questions. Experimental sites 1 and 2 followed the same intervention protocol (see Appendix C), but site 2 was 7 weeks behind site 1.

Initially, the nonequivalent control group with a delayed treatment design was selected for use in this study. Because of the difficulty of obtaining subjects, a third site was recruited as an experimental site. With this addition and the associated time constraints of the study, an overlap of treatment occurred between the control site and the second experimental site. The addition of another site and the corresponding delay in

treatment compromised the nonequivalent control group design. To optimize the potential of the study to answer the research questions, given the difficulties encountered in obtaining volunteers, a pretest-posttest design was added to the study. Although sample sizes were small, comparison of treatment effect between the experimental 1 group and the control group preserved the internal validity of the nonequivalent control group design. Addition of the pretest-posttest design elevated the sample size through three replications over an extended period of time and provided a measure of control over possible seasonal effects.

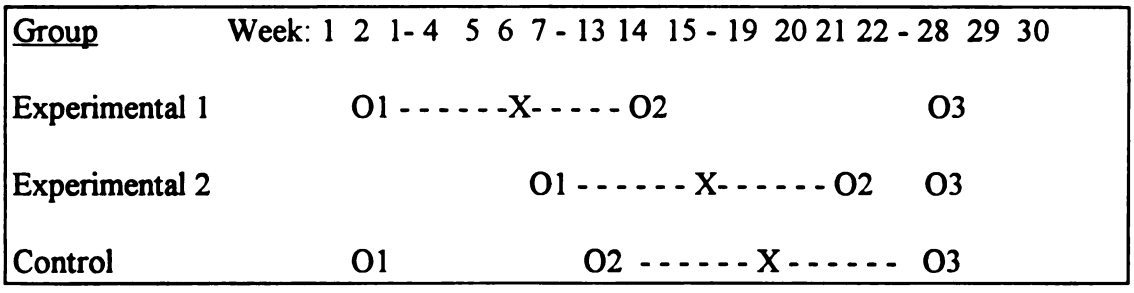

Figure 1. Research design.
X = 15-week intervention; O1 = Pre-evaluation; O2 = Post I evaluation; O3 = Post II evaluation.

The nonequivalent control group with a delayed treatment design controls for internal validity in the areas of history, maturation, testing, and instrumentation (Campbell & Stanley, 1963). The preintervention evaluation (see Appendixes D, E, and F) and postintervention evaluation instruments (see Appendixes D, G, and H) were the same for all groups and were completed independently by each subject. The control group received the same measures as experimental site 1 but did not receive the treatment until later.

The pretest-posttest design has poor interval validity in that testing, maturation, and history can be confounded with treatment effect (Campbell & Stanley, 1963). The

interval between pretest and posttest was 15 weeks. Because of this lengthy period and the self-report format of the evaluation forms, the effect of testing was minimized. To control for maturation, the three evaluation forms (preintervention, postintervention I, and postintervention II) were administered to all treatment groups at the same time relative to the intervention protocol. Administering the intervention at three different times, spanning two seasons over a 6-month period, decreased the likelihood of an effect due to history. With the combination of the nonequivalent control group design and pretest-posttest design, the negative influences of history and maturation on internal validity were minimized.

External validity problems in the nonequivalent control group design include interaction of testing and intervention, and interaction of selection and intervention (Campbell & Stanley, 1963). The first problem, interaction of testing and intervention, was controlled for by administering intervention evaluation forms to subjects in all groups at the same point in their intervention protocol. The control site subjects completed the Processes of Change Questionnaire (see Appendix G) two times, once before and once after treatment. The postintervention II Processes of Change Questionnaire was not used, however, in the analysis of data relative to question 3. The second problem was a limitation rather than a problem of control in that the subjects were volunteers and therefore a population rather than a sample. The external validity problems in the pretest-posttest design were the same as in the nonequivalent control group design.

Because the subjects included in the study were not randomly selected, the results may be generalized only to volunteer participants with similar demographic characteristics.

Accordingly, the problems of selection were minimized (Weiss, 1972). Data on demographic characteristics (e.g., age, gender, race, education) that have been shown to affect the physical activity level of adults (Clark, 1995; King et al., 1992; Wolinsky et al., 1995), were collected to help describe the nature of the volunteer participants.

Variables

The dependent variable for Research Questions 1 and 2 was the stage of change. The independent variable was the experimental treatment (promotion and publicity, the health fair, educational programs, and physical activity programs).

The dependent variable for Research Question 3 was variation in the behavioral processes of change. The independent variable was the stage of change measured at two levels (early stages compared to late stages).

Intervention

The intervention (see Appendix C) consisted of a 3-week promotional and recruitment period followed by a 15-week educational and physical activity program entitled "Unlock the Door to Better Health, Physical Activity Is the Key" (see Appendix I). The 15-week program included a health fair, educational programs, a chair exercise program, and a contract physical activity program (see Appendix I). All intervention events were held at the housing sites, in the community room, library, or game room. The investigator led all intervention events except two chair exercise sessions per site (six total). A trained graduate student substituted at those sessions. The same graduate

student measured height and weight at the health fair and helped two subjects who had visual impairments to perform the chair exercises correctly.

Site Selection and Sample

Selection of Residential Sites

Nine low-income elderly housing units (see Appendix A) within the Tri-County Office on Aging in Michigan (Clinton, Eaton and Ingham counties) constituted the population of sites for the study. Criteria used to select sites were (a) a minimum of 100 living units, (b) head of household at least 62 years of age, and (c) a room large enough to accommodate 30 chair/wheelchair exercise participants.

Selection Process

Each housing unit, in the pool of qualifying units, was assigned a number. Originally, the investigator randomly selected two housing units (numbers 1 and 2) from the pool and sent an information letter (see Appendix J) about the study to the housing site manager. One week later, the investigator telephoned the manager to answer questions and schedule an informational meeting. At this meeting, the investigator explained the study, answered questions, and obtained approval to conduct the study. The two consenting sites were then randomly assigned to control and experimental sites.

An insufficient number of subjects volunteered at the experimental site (see following section entitled Recruitment). Accordingly, the third randomly identified housing site was selected from the pool. That site was contacted, and the same protocol

was followed as in the original two housing units. Upon consenting to participate, the third housing site became experimental site 2.

The total pool of nine housing sites comprised 1,568 low-income residential housing units. The three randomly selected housing units represented 518 units, approximately one-third of the total units. A comparison of the demographics of the three housing sites is presented in Table 1.

Table 1. Housing Site Demographics

Site	Number of Units	Maximal Income Single	Average Age (Yrs.)	Race % White	Gender % Female
Exper. 1	100	$24,700	71.0	90.0	89.0
Exper. 2	220	$17,000	65.0	70.0	85.0
Control	200	$24,700	72.4	92.5	81.0

Recruitment

After procuring the experimental and control sites, the researcher sent an informational letter (see Appendix K) to all residents, inviting them to join the free physical activity program. Informational meetings were held, during which active recruitment was initiated. At that time, the intervention program and incentives were explained. Volunteer participant and managers were asked to promote the program and recruit other residents.

The targeted sample size was 50 subjects per site. That number of subjects was estimated to be sufficient to answer the study questions while allowing for mortality of some subjects. Because 50 subjects were not recruited at the first experimental site, it was necessary to obtain a second site. The same recruitment procedures were used at all sites.

Subjects

All residents of each housing site were eligible to participate in the study. Although the housing sites were designated for the elderly, the researcher learned that some younger individuals (< 60 years, who had a disability) were eligible to live in these housing units. These residents were allowed to participate in the study, but their data were not used.

A total of 103 residents (61 experimental and 42 control) signed informed-consent forms. Of the 103 consenting volunteers, 52 did not meet all of the criteria for inclusion in the study. The standards for inclusion were: (a) age (at least 60 years of age), (b) completing the first evaluation form before the health fair, and (c) turning in all three evaluation forms (preintervention, postintervention I, and postintervention II).

To describe volunteers who joined late and those who signed consent forms but did not complete post intervention I and post intervention II evaluation forms, a participation-status form (see Appendix L) was used to indicate reasons why the study was joined late or not completed. Late subjects were defined as those who entered the program after the health fair. Reasons for accepting late entries were being ill at time of registration, being recruited by a friend after the health fair, attending the health fair aroused interest, or misplacing the informational letter about the program.

Instruments

Stages of Change

An adapted Stages of Change instrument designed by Marcus, Selby, et al. (1992) was used in the study. The adaptation used five levels of change and an updated definition

of regular physical activity or exercise. The definition used in this study was an accumulation of 30 minutes of moderate-intensity physical activity on at least 4 days of the week. This definition is the current recommendation of the Centers for Disease Control and the American College of Sports Medicine to acquire a health benefit through physical activity (Pate et al., 1995). The original definition used by Marcus, Selby, et al. was three or more times per week for 20 minutes or more at each time (ACSM, 1990). The original definition represented a fitness benefit rather than a health benefit. The health benefit standard was selected because it was consistent with the current ACSM guidelines and was more appropriate for older adults. The Stages of Change instrument was included in all three evaluation forms (see Appendix D) under the area of physical activity habits.

The reliability of the exercise Stages of Change instrument was tested by Marcus, Selby, et al. (1992). Reliability was determined by test-retest, using a worksite population over 2 weeks. A Kappa index of .78 was reported. This represents strong agreement between stages of change observed at both time periods (Flies, 1981).

An individual's assessment of his or her stage-of-change status is valid for no more than 6 months (Velicer, Hughes, Fava, Prochaska, & DiClemente, 1995). In this study, the stage-of-change status was assessed three times (preintervention, postintervention I, and postintervention II).

Concurrent validity for the stages of change was assessed with the Seven-Day Recall Activity Questionnaire (Marcus & Simkin, 1993). The original questionnaire (Blair, 1984) used an interview format and was adapted to written response format in the Marcus and Simkin (1993) study. In this study, a written Seven-Day Physical Activity

Recall instrument (see Appendix E) was used as in the Marcus and Simkin (1993) study. The recall instrument was used to identify the amount of time a subject spent in physical activity and compare it to the subject's stage of change.

In this study, adaptations to the original instrument (Blair, 1984) included (a) eliminating the sleep time, (b) adding examples of moderate and vigorous activities relevant to older adults, and (c) adding a calendar format to facilitate recall. Sleep time was not a factor that was to be analyzed in this study, so the question was eliminated. Because many older adults associate exercise with calisthenics or a formal exercise program, examples of other forms of physical activity were given (e.g., sweeping, gardening, and dancing) to help broaden participant's understanding of health-related levels of physical activity. The revised instrument was tested in a pilot study (see Appendix M) and later used in the preintervention evaluation form (see Appendix E).

Revised Physical Activity Readiness Questionnaire

The revised Physical Activity Readiness Questionnaire (rPAR-Q, Canadian Society for Exercise Physiology, 1994) (see Appendix F) was originally designed for persons 15 to 69 years of age. The rPAR-Q was designed to decrease the high proportion of apparently healthy older adults who were being screened out by the original PAR-Q. Cardinal and Cardinal (1995) tested the rPAR-Q on a population of 169 older adults (mean age 76.5 years) and found that the revised version of the PAR-Q screened out fewer older adults than did the original PAR-Q. The two tools were compared, and there was 78.7% agreement in exclusion or inclusion of potential participants (Cohen kappa = .50) (Cohen, 1977).

In attempting to promote physical activity for the older adult, decreasing barriers to participation is important. Some older adults perceive acquiring permission from a physician as a barrier to participating in a physical activity program. The rPAR-Q increases the accuracy of correctly identifying older adults who can safely participate in a low- to moderate-intensity physical activity program and decreases a barrier to participation. Cardinal and Cardinal (1995) did not advocate using the rPAR-Q as the exclusive admission criterion but advocated using the American College of Sports Medicine (1995) guidelines, which recommend the rPAR-Q as a minimal standard of entry into a low- to moderate-intensity exercise program. Medical clearance should be received by (a) people with a disease, (b) men over 40 or women over 50 who are planning to participate in a vigorous physical activity program, or (c) those with two or more major risk factors or symptoms of cardiopulmonary or metabolic disease (Shephard, 1994b). The present study involved low- to moderate-intensity physical activity programs; therefore the rPAR-Q was used.

Processes of Change

The Processes of Change Questionnaire (see Appendix G) was adapted from Marcus, Rossi, et al. (1992) to fit an elderly population. The original questionnaire was designed for a worksite population. Questionnaire items that referred to the worksite were changed to fit persons living in residential units for low-income elderly. The integrity of all other terms was maintained. The investigator conducted a pilot study (see Appendix M) on the Processes of Change Questionnaire for utility and reliability with a group of low-income older adults.

The transtheoretical model has been examined for conceptualizing the relationship between the 10 processes of change and hierarchical models such as the goodness-of-fit index (Marcus, Rossi, et al., 1992; Prochaska et al., 1988). Goodness-of-fit is an assessment of the proportions of the observed response pattern to the response pattern predicted by the model (Kirk, 1982). In a smoking-cessation study ($N = 970$), the two-factor model, experiential and behavioral, had the best goodness-of-fit index (GFI = .890) (Prochaska et al., 1988). The experiential factor consisted of five processes of change (consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation). The behavioral factor consisted of the remaining five processes of change (counterconditioning, helping relationships, reinforcement management, self-liberation, and stimulus control).

Marcus, Rossi, et al. (1992) found the same two-factor model ($N = 1,171$) to be the best fit for exercise in a worksite population. The correlation for exercise between the two-factor model and processes of change was .908. A value of .90 or above is considered an excellent fit. A one-way multivariate analysis of variance was conducted on the stage of change (independent variable) and 10 processes of change (dependent variable) (Marcus, Rossi, et al., 1992). The effect of stage of change was significant ($p < .001$). A univariate analysis of variance was conducted for each process of change, and all were significant ($p < .001$).

As indicated previously (Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992), the Stages of Change and Processes of Change instruments are reliable and valid. The two instruments assess the readiness of the individual to change a behavior toward more

activity and strategies to use to change a behavior from an inactive to a physically active lifestyle. For this study, only the behavioral processes of change were analyzed, but all processes of change were applied in the design of the intervention.

The investigator tested all instruments for reading ease and reading level in a pilot study using low-income elderly adults. The need for a pilot study became apparent after reading Davis, Crouch, Wills, Miller, and Abdehou (1990), who found a 5- to 7-year gap between reading comprehension and the readability of patient education materials. The average adult reading level in the United States is between sixth and seventh grade (Cardinal & Sachs, 1992). Instruments were adapted to adjust the reading level to eighth grade or below using the Flesch-Kincaid Grade Level computer test (Microsoft Word, Version 6.0). Reading ease was adapted to a score of 60 or above using the Flesch Reading Ease computer test (Microsoft Word, Version 6.0). Standard reading averages are between 60 and 70, with a higher score indicating more people can easily understand the reading material.

Pilot Study

A two-phase pilot project (see Appendix M) was conducted with 15 low-income older adult volunteers to verify the utility of all instruments. The degree to which the instrument items were understood was studied. In the first phase of the pilot study, seven female subjects completed the evaluation forms and identified words, phrases, or sentences that were unclear. Small revisions of the instruments (less complex or more common words) were completed. Also, print size was changed to a 14-point font (Times New Roman), which was the preferred print size of the pilot subjects.

The second phase established test-retest reliability for the Stages of Change and Processes of Change instruments. Eight female subjects completed the stage-of-change and processes-of-change sections of the evaluation form on two occasions, (4 days apart), to assess the test reliability. Test-retest reliability was .67 for the stages of change. Reliability for the processes of change was .39 using the Excel Microsoft Windows, version 3.1, correlation coefficient function. Between trials, the investigator learned that the pilot subjects had discussed how to respond to the test instruments. These discussions may have negatively affected the reliability of the instruments. Due to the interaction of subjects, small sample size, and an inability to replicate the pilot with a larger group, justification to use the instruments was based on prior research. Previous researchers strongly supported the use of the two instruments (Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992; Marcus & Simkin, 1993).

Data-Collection Plan

Informed Consent

After receiving approval to conduct the study from the University Committee on Research Involving Human Subjects (see Appendix N), the investigator contacted housing site residents. An introductory letter, a tentative schedule, a description of events, and an informed-consent form (see Appendix K), were distributed to all residents at the control and experimental sites. The information was placed under the resident's door or on a fastener on the door, according to the policy of the housing site. The week following distribution, two meetings were held at each site to explain the study, answer questions, assist with consent-form completion, and collect the completed forms.

The meetings were scheduled when the majority of residents were available on different days of the week. The dates and times were scheduled with the advice of the housing site manager to avoid conflicts with other programs. All meetings were led by the investigator and held in the community room, game room, or library. The investigator's telephone number was provided incase residents preferred to ask questions confidentially or were unable to attend either meeting. Residents also could turn in the consent form to the housing site's office. At each site a secured box was provided to store forms and maintain confidentiality.

Pre- and Postintervention Evaluation Form

The investigator distributed the preintervention evaluation form and postintervention evaluation forms (I & II) using site distribution procedures. The preintervention evaluation form (see Appendixes D through F) consisted of five parts: daily living activities, physical activity habits (stage of change), personal information (demographic data), exercise record (Seven-Day Physical Activity Recall), and the revised Physical Activity Readiness Questionnaire (rPAR-Q). The postintervention evaluation forms (see Appendixes D, G, and H) consisted of daily living activities, physical activity habits (stages of change), personal information (demographic data), processes of change questionnaire and 7-day physical activity record. Demographic data were collected three times to verify changes in health status and medications that could influence participation in physical activity. These data also proved valuable in identifying subjects who forgot to write their names on one of the evaluation forms.

All instruments involved checking a response, writing a short answer, or recording the amount of physical activity during a 7-day period. Data collection took place at the housing site in the privacy of the subject's own housing unit or in a public room of the housing site (community room, game room, or library). To assist participants in reading, understanding, and completing the forms, small-group sessions were held. At each session, the investigator answered questions and, if desired, read the items out loud. The investigator assisted residents with all phases of form completion, as needed. The form-completion sessions were optional, but subjects were encouraged to attend. Subjects also could request private form-completion sessions at their housing unit. Four individuals (including one couple) requested a private session (one at each site). Forty-five 1-hour small-group sessions were held at the three sites to help participants complete the pre- and postintervention evaluation forms.

Incentive Drawings

As suggested by McKenzie and Jurs (1993), incentive drawings were used to increase participation in the physical activity program and in completion of the evaluation forms. The incentives used were similar to those used by Marcus, Pinto, et al. (1994), Marcus, Selby, et al. (1992), and Marcus, Simkin, et al. (1996). Seven incentive drawings were conducted during the study (see Appendix C).

Data were collected 1 week before the health fair (preintervention evaluation form), at the end of the 10th week of the experimental group's chair exercise program (postintervention I evaluation form), and at the end of the 10th week of the control group's chair exercise program (postintervention II evaluation form). Subjects had 2

weeks to complete and return the forms. Forms were turned in at a small-group session or at the manager's office in a secured box. Any subject who had not returned an evaluation form by the deadline was delivered a reminder letter (see Appendix O) along with another evaluation form. The subject had 1 additional week to complete the form. Evaluation forms received after the 1-week extension were not included in the data analysis.

Attendance was recorded at all meetings associated with the program (group sessions, the health fair, educational programs, contract lectures, and sessions of the physical activity program). Participants signed in on an attendance sheet, this entered them into the incentive drawing for that segment of the intervention.

