AN ANALYSIS OF THE STAGES OF EXERCISE CHANGE AMONG OLDER ADULTS WITH A CHRONIC ILLNESS

by

Zan Mireille Romeder

Bachelor of General Studies, Simon Fraser University, 1997

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

in the Department

of

Gerontology

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SIMON FRASER UNIVERSITY

December 1999

Approval

Name:	Zan Romeder
Degree:	Master of Arts (Gerontology)
Title of Thesis:	An analysis of the stages of exercise change among older adults with a chronic illness
Chair:	Dr. Barbara Mitchell, Assistant Professor Sociology/Anthropology & Gerontology Program
Examining Committee:	Dr. Andrew Wister Senior Supervisor Associate Professor, Gerontology

_____

Dr. Gloria Gutman, Professor, Gerontology Program
Examining Committee Member

_____

Dr. Susan Crawford, Adjunct Professor
Gerontology Program
Examining Committee Member

_____

Dr. David Cox
Associate Professor, Department of Psychology
External Examiner

_____

Date Approved: _____

Abstract

This thesis examines stages of exercise change among older adults with a chronic illness. The Transtheoretical Model is applied to understand exercise behavior, a self-care practice recommended for the management of chronic illnesses. The thesis contains two parts. Part one consists of a unique description of the stages of exercise change over a two-year period. Part two involves testing hypotheses pertaining to the prediction of positive exercise change over a one-year period. The theories of planned behavior and self-efficacy are applied in conjunction with the Transtheoretical Model to develop the hypotheses. It is hypothesized that exercise history and illness factors will act as barriers for positive exercise behavior because of the characteristics of the population under study.

The data used in this study came from the Vancouver North Shore Self-Care Study. The North Shore study collected detailed health and self-care information on adults aged 50 and older who reported having one of four major chronic illnesses: arthritis, stroke, heart problems and hypertension. After omitting those with stroke (due to small numbers), there were a total of 879 subjects at baseline (wave 1), 735 in wave 2, and 665 in wave 3. The results from the descriptive analysis indicate that the majority of the sample are exercising regularly, and that only 4.3% are sedentary for the entire study. Significant stage movement towards exercise maintenance was also found despite there being no formal exercise intervention. A large number of people were found to be moving from maintenance to precontemplation (active to sedentary) and from

precontemplation to maintenance, illustrating that many are not moving through the stages, as suggested by the Transtheoretical Model, but from one extreme to the other.

At the bivariate level, exercise history and three illness factors were statistically significant, and moderate support was found for the theories of planned behavior and self efficacy. A multivariate analysis was conducted to determine the predictive factors of positive exercise stage change. Exercise history and four illness factors (type of illness, duration of illness, comorbidity and activity restriction) were found to be statistically significant. Age was found to be negatively associated with positive exercise behavior, but education and gender were not statistically significant. Overall, the results of the study indicate moderate predictive power for the theories of planned behavior and self efficacy, and strong support for the hypothesis that exercise history and illness factors are important factors (facilitators and barriers) for positive exercise stage change.

An integration of both sections of the thesis leads to the conclusion that illness factors are at the root of exercise stage change; where they are causing extreme movement patterns and acting as barriers to positive exercise stage change.

In the future, it is recommended that health promotion programs consider the profound effect that a chronic illness has on one's ability to exercise regularly. The current theories applied to understand exercise behavior such as the theory of planned behavior and self efficacy theory need to reconsider how the impact of a chronic illness, physiologically and psychologically, affect one's decision to exercise.

Acknowledgement

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Chapter I

Introduction

A progressive reduction of habitual physical activity with age has been found in surveys of both single communities and representative national samples (Shephard, 1994). An inverse relationship between regular physical activity and chronic illness has been extensively documented (Sallis et al., 1986). There is growing evidence that regular exercise can delay the functional losses that lead to dependency and institutionalization (Shephard, 1997). Regular physical activity ensures that function at any given age is some 20% higher than in a sedentary person (Shephard). Exercise has the potential to act as a single intervention impacting positively on both the physical and mental health of the elderly (Leith & Taylor, 1992; Duncan & McAuley, 1993; Shephard, 1997). Since the vast majority of North Americans do not engage in sufficient amounts of exercise to experience many of the health benefits, it is of scientific interest to develop an understanding of the determinants of physical activity adoption and maintenance (Sallis et al., 1986). In Canada, it is estimated that between 32% and 70% of those aged 65 and over exercise less than once a week or never (Statistics Canada, 1999). It is important to analyze the causes of the trend toward a reduction of exercise behavior in senior citizens and to seek methods of preventing or reversing the age-related decline in habitual physical activity (Shephard, 1994).