Preparation of the Data

All data were coded and entered in spreadsheet format according to the code manual (see Appendix P). All data were checked for accuracy (out-of-range data and missing data) by comparing a printed copy of the spreadsheet with the evaluation forms before data analysis.

Data from the 37-item Processes of Change Questionnaire were grouped into the 10 processes of change (see Appendix G, bolded headings). Each of the 10 processes of change had three or four items. If a process of change had more than one unanswered item, that process of change was omitted from the data analysis. If only one item was unanswered, the answered items representing that process of change were averaged. This score was used in the next data-grouping procedure. The 10 processes of change were then grouped into the experiential (items 23-40) and behavioral (items 41-59) categories. Scores on the five experiential processes of change were averaged to obtain a composite

score representing the use of experiential strategies. Similarly, scores on the five behavioral processes of change were averaged to obtain a composite score representing use of behavioral strategies. If a process of change was omitted, due to missing data, scores on the four remaining processes of change were used to establish the composite score. If a subject left more than 10% (4 items or more) of the process of change items unanswered, the subject was removed from data analysis for Research Question 3. In this study, only the behavioral processes of change were analyzed.

Analysis of Data

All data were analyzed using SPSS for Windows, version 6.1. An alpha level of $p < .05$ was used as the criterion for statistical significance in all tests.

Research Question 1 addressed the effect of the 15-week intervention treatment on altering participants' stage of change. An analysis of covariance was used to determine differences in the nonequivalent control group design. A t-test of dependent samples was used to determine the pretest-posttest differences within experimental groups. These tests were selected to be consistent with previous research (Marcus, Selby, et al., 1992).

Research Question 2 addressed the maintenance, advancement, or regression of the stage of change at least 2 months after termination of the physical activity program. A Wilcoxon matched-pairs signed rank test was used to determine significance of the difference in subjects' stages of change at these points in time.

Research Question 3 addressed participants' use of behavioral processes of change during early and late stages of change. A t-test for independent samples was used to compare the composite score for behavioral processes of change of early stages of change

(precontemplation, contemplation, and preparation) with the composite score for behavioral processes of change used during late stages of change (action and maintenance).

Chapter 4

RESULTS AND DISCUSSION

The three research questions are addresses in this chapter. Research Question 1 focused on the effect of a 15-week physical activity intervention, designed in accordance with the transtheoretical model, on the stage of change in a low-income elderly population. Research Question 2 addressed whether the stage of change in the experimental group was sustained, advanced, or regressed 2 months after the completion of the physical activity program. Research Question 3 focused on differences in the use of behavioral processes of change between low-income elderly adults who identified their stage of change as action or maintenance and those who identified their stage of change as precontemplation, contemplation, or preparation. A description of the sample and the equivalency of the experimental groups precedes the results and discussion of each of the three research questions.

Description of the Sample

One hundred three volunteers signed informed-consent forms. The standards for inclusion in the sample were (a) age (at least 60 years of age); (b) completing of the first evaluation form before the health fair at experimental site 1 (experimental site 2 had until their health fair); and (c) turning in all three evaluation forms (preintervention, postintervention I, postintervention II).

Mortality rates were calculated on the 90 volunteers who met the age standard (8 subjects too young) and entry deadline (5 subjects entered late). The experimental volunteers had a 40% mortality rate (21 out of 52), and the control volunteers had a 42% mortality rate (16 out of 38).

Of the 103 original volunteers, 50 did not meet the standards for inclusion in the study. These 50 subjects were given participation-status forms (see Appendix L) to determine why they had not completed the program or had joined the program late. If a subject did not meet the age requirement and dropped out of the program, he or she received a participation-status form but was classified in the too-young category. A summary of participation status is shown in Table 2.

Table 2. Reasons for Volunteer Mortality

Site	Late Entry	Too Young	Chronic Disease	Moved	Illness	Other	No Response
Exper. 1	1	2	0	0	3	3	2
Exper. 2	1	5	0	0	4	5	4
Control	3	1	2	1	5	4	4
Totals	5	8	2	1	12	12	10

If the category of "other" was indicated, subjects were asked to specify a reason for not participating. The responses included too busy, problem with form completion, personal, and afraid of losing welfare benefits. Ten volunteers (20%) did not respond to the participation-status form. One of the nonresponders spoke very limited English and may not have understood the purpose of the form.

The remaining 53 volunteers were used as subjects for the study. Two of these subjects did not turn in the postintervention I evaluation form but continued to participate in the study. Of the 51 remaining subjects, 5 were lost due to incomplete data, leaving 46 subjects for data analysis. These 46 subjects, 27 experimental and 19 control, completed all three intervention evaluation forms (preintervention and postintervention I & II).

Participation in the intervention program was not required, but subjects were encouraged to attend. Excluding the contract option, there were 51 intervention sessions. Participant attendance ranged from 1 to 41 sessions (2% to 80% attendance, respectively). Attendance at the chair exercise sessions varied from 0 to 33 (92%) out of a total of 36 sessions. Participation in the intervention program is reported in Table 3.

Table 3. Participation in the Intervention Program

Group	n	Health Fair (Number)	Educ. Lecture 1 (Number)	Educ. Lecture 2 (Number)	Contract Log (Number)	Contract Lectures (Mean)	Chair Exercise (Mean)
Exper.	27	23	7	16	5	5.0	13.59
%		85	26	59	19		
SD						3.7	10.71
Range						0-11	0-33
Control	19	14	5	7	0	3.0	11.47
%		74	26	37	0		
SD						2.85	8.36
Range						0-9	0-25

To determine the intervention effect, a criterion of 60% attendance in either the educational programs (9 out of 15) or the chair exercise sessions (22 out of 36) was established. This criterion was perceived to be the minimum exposure necessary to

categorize an individual as a participant in the intervention program. Seventeen subjects met the 60% criterion to analyze the intervention effect.

Equivalency of the Experimental Groups

The 46 subjects of the study (17 experimental site 1, 10 experimental site 2, and 19 control) were measured for similarity of demographic characteristics shown to affect physical activity level (Clark, 1995; King et al., 1992; Wolinsky et al., 1995). Demographic information on the subjects from the preintervention evaluation form is presented in Table 4.

Table 4. Preintervention Equivalency of Subjects on Selected Physical-Activity-Related Demographic Variables

Group	n	Age (SD)	Ed. in Yrs (SD)	Health[a] (SD)	Gender % Female	Married %	Race % White
Exper.	27	76.5 (7.14)	11.9 (1.9)	2.82 (.92)	92.9	21	89.3
Control	19	77.6 (7.37)	11.7 (1.7)	2.79 (.92)	94.7	10	84.0

[a] Health Status: a 5-level self-rating scale, where 1 = excellent, 5 = poor.

Two-tailed t-tests were used on demographic variables (age, years of education, health status, medications), compiled from the preintervention evaluation forms, to evaluate the equivalency of all intervention groups. All tests were nonsignificant. The results of these tests are included in Tables 5 through 8. Frequency distributions and percentages were used in comparing respondents on the preintervention demographic variables in terms of gender, marital status, and race (see Tables 9 through 11).

Table 5. Preintervention Equivalency of All Groups in Terms of Age (in years)

Group	n	Mean	SD	t-test	Significance
Exper. 1	17	75.5	8.39		
Exper. 2	10	76.9	4.56	-0.49[a]	.63
Total Exper.	27	76.0	7.14		
Control	19	77.6	7.37	-0.73[b]	.47

[a] = df (25). [b] = df (44).

Table 6. Preintervention Equivalency of All Groups in Terms of Years of Education Completed

Groups	n	Mean	SD	t-test	Significance.
Exper. 1	17	11.6	1.84		
Exper. 2	10	12.4	1.78	-1.12[a]	.27
Total Exper.	27	11.89	1.83		
Control	19	11.68	1.67	0.39[b]	.70

[a] = df (25). [b] = df (44).

Table 7. Preintervention Equivalency of All Groups in Terms of Health Status[a]

Groups	n	Mean	SD	t-test	Significance
Exper. 1	17	2.76	.97		
Exper. 2	10	2.90	.88	-0.36[b]	.72
Total Exper.	27	2.81	.92		
Control	19	2.79	.92	0.09[c]	.93

[a] Health Status: a 5-level self-rating scale, where 1 = excellent, 5 = poor.
[b] = df (25). [c] = df (44).

Table 8. Preintervention Equivalency of All Groups in Terms of Number of Kinds of Daily Medications

Groups	n	Mean	SD	t-test	Significance
Exper. 1	17	3.94	2.90		
Exper. 2	10	2.20	2.20	1.63[a]	.12
Total Exper.	27	3.30	2.76		
Control	19	3.11	2.45	.24[b]	.81

[a] = df (25). [b] = df (44).

Table 9. Preintervention Equivalency of All Groups in Terms of Gender

Groups	n	Men	%	Women	%
Exper. 1	17	1	5.9	16	94.1
Exper. 2	10	1	10.0	9	90.0
Total Exper.	27	2	7.4	25	92.6
Control	19	1	5.3	18	94.7

Table 10. Preintervention Equivalency of All Groups in Terms of Marital Status[a]

Groups	n	Single	%	Married	%
Exper. 1	17	14	82	3	18
Exper. 2	10	7	70	3	30
Total Exper.	27	21	78	6	22
Control	19	17	89	2	11

[a] Marital Status: a 2-level scale, where 1 = single (widowed, divorced), 2 = married.

Table 11. Preintervention Equivalency of All Groups in Terms of Race

Group	n	White n (%)	Black n (%)	Asian n (%)	Native Am. n (%)	Hispanic n (%)	Other n (%)
Exper. 1	17	17 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Exper. 2	10	7 (70)	2 (20)	0 (0)	0 (0)	0 (0)	1 (10)
Total Exper.	27	24 (88.9)	2 (7.4)	0 (0)	0 (0)	0 (0)	1 (3.7)
Control	19	16 (84.2)	1 (5.3)	0 (0)	1 (5.3)	0 (0)	1 (5.3)

A significant difference ($t(25) = 2.71$, $p = .01$) was found in the preintervention evaluation stage of change between experimental group 1 and experimental group 2 (see Table 12). A significant difference ($t(34) = 3.20$, $p = .003$) also was found in the pre-intervention evaluation stage of change between experimental group 1 and the control group. Scores on the preintervention evaluation stage of change instrument between the total experimental group and the control group were not significantly different. However, the difference in scores was approaching significance (t (44) = 1.96, $p = .06$)(see Table 12).

Table 12. Equivalency of All Groups in Terms of Initial Stage of Change[a]

Groups	n	Mean	SD	t-test	Significance
Exper. 1	17	4.47	0.80		
Exper. 2	10	3.40	1.27	2.71[b]	.01
Exper. 1	17	4.47	0.80		
Control	19	3.42	1.12	3.20[c]	.003
Total Exper.	27	4.07	1.11		
Control	19	3.42	1.12	1.96[d]	.06

[a] Stage of change: a 5-level self-rating scale, where 1 = precontemplation, 2 = contemplation, 3 = preparation, 4 = action, 5 = maintenance. [b] = df (25). [c] = df (34). [d] = df (44).

Experimental group 1 had a high proportion of subjects in the maintenance stage of change (65%). Experimental group 2 had three subjects in the maintenance stage of change (30%). Subjects in the maintenance stage of change could not advance their stage of change because they were already at the highest level measured.

Similarly, the experimental group 1 had a much larger number of maintenance subjects than the control group. The experimental group 1 had 65% (11 out of 17) in the maintenance stage of change. The control group had 24% (5 out of 19) in the maintenance stage of change. With this lower number of maintenance subjects in the control group, the potential to advance their stage of change was more favorable.

In the total experimental group, 14 of the 27 subjects were at maintenance, the highest stage of change. This left only 48% (13 out of 27) of the experimental group with any potential to advance their stage of change. In the control group, 5 of 19 subjects were at maintenance, leaving 74% (14 out of 19) with the potential to advance their stage of change. Because the potential for gain favored the control group, the test of intervention effect between experimental and control subjects would be conservative. To determine whether nonmaintenance subjects in the experimental and control groups were equivalent, a t-test was performed. The t-value obtained was $t(25) = .80$, $p = .43$ (see Table 13).

Table 13. Equivalency of Experimental and Control Groups in Terms of Initial Stage of Change[a], With Maintenance Subjects Removed

Group	n	Mean	SD	t-test	Significance
Total Exper.	13	3.08	0.76		
Control	14	2.86	0.66	0.80[b]	.43

[a]Stage of change: a 4-level self-rating scale, where 1 = precontemplation, 2 = contemplation, 3 = preparation, 4 = action. [b] = df (25).

Results and Discussion

Research Question 1

The first research question concerned the effect of a 15-week intervention designed in accordance with the transtheoretical model on advancing the stage of change of low-income elderly individuals toward a more active lifestyle. To answer the question, two tests were used. The first test analyzed the intervention effect using a nonequivalent control group with delayed treatment design. The postintervention I stage of change was compared between the experimental group 1 and the control group with the preintervention stage of change as a covariate. The second test analyzed the intervention effect using a pretest-posttest design. The preintervention stage of change was compared to the postintervention I stage of change within the treatment groups.

To test the effect of treatment in a nonequivalent control group design, an analysis of covariance was used. The means and standard deviations are presented in Table 14. Because the nonequivalent control design groups were significantly different in their initial stage of change, the preintervention evaluation stage of change was analyzed as a covariate. The postintervention I evaluation stage of change was compared between the

experimental group I and the control group. A significant difference was found between the experimental (1) and control groups, F (2, 35) = 12.58, p = .001 (see Table 15).

Table 14. Means and Standard Deviation for the Stage of Change[a] in the Experimental (1) and Control Groups

Group	n	Mean (Pre)	SD	Mean (Post I)	SD
Exper. 1	17	4.47	0.80	4.53	0.72
Control	19	3.42	1.12	4.11	1.10

[a]Stage of change: a 5-level self-rating scale, where 1 = precontemplation, 2 = contemplation, 3 = preparation, 4 = action, 5 = maintenance.

Table 15. Effects of the Intervention Within and Across Treatment Groups

Source	df	Means Square	F	Significance.
Between (Within + Residual)	33	0.54		
Covariate (Initial Stage of Change)	1	12.08	22.20	.001
Between Groups	1	0.31	0.57	.47
Within Subject (Within + Residual)	35	0.90		
Group X Stage of Change	2	6.85	12.59	.001

Although subjects at all sites were provided the same promotional protocol before receiving the treatment, the effect of the promotional activities on subjects at the control site may have affected these subjects' increase in activity level before the intervention. Knowledge that a physical activity intervention was coming to the control site in fall could have increased the control subjects' awareness of their physical activity habits. Also, the recruiting of subjects in late May, when the weather was conducive to more outdoor

activity, could have affected the control subjects' physical activity patterns before the treatment. These two factors could account for some of the advancement in the stage of change that occurred before the control group received the complete physical activity intervention in the nonequivalent control group design.

A t-test for dependent samples was used to test the effect of the intervention in the pretest-posttest design. Seventeen subjects from all three treatment groups met the 60% intervention attendance criterion. The results of this analysis are presented in Table 16. The test revealed a significant difference between the pretest and posttest ($t(16) = -2.38$, $p = .03$). These data also suggest an intervention effect. It should be noted, however, that this design does not control for history, maturation, or testing.

Table 16. Pretest-Posttest Intervention Effect on Stage of Change[a]

Stage of Change	n	Mean	SD	t-test	Significance
Pretest	17	4.06	1.14		
Posttest	17	4.47	0.72	-2.38	.03

[a]Stage of change: a 4-level self-rating scale, where 1 = precontemplation, 2 = contemplation, 3 = preparation, 4 = action, 5 = maintenance.

Several factors could have influenced this result. Two of these possible influences were season of the year and available facilities. First, the three (experimental 1, experimental 2, control), 15-week interventions spanned a 6-month period. Second, the control site offered garden plots to residents. Several of the residents at the control site started gardens after the preintervention evaluation data collection and maintained the garden through the postintervention I evaluation data collection. The garden plots

provided an additional opportunity for these residents to be physically active, before they received the intervention, and may have confounded the intervention effect. Garden plots were not available at either of the experimental housing sites.

Maturation of subjects during the 15-week intervention was perceived to have little influence on these individuals, who had a mean age of 76 years. With the lengthy time between testing (15 weeks) and the self-report format of the evaluation forms, the effect of testing was minimized.

Within the limitations of this study, it appears that an intervention based on the transtheoretical model can be effective in improving the stage of change of low-income elderly volunteers. The differences observed were conservative estimates in that a high percentage of the experimental group were at the maintenance level (the highest level of the stage-of- change instrument). This could be due to preexisting exercise programs conducted at the experimental sites. Many of the participants in the preexisting exercise programs volunteered to take part in the study.

Stages of change were self-identified by the subjects. To ensure the subjects' accuracy in estimating their physical activity levels, several verifying items in the evaluation forms were used. These items included the amount of time spent participating in physical activity (see Appendix E, Seven-Day Physical Activity Recall) and the activities of daily living (see Appendix D).

The attempt to document the subjects' ability to self-report their physical activity behavior and compare this to their selection of a stage of change was not successful. In the pilot study, subjects had few problems filling out the physical activity recall and the

activities of daily living forms. In this study, however, several problems emerged with these forms. Recalling the amount of time spent in each physical activity at a moderate intensity level was problematic. Several subjects had neurological problems that made it difficult for them to write. Visual impairments also made it difficult for some subjects to keep track of the time it took them to perform a certain physical activity. Many of the subjects had unstructured lives and did not maintain a sense of time, which is more typical of younger individuals who are employed or raising a family. Also, subjects stated that time was not a factor in completing a task. It did not make any difference to them whether a task took 10 minutes or 30 minutes as long as the task was done. It was difficult for these subjects to record how long it took them to sweep a floor or walk to a local store, and many of their estimates were outside reasonable limits. Accordingly, these data were not used.

The second data set for checking the validity of self-reports of physical activity levels was a group of items measuring the activities of daily living (see Appendix D). The subjects rated their ability to perform daily living activities (e.g., sweep, prepare meals, get up from a chair, walk one block). This information was used to informally identify discrepancies between items documenting their ability to perform a physical activity and their listing of time spent doing that activity. For example, if a subject indicated he or she could not walk one block without stopping and listed 10 minutes of continuous brisk walking, a discrepancy between the two items was identified. In this informal observation, activities of daily living and physical activity level were compatible, indicating that elderly subjects were able to discern their physical activity level and their related stage of change.

The activities of daily living measure (see Appendix D) used a three-factor scale (easy to do, difficult to do, unable to do). Several subjects commented that they were between the categories listed, especially between "easy to do" and "difficult to do." To improve the identification of the ability to do activities of daily living, a scale with smaller increments may be needed.

Participation in the various components of the intervention program varied. The contract program had the least participation. Only three of five subjects were consistent in turning in the logs, and all three were in the maintenance stage of change. The other two subjects were in the contemplation stage of change. One subject decided she was too busy and participated very sparingly in any of the intervention programs. The other subject turned in two logs, but participated frequently in other intervention components of this study and advanced to the action stage. At this point, it appears that the contract method is a poor strategy to use with low-income older adults in the early stages of change. However, this was a very limited sample and the contract method needs further evaluation.

Other instructor led physical activity intervention programs based on the transtheoretical model are rare. Most investigators have examined the use of the transtheoretical model in behavior change in physical activity programs that are not actively led by a staff person or investigated the development of reliable instruments to identify model components (stage of change and processes of change) (Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992; Marcus & Simkin, 1993). The few intervention studies (Long et al., 1996; Marcus, Banspach, et al., 1992) that have been conducted involved handing out written material based on one's stage of change, providing a list of

relevant community resources, and encouraging increases in physical activity. The studies with older adults (Barke & Nicholas, 1990; Gorely & Gordon, 1995; Lee, 1993) have used questionnaires on physical activity behavior, with no physical activity intervention program.

Research Question 2

The second research question addressed whether the stage of change in the experimental groups was sustained, advanced, or regressed 2 months after the completion of the physical activity intervention program. Whether stage of change significantly advanced, sustained, or regressed was determined using the Wilcoxon matched-pairs signed rank test.

Twenty-seven subjects (experimental site 1, $\underline{n} = 17$; experimental site 2, $\underline{n} = 10$) were available for examination of this question. Of the eight experimental subjects who advanced their stage of change with the intervention, one subject had surgery and was under a physician's order to limit physical activity. That subject was omitted from the analysis of data associated with this research question. Eighteen of the experimental subjects sustained their stage of change during the intervention. Of these, four had health problems unrelated to the study and were dropped from the analysis of data documenting longer term intervention effects. These five subjects were omitted from the postintervention analysis, leaving 22 subjects.

The Wilcoxon matched-pairs signed rank test was used to test the probability that the changes obtained could be attributed to chance. The test involves ranking the experimental subjects' ($\underline{n} = 22$) stage of change after intervention and 2 months

postintervention (see Table 17). No significant difference was found ($z = -1.34$, $p = .18$). Nonsignificance suggests that postintervention I and postintervention II differences were stable. Although the small sample size limited the ability to draw strong conclusions about the lasting effect of the intervention program, it appears that subjects did sustain their physical activity levels 2 months after the intervention.

Table 17. Postintervention Effect

Mean Rank	Sum of Ranks	Cases (N=22)	Rank	z	Sign.
3.00	3.00	1	Decrease		
3.00	12.00	4	Increase		
		17	Tie	-1.34	.18

Twenty out of 22 subjects (91%) sustained or advanced their stage of change 2 months postintervention. Of the seven experimental subjects who advanced their stage of change during the intervention, five sustained (71%) and two advanced (29%) their stage of change 2 months postintervention. Of the 14 experimental subjects who sustained their stage of change during the intervention, 11 sustained (78%), 2 advanced (14%), and 1 regressed (7%) their stage of change 2 months postintervention. The one subject who regressed went from maintenance to action. During one-half of the 2-month postintervention period, she had reduced her physical activity level below the maintenance standard of accumulating 30 minutes of physical activity at least four times a week for 6 continuous months.

The results showed that the older adults did not regress in their physical activity level during the 2-month postintervention time span. The sustaining of a physical activity level is a positive aspect when dealing with subjects averaging 75 years. Postintervention effect has not been examined in other research.

Research Question 3

The third research question concerned the use of the behavioral processes of change by subjects who identified their stage of change as action or maintenance, as compared with those who identified their stage of change as precontemplation, contemplation, or preparation. The average number of behavioral processes of change was the dependent variable, and the stage of change at postintervention I was the independent variable.

The small sample size in this study restricted the examination of the use of behavioral and experiential processes of change between the five separate stages of change. To address the question, early and late stages of change were pooled and compared. A t-test for independent samples was conducted to compare the use of behavioral processes of change by subjects in the early and late stage of change at postintervention I data collection (see Table 18). The results of the t-test ($t(39) = 1.40$, $p = .17$) indicated no significant difference between the use of behavioral processes of change by the action and maintenance group (late) as compared to the precontemplation, contemplation, and preparation group (early).

Table 18. Use of Behavioral Processes of Change

Group	n	Mean	SD	SE Mean	t-test	Sign.
Behavioral Early	13	2.55	.59	.17		
Behavioral Late	28	2.90	.81	.15	-1.40	.17

The action and maintenance stage-of-change subjects (n = 28) at postintervention I data collection did use more behavioral processes of change than did the subjects in precontemplation, contemplation, and preparation stages of change (n = 13) at postintervention I data collection. This finding was consistent with those from other studies (Marcus et al., 1996; Prochaska et al., 1992) that found behavioral processes of change were used more frequently in the later stages of change.

In reviewing subjects' responses to the Processes of Change Questionnaire, 2 of the 10 processes-of-change categories appeared to be problematic. Environmental reevaluation (n = 5) and helping relationships (n = 7) were the categories with the most subjects leaving processes-of-change items blank. Several subjects in the maintenance stage had a problem in answering environmental reevaluation item 30: "I would be a better example for others if I exercised regularly." These subjects thought this item did not apply to them because they already exercised regularly. Statements that were left blank need to be analyzed for clarity.

Although the small sample size limits the generalization of the use of behavioral processes of change, it appears the low-income older adults in this study were similar to other populations. Subjects in the late stages of change used behavioral processes of

change (mean = 2.90) more than did subjects in the early stages of change (mean = 2.55), but this difference was not significant.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The national health goals and the surgeon general's report have recognized the need to increase physical activity among all Americans and particularly in low-income and elderly populations. Physical activity has been shown to improve the quality of life and to assist in maintaining independence of the elderly. Yet approximately 40% of those 65 years and older remain inactive.

Life expectancy is increasing, and the number of elderly is growing. Health care professionals face the difficult task of providing health services to a growing population with increasing medical costs. Ironically, there is limited knowledge of appropriate health promotion programs for the elderly. Health promotion programs have improved the health status of participants, and physical activity should be a cornerstone of any comprehensive health promotion program.

Theoretical frameworks are helpful in designing quality physical activity programs. The transtheoretical model provides a framework that has been used successfully in studies of behavior change. The focus of the model is on intentional change. The model consists of two components--stages of change (readiness to change a behavior) and processes of change (strategies to change a behavior)--and has been used in designing

interventions for smoking cessation, weight control, sunscreen use, and physical activity in the work place. The model has not been used, however, to study behavior change in terms of physical activity in a low-income elderly population. The researcher's purpose in this study was to investigate the effects of a physical activity intervention, designed in accordance with the transtheoretical model, on changes in behavior toward higher levels of physical activity in a low-income elderly population.

In this study, a 15-week physical activity intervention program was designed, based on the transtheoretical model. The intervention included a health fair, educational programs, and two physical activity programs.

The research designs used in this study were a nonequivalent control group with a delayed treatment and a pretest-posttest. Volunteers were recruited from three low-income elderly housing sites in Michigan (2 experimental and 1 control). The control site received the 15-week intervention after the experimental sites. Data were collected at three times related to the intervention protocol (preintervention and postintervention I and II).

The following research questions were addressed.

1. Do low-income elderly individuals exposed to a 15-week intervention designed in accordance with the transtheoretical model (a) sustain, advance, or regress in their stage of change toward a more active lifestyle, and (b) change more than a group of controls who do not receive the treatment condition?

2. Do low-income elderly individuals exposed to a 15-week physical activity intervention based on the transtheoretical model sustain, advance, or regress in their stage-of-change level 2 months after the intervention?

3. Do low-income elderly adults who identify their stage of change as action or maintenance use more behavioral processes of change than those who identify their stage of change as precontemplation, contemplation, or preparation?

Research Question 1 addressed an intervention effect in a nonequivalent control group design and a pretest-posttest design. Using an analysis of covariance to test group differences in the nonequivalent control groups, a significant difference ($F(2, 35) = 12.59$, $p = .001$) was found in the intervention effect. In the pretest-posttest design, a t-test for dependent samples was used. Again, the intervention effect was significant ($t(16) = -2.38$, $p = .03$).

Research Question 2 concerned the degree to which the stage of change following the intervention was sustained, advanced, or regressed 2 months postintervention. Of the experimental subjects who sustained or advanced their stage of change after the intervention, 91% sustained or advanced their stage of change 2 months postintervention. A Wilcoxon matched-pairs signed rank test was used to compare subjects' stage of change after the intervention with their stage of change 2 months after the intervention. No significant difference was found ($z = -1.34$, $p = .18$), which supported the stabilization of the stages of change toward an active lifestyle.

Research Question 3 compared the use of behavioral processes of change by subjects in the action and maintenance stage of change (late stage) versus those in the

precontemplation, contemplation, and preparation stage of change (early stages). In this data analysis, a t-test for independent samples was used. The dependent variable was the mean behavioral processes of change at postintervention I, and the independent variable was the stage of change (late versus early) at postintervention I. Subjects in the late stage of change (mean = 2.90, n = 28) did not use behavioral processes of change significantly differently ($t(39) = 1.40$, $p = .17$) from those in the early stage of change (mean = 2.55, n = 13).

Conclusions

Within the limitation of this study, the following conclusion were drawn:

1. Low-income elderly volunteers significantly advanced their stage of change toward a more active lifestyle after a 15-week physical activity intervention program.

2. Low-income elderly volunteers sustained or advanced their stage of change 2 months postintervention.

3. Behavioral processes of change were used more (but not significantly so) by low-income older adult volunteers in the action and maintenance stages of change than by low-income older adults in the precontemplation, contemplation, and preparation stages of change.

Recommendations

The results of this study support the use of the transtheoretical model as an aid in designing a physical activity program for low-income older adults. The model provides a theoretical framework for developing physical activity behavior change programs

consistent with the national health goals. Older adults can identify their physical activity stage of change. Knowing the participants stage of change and using the appropriate processes of change, a physical activity intervention can be designed that is effective in changing the activity level of low-income elderly volunteers. The following recommendations are offered for future studies.

1. Design the investigation to control for seasonal effects. A year-long physical activity program would be best.

2. To understand confounding factors, demographic characteristics that affect physical activity (age, socioeconomic level), and opportunities for physical activity, a large sample of sites and participants should be used.

3. To study postintervention effects, longer intervals between six months and 1 year are desirable. Comparing the results to a control with no intervention would allow the researcher to document the effect of the intervention in reversing or retarding the decline seen in elderly populations.

4. Analyze the processes of change that are used most frequently by older adults in each of the stages of change. Use these processes of change to design physical activity interventions specific to the participants' revealed stage of change.

Other Observations

Several observations that the investigator made in conducting this study may be helpful to future investigations of low-income elderly populations and physical activity. Although these observations are not data based and are restricted to this investigator's

interpretation of the implementation process, they may be helpful in designing and conducting similar studies.

The scheduling of the intervention programs was a problem at all three sites; however, scheduling problems were minimal at the site with the most experienced manager. Meetings were held with each site manager. Whenever possible, days and times were selected that did not interfere with the regular routine at the site. Also, chair exercise sessions were scheduled to avoid a conflict with preexisting exercise classes. The experienced manager was familiar with the routine at the site and was aware of important factors like conflicts with popular television shows and informal meetings of certain residents. The experienced manager also was better able to help identify and recruit residents than were the less experienced managers. In selecting housing sites for a study, experienced managers can provide more insight into contextual factors that can affect the implementation of the study. Less experienced managers need to be made aware of factors that can affect program implementation. These managers need to meet residents and identify what the residents' preferences are.

The chair exercise sessions initially were scheduled to try to accommodate as many residents as possible. At least one chair exercise session was scheduled in the morning and one in the afternoon. Although the idea seemed correct, the two options were confusing to the residents. The investigator's experiences in this study and in working with other physical activity programs for elderly groups suggest that consistent times and days of exercise sessions are more important to participation than having multiple options.

Planning an intervention program that interfaces with other scheduled events is crucial in enhancing participation and adherence to the intervention (Dishman, 1991). The best time for the intervention programs in this study seemed to be close to a congregate meal or other compatible activities. Residents with a mobility impairment favored this type of schedule because both activities could be completed in one trip. If a multiactivity session is planned, care must be taken that the combined activities are not too long. On days when transportation was provided to shopping centers or grocery stores, attendance was poor. Many residents found it too exhausting to participate in these trips and participate in the intervention program. The stamina of this group was limited.

In this study, each resident received a monthly calendar with all events listed. This seemed to help, but subjects still missed activities. Subjects frequently commented about coming to the community room for a program at the correct time but on the wrong day. Consistency in the days and time of programs would minimize this problem.

The physical location of the housing sites can be a barrier to participation. One site was located where residents felt safe to go outside for a walk alone. At the other two sites, some residents expressed concern about walking by themselves even though both of the sites had excellent walking paths. The suggestion was made to walk with a partner or small group, but this adds complexity to the intervention. This finding is consistent with those of other studies, which have indicated that unsafe settings prohibit participation in physical activity (Chodzko-Zajko, 1997; Kimble & Longe, 1989; Shephard, 1987).

Policies of the sites related to the use of stairwells reflect a concern about safety. One site maintained locked stairwells. A resident could go out into the stairwell, but once

the door shut, it was locked. Although residents had a key to unlock the door, it was so cumbersome to do so that residents chose not to walk the various floors. At the other two sites with unlocked stairwells, mobile residents frequently used the stairs and hallways for walking.

All three sites had signs at the entrance announcing that they were smoke-free facilities. At one site, smoking was allowed in one area of the community room used for the exercise program. Although the smokers were confined to this area, the smoke from the cigarettes permeated the entire area. Accordingly, the setting was not conducive to conducting a health promotion program or a physical activity class. Smoking was not allowed when a presentation was being given, but it was allowed up to the time of the presentation. A special exhaust system was installed in the area, but it did not provide adequate ventilation, and it added noise that interfered with communication. Because of the background noise, subjects with hearing aids would turn off the exhaust system. Residents with a respiratory illness or sensitivity to smoke also would avoid attending events where prior smoking was allowed. Although the community room facility was excellent for health promotion programs, the smoking policy can affect attendance.

Presenters also were affected by the smoking in the community room. One of the exhibitors at the health fair had a chronic respiratory disease and was severely affected by the smoke residue, even though no one had smoked in the room for at least 2 hours before the event. The investigator also was affected by the smoke residue with throat irritations and smoke-scented clothes.

It also appears that having a room for exercise that provides privacy for the participants is important. Subjects did not like being observed by nonexercising residents. While observing participants in the chair exercise program, the researcher noticed two tendencies. One, subjects in an early stage of change tended to sit toward the back of the room. Two, if a subject came into a chair exercise session late and chairs were available close to the instructor, a person in a late stage of change would take a position close to the instructor, but a person in an early stage of change would find another chair and move to the back of the class. The choice of seating may be related to the self-efficacy of the participant. Other studies have shown that self-efficacy increases as one progresses through the stages of change (Gorely & Gordon, 1995; Lee, 1993; Marcus, Eaton, et al., 1994). Exercise participants in the early stage of change may not feel as secure in doing the exercises or may be more self-conscious about working in a group than participants who are in late stages of change.

Many subjects made comments to the researcher about improvements they experienced after participating in the intervention that were not measured by the instruments used in the study. Some of the comments included (a) a demonstration of getting out of a chair without having to give herself a boost, (b) dropping a dress size, (c) the ability to walk for a longer distance, (d) experiencing better balance and more strength, (e) easier to deal and reach the cards while playing euchre, (f) easier to reach above the head, (g) less pain in joints, (h) ability to get her heel down to the floor without pain, and (i) having more energy. Although flexibility measurements were not taken, the

investigator noticed increases in the subjects' range of motion. This included bigger arm circles and arms raised to a greater height above the head.

Being at each site for 15-weeks allowed the investigator to get to know non-participating residents as well as participating residents. In talking with nonparticipants, the researcher identified several program planning issues. One issue was the completion of the forms in the study. Due to impaired eyesight, poor reading ability, or insecurity about filling out any form without a family member or friend present, some residents chose not to participate in the program. After seeing the program and chair exercise class, these residents indicated that they would have participated if they had not been required to complete forms. Even though subjects were assisted with this task, it was clear that completing forms as a prerequisite limited participation.

This population of residents typically did not read signs or were unable to read signs about events being held at the housing site. Each site had bulletin boards, newsletters, and flyers to inform residents about activities. In addition, every resident received a letter placed under his or her apartment door or on a fastener attached to the apartment door. Yet many people stated that they did not know about the program or had not seen the signs. To assist in promoting events, announcing the event(s) at congregate meals and other social or small-group sessions might improve communication. Also, making announcements just before the start of the activity might serve as a reminder to residents. This type of announcement did increase attendance at the health fair. A resident who was visually impaired suggested the need to have a telephone recording highlight daily events and important future events or deadlines.

The influence of peers had both positive and negative effects on the program. On the positive side, many residents encouraged a friend to join the program. This was especially helpful in getting people in the lower stages of change to participate. On the other side, if a leader of a group decided not to participate, then her entire group might have avoided or dropped out of the program. This occurred at one of the housing sites. A group of friends had signed up for the program and completed the preintervention evaluation form at a small-group session. At the time of the postintervention I evaluation, this entire group decided to quit the program. Those who did return the participation status form indicated no illness or health-related reason for their choosing not to participate. Reasons they gave were being too busy, personal, or not interested any more. Gaining support from peer leaders may be an important strategy to increase or maintain participation in health promotion programs. Before beginning a program, making a presentation to the resident council, requesting their help in encouraging participation, may provide support from the peer leaders.

Persons in the maintenance stage did not seem as likely to be influenced by peers. Maintenance subjects participated in other physical and group activities and were more likely to come by themselves. Physical activity had become an established part of their lives.

In this study, the only men who participated in the study were married. In most cases, these subjects' wives encouraged them to participate. Other men at the housing sites showed little interest in participating, but they observed what was going on during

the activity sessions and came to the health fair. At all sites, the majority of residents were single women. Most men at the housing sites were younger or had a disability.

The average age of the subjects was higher than the average age of the housing site residents. In observing the residents, the researcher noted that one site had younger residents (40 to 55 years), and the average age at that site was the lowest of the three sites. These subjects were not attracted to the program or dropped out of it. The exercise program was designed for older adults to improve flexibility and strength. These younger subjects may have thought the program was not appropriate for them. To meet younger residents' needs, a different type of program may have drawn more participation. The target population of this study was older adults, but the importance of making programs relevant to the needs of the participants was evident at that site.

One site had a very different atmosphere from the other two sites. Reasons for this difference were hard to pinpoint, but it definitely affected program implementation. Residents at that site were the most diverse racial group, had the lowest maximum income, and had the largest number of younger residents (many had disabilities). Participation by residents in the events or programs at that site was reported as poor. Many times a large number of residents would sign up for an event (intention) but would not show up for the event (lack of action). According to the secretary, collecting required housing forms from the residents was a major undertaking. These residents did not have a strong commitment to follow up their intentions, nor did they place importance on forms required for their housing contracts. Similar patterns were seen in this study. This site also had the largest dropout rate (52%). In the investigator's opinion, volunteers thought physical activity

was important, and, they intended to be more physically active. What may have been lacking was the self-efficacy to implement that intention into a more physically active lifestyle. This seemed similar to what King et al. (1992) found--that the intention to exercise was not predictive of actual participation in exercise but that self-efficacy was related to the adoption and maintenance of exercise.