The Health Promotion Framework (Epp, 1986) provides the conceptual backdrop for the present study. The goal of the health promotion framework is achieving health for

all.   The framework consists of health promotion mechanisms and a series of implementation strategies. Health promotion is seen as the process of enabling people to increase control over their health and the implementation strategies make it possible for all Canadians to achieve equitable access to health. See Appendix A for a visual representation of the health promotion framework. The framework helps to formulate ways of dealing with day-to-day health issues by linking together a set of concepts, providing a way to think about and take action toward achieving health for everyone. It can be used to visualize the kinds of mechanisms and strategies that are needed to support and encourage Canadians as they strive to live healthy, full lives (Epp, 1986).

Enhancing people's capacity to cope is a major national health challenge identified by the health promotion framework; a challenge that is extremely relevant to the seniors population coping with a chronic illness. One of the ways to achieve this goal is to support people to exercise on a regular basis, a self-care practice. Exercise is most beneficial when done regularly over a long period of time but it has a positive effect when started at any point in time (Shephard, 1997). Research has demonstrated that exercise is beneficial. What is now required is research on how to develop effective intervention strategies for increasing physical activity among older adults (Barke & Nicholas, 1990). Therefore, understanding how and why people change or adopt healthy lifestyle behaviors, such as exercise, would allow for the development of more effective health promotion programs.

Self-care, a health promotion mechanism, is the focus of this study. Encouraging self-care means encouraging healthy choices such as regular exercise (Epp, 1986). Although the framework is designed to be used as a whole it is important to identify how

specific mechanisms can be encouraged and promoted. Self-care provides independence, empowerment and is also cost-effective, therefore research in this area is beneficial to the seniors population and to the health care system (Punamaki & Aschan, 1994; Omenn, 1990).

Self-care is defined in a variety of ways. Dean (1986, p. 62) summarizes self-care as

> "The range of activities individuals undertake to enhance health, prevent disease, evaluate symptoms and restore health. These activities are undertaken by lay people on their own behalf, either separately or in participation with professionals. Self-care includes decisions to do nothing, self-determined actions to promote health or treat illness, and decisions to seek advice in lay, professional and alternative care networks, as well as evaluation of and decisions regarding action based on that advice".

Self-care may focus on illness such as managing diabetes, or on prevention such as taking vitamins, or health enhancement such as meditation. In addition, self care is practiced widely, and is the predominant form of medical and health care (Gantz, 1990). Medical self-care is conceptualized broadly as actions concerning medical problems or health maintenance, which includes disease prevention and care of self in illness (Vickery & Iverson, 1994). There are no cures for chronic illnesses, and since 85% of those aged 65 and over have at least one chronic illness, self-care becomes extremely relevant (Padula, 1992). Medical self-care is a major determinant of physical and psychological well-being and of functional capacity (Dean, 1986). It is also an important element in the successful management of a chronic illness (Clark et al., 1991; Baker and Stern, 1993). "More active and assertive self-care may appeal to the fundamental need which older persons have for autonomy and for maintaining a degree of control" (Hickey, Dean & Holstein, 1986).

Self-care refers to actions that are in the domain of personal control, including nutrition, exercise and risk reduction. In looking at exercise as a self-care practice, it would be valuable to have it become a habit for people. The exercise literature indicates that it is a challenge to support people to exercise regularly (Dishman, 1994a). Indeed, the greatest gains in public health via physical activity will come when persons who are sedentary adopt moderate-intensity physical activity (Powell & Blair, 1994). Medically vulnerable patients need to be included in research and promotion if the public health benefits of exercise are to be fully realized (Clark, 1999). Seniors with a chronic illness are rarely included in physical activity studies despite the important benefits of exercise for these individuals (Clark, 1999). It is this group that will be the focus of the present study.

Appropriate and timely self-care can result in reduced health-care costs through more rapid symptom amelioration and the possible protection of the health-care system from demands for attention to less serious complaints that can be managed more appropriately via self-care (Kart & Engler, 1994). Physical activity has been demonstrated to have cost and health benefits among adults of all ages, including those in their eighth and ninth decade of life (Clark, 1996; Fiatarone et al., 1994; Wolinsky, Stump & Clark, 1995). Wolinsky et al. (1995) report that perceived health, health status, nursing home placement, hospital episodes and functional status were all favourably affected by self-reports of exercise at baseline.