The revised physical activity readiness questionnaire (rPAR-Q) was used as a screening tool for this study. The tool is appropriate for a low- to moderate-intensity physical activity program (Cardinal & Cardinal, 1995; Shephard, 1994b). Before they completed the rPAR-Q, subjects were asked "Do you have any problems that limit your participation in physical activity or exercise?" and "Please list problems that may limit your physical activity or exercise." A huge discrepancy was noted between the subjects' response on the rPAR-Q and their answers to these questions. Although subjects identified heart problems, blood pressure medications, joint disorders, or dizziness on the rPAR-Q, they did not identify these same conditions in the other questions. The following are four possible explanations for the observed discrepancy in the responses. One, the subjects were not aware that these medical conditions affected their ability to participate safely in a physical activity or exercise program. Two, the questions were worded poorly and did not elicit the desired response. Three, identifying one's inability to be physically active may have reflected a dependency that could limit one's ability to maintain an apartment and stay at a housing site. Four, subjects had difficulty writing or spelling the names of medical conditions and left the question blank rather than revealing a writing or spelling problem. Whatever the reason for the discrepancy, accurate responses are needed

to ensure that an appropriate and safe physical activity program is provided for subjects. It seems that using a preliminary screening tool that includes a check list of medical conditions would be better than employing open-ended statements for low-income older adults. Educating low-income older adults on the effect of physical activity and medical conditions or medications also may be needed.

Implications for Future Studies

Observations made in this study can benefit the design and implementation of physical activity programs for low-income elderly populations. These observations integrate the use of a theoretical framework and the contextual factors that affect program design. In summary, several suggestions seem pertinent to planning a safe and successful physical activity program.

1. Screening instruments should use a checklist rather than an open-ended format. The development and testing of appropriate screening instruments for this population are needed to ensure that the program is safe for participants.

2. Familiarity with the site and its policies is crucial to making the program responsive to the target population's needs. Sensitivity to present schedules and connecting events to daily routines (e.g., congregate meal, coffee hour, social gathering) may increase participation.

3. It should be remembered that many individuals in this group live relatively unscheduled lives that are not dependent on time schedules common to working populations. Also physical limitations (visual impairments, neurological disorders) may hamper elderly people's ability to record time spent in physical activity. Frequent

reminders about program events are needed in various formats (e.g., newsletters, table tents, oral announcements, personal letter, tape recording) to maximize attendance and adherence to programs.

4. Management and peer leaders need to have input into the program for it to be successful. Meetings with these groups four months before the intervention would allow the program leader to observe the setting; become acquainted with the residents, leaders, and managers; and provide an opportunity to incorporate input into the program.

5. Management and peer leaders need to support the physical activity program. By leadership groups endorsing the program, more individuals are likely to participate and recruitment may be easier.

6. Paper work needs to be kept to a minimum to decrease barriers to participation. Family members, friends, or a trusted health professional can assist in completing necessary forms, encourage participation, and reduce barriers to participation. Large print (14 font) and responses that require a check mark are also helpful.

7. Researchers should be sensitive to the self-efficacy of the participants in a physical activity promotion program, particularly programs designed for individuals in the early stages of change. Participants must believe they can perform the physical activity before they will participate.

8. Sequential pilot studies should be conducted to clarify and establish the reliability of all instrument and program protocols.

9. The format of the Stage of Change instrument should be changed to a yes and no response (U.S. Department of Health and Human Services, 1997). In small-group

sessions, individuals found it easier to identify their stage of change if they could give a yes or no response.

10. In addition to a cassette tape recording and a description and list of chair exercises, a videotape recording of the chair exercise session may be helpful. Several participants indicated they preferred a videotape recording so they could both see a demonstration of the chair exercises and hear the exercise directions.

APPENDIXES

APPENDIX A

APPENDIX A

Housing Site Pool

Pool of Housing Sites in Tri-County Office of Aging in the State of Michigan (Clinton, Eaton, and Ingham Counties)

Site	*Random Number
1. Capitol Commons Senior High Rise	4
2. Cedar Place	1
3. East Glen Apartments	2
4. Friendship Manor	8
5. Grange Acres	9
6. Riverfront Towers	3
7. Serenity Place	6
8. Somerset Place	5
9. Tamarack Apartments	7

*Random numbers selected from a Random Number Table in Kirk (1982), p. 808.

APPENDIX B

APPENDIX B

Definitions

Definitions of Processes of Change: (DiClemente, 1993; Marcus, Rossi, et al., 1992)

Experiential Processes of Change:

1. Consciousness raising: efforts by an individual to seek new information and to gain understanding and feedback about the problems.
2. Dramatic relief: affective aspects of change, often involving an emotional experience related to the problem behavior.
3. Environmental reevaluation: individual considering and assessing how his or her behavior affects the physical and social environment.
4. Self-reevaluation: individual assessing feelings and thoughts about self with respect to the behavior change.
5. Social liberation: individual acceptance of new alternatives available in the external environment to move toward the behavior change.

Behavioral Processes of Change:

6. Counterconditioning: substituting an alternative behavior for the problem.
7. Helping relationship: support system for attempting behavior change.
8. Reinforcement management: changing the contingencies that control or maintain the problem behavior.
9. Self-liberation: individual's choice and commitment to change the problem, belief in self.

10. Stimulus control: control of situations that trigger the problem behavior.

Definitions of Stages of Change: (As related to "Unlock the Door To Better Health: Physical Activity Is a Key," a physical activity program, definitions adapted from Marcus, Rakowski, & Rossi, 1992).

1. Precontemplation: Individual is sedentary and has no intention to starting a physical activity or exercise program in the next 6 months.

2. Contemplation: Individual is inactive but intends to start a physical activity or exercise program in the next 6 months.

3. Preparation: Individual may participate in physical activity or exercise sometimes but not regularly. (Regularly means the accumulation of 30 minutes or more of moderate intensity physical activity on most days of the week (Pate et al., 1995). In this study, "most days of the week" meant a minimum of 4 days per week.

4. Action: Individual participates regularly in physical activity or exercises but has done so for fewer then 6 months.

5. Maintenance: Individual has participated regularly in physical activity or exercises for 6 months or longer.

APPENDIX C

APPENDIX C

Intervention Protocol

Part I - Description of the Intervention

The intervention consisted of two major components. First, a 3-week preintervention period designed to promote the program and recruit subjects. Second, a 15-week treatment period (see Appendix N, Part II). Four types of interventions were initiated at all sites. The program announcement and publicity, health fair, educational programs, and physical activity program were designed in accordance with the 10 processes of change.

In the first week of promotional activities, posters and table tents (triangular shaped advertisements) were displayed at the housing sites to generate interest in the study. All posters and table tents included the study icon (a key symbol). Some posters indicated that a letter would be sent to each resident and an opportunity to participate in free education and/or physical activity programs entitled "Unlock the Door To Better Health, Physical Activity Is the Key." Other posters showed a wreath of keys with various benefits of physical activity (e.g., getting up from a chair, decreasing arthritis pain). Posters were displayed on each floor, in elevators, in laundry rooms, and on general-information bulletin boards, as stipulated by the management. Table tents were displayed in the community room, library, and waiting room of each site. An introductory letter, schedule, description of program events, and consent form (see Appendix K) were

delivered to each resident's unit at the end of week 1. New posters were displayed, advertising the informational meetings.

In the second week of promotional activities, informational meetings were held. Two meetings were held at each site. Each meeting consisted of an introduction to the program, followed by a question-and-answer session for participants. Those wishing to volunteer as subjects turned in the informed-consent form at the meeting or had the option of turning it in to the housing-site office by the Friday of week 2.

In the third week of promotional activities, small-group sessions were held and health fair posters were distributed. Each site had five small-group sessions. At these sessions, residents were given assistance in completing the preintervention evaluation form (see Appendix D, E, and F). The sessions provided the leader with an opportunity to meet the subjects. At the sessions, forms were read out loud, assistance provided to those requesting it, questions answered, and forms checked for accuracy. Subjects attending were encouraged to recruit other participants. Posters also encouraged residents to join the program. All subjects who completed the preintervention evaluation form were given monthly calendars (see Appendix K) to remind them of the dates and times of program events. Schedules were also posted on the main bulletin board for each housing site and at sites designated by the management (e.g., laundry room, elevators, newsletter).

The health fair (see Appendix I, Part I-A) was held at the experimental site the week after the collection of preintervention data. The health fair was open to all housing site residents. Additional signs were posted by each elevator door the day of the health fair as further reminders. The health fair was 3 hours long. Its purpose was to make

residents aware of their health status, the need for physical activity, and to advertise future programs designed to assist in increasing knowledge and awareness of and/or participation in physical activity. Benefits of physical activity were displayed in the community room on posters in the shape of a key. Each resident was given a health-fair pamphlet (see Appendix I, Part I-B) that included a list of exhibitors and a place to record screenings. Information about the educational and physical activity programs was included in the pamphlet. Residents who were interested in joining the study could sign up at the registration table.

One week after the health fair, the first educational program (see Appendix I, Part II-A) was held. The topic of the 45-minute lecture was how increased physical activity would benefit the elderly population. The following week a second 45-minute educational program (see Appendix I, Part II-B) was held. The topic was how to participate in a safe physical activity program, and there was a review of the revised Physical Activity Readiness Questionnaire (rPAR-Q) (see Appendix F). Each program was presented at two different times to accommodate as many residents as possible. The subjects were encouraged to attend each different educational program. Information was distributed on physical activity safety precautions and taking a pulse. All subjects were reminded that the rPAR-Q had to be returned if they were to participate in the physical activity programs. (The control site also required that residents sign a waiver form. This was not part of the original intervention but was a stipulation of the housing site. The waiver form was distributed to all control-site residents who completed the preintervention evaluation form.)

One week after the second educational meeting, the two physical activity programs were started. The two were conducted simultaneously for 12 weeks. The first program, a strength-and-flexibility chair exercise program (see Appendix I, Part III), was held three times a week for 45 minutes. All exercises were appropriate for residents who were ambulatory and those who used assistive devices such as crutches, canes, walkers, and wheelchairs. Each participant was given a handout on proper exercise techniques (see Appendix I, Part III). Attendance was recorded, and subjects were encouraged to attend all sessions. Two cassette tape recordings of the exercise session were provided to each housing site. During the last 2 weeks of the chair exercise program, interested subjects were instructed on how to lead the exercise session from a cassette tape recording. Subjects were given permission to copy the exercise tape for their personal use.

The second physical activity program was a self-monitored contract program with weekly meetings (see Appendix I, Part IV). Subjects recorded their weekly physical activity goals and then monitored their physical activity and/or goals on a log (see Appendix I, Part IV-A). Verification from another person was optional but was highly encouraged. Subjects turned in the log at the weekly contract lecture. The first lecture was an informational meeting and included instructions on how to complete the log, safe physical activity techniques, and setting goals. Subjects filled out a new log each week. After the initial session, the weekly meetings covered various topics on exercise, flexibility, strength, body composition, common chronic diseases, and appropriate physical activity for those with these diseases (see Appendix I, Part IV-B). A subject could attend the contract lecture and not participate in the contract logs and meetings. Questions from

the group were answered, and strategies to increase or maintain exercise were discussed. A subject could attend the initial contract lecture but decide not to participate in the self-monitored program. Subjects were encouraged to turn in their log and participate in the weekly meetings.

During week 4 of the physical activity programs, a letter was sent to all subjects. The letter encouraged participation in the various programs, and residents who had not joined the program were welcomed.

An incentive program (cash prizes) was incorporated into the intervention. Each site had seven cash prize drawings totaling $330. After the completion of each intervention evaluation form (preintervention, postintervention I, and postintervention II), a drawing (five names, each receiving $10) was held. For a participant to be eligible for the drawing, he or she had to complete and turn in the evaluation form by the deadline. Subjects attending a small-group session to complete or turn in forms had an additional chance at the drawing.

A fourth drawing (three names, each receiving $10) was held for all residents who participated in the health fair. The last three drawings (five names, each receiving $10) were held after the fourth, eighth, and twelfth weeks of the physical activity programs. Subjects attending the educational meetings, contract lectures, activity programs, turning in logs on time, or having the log verified by a support person had their names placed in a drawing every time they participated. Refreshments were served at all informational meetings, group sessions, the health fair, educational meetings, and contract lectures.

APPENDIX D

APPENDIX D

Preintervention and Postintervention Evaluation Forms

Name _____ Apartment Number _____

Daily Living Activities

(Check the most appropriate heading.)	Easy To Do	Difficult To Do	Unable To Do
1. Can you prepare your own meals? (provided the ingredients are available)	_____	_____	_____
2. Can you sweep a floor or vacuum a carpet?	_____	_____	_____
3. Can you carry a laundry basket with clothes in?	_____	_____	_____
4. Can you do your own grocery shopping?	_____	_____	_____
5. Can you carry a bag of groceries?	_____	_____	_____
6. Can you cut your own toenails?	_____	_____	_____
7. Can you reach objects above your head?	_____	_____	_____
8. Can you look to your side by only turning your head?	_____	_____	_____
9. Can you get up from a chair?	_____	_____	_____
10. Can you walk 1 block without stopping?	_____	_____	_____
11. Can you walk 5 blocks without stopping?	_____	_____	_____
12. Can you walk 10 blocks (1 mile) without stopping?	_____	_____	_____

13. Do you have any problems that limit your participation in physical activity or exercise?

_____ yes _____ no

14. Please list problems that may limit your physical activity or exercise.

Physical Activity Habits

Definitions:

- Exercise: activity in which the muscles of the body move, such as walking, gardening, etc.
- Moderate exercise: any activity that causes you to work as hard as a brisk walk.
- Regular exercise: a total of 30 minutes or more of moderate exercise on at least 4 days of every week.

15. What is your current exercise habit?
Check one of the following:

_____ I do not exercise, and I do not intend to start exercising in the next 6 months.
_____ I do not exercise, but I am thinking about starting to exercise in the next 6 months.
_____ I exercise some, but not regularly.

_____ I exercise regularly, but I have only begun doing so within the last 6 months.
_____ I exercise regularly, and have done so for longer than 6 months.

Personal Information

16. Birth date: _____/_____/_____
Month Day Year

17. Gender: (Check one)

_____ Male _____ Female

18. Marital Status: (Check one)

_____ Single (includes widowed, separated, and divorced) _____ Married (includes living living with a partner)

19. Race: (Check one)

_____ White _____ Black

_____ Asian _____ Native American

_____ Hispanic _____ Other

20. Education: (Circle the highest grade of school completed)

Elementary School Secondary School
0 K 1 2 3 4 5 6 7 8 9 10 11 12

College
1 2 3 4 5 or more
(2-year degree) (4-year degree) (graduate school)

21. Please list any medication(s) you are taking.

22. Overall, how do you rate your health status? (Check one)

_____ Excellent _____ Good _____ Average _____ Fair _____ Poor

APPENDIX E

APPENDIX E

Preintervention Evaluation Form - Seven-Day Physical Activity Recall*

Exercise Record

Please answer the following questions about your exercise habits for the past 7 days. Feel free to use the Seven Day Recall Worksheet on the following page for assistance. (If you feel the past 7 days were NOT typical of your exercise habits, select 7 consecutive days that are typical.)

Physical Activity
Look at the examples of exercise on the attached Seven Day Recall Worksheet. The exercises are divided into moderate and vigorous groups. Answer questions 23 and 24 below.

23. What **moderate** exercise or activities similar to these moderate activities did you do during the past 7 days? (Use the worksheet to help you.) Please write down the **TOTAL** number of minutes spent in moderate exercise during the past 7 days.

_____ minutes

24. What **vigorous** exercise or activities similar to these vigorous activities did you do during the past 7 days? (Use the worksheet to help you.) Please write down the **TOTAL** number of minutes spent in vigorous exercise during the past 7 days.

_____ minutes

If you did an exercise you do not know how to classify, write down the exercise and the total minutes spent doing this exercise during the past 7 days.

Exercise	Minutes	Number of days
_____	_____	_____
_____	_____	_____
_____	_____	_____

Seven Day Recall Worksheet

23. **Moderate Exercise** (Include actual time estimated in minutes)

- **Walking activities** such as delivering papers, brisk walk, grocery shopping
- **Yard work activities** such as raking, mowing, gardening
- **Housework activities** such as cleaning windows, sweeping, mopping
- **Leisure activities** such as fishing (casting from shore), calisthenics, table tennis, line dancing, ballroom dancing, golf, volleyball, bicycling

	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Walking							
Yardwork							
Housework							
Leisure							

Total _____ min.

24. **Vigorous Exercise** (Include actual time estimated in minutes)

- **Jogging activities** such as running
- **Yard work activities** such as chopping wood, carrying heavy loads
- **Housework activities** such as scrubbing floors, washing walls
- **Leisure activities** such as water exercise, aerobic dance, tennis

	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Jogging							
Yardwork							
Housework							
Leisure							

Total_____ min.

[* The two charts have been reduced to fit page specifications.]

APPENDIX F

APPENDIX F

Preintervention Evaluation Form - Revised Physical Activity Readiness Questionnaire

Physical Activity Readiness Questionnaire

Regular physical activity is fun and healthy, and more people are becoming active every day. Being physically active is very safe for most people. However, some people should check with their doctor before they begin a physical activity program.

If you plan to become more physically active than you are now, answer the seven questions below. Please read the questions carefully and answer each one honestly:

Check YES or NO.

YES	NO	
____	____	25. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
____	____	26. Do you feel pain in your chest when you do physical activity?
____	____	27. In the past month, have you had chest pain when you were not doing physical activity?
____	____	28. Do you lose your balance because of dizziness or do you ever lose consciousness?
____	____	29. Do you have a bone or joint problem that could be made worse by a change in your physical activity?
____	____	30. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
____	____	31. Do you know of any other reason why you should not do physical activity?

If you answered YES to one or more questions:

Talk with your doctor by phone or in person BEFORE you increase your physical activity or before you have a fitness test. Tell your doctor about the Physical Activity Readiness Questionnaire and which questions you answered Yes.

- Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- You may be able to do any activity you want, as long as you start slowly and build up gradually, or you may need to limit your activities to those which are safe for you.

If you answered NO to all questions:

You can be reasonably sure that you can do the following:

- Slowly increase your physical activity. This is the safest and easiest way to go.
- Take part in a fitness appraisal test. This is an excellent way to determine how much activity you should be doing.
- If you are not feeling well because of a temporary illness such as a cold or a fever, wait until you feel better before becoming more active.

Note: If your health changes so you answer "Yes" to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

- If you answered **Yes** to one of the questions, contact your doctor and receive oral or written permission to participate in a light to moderate physical activity program.

- I have received written or oral permission to participate in a light to moderate exercise program.

_____	_____
Signature	Printed name
_____	_____
Date	Apartment Number

APPENDIX G

APPENDIX G

Postintervention Evaluation Forms - Processes of Change Questionnaire

Processes of Change Questionnaire

There are many ways a person can increase exercise. The following are examples of ways to increase exercise. Read each sentence. Decide how often you used this exercise example during the last month. Place a check by the best answer. [Bolded areas not listed in actual form and font size was 14 point.]

Consciousness Raising

23. I remember information people gave me on the benefits of exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

24. I think about information on how to make exercise a regular part of my life.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

25. I read articles about exercise to learn more about it.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

26. I look for information about exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Dramatic Relief

27. I worry about the warnings of inactivity as a health hazard.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

28. I worry about the inactive people I see and the dangers of inactivity.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

29. I worry about warnings of an inactive life style.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Environmental Reevaluation

30. I would be a better example for others if I exercised regularly.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

31. I wonder how my inactivity affects people close to me.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

32. I might be able to affect others' health if I would exercise more.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

33. Some of my close friends might exercise more if I would.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Self-reevaluation

34. I am thinking about regular exercise and this would make me a healthier, happier person to be around.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

35. I think about the type of person I will be if I keep exercising.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

36. I get disgusted with myself when I do not exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

37. I think about having more confidence in myself if I exercised regularly.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Social Liberation

38. I find society is changing, making it easier for a person to exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

39. I am aware of more people encouraging me to participate in exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

40. I notice that more health care professionals are promoting exercise through classes.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Counterconditioning

41. Instead of remaining inactive, I participate in some exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

42. I try to use exercise as my special time to relax and recover from the day's worries.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

43. When I feel tired, I make myself exercise because I know I will feel better.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

44. When I feel tense, I find exercise a great way to decrease my worries.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Helping Relationships

45. I have someone whom I can depend on when I am having problems with exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

46. I have a healthy friend who helps me exercise when I do not feel up to it.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

47. I have someone who tells me my reasons for not exercising.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

48. I have someone who gives me comments about my exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Reinforcement Management

49. I reward myself when I exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

50. I try to set fair goals for myself rather than setting goals too high and not be successful.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

51. When I exercise, I tell myself that I am being good to myself by taking care of my body.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

52. I do something nice for myself when I try to exercise more.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Self-liberation

53. I tell myself I am able to keep exercising if I want to.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

54. I tell myself that if I try hard enough I can keep exercising..
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

55. I make promises to exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

56. I remind myself that I am responsible for my health and that only I can decide if I will exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

Stimulus Control

57. I put things around my home to remind me of exercise.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

58. I get rid of things that lead to my inactivity.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

59. I keep away from areas that support inactivity.
_____ Never ____ Seldom _____ Sometimes _____ Often _____ Very Often

APPENDIX H

APPENDIX H

Postintervention Evaluation Forms - Seven-Day Physical Activity Record

Seven-Day Physical Activity Record*

Physical activity level varies from week to week. For the next week, please list all of the physical activities you do. Try to be accurate about the amount of time (in minutes) associated with each physical activity. List everything you did. (See example on the next sheet.)

Name _____ Date: _____ to _____

	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
	activity	time	activity	time	activity	time	activity	time	activity	time	activity	time	activity	time
Walking														
Yardwork														
Housework														
Leisure														

Examples of Activities 60. Physical Activity Total Time:_____ min.

- **Walking:** brisk walk, grocery shopping, delivering papers, jogging, running
- **Yardwork**: raking, mowing (no rider mower), gardening, chopping wood, snow shoveling, carrying heavy loads
- **Housework**: cleaning windows, sweeping, mopping, painting, scrubbing floors, washing walls, vacuuming
- **Leisure**: table tennis, dancing, golf (walking), volleyball, bicycling, skiing, roller skating

[* Grid reduced to fit page, actual size 9 3/8" X 3 7/8"]

Seven-Day Physical Activity Record*

Example:

Name Jane Date: May 1, 1996 to May 7, 1996

	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
	activity	time	activity	time	activity	time	activity	time	activity	time	activity	time	activity	time
Walking	Walk	15	Shopping	30			Walk	30			Walk	10		
Yardwork									Gardening	20				
Housework			Sweep	5									Mop Vacuum	10 15
Leisure					Dancing	40								

60. Physical Activity Total Time: 175 min.

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APPENDIX I

APPENDIX I

Unlock the Door to Better Health, Physical Activity Is the Key

Part I - A, Health Fair Exhibitors

Health Fair

Exhibitors (*intervention sites 1,2,3)	Screening/information
1. American Cancer Society (sites 1, 2, 3)	Skin cancer information, self-examination, warning signs, exercise brochures
2. American Heart Association (sites 1, 2, 3)	Exercise and the heart health risks, exercise brochures
3. American Lung Association (sites 1, 2, 3)	Breathing exercises, brochures, pins on smoking cessation
4. Arthritis Foundation (sites 1, 2, 3)	Brochures on various forms of arthritis, information on arthritis exercise classes
5. Community Mental Health (sites 1, 2, 3)	Brochures on medications, alcohol, depression and self-esteem, pens
6. Michigan Cooperative Extension (sites 2, 3)	Proper diet and food portions, screening on proper nutrition
7. Graduate Student, Human Ecology (sites 1, 2, 3)	Height and weight
8. **Home Health Care Service (Amicare Home Healthcare, site1; MedCare System, site 2 & 3)	Blood pressure, glucose screening informational brochures
9. Ingham County Health Department (sites 2, 3)	Cholesterol screening, blood pressure informational brochures, pins

* Intervention sites 1 and 2 were experimental sites; intervention site 3 was the control site.

** Two different home health care systems were exhibitors, but both supplied the same screening and information.

Part I - B, Health Fair Brochure*

Physical

Activity

IS

A

KEY

[*Font reduced fit page, Tri-fold brochure]

This project funded by the ACSM Foundation Healthy People 2000 Project Grants and the Michigan Fitness Foundation.

Unlock the Door

To

Better Health

Name

Health Fair

(Housing Site)
Apartments
(Date)

Welcome

(Housing Site) Residents

Feel free to stop at any of the exhibits. All screenings are optional and free.

Exhibitors

1. **Ingham County Health Department**
   - Blood Cholesterol: _____

2. **American Lung Association**
   - Brochures and information on respiratory health

3. **Arthritis Foundation**
   - Brochures and information on arthritis

4. **American Heart Association**
   - Brochures and information on heart disease and hypertension

5. **Community Mental Health**
   - Brochures and information on aspects of mental health

6. **Body Mass Index**
   - Height: _____
   - Weight: _____
   - BMI: _____

7. **Michigan Cooperative Extension**
   - Nutrition and Diet Information

8. **MedCare Systems**
   - Blood Pressure: _____
   - Glucose: _____

9. **American Cancer Society**
   - Brochures and information on cancer screenings and reducing risk factors

You never outgrow your need for Physical Activity.

It's **not** too late to become involved in the physical activity health promotion program.

Sign up at the registration desk.

Coming events:

-Learn about benefits of physical activity
-How to start a safe program
-Chair exercise class
-Individualized programs
-Education sessions on various health issues

Don't miss out on Unlocking the Door to Better Health.

Part II - Educational Programs

Part II-A, Benefits and Need for Physical Activity (Use poster board 1-4)

I. Definition of Physical Activity
   A. Moving the body in daily living tasks and/or specific exercises to increase energy expenditure or increase one's health fitness level
   B. Compare health fitness and physical fitness
      1. Health fitness: does not require as strenuous physical activity or exercise but provides a health benefit
      2. Physical fitness: higher level of health, requires a more strenuous level of physical activity or exercise, such as three times per week for 20 minutes at target heart rate of 70-85 % of heart rate reserve

II. How much physical activity do you need for a health benefit?
   A. 1995 recommendation of Centers for Disease Control and the American College of Sports Medicine
   B. A total of 30 minutes of physical activity at moderate intensity for most days of the week
   C. Breakdown of the recommendation
      1. How long? (duration)
         a) A total of 30 minutes
         b) Such as
            (1) 2 sessions of 15 minutes each
            (2) 1 session of 15 minutes and 3 sessions of 5 minutes
      2. How hard? (intensity)
         a) As a brisk walk
         b) This is a brisk walk for you
      3. How often? (frequency)
         a) Minimum of 4 days per week
         b) Ideally, every day per week
      4. What type? (mode)
         a) Big muscle movements
         b) Walking-type activity
         c) Housework: sweeping, vacuuming, washing windows
         d) Yardwork: raking, mowing lawn
         e) Leisure: dance, calisthenics, golf, tennis

III. Benefits - Physical Activity Is a Key to Better Health
   A. Improve health fitness status
      1. Components of fitness
         a) Cardiorespiratory: heart and lungs
            (1) Improves endurance, ability to do an activity for a sustained period of time
            (2) Walking, shopping, biking, jogging
         b) Muscular strength and endurance

(1) Ability to push, pull, or lift an object or a body part one or many times
(2) Getting up from a chair, getting out of bed, carrying groceries

c) Flexibility
(1) Ability to move a joint of the body through a full range of motion
(2) Ability to bend over and pull up socks, reach for object above head, put on a coat

d) Body Composition
(1) Amount of body fat compared to lean body weight
(2) Not just scale weight
(3) Affects joint's ability to move body parts, blood composition

2. All components are interrelated; to have a good health fitness, one needs to develop all components
a) Example: A walker will develop their cardiorespiratory system, but if they do not work on the other components, they may not be able to easily get up from a chair, or have the ability to easily pick up objects from the floor
b) Biggest concern has been with cardiorespiratory:
(1) With age, strength and flexibility become more important to help maintain independence
(2) Need to stress ability to do daily living tasks such as dressing, bathing
c) Keeping physically active maintains the different health fitness components; if you don't use it, you'll lose it

B. Prevents or decreases symptoms of chronic disease
1. Ask audience for examples of chronic diseases
2. Diabetes: inability to regulate blood sugar
a) Physically active people less likely to develop diabetes
b) People with diabetes assist to control blood sugar level
c) Help prevent decline in body organs due to diabetes
(1) Blood vessels better health, less clogging
(2) Less wear on kidneys, hard for kidney to process high sugar concentration in the blood
(3) Less problem with eyesight, decrease in eye blood vessel damage
3. Arthritis
a) Decrease the symptoms
(1) Less pain, able to do more
(a) Examples of people who exercise
(i) Able to golf again
(ii) Can drive without pain in hands
(2) Increased range of motion

(a) Examples
(i) Easier to get coat on
(ii) Easier to put on socks and shoes
(3) High blood pressure
(a) Can assist in lowering blood pressure
(b) Does not work for everyone

C. Improve balance and bone health
1. Physical activity allows one to practice balance, learn to adapt movement
2. Osteoporosis: decrease in bone density
a) Physical activity makes bone stronger
b) Bone needs to be stressed to maintain or improve strength and density
c) Lying in bed and space flights have been shown to weaken bone
d) Need weight-bearing activity to improve bone health
3. Improve balance and improve bone strength: less likely to fall, less likely to break a bone if one does fall
4. Example: Lady in exercise class had a bone scan done at the beginning of class; recently she had another bone scan done and found she had increased bone density, which she thought was due to her increase in exercise

D. Relieves anxiety, insomnia, and depression
1. Anxiety: stress, older individuals have many stresses
a) Physical activity acts as a way to neutralize hormones that make a person feel stressed
b) Gives the person something else to think about and enjoy
2. Depression: feeling sad
a) Increase hormones that result in feeling happy (endorphins)
b) Runner's high: good feeling after exercise
3. Insomnia: inability to sleep
a) People who exercise regularly have a more restful sleep
b) Person with arthritis, able to sleep without pain

E. Reduces risks of some cancers
1. Two types of cancer, colon and breast, most decrease shown
a) Colon: helps move food through digestive tract
(1) Decrease chance of cancer causing agent to attack body cells
(2) Assist people with constipation problems
b) Breast
(1) Not sure how works
(2) More active women, less breast cancer

F. Promotes social contact
1. Human is a social creature by nature
a) Need to have contact with others to maintain total health

b) Works to decrease depression
2. Allow individual to be part of group but still work at own level
3. Come to class to see others, check up on each other

G. Decrease medical costs
1. Decrease the number of doctor visits
a) Decrease time
b) Decrease transportation time and cost
2. Decrease the amount of medication needed
3. Canadian study has shown a physical active person will spend seven times less on health care cost than a physically inactive person (Roos & Haven, 1991)

H. Promotes self-care and independence
1. Increase self-esteem, feel good about self
2. Can do things for self, feeling of self-control
3. Able to handle daily tasks such as dressing, feeding, bathing, shopping by self or with minimal assistance
4. Allows to stay independent
a) Maintain the living situation you are in
b) Do not need to move to another living setting for a higher level of care

I. Improves quality of life
1. All of previous benefits add up to a higher quality of life
2. Higher living standard, not necessarily in money but how we enjoy life
3. Can enjoy life, are able to do things

IV. Need for Physical Activity
A. No such thing as being too old to exercise
B. We may not be able to take up sky diving, but we can do something to improve health status
C. Older adults respond similarly to younger adults in physical activity programs, but may progress at a slower rate
D. Human body was designed to move; inactivity increases chance of disease, decreases bone health, and increases cardiovascular disease
E. Medical cost can possibly be decreased or minimized
F. Each individual responsible for own health
1. Does not mean you are responsible for getting a chronic disease, but you are responsible to do the best you can to improve or maintain a healthy body
2. Advance to physical activity: improves health without drugs, without expensive treatment, and is within one's own capacity
G. Quality of life is improved, not necessarily quantity
1. Each individual definition of quality of life
2. Add life to your years, not necessarily years to your life
H. A little physical activity goes a long way; doing something is better than doing nothing

I. Unlock your door to better health, with physical activity as the KEY

Part II-B, How to Start a Safe Exercise Program (Use poster board 1,2,5,6)

I. Review of educational lecture I
   A. Parts of health fitness guidelines
      1. How long? a total of 30 minutes
      2. How hard? as a brisk walk
      3. How often? a minimum of 4 times per week
      4. What type? walk, bike, rake, sweep, vacuum, wash windows, dance, specific exercises
   B. Benefits of Exercise - Ask audience for benefits from last week's lecture or what they have experienced

II. How to start a safe exercise program?
   A. Know your limitations
      1. Everyone has limitation in life, even Olympic athletes have limitations; you need to know what your limitations are
      2. Screening: a way to find out limitations
         a) Physical Activity Readiness Questionnaire, part of first evaluation form you completed
         b) Take a fitness test
            (1) Stress test or graded exercise test: walk on treadmill or bike while heart rate is monitored
            (2) Walk/run test, sit ups, push ups
            (3) Blood pressure, heart rate, vital capacity (breathing ability)
      3. Talk to physician/doctor
         a) Know I have an illness, disease or chronic condition; what is safe for me to do?
         b) Do I need to limit what I do?
         c) Do I need to omit some types of exercise?
      4. Most people can safely start a low-level physical activity program without undue risk - If you have any questions, contact your doctor
      5. If you plan to start a high-level physical activity program, contact your doctor before starting and listen to his/her advice
   B. Normal responses
      1. Ask audience what body changes they experience when they do physical activity
      2. Handout: Physical Activity Safety Precautions
      3. Normal responses
         a) Increase in rate and depth of breathing
         b) Increase heart rate
         c) Increase blood pressure
         d) Mild-moderate sweating
         e) Flushing of skin

f) Mild muscle aches and tenderness

C. Warning signs (on handout with normal responses)
1. Three important aspects
a) Know the warning signs
b) Listen to body for warning signs
c) Take appropriate action
2. STOP activity if
a) Cramps develop in any body part(s), muscles are not working correctly
b) Chest pain (angina), pressure or tightness in chest, may be a problem with your heart
c) Severe shortness of breath, your body is not getting enough air or supply of oxygen
d) Pain in shoulder(s) or down the arm(s), may indicate heart is not functioning correctly
e) Profuse sweating, sweat is just dripping off the person
f) Dizziness or fainting, body and/or brain is not adjusting to exercise
g) Loss of muscle control, muscles are not functioning correctly
h) Nausea, feeling sick to stomach
i) Severe or prolonged fatigue after physical activity
3. SLOW DOWN activity if
a) You cannot pass the talk test
(1) Ask audience to say hello to their neighbor, How are you?
(2) If you can talk without gasping for air and can hold a conversation, you should be working at an appropriate level
b) Severe soreness after last physical activity session
c) Heart rate did not return to normal 1 hour after exercise
(1) Need to know what a normal heart rate is for yourself; we will practice this later
(2) 72 is average but can range from 60 to 80
d) Return to physical activity after an injury or illness

D. Progress slowly
1. Do not try to conquer the world in a day
2. Little steps are wise steps
3. Examples
a) Add 1 minute of exercise each day
b) Increase only the intensity, duration, or frequency of your exercise program; do not increase more than one thing at a time
c) Do the same exercise session twice, then progress slowly and only if none of the warning signs occur

E. Breathe
   1. It sounds easy, but people tend to hold their breath when doing an exertion or holding a stretch
   2. What happens if you do not breathe:
      a) Increase your blood pressure due to increased pressure in chest cavity
      b) Think of blood vessels as straws; if pressure in chest cavity gets too high blood vessel would partially or completely collapse, allowing little or no blood supply to heart

F. Types of intensity checks
   1. Talk test, already covered
   2. Heart rate (Handout 2 - How to take a pulse rate, see handout)
   3. Rating of Perceived Exertion (RPE)
      a) Is a rating scale from 1 to 10 on how you feel you are working
      b) A rating of 3 or 4 would be moderate level, as a brisk walk
      c) Ask audience how hard they are working when:
         (1) Sitting in a chair
         (2) Folding clothes
         (3) Brisk walking
         (4) Running one block

G. Good body alignment
   1. Ear, shoulder, hip, and ankle in a straight line; this may alter slightly with age
   2. Keep muscles in good position to work
   3. Concentrate on good posture

H. Work both sides of the body
   1. Do work with one side, need to work other side; example: lift a can of soup or a weight
   2. Both sides may not be the same, but need to work both sides; example: one knee bends to 90 degrees, the other bends to 50 degrees
   3. Try to work the joint in all directions that the joint moves

I. Work all components of fitness
   1. Ask what are the components (review of last week)
      a) Cardiorespiratory
      b) Muscular strength and endurance
      c) Flexibility
      d) Body composition
   2. All parts are interrelated -- to develop a good level of health fitness, need to work on all components
   3. Doing something is better than doing nothing; starting a physical activity program is the biggest health benefit you can receive

PHYSICAL ACTIVITY SAFETY PRECAUTIONS

Handout 1

Physical activity, as with anything in life, is not done without risks. When beginning a physical activity program, always check with your physician and then progress slowly.

Normal physical activity responses:

1. Increased rate and depth of breathing
2. Increased heart rate
3. Increased blood pressure
4. Mild to moderate sweating
5. Flushing of the skin
6. Mild muscle aches and tenderness during the first weeks of physical activity or when increasing the intensity (how hard), frequency (how often), or length of the session.

The following are warning signs from your body. Listen to your body and the signals it is sending you; then take the appropriate actions.

Signs of Overexertion (YOU are working TOO Hard!)

1. **STOP** Physical Activity
    a. Cramps develop in any body part(s)
    b. Chest pain (angina), pressure or tightness
    c. Severe shortness of breath
    d. Pain in shoulder(s) or down the arm(s)
    e. Profuse sweating or nausea
    f. Dizziness or fainting
    g. Loss of muscle control
    h. Nausea
    i. Severe or prolonged fatigue after physical activity
2. **SLOW DOWN** Physical Activity
    a. Can NOT pass the talk test (being able to talk without gasping for air)
    b. Severe soreness after the last physical activity session
    c. Heart rate did not return to the resting rate one hour after physical activity
    d. Returning to physical activity after an injury or illness

How To Take a Pulse

Handout 2

Places to take the pulse:

1. Carotid pulse: side of neck. Place fingers beside the Adam's apple and slide to side of neck under the jaw bone.
2. Radial pulse: thumb side of wrist. Position hand palm up and place the fingers at base of the thumb.