Understanding self-care behavior is a priority because self-care is the primary means of caring for health problems (Kemper, Lorig & Mettler, 1993). There are many people who initiate positive lifestyle changes on their own without the support of

structured programs. Knowing the factors that enable natural positive lifestyle changes would be beneficial to health care professionals who promote self-care and are committed to achieving health for all.

Exercise is also a recommended activity for the self-management/self-care of arthritis, heart disease, asthma, diabetes and chronic obstructive pulmonary disease (Clark et al., 1991). The majority of the existing research literature on exercise focuses on structured programs (Dishman, 1994a). There is a need for research in the area of naturally occurring exercise behavior. The present study addresses this issue by means of an analysis of the predictors of exercise change among older adults who are managing a chronic illness.

Chapter II

Theoretical Rationale and Review of the Research Literature

The Transtheoretical Model (TM: Prochaska and DiClemente, 1982) was originally designed for application in the area of smoking cessation, but has been applied to a wide variety of health behaviors. The model consists of five stages that people move through as they move from thinking about changing a behavior to actually making the new behavior a habit. The stages take into account one's intention to exercise, and past and current exercise behavior. Researchers have applied the model to exercise and have found that the stages distinguish people at different levels of exercise behavior (Barke & Nicholas, 1990). For this study, the TM has been chosen because it allows for a detailed assessment of where people are at in terms of using exercise as a self-management tool.

The TM consists of five stages: precontemplation, contemplation, preparation, action and maintenance. Precontemplation occurs when a person has no intention of exercising. Contemplation occurs when a person is considering exercise. Preparation occurs when one is exercising but not on a regular basis. Action means a person has exercised regularly for less than six months. Finally, maintenance occurs when a person has exercised regularly for a period longer than six months. The model states that people move and spiral through these stages in a sequential manner. People often must make several attempts at behavior change, so the stages can be cyclical instead of linear (Dishman, 1994). A progression may be followed by regression, and back and forth until maintenance is finally attained.

Barke and Nicholas (1990) were the first to apply the Transtheoretical Model to the process of acquiring and maintaining regular physical activity in the older adult population. It was found that the TM effectively distinguishes older adult groups who vary in current physical activity levels. People at the different stages have different levels of readiness for exercise. Barke and Nicholas conclude that exercise programs should take into consideration what stage a person is at in order to design programs that match the particular stage. For example, a person in the action stage would receive an action oriented program, and someone at the contemplation stage would receive information on the benefits of exercise. Exercise researchers have recommended that the Transtheoretical Model be applied to exercise behavior, as the exercise field needs to shift from predictive models to process models to better understand behavior change (see for example, Marcus et al., 1992).

Stage theories generally do not explain how or why people move through the stages. The TM relies on other theories to explain the movement from one stage to the next, since it is transtheoretical by design. The application of specific theories is needed to explain the mechanisms that prompt people to move through the stages towards exercise maintenance. In this study, there is no specific exercise program causing the changes over time, therefore a theoretical application to the Transtheoretical Model is necessary in order to understand the natural behavioral patterns. In this study, two theories are examined and synthesized with the TM: the theory of planned behavior and Bandura's self efficacy theory (Ajzen, 1985; Bandura, 1977).

Before moving into a discussion of the above noted theories, an introduction and description of the dependent variable examined in this study is required. The variable

under study is termed "exercise stage change". It consists of two groups: a positive exercise stage change group and a negative exercise stage change group. Table 1 provides a description of the variable. The two groups were formed based on upward or downward movement through the stages of change (TM) from Time 1 to Time 2. The comparison is between those who move towards maintenance or are already maintaining, and those who move towards a sedentary lifestyle or are already sedentary. A number of other ways of grouping people were explored, such as comparing those who maintain exercise to those who maintain then become sedentary, but because of insufficient numbers for statistical analysis, the current proposed variable was used. The majority of the sample are not adopting exercise for the first time, therefore, the study is mainly an examination of maintenance, and adoption of exercise after an interruption in an exercise routine. The underlying assumption is that there are similar factors responsible for the adoption and maintenance of exercise. The next section will describe the theories used in conjunction with the Transtheoretical Model, and state the generated hypotheses.