How to find the pulse:

1. Use two fingers, the index and middle fingers. Do not use your thumb.
2. Press LIGHTLY. Pressing hard will slow down the pulse and underestimate how hard you are working.
3. Feel for the pulse immediately after physical activity. The pulse slows down very quickly after physical activity. Waiting too long will not give you an inaccurate measurement of how hard you are working.
4. Start your count from zero. Count zero, one, two, three,.....
5. Count your pulse for 6 seconds after exercise. Add a zero to the number you counted. This will give the number of heart beats per minute. Example: count of 10 equals 100 heart beats per minute.

Suggestions and Hints:

1. The radial pulse may be easier to find if you flex the wrist toward you. A small pocket will form on the thumb side of the wrist and may make it easier to find the pulse.
2. NEVER feel for both carotid pulses (both side of the neck) at the same time. This restricts blood flow to the head and may cause dizziness or fainting.
3. Practice, practice, practice. Practice taking your pulse often. This will increase your ability to find the pulse quickly.
4. If you are taking heart medication that is a type of beta blocker, heart rate is not a good method to measure how hard you are working.
5. Learn what a resting heart rate is for you. Monitor your heart rate so you know if your heart is responding normally at rest or during physical activity.

Poster Boards (22 inches x 28 inches)

Poster 1: Benefits of Physical Activity and How to Start a Safe Exercise Program

Poster 2: How much exercise do you need for a health benefit?
How long? a total of 30 minutes
How hard? as a brisk walk
How often? minimum of 4 days/week
What type? walk, bike, rake, sweep, vacuum, wash windows, dance, exercise

Poster 3: Why stay physically active?
Benefits:
Improve health fitness level - Cardiorespiratory System
- Muscular Strength & Endurance
- Flexibility
- Body Composition
Prevent or decrease symptoms of chronic diseases

Poster 4: Benefits: (cont.)
Improves balance & bone health
Relieves anxiety, insomnia, & depression
Reduces risk of some cancers
Promotes social contact
Decreases medical costs
Promotes self-care and independence
Improves quality of life

Poster 5: How to start a safe exercise program?
Know your limitations - Screening
- Talk with physician
Normal response
Warning signs
Progress slowly
Breathe
Good body alignment
Work both sides of the body
Work on all components of fitness

Poster 6: Intensity Checks
Talk test
Heart rate
Rating of Perceived Exertion: 0-Nothing at all; 0.5-Very, Very Weak;
1-Very Weak; 2-Weak; 3-Moderate; 4-Somewhat Strong; 5-Strong; 6- ;
7-Very Strong; 8- ; 9- ; 10-Very, Very Strong; *-Maximal

Part III - Chair Exercise Program

The chair exercise program is a 45-minute program conducted three times a week. All exercises can be done sitting in a chair or standing next to a chair. Participants who are not able to stand will be offered alternative exercises and can remain seated the entire time. The guidelines for safe exercise participation and how to perform flexibility and strength exercises will be emphasized (see Appendix I, Part II-B and Part III).

The program will consist of a 12-week session. During the first session, the warm-up and cool-down exercises will be demonstrated by the leader, and no more than three repetitions of each exercise will be done by class participants. The flexibility and strength section will have six exercises done from each section. Two new exercises will be added each day until all exercises are included. Beginning the seventh week of the program, volunteer participants will be asked to assist in performing the exercises in front of the class. Beginning the ninth week, participants will be asked to lead the exercises following a cassette tape recording or providing verbal directions for the exercises. By the end of the twelfth week, participants will be able to be self-directed in leading the chair exercise program and continue the program after the initial course time period.

Chair Exercise Program Description

Warm-up (Entire warm-up done sitting in a chair)

1. Deep breathing: Sit up straight, shoulders relaxed. Breathe in through the nose and exhale through the mouth.
2. Look over your shoulder: Chin parallel to floor, slowly turn head to look over one shoulder. Hold. Slowly turn head to look over opposite shoulder and hold.
3. Ear to shoulder: Looking straight ahead. Tip chin toward the chest. Hold. Tip ear to the shoulder on the same side of body. Hold. Tip chin toward the chest. Hold. Tip opposite ear to shoulder on the same side of the body. Hold.
4. Shoulder shrug: Shrug shoulders toward ears. Slight hold and return to normal sitting position. Shrug shoulders down toward the floor. Hold. Relax. Shrug shoulders forward. Hold. Relax. Shrug shoulders backward. Hold. Relax.
5. Shoulder rolls: Slowly roll the shoulders in one direction (alternate shoulders or do both at once). Slowly roll shoulders in the reverse direction.
6. Lateral arm lift: Hold arms along the side of the chair. Slowly raise one arm to the side, palm up and elbow straight, until hand is above the shoulder. Turn palm away from the body. Lower the straight arm to the starting position. Repeat on other side.
7. Wrist curls: Hold hands out in front of body, palms up. Slowly curl the fingers and hands toward the chest, making a fist. Slowly uncoil the fist to starting position.
8. Reverse wrist curls: Hold hands out in front of body, palms down. Slowly make a fist and bring the back of the hands toward the chest. Slowly uncoil the fist to the starting position.
9. Pendulum swing: Start with the arms along the side of the chair. Move one arm forward, the other arm backward. Reverse the direction. Arms will swing back and forth like a pendulum. Slow down arm swing gradually.

10. Walk in place: Sitting in the chair, move the legs as if walking or marching in place. Gradually add the pendulum swing (#9). Work at pace to increase circulation but not to feel short of breath. Gradually slow down the arm movement, followed by the leg movement.
11. Ankle circles: With right heel on the ground or straightening the right knee and holding the leg in the air, turn the right ankle in a circle. Work full range of movement. Reverse the direction. Repeat with the left leg.
12. Knee hugs: Bend the right knee and lift the leg toward the chest. Grab the leg with both hands (either at thigh or shin) and give the knee a hug. Hold. Repeat with the left knee. (Options: Flex/extend toe of leg being hugged; point toe toward center of body or away from the body; combine previous two movements.)

Talk test: Participants are asked to greet their neighbors. If they do not know the person sitting next to them, participants are asked to introduce themselves.

Flexibility

(All exercises can be done sitting. Exercises #10-15 can be done standing next to the chair. Participants decide whether they should stand or sit, depending on their standing stability and mobility limitations.)
1. Open the door: Hold arms out to side. Keep elbows lower than the shoulders. Pretend to grab a door knob with each hand and open and close the door. (Option: Hold hands to side and move shoulders forward and backward.)
2. Arm circles: Hold arms to side, palms up, elbows below shoulder height. Circle arms forward. Reverse the direction. Circle size, height of the arms, and speed are varied by the participant. Alternative exercise: hold arms to side, palms down.
3. Biceps/triceps stretch: Biceps: Bring the right arm across the upper chest with the elbow below the shoulder. Grab the right arm with the left hand above or below the right elbow (not on the elbow). Pull the right arm toward the chest. Wiggle the fingers or walk the fingers against the thumb while holding the stretch. Slowly lower the right arm to the side. Triceps: Take the right hand and point the fingers at the spine. Hold. Repeat with left arm. (Options for triceps: Support the right arm with the left hand or place the left hand on the right elbow and gently pull the right arm toward the head.)
4. Figure 8: Using the right arm, make a loop on the left side of the body and then a loop on the right side of the body (figure 8). Reverse the direction. Repeat with left arm. Repeat using both arms at the same time. (Options: Make figure 8 loop above the head and below the head; make a loop on right side, figure 8 in front of body, loop on left side, figure 8 in front of body; alternate figure 8 on side of body and then in front of the body.)
5. Ankle extension and flexion: Start with the right heel on the floor or straighten right knee and hold leg in air. Point the toe toward your body. Hold. Point toe away from body. Hold. Place right foot on floor. Repeat with left leg. (Options: Turn toe inward, hold, turn toe outward, hold; combination, flex ankle, extend ankle, toe in, toe out.)
6. Torso turn: Can be done seated or standing. Seated: keep feet flat on the floor and hips facing forward. Slowly turn the upper body and look over the right shoulder. Hold. Slowly turn to face the front. Slowly turn the upper body and look over the left shoulder.

(Caution participants not to turn too far; a slight stretch should be felt, not pain or discomfort.) (Option: place arms out to side, with elbows bent, and fingers pointing toward the ceiling.)
Standing: Repeat seated exercise in a standing position. Participant may wish to hold on to chair with the hand opposite the turning direction or leave hands by side of body

Exercises # 7-10 can be done standing or sitting. Standing assists in developing balance.

7. Side bend: Slowly lean the upper body to the left while reaching the right arm over the head. Keep the arm close to the ear. Arm may be straight or bent at the elbow. Feel the stretch along right side of trunk. Repeat with lean to right side. (Options: If standing, participant may hold onto chair with the hand(s); lean to the side without reaching arm over the head.)
8. Trunk circles: If done sitting, move away from the back of the chair. Keep the chin in a natural position. Lean forward with the upper body. Slowly rotate the upper body in a counterclockwise direction (front, side, back, side). Repeat several times. Sit up or stand up slowly. Repeat the exercise in a clockwise direction. (Caution: Participants should work at their own pace; dizziness can result from doing the exercise too fast or switching directions too quickly.)
9. Hip tilt: (directions given for standing) Keep upper body erect. Tilt hips forward (toward chair). Tilt hips to right. Tilt hips back (away from chair). Tilt hips to left. Repeat. Stand up straight. Reverse the direction.
10. Hip circles: Slowly turn the hips in a circle (trying to keep a hula hoop moving). Reverse the direction.

Intensity check: Pulse check, relative perceived exertion, or talk test. (Note: We take a pulse check for 6 seconds; pulse should be no higher than 10 beats per 6 seconds. If person has problems finding and/or taking a pulse, talking to their neighbor is recommended.)

Strength

(All exercises can be done sitting. Exercises # 8-12 are usually done standing, but participants can do all exercises sitting. Proper breathing techniques are emphasized.)
1. Finger press: Bend the elbows and raise the arms to the side. Elbows are below shoulder height. Place finger tips together. Press the fingers together and hold as you exhale. Relax and inhale. (Option: If pressing the fingers together causes pain, stretch the finger joints and hold as you exhale.)
2. Rowing: Place straight arm in front of the body just below shoulder height. Pretend to grab two oars (or weights). Slowly pull the oars toward the chest while exhaling. Relax, and return to starting position as you inhale.
3. Seated bent leg lift: Can be done with single or double legs.
Single: Lift the right knee toward the chest. Move the bent right knee to the right side and touch the toe to the floor. Bend the right knee, lift foot off the floor, move the leg to center of body, and lower foot to the floor. Repeat on left side.

Double: Lift both knees toward the chest. Move the bent legs to the right side and touch both feet to the floor. Bend both knees and lift both feet off the floor; move the legs to the center of the body and touch both feet to the floor. (Option: After touching the feet to the side, bend the knees and lift both feet off the floor and swing the legs all the way over to the other side of the chair. Lift feet off the floor, move legs to the center of the body, and return the feet to the floor. Repeat, starting on the opposite side.) (Caution: Important to emphasize breathing.)

4. Seated sit-up: Sit in chair so that feet are flat on the floor and away from the back of the chair. Place hands at side of chair or interlock fingers and hold arms out in front of the body. Slowly lean back toward the chair. Contract the abdominal muscles and return to an upright sitting position. Inhale while leaning back toward the chair. Exhale while contracting abdominal muscles and returning to an upright sitting position.
5. Seat press/hip lift: Contract the seat muscles (gluteus) and hold. Exhale as you hold contraction. (Option: Grab the side of the chair, extend the arms, lifting the seat off the chair while contracting the seat muscle.)
6. Seat walk: Sit to the back of the chair. Pick up the right hip and move it forward, away from the back of the chair. Pick up the left hip and move it forward, away from the back of the chair. Repeat with right hip and left hip. Reverse the direction, bringing the hips back toward the chair, alternating right hip and left hip. Repeat forward and backward seat walk. (Option: If there is pain or discomfort, the participant can walk or march in place while seated in the chair.)
7. Straight leg lift: Slowly straighten both legs and lift feet off the floor. Hold this position. Slowly lower legs to starting position. (Options: Alternate flexing/extending both ankles while holding; flex one foot and extend the other foot.)
8. Shoulder touch: Straight arms to sides, palms up, elbows slightly lower than shoulders. Slowly make a fist, contact upper arm muscle, bending the elbows and bringing the hands toward the shoulders while exhaling. Reach the arms toward the sky while inhaling. Pretend to grab a bar and slowly pull it down toward the shoulders while exhaling. Straighten arms to side while inhaling (starting position).
9. Armpit touch: Straight arms to side, palms down, elbows slightly lower than shoulders. Slowly make a fist, bending the elbows and bringing the hands toward the armpits while exhaling. Straighten arms to starting position while inhaling. Turn hands palm up. Make a fist and bend elbows to 90-degree angle while exhaling. Straighten arms to starting position while inhaling.
10. Heel lift: Sitting: Place feet flat on the floor. Slowly raise heels off the floor. Slight hold. Slowly lower heels to floor. Standing: Face back of chair, toes pointing forward. Place hands on back of chair for support. Slowly raise heels off the floor. Slight hold. Slowly lower heels to floor. (Options: Point toes toward each other and repeat the heel lift; point toes away from each other and repeat heel lift.)
11. Lateral leg lift: Standing behind the chair and using the back of the chair for support. Stand on the left leg and slowly raise the right leg to the right side. Hold. Slowly lower the leg to the floor. Repeat on left side, standing on the right leg, lifting the left leg. (Options: Extend/flex ankle as you hold position; point toes toward chair and away from chair). Sitting: Slowly raise right leg to the right side, hold. Repeat to left side.

12. Knee lift: Stand behind the chair or slightly to one side. Hold on to the back of the chair for support. Stand on the left leg. Bring the right knee up in front of the body. Hold. Set the right foot on the floor. Turn the right knee to the side, bend the knee, and lift the right leg to the side. Hold. Set the right foot on the floor. Bend the right knee and lift the right heel toward the buttocks. Hold. Make sure the thighs are parallel to each other. Repeat with the left leg while standing on the right. (Options: When bring the heel toward the buttocks, grab the ankle of the bent leg foot with the opposite hand and hold. The thighs must be kept parallel or do not attempt this exercise option.)

Intensity check: pulse check (6 seconds), relative perceived exertion, or talk test. Done the same as after flexibility exercises. Heart rate no higher than 12 beats per 6 seconds.

Cool down

Exercises # 6 & 7 are best if done from a stand.

1. Arch and waterfall: Arms alongside chair. Slowly lift hands to side and up over the head while inhaling. Lower the arms in front of the body, wiggling the fingers and exhaling.
2. Forward lean: Sit up straight and keep chin in a natural position. Slowly lean forward at the waist for 4 counts while exhaling. Slowly rise to a sitting position for 4 counts while inhaling.
3. Chin push: Sitting up straight, gently push the chin straight back with two fingers. This will make you sit up very straight in a good posture position. Hold. Relax.
4. Wrist curls: Repeat exercise # 7 in warm-ups.
5. Finger stretch: Hold arms in front of body; elbows can be slightly bent. Spread the fingers on both hands as far as possible and hold. Relax and repeat.
6. Calf stretch: Stand behind the chair. Hold on to the back of the chair for balance. Stand in a forward stride position, right leg forward, left leg back, with both feet pointing straight ahead. Keep both feet flat on the floor. Bend the right leg (keeping the right knee over the right ankle) and keep the left leg straight (do not lock the knee). Hold. Repeat with left leg forward and right leg back. Keep seat tucked under to prevent arch in lower back.
7. Archilles stretch: Start exercise as in exercise # 8. Bend both knees (slight squat position) and keep seat tucked under. Hold. Relax. Repeat with left leg forward and right leg back.
8. Lunge: Stand behind the chair. Hold on to back of chair for balance. Take a big step to the right side into a lunge position (right leg will be bent, with the right knee over the right ankle, and left leg will be straight). The toe and knee of the same-side leg should be pointing in the same direction. Hold. Repeat to other side.
9. Rainbow: Arms at side. Inhale through the nose and raise the arms above the head with the palms facing each other. Turn the palms away from each other and slowly lower the arms to the side while exhaling through the mouth. Repeat.

PROPER PHYSICAL ACTIVITY TECHNIQUES

Proper Stretching Techniques

1. Remember to BREATHE! Do NOT hold your breath.
2. Use a slow, sustained stretch. Do NOT bounce.
3. Stretch to the point of slight tightness (slight discomfort) and hold the position.
4. Repeat the stretch several times. Start with three repetitions maximum and slowly increase the number.
5. Always stretch both sides of the body, front/back, right/left.
6. Keep your body in proper alignment (correct posture).
7. Do NOT be concerned with what your neighbor is doing. Each person has a different flexibility level. Work within your ability.

Proper Strength Techniques

1. Remember to BREATHE! Do NOT hold your breath.
2. Attempt to breathe (exhale) during the exertion/lifting process.
3. Use a slow, even count during strength exercises. The lifting and lowering processes should be about equal in length.
4. Start strength exercises concentrating on a full range of movement with no weight or resistance.
5. Progress slowly; start with three repetitions and increase by one or two repetitions.
6. Keep your body in proper alignment (correct posture).
7. Always work muscle groups on both sides of the body.
8. Do NOT be concerned with what your neighbor is doing. Each person has a different strength level. Work within your ability.

***** IF YOUR BODY SHOWS ANY SIGNS OF OVEREXERTION, STOP OR SLOW DOWN! LET SOMEONE KNOW YOU ARE EXPERIENCING SOME SIGNS OF OVEREXERTION AND IF YOU ARE IN A CLASS, NOTIFY ONE OF THE INSTRUCTORS. *****

***** Most IMPORTANT, have fun while you maintain or increase your flexibility and strength. *****

Preliminary Instructions
Cassette Tape Recording

The following chair exercise session is part of a health promotion program entitled "Unlock the Door to Better Health," designed by Jane Braatz. The program emphasizes flexibility and strength exercises at a low to moderate intensity. Participants should consult their doctor before starting any physical activity program and remember three general rules:

1. The exercises are not competitive; work at a pace appropriate for you.
2. Listen to your body; eliminate any exercise that causes you pain or you have been told not to do.
3. Remember to breathe, particularly when you are holding a stretch or contracting a muscle.

Part IV-A - Physical Activity Log

Weekly Log

Physical Activity Log

Name_____ Housing Number_____

Week of _____to_____

Physical Activity or Exercise	How long?	How many times?	Verification*
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

List any improvements in your health since you started the physical activity program:

_____

_____

List any problems or reasons that limited your physical activity program this week:

_____

_____

Question(s) for weekly meeting:_____

_____

Topics you would like to see covered in the weekly meeting: _____

_____

* Verification allows an additional entry into the prize drawing.

Part IV-B - Weekly Contract Meeting Topics

As part of the contract physical activity program, weekly lectures were presented. Each lecture lasted 30 minutes. Any subject could attend the lecture, even if he or she was not participating in the contract method. Major outline headings of the lecture content follow. Each major heading had several subheadings. Lecture handouts highlighted the outline headings. The lecture outlines and lecture handouts can be purchased from the author.

Lecture I - How to Complete the Logs and Develop Goals

This was an informational meeting. Persons attending did not have to commit to participating in the contract lecture. The following were the major areas covered: (a) What is the contract method? (b) reasons for choosing the method, (c) how to complete the form (example distributed), (d) listing of individual goals, (e) selection of one goal to put into action, and (e) individual log completion. Handout: Example of Log.

Lecture II - Flexibility, Use It or Lose It

Major areas covered: (a) background information (definition, factors affecting flexibility, safety factors inherent in muscles), (b) ways to increase flexibility, (c) guidelines for stretching (ACSM, 1995) (intensity, frequency, duration, guidelines for older adult), (d) benefits of good flexibility, (e) normal ranges of motion, and (f) things to do in daily living to improve flexibility. Handout: Flexibility, Use It Or Lose It.

Lecture III - Muscular Strength and Endurance

Major areas covered: (a) background information (definitions, factors that affect strength), (b) ways to increase strength; (c) guideline for strength (ACSM, 1995) (intensity, frequency, duration, guidelines for older adults), (d) benefits of strength, and (e) things to do in daily living to improve strength. Handout: Muscular Strength and Endurance, Keys to Daily Activities.

Lecture IV - Taking Control of the Balancing Act, Weight Control

Major areas covered: (a) introduction --questions about losing and gaining weight. (Quiz in Healthy Eating for a Healthy Life, AARP, 1994), (b) taking control of weight (intake, food guidelines, output, factors that affect the balancing act), (c) general food guidelines (food pyramid, nutrients), (d) benefits of exercise in weight control, and (e) steps to improve diet and exercise. Handout: AARP. (1994). Healthy Eating for a Healthy Life. (PF 5238(994) - D15565) pamphlet.

Lecture V - Hypertension and Physical Activity

Major areas covered: (a) background information (definition, classification of blood pressure, factors that affect blood pressure), (b) nonpharmacological treatments, (c) guidelines to becoming more physically active with hypertension, (d) benefits of exercise, and (e) blood pressure demonstration (participants had the option to have their blood pressures taken or listen to the blood pressure sounds). Handout: Hypertension and Physical Activity. Equipment: Blood pressure kit.

Lecture VI - Arthritis and Physical Activity

Major areas covered: (a) background information (definition, common types), (b) treatment and intervention, (c) benefits of exercise, (d) components of exercise program, (e) tips on exercising with arthritis, and (f) resources: Arthritis Foundation. Handout: Arthritis and Physical Activity.

Lecture VII - Heart Disease and Physical Activity

Major areas covered: (a) background information (definition, common types, symptoms), (b) structure of heart (anatomy and function), (c) risk factors of heart disease, (d) benefits of exercise, (e) guideline to improve heart health (ACSM, 1995), and (f) resources: American Heart Association. Handout: Heart Disease and Physical Activity.

Lecture VII - Respiratory Disease and Physical Activity

Major areas covered: (a) background information (definitions, common types, symptoms, causes), (b) structure of respiratory system (poster, American Lung Association), (c) smoking and respiratory disease, (d) guidelines to exercise (American Lung Association), and (e) resources: American Lung Association and American Cancer Society. Handout: Respiratory Disease and Physical Activity. Supplementary pamphlet: American Lung Association, Help Yourself to Better Breathing (#4001, 7/95).

Lecture IX - Osteoporosis, Falls and Physical Activity

Major areas covered: (a) background information (definition, disease facts), (b) bone development, (c) risk factors for osteoporosis (d) benefits of exercise, (e) guidelines for exercise and osteoporosis, (f) characteristics of fallers, and (g) resources: Arthritis Foundation. Handout: Osteoporosis, Falls and Physical Activity and How to Get Up From and Down to the Floor. Supplementary pamphlet: Arthritis Foundation Disease Series: Osteoporosis, (#4191/5-95).

Lecture X - Diabetes and Physical Activity

Major areas covered: (a) background information (definitions, types), (b) warning signs, (c) benefits of exercise, (d) complications of diabetes; and (e) exercise guidelines ACSM, 1995) & American Podiatric Medical Association. Handout: Diabetes and Physical Activity.

Lecture XI - Stress and Physical Activity

Major areas covered: (a) introduction (what causes stress in older adults, scenario of stressful situation), (b) stress (definition, stress situations, rate stress, signs), (c) stress response; (d) general adaptation syndrome, (e) diseases associated with improper handling of stress, and (f) ways to release stress (physical activity, deep breathing, progressive relaxation, counting to 10, imagery, personal ways). Handout: Stress and Physical Activity.

Lecture XII - Keep It Going

Major areas covered: (a) importance of maintaining health and independence throughout aging, (b) ways to put physical activity into your lives (local opportunities for physical activity), and (c) A Report of the Surgeon General (Physical Activity and Health: Older Adult, 1996). Handouts; Keep It Going & Physical Activity and Health: Older Adults (U.S. Department of Health and Human Services, 1996).

APPENDIX J

APPENDIX J

Introductory Letter to Manager

Address
City, State Zip
Date

Manager
Housing Site
Address
City, State Zip

Dear Manager,

As a housing manager for a primarily older population, you realize the importance of your residents' ability to maintain independence and enhance their quality of life. Health promotion programs for your residents can assist in maintaining the mental, social, and physical components of their good health, and enhance the public relations status of your site.

As a graduate student in the final stages of a Ph.D. program, I am interested in working with older adults to improve their health status. Programs in physical activity have been shown to improve the health status of older adults. They contribute to reducing medical cost, maintaining independence, and enhancing the quality of life. Yet, the majority of older adults do not participate in helpful physical activities.

Most physical activity programs have not been very successful in keeping people active. There is typically a high dropout rate, and it is hard to get older adults to participate and stay active once the program ends. Reviews of these programs show that they violate several important guidelines. To improve this record, I have developed a progressive program that helps older adults become more active through a series of health promotion programs. The program includes awareness literature and announcements, a health fair, education programs on physical activity, and a low- to moderate-intensity physical activity program (see attached sheet for details). The program runs 15 weeks. The cost of the program ($3,000 to $4,000) will be waived for the residents at your housing site, in exchange for their participation in the program's evaluation.

Residents will be asked to volunteer for the study. Volunteers can choose to participate in any, all, or none of the program. These residents will fill out several forms before and after the health promotion programs. Residents needing assistance in form completion will receive help in a group meeting. All responses will be confidential.

The feedback from the residents at your housing site will be of great benefit to improving health promotion programs for older adults. Volunteers who decide to participate in the program will have the additional benefit of improving their health status and quality of life. Volunteers will also be eligible for prizes for their participation.

Enclosed is a brief explanation of the health promotion program. I will be contacting you within the next week to see if you have any questions and if your housing site is interested in participating in this program. I am willing to come to your site to explain the program to you and/or the resident advisory board.

Thank you for taking the time to read and consider my request. If you have any questions, feel free to contact me at (517) 699-1864.

Sincerely,

Jane Braatz
Michigan State University Graduate Student

Health Promotion Program Schedule

Two housing sites in the Tri-County Office of Aging area will be randomly selected to participate in this program. Each resident volunteer must fill out the feedback forms at three different times (see bolded areas).

Week	Program	Site number
1-2	**Consent to participate and feedback 1**	1 & 2
3	Health fair (A)	1
4	Education Program (B): Benefits of Exercise	1
5	Education Program (B): How to Exercise Safely	1
6 - 17	Physical Activity Programs: (1) Chair Exercise(C) (2) Self-initiated with weekly lecture(D)	1
15-17	**Feedback 2**	1 & 2
18	Health fair (A)	2
19	Education Program (B): Benefits of Exercise	2
20	Education Program (B): How to Exercise Safely	2
21-32	Physical Activity Programs: (1) Chair Exercise (C) (2) Self-initiated with weekly lecture (D)	2
30-32	**Feedback 3**	1 & 2

(A) The health fair will be held for 3 hours. Eight to ten groups will be invited to participate and will provide health screenings and educational information. All residents can attend the health fair even if they did not volunteer to participate in the study.

(B) Education Program: Each session consists of a 45-minute lecture, with handouts and a question and answer session.

(C) Chair Exercise: Low- to moderate-intensity exercise done sitting on or standing next to a chair. All exercises can be done sitting. The program emphasizes maintaining daily living functional capacity through range-of-motion and strength exercises.

(D) Self-initiated with weekly lecture: Individually designed exercise programs. Each week the participant decides upon his/her exercise goals and writes down the goals on a physical activity log. The log is turned in at the weekly meeting. A new log is written for the next week.

APPENDIX K

Housing Resident Introductory Information
(All pages were in 14 font size)

Part I - Introductory Letter

Date

Dear Resident,

Physical activity is beneficial to older adults in maintaining independence. Many older adults are inactive but could improve their health level if they became more active. There are various reasons why older adults are not physically active. These include lack of transportation, not knowing how to safely start an exercise program, being unaware of benefits of exercise, and the lack of money to pay for exercise programs. All these problems have been solved for you.

The management of (housing site) has agreed to offer a health promotion program at your housing site. Normally this program would cost between $3,000 to $4,000. There will be **NO cost to you** or (housing site) to participate in the program in exchange for filling out three written feedback forms.

All volunteers for the program will be able to win prizes for completing evaluation forms, and all information on the forms will be confidential. Group meetings will be held to assist in filling out the forms. You may participate in all, some, or none of the health promotion events.

By participating in the health fair and education classes, you will learn about the benefits of exercise and how to safely participate in an exercise program. By participating in the exercise sessions, you will gain health benefits from the increased exercise. In addition to the personal benefits, your name will be placed in a drawing for prizes for every time you attend a health promotion event.

More information on the programs is attached to this letter. Two meetings will be held (date) at (time) and (date) at (time) in the community room to discuss the program and give you a chance to ask questions. Snacks, coffee, and juice will be served at the meeting. If you cannot attend the meeting and have questions, please call me at my home (699-1864). If you want to participate, the enclosed consent form must be signed and turned in at the meeting or to the (housing site) office by (deadline date).

Thank you for your interest in this program. We hope you will take advantage of this opportunity to participate in a program that can improve your health.

Sincerely,

Jane Braatz
MSU Graduate Student

Part II - Informed Consent Form

Informed Consent Form

I have read the enclosed letter and description of the health promotion program. I understand that participation in this study includes completing evaluation forms at three different times and that help in completing the forms will be available. (It will take approximately 30 to 60 minutes to fill out each form.) I also understand that I will be eligible to win prizes for filling out the forms.

I understand that I may participate in any, all, or none of the health promotion events. These events include a health fair, several education programs, and exercise sessions. Participation in the exercise sessions will require the completion of an additional form (the Physical Activity Readiness Questionnaire). This form identifies if you can safely participate in an exercise program, with or without a doctor's consent.

Risks and Benefits

Increasing one's exercise level can lead to muscle soreness, injury, and, in a rare situation, death. These risks will be minimized in this program by using safe exercise techniques for an older population that emphasize working at one's own pace. The exercise program starts slowly and increases to a low to moderate exercise level. I understand that the program will be conducted by a certified health fitness instructor who is certified in first aid and cardiopulmonary resuscitation (CPR) and that emergency procedures will follow the housing site's emergency plan.

I understand my participation will provide information that will help develop health promotion programs for older populations. Individual benefits include learning about the benefits of and need for exercise, how to safely begin an exercise program, and actual participation in a guided exercise program. Furthermore, as with other physically active people, I may begin to feel better and enjoy an improved quality of life.

Questions

I have had the chance to ask questions about the program and understand what is required of me to participate in this study. I also know that if I have additional questions, I can ask the health promotion leader or call 699-1864.

Consent

I have read the informed consent form, and I understand what is required of me. I can participate in any of the health promotion programs, I may decline to participate in any or part of a health promotion program, or I may withdraw from the study at any time.

Name _____ _____
Print Signature

Date _____ Apt. # _____ Witness _____

Part III - Schedule of Housing Sites (Experimental I & II, Control)

Unlock the Door to Better Health
Physical Activity Program

Schedule Experimental I

Week	Event	Day/Time	Place
5/20	Advertisement	All week	Lobby, Community Room, Library, Laundry Room, etc.
	Informational Letters	Fri. 24/am	Each Apartment
5/27	Informational Meetings	Wed. 29/10:00 am	Community Room
		Thu. 30/10:00 am	Community room
6/3	Fill out forms	Mon. 3/4:00 pm	Community Room
	Small Group Sessions	Wed. 5/3:00 pm	Community Room
		Wed. 5/4:00 pm	Community Room
		Thu. 6/10:00 am	Community Room
		Thu. 6/11:00 am	Community Room
6/10	Health Fair	Thu. 13/9:00-noon	Community Room
6/17	Benefits of Exercise	Thu. 20/10:00 am	Community Room
		Fri. 21/10:00 am	Community Room
6/24	How to Start	Thu. 27/10:00 am	Community Room
		Fri. 28/10:00 am	Community Room
7/1-	Physical Activity Programs		
9/16	Chair Exercise	M,W, F/10:00 am	Community Room
	Contract (Individual)	Thu. /10:00 am	Community Room
9/9	Fill out forms	Wed. 11/3:00 pm	Community Room
	Small Group Sessions	Wed. 11/4:00 pm	Community Room
9/16	Fill out forms	Thu. 19/1:30 pm	Community Room
	Small Group Sessions	Fri. 20/9:00 am	Community Room
		Fri. 20/11:00 am	Community Room
12/9	Fill out forms	Wed. 11/4:00 pm	Community Room
	Small Group Sessions	Thu. 12/10:00 am	Community Room
		Thu. 12/11:00 am	Community Room
12/16	Fill out forms	Wed. 18/4:00 pm	Community Room
	Small Group Sessions	Thu. 19/10:00 am	Community Room

Unlock the Door to Better Health
Physical Activity Program

Schedule Experimental II

Week	Event	Day/Time	Place
7/8	Advertisement	All week	Lobby, Community Room, Library, Laundry Room, etc.
	Informational Letters	Fri. 12/am	Each Apartment
7/15	Informational Meetings	Mon. 15/11:00 am	Community Room
		Thu. 18/2:00 pm	Community room
7/22	Fill out forms	Mon. 22/11:00 am	Library
	Small Group Sessions	Tue. 23/10:00 am	Library
	(attend only one)	Tue. 23/11:00 am	Library
		Wed. 24/2:00 pm	Library
		Wed. 24/3:00 pm	Library
7/29	Health Fair	Tue. 30/9:00-noon	Community Room
	Benefits of Exercise	Thu. 1/2:00 pm	Community Room
8/5	Benefits of Exercise	Mon. 5/11:00 am	Community Room
	How to Start	Tue. 6/11:00 am	Community Room
		Wed. 7/2:00 pm	Community Room
8/12-	Physical Activity Programs (12 weeks)		
10/28	Chair Exercise	Tue. 10:00 am	Community Room
		Thu. 12:00 pm (Noon)	Community Room
		Fri. 1:00 pm	Community Room
	Contract (Individual)	Thu.10:00 am	Community Room
10/21	Fill out forms	Mon. 21/11:00 am	Library
	Small Group Sessions	Wed. 23/11:00 am	Library
		Fri. 25/2:00 pm	Library
10/28	Fill out forms	Mon. 28/11:00 am	Library
	Small Group Session	Wed. 30/11:00 am	Library
12/9-	Fill out forms	To be decided	Library
12/16	Small Group Sessions		

Unlock the Door to Better Health
Physical Activity Program

Schedule Control

Week	Event	Day/Time	Place
5/20	Advertisement	All week	Lobby, Community Room, Library, Laundry Room, etc.
	Informational Letters	Fri. 24/am	Each Apartment
5/27	Informational Meetings	Wed. 29/2:30 pm	Community Room
		Thu. 30/2:30 pm	Community Room
6/3	Fill out forms	Mon. 3/10:00 am	Arts and Crafts Room
	Small Group Sessions	Tue. 4/10:00 am	Arts and Crafts Room
		Wed. 5/10:00 am	Arts and Crafts Room
		Thu. 6/1:30 pm	Community Room
		Thu. 7/2:30 pm	Community Room
8/26	Fill out forms	Tue. 27/10:00 am	Arts and Crafts Room
	Small Group Sessions	Thu. 29/1:30 pm	Community Room
		Thu. 29/2:30 pm	Community room
9/2	Fill out forms	Tue. 3/10:00 am	Arts and Crafts Room
	Small Group Sessions	Thu. 5/2:30 pm	Community Room
9/9	Health Fair	Thu. 12/9:00-noon	Community Room
9/16	Benefits of Exercise	Tue. 17/10:00 am	Arts and Crafts Room
	Education I	Fri. 20/2:30 pm	Community Room
9/23	How to Start	Tue. 24/10:00 am	Arts and Crafts Room
	Education II	Wed. 25/2:30 pm	Community Room
9/30-	Physical Activity Programs		
12/16	Chair Exercise	M, W/1:30 pm	Community Room
		Fri. /10:00 am	Community Room
	Contract (Individual)	Thu. /1:30 pm	Community Room
12/9	Fill out forms	Tue. 10/10:00 am	Arts and Crafts Room
	Small Group Sessions	Thu. 12/1:30 pm	Community Room
		Thu. 12/2:30 pm	Community Room
12/16	Fill out forms	Tue. 17/10:00 am	Arts and Crafts Room
	Small Group Sessions	Thu. 19/2:30 pm	Community Room

Part IV - Description of Health Promotion Events

Description of Events

The **health fair** will be held for 3 hours. Eight to 10 groups will be invited to participate and will provide health screenings and educational information. All residents can attend the health fair even if they did not volunteer to participate in the study.

Education Program: Each session consists of a 45-minute lecture, with handouts and a question and answer session.

Chair Exercise: Low to moderate exercise done sitting on or standing next to a chair. All exercises can be done sitting. Exercises emphasize range of motion and strength.

Contract (individual) with weekly lecture: Individually designed exercise programs. Each week the participant decides upon his/her exercise goals and writes down the goals on a physical activity log. The log is turned in at the weekly meeting. A new log is written for the next week.

June
Physical Activity Program Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12	Health Fair 13 9:00 - Noon	14	15
16	Benefits to 17 Exercise 10:00 am	18	19	20	Benefits to 21 Exercise 10:00 a.m.	22
23/30	24	25	26	How to 27 start a Program 10:00 a.m.	How to 28 start a Program 10:00 am.	29

This project is partially funded through the ACSM Foundation Healthy People 2000 Project Grants and Michigan Fitness Foundation

APPENDIX L

APPENDIX L

Participation-Status Form
(14 point font in study)

(Date)

Dear (participant's name),

At the end of May you indicated interest in participating in a physical activity health promotion program by signing a consent form. In (month) the (number) evaluation form was delivered to your apartment but was not returned to me or the (housing site) Office.

I would appreciate your letting me know if you wish to continue in the physical activity health promotion program. Would you please fill out the attached sheet of paper and return it to the (housing site) office? Your assistance in this matter will allow me to have an accurate count of participants, save paper and money, and not bother you with unwanted materials.

If you do wish to participate in the health promotion program, you will need to complete the three evaluation forms. All forms will be provided and assistance provided. If you have questions call 699-1864 and ask for Jane.

Thank you.