Table 1: Positive and Negative Exercising Groups From Time 1 to Time 2

Positive stage change	Negative stage change
Maintenance → Maintenance	Maintenance → Down
Action → Action or up	Action → Down
Preparation → Preparation or up	Preparation → Down
Contemplation → Up	Contemplation → Contemplation or down
Precontemplation → Up	Precontemplation → Precontemplation

Theory of Planned Behavior

The Theory of Planned Behavior (TOPB: Ajzen, 1991) suggests that behavior can be predicted by intention and that three components primarily determine intention: attitude, social norms and perceived behavioral control. Attitude is believed to be a function of behavioral beliefs that refer to the perceived advantages and disadvantages of performing the behavior. Social norms are determined by normative beliefs that center on individuals or groups who are important to the individual. Perceived behavioral control is determined by beliefs with a focus on opportunities and resources available for performing the behavior. The summary proposition of the TOPB is that people will intend to perform a behavior when they evaluate it positively, believe that important others think they should perform it, and perceive it to be under their own control.

Studies using this theory have found that about 30% of the variability in exercise behavior is explained by intention alone. The social norm component is less consistently associated with exercise and does not appear to be a stable variable for the interpretation of exercise behavior (Godin, 1994a). The perceived control component explains between 4% and 20% of exercise behavior, with an average of 8%. Courneya (1995) applied the theory of planned behavior to understand the readiness for regular exercise in older adults. Intention, attitude and perceived control had direct linear relationships with the stages of the Transtheoretical Model. Precontemplators had more negative attitudes, lower control beliefs, lower intentions and subjective norms than members of all other stages.

In Shephard's (1994) summary of the determinants of exercise in people aged 65 years and older he concludes that the TOPB does not provide a complete description of the reasoned behavioral process. External variables, such as habits, socioeconomic status, age and gender influence various steps in the formation of a behavioral intention. There are also physical and psychological barriers, real and perceived, that limit the translation of intention to exercise into overt behavior (Ajzen, 1985; Triandis, 1977). For this study, we have chosen to examine how barriers related to having a chronic illness come into play with the theory. In particular, the type of illness, comorbidities, duration of illness, number of medications, hospital stays, activity restrictions, pain, and past exercise behavior may be important barriers to exercise intention and behavior. The TOPB was not developed specifically for a senior population with a chronic illness, and therefore it is important to examine how the model fits with this population. For this study it is hypothesized that illness factors and past exercise history act as barriers between intention and performance of actual exercise. It is also hypothesized that the positive stage change group will have a more positive attitude and greater control over their illness than the negative stage change group. Figure 1 illustrates the TOPB model and indicates where barriers and external variables are hypothesized to have an effect.

Figure 1: Barriers to Exercise and the Theory of Planned Behavior

Age, Gender, Education

Attitudes   Norms   Perceived Behavioral Control

Intention to exercise

Barriers* - - - - - - - - - - - - - - - History of Exercise*
(illness factors)   (exercise at age 50)

EXERCISE
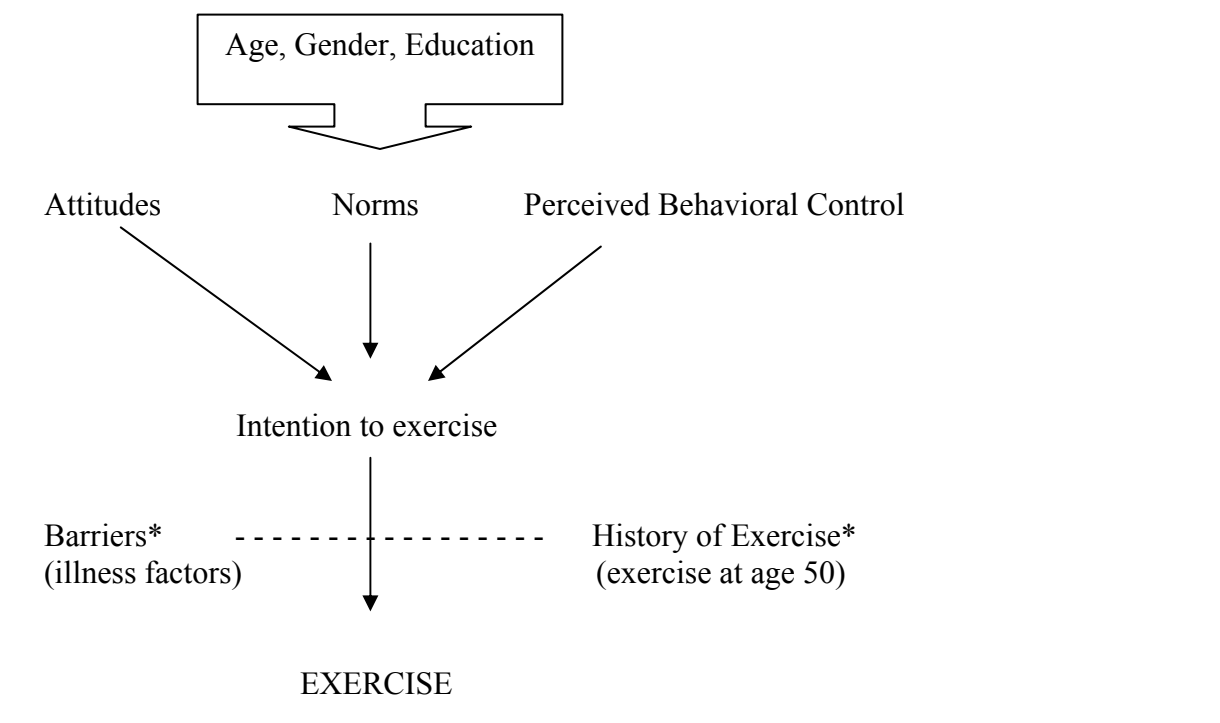
*additions to the theory of planned behavior

Self Efficacy Theory

Bandura (1977) suggests that all behavioral changes are mediated by a common cognitive mechanism termed self-efficacy, a belief that one can successfully perform the desired action. Self-efficacy evaluations are assumed to influence choice, effort expenditure, thoughts, emotional reactions and behavioral performance (Prochaska & Marcus, 1994). The theory further distinguishes between expectation and outcome

efficacy. Expectation efficacy is the conviction that one can successfully execute the behavior. Outcome efficacy is the belief that a given behavior will lead to certain outcomes. Thus, expectation efficacy represents judgements of personal competence, while outcome efficacy represents judgments of the likely impact of a given behavior. According to self-efficacy theory, the attempt to increase exercise behavior is influenced by self-judgement of the expected benefits of regular exercise and the perceived ability to exercise regularly (Godin, 1994a).

Expectation efficacy is developed through four types of influence: primary experiences, secondary experiences, verbal persuasion and physiological states (Clark, 1996). Primary experience refers to previous exercise experience and previous success. Secondary experience represents observations of others' exercise experiences, such as family, peers and media. Verbal persuasion comes from many sources including supportive others, health care professionals and media presentations. Physiological states represent current feelings and sensations such as aches, pains or nervousness. Each of these four influences may enhance or act as barriers to efficacy expectations.

Previous studies of exercise behavior and promotion have rarely investigated self-efficacy and barriers to exercise within samples of older people (Clark, 1996). The physiological state domain is relevant to the older population with a chronic illness. For example, physiological states such as pain or fear of injury could act as strong barriers to exercise. In this study, illness factors will be examined as a measure for physiological state. The illness factors included in the study go beyond the physiological component and include factors such as hospital stays, type of illness and duration of illness.

The self-efficacy model has been successfully applied in explaining exercise behavior, both in programs and in spontaneously adopted physical activity (Godin, 1994). Self-efficacy is able to predict exercise behavior over and above the influence of other important variables included in other theoretical frameworks (Godin; Dishman, 1994). The strongest correlate with exercise behavior among adults is self-efficacy, and self-efficacy scores increase linearly across the stages of change from the Transtheoretical Model (Prochaska & Marcus, 1994; Sallis et al., 1989). Marcus et al. (1992) found that scores on self-efficacy significantly differentiated employees at most stages of exercise change. Employees who had not yet begun to exercise, in contrast with those who exercised regularly, had little confidence in their ability to exercise. What has not been researched is how self-efficacy affects exercise behavior in a population with a chronic illness. In the present study a scale measuring illness efficacy is included. The measure is designed to assess how confident one is about one's ability to control different aspects of one's condition. Although the measure is not specific to exercise it will be used as the main measure of self efficacy along with four other variables to measure the different aspects of self-efficacy.

It is hypothesized that of all the measures for efficacy, illness factors (physiological state) will have the greatest impact. The positive stage change group will have greater illness efficacy scores than the negative stage change group. Perceived health, an expectation efficacy factor, is expected to be higher for the positive group. Exercise history, a variable used to measure primary experience for expectation efficacy, is included in the analysis as a barrier to positive stage change. The literature has found that past exercise history has a positive relationship with exercise (Dishman, 1994;

O'Brien Cousins, 1995; Shephard, 1997). Because the population under study consists of older adults it is important to examine how history of exercise acts as a facilitator or barrier of exercise. 'Importance of exercise', a measure for expectation and outcome efficacy, will be higher for the positive group, and 'reading up on condition' (in general), a measure for outcome efficacy, will be higher for the positive group. It is assumed that reading materials will contain some information on the benefits of exercise. Figure 2 illustrates the self-efficacy theory and indicates the variables included in the study.