Jane Braatz

Participation Status

Name _____ Apartment _____

Please check one of the following:

_____ I wish to continue in the physical activity health promotion program.

_____ I have decided not to continue in the physical activity health promotion program. Please indicate a reason for the switch:

_____ Care-giving obligation
_____ Chronic disease
_____ Moving from housing site
_____ Other (specify)
_____ Illness
_____ Injury

Thank you for completing this form. Please return to the (housing site) Office by (date).

APPENDIX M

APPENDIX M

Pilot Study

After receiving approval of the Michigan State University Committee on Research Involving Human Subjects (see Appendix B), a low-income elderly housing site in the Tri-County Office of Aging in Michigan, but not in the pool of sites (see Appendix A), was contacted to participate in phase one of the pilot project. A senior center in the Tri-County Office Area of Aging in Michigan was contacted to participate in phase two of the pilot study. Upon receiving approval from the housing site management or senior center director, an informational meeting was held to explain the pilot project and seek volunteers to sign a consent form. Phase one had seven female volunteers, and phase two had eight female volunteers. Demographics of the subjects in each phase are provided in table M[1]. In exchange for participating in the pilot study, each site was provided with an educational program on the benefits of physical activity to well-being and safety precautions necessary to start a physical activity program.

Table M[1]. Demographics of Pilot Study Subjects

	N	Age (SD)	Married %	Race % White	Yr. Ed. (SD)	Health[a] (SD)	Stage of Change (SD)
Phase 1	7	69.1 (12.0)	0.00	43	6.4 (5.7)	2.4 (.54)	4.5 (.79)
Phase 2	8	77.6 (8.1)	13.0	100	12.3 (2.0)	2.5 (1.2)	3.6 (1.1)

[a]Health status rating on a scale of 1-5, 1 = excellent, 5 = poor.

After receiving informed consent, the researcher conducted phase one of the pilot study on the pre- and postintervention evaluation forms. The forms were tested for readability and understandability in a low-income elderly population. Volunteers attended a small-group session or individual sessions to complete the evaluation forms. The investigator read the evaluation forms to the participants, assistance was given in calculating the seven-day recall level and supervision in proper form completion. Volunteers were asked to identify words, phrases, and sentences that were not clear either by circling the unclear items or telling the investigator. After the evaluation forms were completed, a discussion was held on how to improve the evaluation. The investigator recorded any comments about the questionnaire items.

Two of the subjects could not read English. Both subjects, however, spoke English fluently. They were assisted in completing the forms by a Spanish-speaking volunteer and the investigator. There was a problem in ensuring the accuracy of the Spanish speaking volunteer's interpretation of the evaluation form and determining whether she influenced the decision of the two non-English-reading subjects.

Minor revisions were made based on the comments, responses to questions, and items circled on the evaluation forms. The font type and size preference was in the Times New Roman and 14, respectively. This type and size font was used in all materials in phase two. No major revisions were necessary.

In phase two of the pilot study, the preintervention and postintervention evaluation forms were administered to eight female volunteers at a senior center. Subjects completed the evaluation forms at a group meeting. At the group meeting, the evaluation items were

read aloud, and subjects were assisted in filling out the forms by the investigator or a trained graduate student. All eight subjects completed the stage-of-change and process-of-change evaluation portions of the evaluation forms 4 days following the initial group meeting. The same protocol was followed as with the first trial.

A test-retest correlation coefficient on the stage-of-change and processes-of-change items was calculated using Microsoft Windows Excel, version 3.1, correlation coefficient function. The stage-of-change correlation coefficient was $\rho = .67$ and the process-of-change correlation coefficient was $\rho = .39$. Both coefficients were low.

A confounding factor for the low correlation may have been a discussion of the forms by subjects between the test trials. After the second trial was completed, the researcher discovered that subjects discussed their responses after the first trial. Subjects implied that this discussion might have influenced their responses on the second trial which would negatively affect reliability. Discussion of the test responses and inability to replicate phase two of the pilot study resulted in these reliability values being ignored. The stages-of-change and processes-of-change instruments were used based on the strength of previous research (Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992; Marcus & Simkin, 1993).

After completing the pilot study, it was decided that subjects who had difficulty understanding the English language would be allowed to participate in the intervention program. Their data would not be included, however, if an interpreter was needed to fill out the forms or the investigator thought the subject did not understand the forms.

APPENDIX N

APPENDIX N

Human Subject Approval and Promotion

Part I - A, Human Subjects Approval Forms (pilot and dissertation)

MICHIGAN STATE
UNIVERSITY

May 2, 1996

TO: Janelle Braatz
6916 Kingdon Ave.
Holt, MI 48842

RE: IRB#: 96-295
TITLE: PHYSICAL ACTIVITY BEHAVIOR CHANGE IN AN ELDERLY POPULATION USING THE TRANSTHEORETICAL MODEL
REVISION REQUESTED: N/A
CATEGORY: 2-G
APPROVAL DATE: 05/02/96

The University Committee on Research Involving Human Subjects'(UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/ CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

David E. Wright, Ph.D
UCRIHS Chair

DEW:bed

cc: Paul G. Vogel

MICHIGAN STATE
UNIVERSITY

May 23, 1996

TO: Janelle Braatz
6916 Kingdon Ave.
Holt, MI 48842

RE: IRB#: 96-295
TITLE: PHYSICAL ACTIVITY BEHAVIOR CHANGE IN AN ELDERLY POPULATION USING THE TRANSTHEORETICAL MODEL
REVISION REQUESTED: 05/22/96
CATEGORY: 2-G
APPROVAL DATE: 05/02/96

The University Committee on Research Involving Human Subjects'(UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/ CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Paul G. Vogel

Part II - Poster and Table Tents

Poster Contents (large key in the background)

Unlock the Door to Better Health

Find out how you can "KEY" into better health

Informational Letter Coming This Friday

Informational Meetings Next Week

Wanted: Residents to participate in a survey about physical activity. Both physically active and inactive participants needed.

Participants eligible for prizes

Join me for Refreshments

Questions? Call Jane at 699-1864

Funding sources listed.

Poster Wreath (Small keys with a benefits of physical activity written on each key. Keys arranged in a wreath formation.)

Center of poster:

Physical Activity is a KEY to Better Health

Informational Letter Coming This Week

Funding sources listed

Benefits listed on the individual keys:

Getting up from a chair
Improving fitness
Enjoying the out-of-doors
Putting on a coat
Enjoying life
Improving circulation
Decreasing arthritis pain
Feeling good
Participating in activities with grandchildren
Improving the quality of life
Decreasing stress
Maintaining independence

Table tents:

Side one (key hole in background): Unlock the Door to Better Health
Side two (key in background): Physical Activity is the KEY

Funding source listed on both sides.

APPENDIX O

APPENDIX O

Participant Reminder Letter

(Date)

Dear (Site) Resident,

This is a reminder that the second evaluation form for the physical activity health promotion program was to be turned in to the office on (Deadline Date). Please turn the form in by (Date, one week after deadline, time). If you misplaced the form, I left extra forms in the (site) office. If you would like assistance in completing the form, please feel free to contact me at 699-1864.

Thank you for completing the form and assisting me in completing my degree at Michigan State University. Your participation in this program will provide you an opportunity to improve your health and provide valuable information to improve physical activity health promotion programs for older adults.

Sincerely,

Jane Braatz
MSU graduate student

APPENDIX P

APPENDIX P

Code Manual

VARNAME	Value	Missing	Variable
ID			Identification Number
SITE	1=Experimental 1 2=Experimental 2 3=Control		Housing sites
DROPADD	1=Drop 2=Add		Status of Participation
AGE			Age in years as of 5/31/96
MONTH	1=Jan., 7=Jul. 2=Feb., 8=Aug. 3=Mar., 9=Sept. 4=Apr., 10=Oct. 5=May, 11=Nov. 6=Jun., 12=Dec.		Birthday month
DAY			Birthdate day
YEAR			Birthday year
GENDER	1=Male 2=Female		Gender
MARITAL	1=Single 2=Married		Marital Status
RACE	1=White 2=Black 3=Asian 4=Native American 5=Hispanic 6=Other		Race
EDYR	1-17	20	Yrs. of ed. completed
MEDS	0-14		No. of medications
HEALTH1	1=Excellent 2=Good 3=Average 4=Fair 5=Poor		Self-rated health status-Pre
HEALTH2	"		Self-rated health status-Post 1
HEALTH3	"		Self-rated health status-Post 2
DLME1A	1=Easy to do 2=Difficult to do	9	Meal preparation-Pre

	3=Unable to do		
DLSW2A	"	"	Sweep floor-Pre
DLLA3A	"	"	Carry laundry-Pre
DLSH4A	"	"	Grocery shopping-Pre
DLBAG5A	"	"	Carry bag of groceries-Pre
DLTOE6A	"	"	Cut toenails-Pre
DLHEA7A	"	"	Reach above head-Pre
DLSID8A	"	"	Turn head sideways-Pre
DLGET9A	"	"	Get up chair-Pre
DL1B10A	"	"	1 block walk-Pre
DL5B11A	"	"	5 block walk-Pre
DL1012A	"	"	10 block walk-Pre
DLME1B	1=Easy to do	9	Meal preparation-Post 1
	2=Difficult to do		
	3=Unable to do		
DLSW2B	"	"	Sweep floor-Post 1
DLLA3B	"	"	Carry laundry-Post 1
DLSH4B	"	"	Grocery shopping-Post 1
DLBAG5B	"	"	Carry bag of groceries-Post 1
DLTOE6B	"	"	Cut toenails-Post 1
DLHEA7B	"	"	Reach above head-Post 1
DLSID8B	"	"	Turn head sideways-Post 1
DLGET9B	"	"	Get up chair-Post 1
DL1B10B	"	"	1 block walk-Post 1
DL5B11B	"	"	5 block walk-Post 1
DL1012B	"	"	10 block walk-Post 1
DLME1C	1=Easy to do	9	Meal preparation-Post 2
	2=Difficult to do		
	3=Unable to do		
DLSW2C	"	"	Sweep floor-Post 2
DLLA3C	"	"	Carry laundry-Post 2
DLSH4C	"	"	Grocery shopping-Post 2
DLBAG5C	"	"	Carry bag of groceries-Post 2
DLTOE6C	"	"	Cut toenails-Post 2
DLHEA7C	"	"	Reach above head-Post 2
DLSID8C	"	"	Turn head sideways-Post 2
DLGET9C	"	"	Get up chair-Post 2
DL1B10C	"	"	1 block walk-Post 2
DL5B11C	"	"	5 block walk-Post 2
DL1012C	"	"	10 block walk-Post 2
PROBA	1=yes		Problems limit phy. act.-Pre
	2=no		
PROBB	"		Problems limit phy.act.-Post 1
PROBC	"		Problems limit phy.act.-Post 2
NOPRBA			Number of problems-Pre

NOPRBB			Number of problems-Post 1
NOPRBC			Number of problems-Post 2
SOCA	1=Precontemplator 2=Contemplator 3=Preparation 4=Action 5=Maintenance		Stage of change-Pre
COSOCA	1=Precontemplator 2=Contemplator 3=Preparation 4=Action 5=Maintenance		Stage of change-Pre Covariate
SOCB	"	9	Stage of change-Post 1
SOCC	"	"	Stage of change-Post 2
ACTMINM			Moderate act. min.-Pre
ACTMINV			Vigorous act. min.-Pre
PAR25	1=Yes 2=No		PARQ-Heart condition
PAR26	"		PARQ-Pain in chest
PAR27	"		PARQ-Pain with phy.act.
PAR28	"		PARQ-Lose balance
PAR29	"		PARQ-Bone/joint problem
PAR30	"		PARQ-Medications
PAR31	"		PARQ-Other reasons
ACWALA			No. min. walking-Post 1
ACYARA			No. min. yardwork-Post 1
ACHOUA			No. min. housework-Post 1
ACLEIA			No. min. leisure-Post 1
ACTOTA			No. min. total act.-Post 1
PC23A	1=Never 2=Seldom 3=Sometimes 4=Often 5=Very Often	9	Consciousness raising1-P1
PC24A	"	"	Consciousness raising2-P1
PC25A	"	"	Consciousness raising3-P1
PC26A	"	"	Consciousness raising4-P1
PC27A	"	"	Dramatic relief 1-P1
PC28A	"	"	Dramatic relief 2-P1
PC29A	"	"	Dramatic relief 3-P1
PC30A	"	"	Environmental reev1-P1
PC31A	"	"	Environmental reev2-P1
PC32A	"	"	Environmental reev3-P1
PC33A	"	"	Environmental reev4-P1

PC34A	"	"	Self-reevaluation1-P1
PC35A	"	"	Self-reevaluation2-P1
PC36A	"	"	Self-reevaluation3-P1
PC37A	"	"	Self-reevaluation4-P1
PC38A	"	"	Social liberation1-P1
PC39A	"	"	Social liberation2-P1
PC40A	"	"	Social liberation3-P1
PC41A	"	"	Counterconditoning1-P1
PC42A	"	"	Counterconditioning2-P1
PC43A	"	"	Counterconditioning3-P1
PC44A	"	"	Counterconditioning4-P1
PC45A	"	"	Helping relationship1-P1
PC46A	"	"	Helping relationship2-P1
PC47A	"	"	Helping relationship3-P1
PC48A	"	"	Helping relationship4-P1
PC49A	"	"	Reinforcement manag1-P1
PC50A	"	"	Reinforcement manag2-P1
PC51A	"	"	Reinforcement manag2-P1
PC52A	"	"	Reinforcement manag3-P1
PC53A	"	"	Self-liberation1-P1
PC54A	"	"	Self-liberation1-P1
PC55A	"	"	Self-liberation3-P1
PC56A	"	"	Self-liberation4-P1
PC57A	"	"	Stimulus control1-P1
PC58A	"	"	Stimulus control2-P1
PC59A	"	"	Stimulus control3-P1
ACWALB			No. min. walk-Post 2
ACYARB			No. min. yardwork-Post 2
ACHOUB			No. min. housework-Post 2
ACLEIB			No. min. leisure-Post 2
ACTOTB			No. min. total-Post 2
PC23B	1=Never 2=Seldom 3=Sometimes 4=Often 5=Very Often	9	Consciousness raising1-P2
PC24B	"	"	Consciousness raising2-P2
PC25B	"	"	Consciousness raising3-P2
PC26B	"	"	Consciousness raising4-P2
PC27B	"	"	Dramatic relief 1-P2
PC28B	"	"	Dramatic relief 2-P2
PC29B	"	"	Dramatic relief 3-P2
PC30B	"	"	Environmental reev1-P2
PC31B	"	"	Environmental reev2-P2
PC32B	"	"	Environmental reev3-P2

PC33B	"	"	Environmental reev4-P2
PC34B	"	"	Self-reevaluation1-P2
PC35B	"	"	Self-reevaluation2-P2
PC36B	"	"	Self-reevaluation3-P2
PC37B	"	"	Self-reevaluation4-P2
PC38B	"	"	Social liberation1-P2
PC39B	"	"	Social liberation2-P2
PC40B	"	"	Social liberation3-P2
PC41B	"	"	Counterconditoning1-P2
PC42B	"	"	Counterconditioning2-P2
PC43B	"	"	Counterconditioning3-P2
PC44B	"	"	Counterconditioning4-P2
PC45B	"	"	Helping relationship1-P2
PC46B	"	"	Helping relationship2-P2
PC47B	"	"	Helping relationship3-P2
PC48B	"	"	Helping relationship4-P2
PC49B	"	"	Reinforcement manag1-P2
PC50B	"	"	Reinforcement manag2-P2
PC51B	"	"	Reinforcement manag2-P2
PC52B	"	"	Reinforcement manag3-P2
PC53B	"	"	Self-liberation1-P2
PC54B	"	"	Self-liberation1-P2
PC55B	"	"	Self-liberation3-P2
PC56B	"	"	Self-liberation4-P2
PC57B	"	"	Stimulus control1-P2
PC58B	"	"	Stimulus control2-P2
PC59B	"	"	Stimulus control3-P2
HEALFAIR	1=Attended 0=Not attend		Health fair attendance
EDLEC			No. ed. lecture attended
CONLEC			No. contract lecture attended
ACTATTEN			No. activity sessions attended
CONTRACT	1=Participated 0=Not participate		Participated in contract
FORMS3	1=Turned in 9=Incomplete 8=Too young 7=Added late		Evaluation form 3-Post 2
FORMS2	"		Evaluation form 2-Post 1
FORM1	"		Evaluation form 1-Pre
FILTER_$	Age≥60, All forms turned in		Cleaned subject pool
GROUP	2=Experimental 3=Control		Treatment groups
TRSOCAB			Difference between socb-soca
TRSOCBC			Difference between socc-socb

CONSRA1		Average conscious. rai. P1
DRAMREL1		Average dramatic relief P1
ENVIREE1		Average environ. reeval. P1
SELFREE1		Average self-reevaluation P1
SOCILIB1		Average social liberation P1
EXPERPC1		Average experiential PC P1
COUNCON1		Average counterconditi P1
HELPREL1		Average help. relation P1
REINMAN1		Average reinforce. man. P1
SELFLIB1		Average self-liberation P1
STIMCON1		Average stimulus con. P1
BEHAVPC1		Average behavior PC P1
CONSRA2		Average conscious. rais. P2
DRAMREL2		Average dramatic relief P2
ENVIREE2		Average environ. reeval. P2
SELFREE2		Average self-reevaluation P2
SOCILIB2		Average social liberation P2
EXPERPC2		Average experiential PC P2
COUNCON2		Average countercondition P2
HELPREL2		Average help. relationship P2
REINMAN2		Average reinforce. man. P2
SELFLIB2		Average self-liberation P2
STIMCON2		Average stimulus control P2
BEHAVPC2		Average behavior PC P2
NNOAACT1	1=Precon. & cont. 2=Prep., action, main.	Activity level SOC
SOCGROU1	5=Beginning (p,c,p) 6=Advanced (a,m)	Activity level SOC B
SOCGROU2	"	Activity level SOC C
DL1AB		Difference DL1A-DL1B
DL1BC		Difference DL1B-DL1C
DL2AB		Difference DL2A-DL2B
DL2BC		Difference DL2B-DL2C
DL3AB		Difference DL3A-DL3B
DL3BC		Difference DL3B-DL3C
DL4AB		" DL4A-DL4B
DL4BC		" DL4B-DL4C
DL5AB		" DL5A-DL5B
DL5BC		" DL5B-DL5C
DL6AB		" DL6A-DL6B
DL6BC		" DL6B-DL6C
DL7AB		" DL7A-DL7B
DL7BC		" DL7B-DL7C
DL8AB		" DL8A-DL8B
DL8BC		" DL8B-DL8C

DL9AB		" DL9A-DL9B
DL9BC		" DL9B-SL9C
DL10AB		" DL10A-DL10B
DL10BC		" DL10B-DL10C
DL11AB		" DL11A-DL11B
DL11BC		" DL11B-DL11C
DL12AB		" DL12A-DL12B
DL12BC		" DL12B-DL12C
SOCAD	6=Soc p,c,p,a 7=Maintenance	SOC advanceable stages
TREATEF	1=Precontemplation 2=Contemplation 3=Preparation 4=Action 5=Maintenance	Treatment effect
SOCPRETR	"	Pretreatment SOC
ACT60	1=Attended 60%	Attended 60% intervention
NONEQUGR	1=Experimental 2=Control	Nonequivalent control group design

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