Figure 2: Self Efficacy Theory and Exercise Behavior

Self Efficacy

Outcome Efficacy
(belief that a given behavior will lead to certain outcomes)

1. Importance of exercise*
2. Read up on condition*

Expectation Efficacy
   (judgement of personal competence)

   Illness Efficacy * (overall measure)

1. Primary experience: Exercise history** and perceived health*
2. Secondary experience: Importance of exercise*
3. Verbal Persuasion: not included in study
4. Physiological states: Illness factors*

* variables included in the study
**included in the barriers to exercise
   behavior section

Theoretical Synthesis

The above theories account for approximately 35% of the variance in exercise behavior (Godin, 1994). This fact is not surprising given that the main purpose of the models is to reveal the decision making process that underlies and precedes an action. It is proposed that this study build on this work by integrating TOPB, self-efficacy, illness factors and other key variables found to be important in the existing research literature. It is important to consider a combination of variables representing a range of domains to understand exercise behavior (Dishman, 1994). This approach is similar to Clark's (1999) study where a new model was created based on existing theoretical models to examine how exercise knowledge, perceived barriers and self-efficacy work in conjunction to impact exercise levels among soicoeconomically disadvantaged older adults.

Review of the Research Literature

The Transtheoretical Model was applied to exercise behavior for the first time in 1988 at the University of Rhode Island (Sonstroem, 1988). In 1990, Barke and Nicholas, measured stages of exercise change in a group of older adults. Their findings indicate that the stages of change scale does effectively distinguish groups of older adults who differ in level of physical activity. A study conducted by Marcus et al. (1992) used the TM to design an intervention to increase the adoption of physical activity. The findings indicate that using a stage-matched intervention enhanced exercise adoption. In

Dishman's (1994) summary on the TM he reports that "to date, a number of cross-sectional studies, one longitudinal study and one intervention study have been conducted" (p.176). He concludes that more longitudinal studies with diverse samples are needed because the TM model deals with behavior change, and only some aspects of change can be studied with a cross-sectional design.

In a cross sectional study by Lee (1993) it was found that the main statistically significant differences between exercisers and precontemplators were that precontemplators were older, had lower exercise knowledge, perceived lower levels of family support for exercise, expected fewer psychological benefits from exercise, and rated exercise as less important than avoiding smoking. The main statistically significant difference between contemplators and those in the action or maintenance stage involved perception of practical barriers.

No single variable solely determines exercise behavior. However, self-efficacy has been consistently identified as playing an important role in exercise behavior (McAuley, 1992; Sallis & Hovell, 1990; McAuley & Jacobson, 1991). Self-efficacy is predictive at all stages of exercise (Marcus et al., 1992). But, it appears that the role played by efficacy cognitions in the maintenance of exercise participation is more potent in those circumstances in which physical activity presents the greatest challenge such as in initial stages of adoption, longer term maintenance and in exercise prescribed for secondary prevention of disease (McAuley et al., 1994).

Primary experiences, one of the four major sources that influence efficacy expectations, such as exercise history, has been found to have a direct influence on future behavior. For example, Dishman (1994) states that physical activity at middle age (50s)

consistently predicts future activity in old age. Godin, Valois, Shephard and Desharnais (1987) found simple correlations between intention to exercise and actual behavior but they became statistically insignificant when past exercise history was entered into the model. It is unclear whether exercise history from childhood or early adulthood has a direct influence on activity in old age.

Application of the Theory of Planned Behavior to exercise has found that attitude seems to exert its influence upon behavior largely through intention, and subjective norms have little influence on behavior (Shephard, 1986). Godin (1994) reviewed twelve published studies and found that an average of 30% of the variability in exercise behavior is explained by intention alone. Past behavior or habit of exercising, an external variable, has been found to have a significant influence on the translation of intention into overt behavior and is a reliable predictor of exercise behavior (Godin et al., 1987; Valois, Desharnais & Godin, 1988). Other external variables such as real or perceived barriers have been argued to have a substantial impact on the translation of intention into behavior (Godin, 1994).

The barriers to exercise, such as illness factors, have received some attention in the literature. Lack of exercise ability due to disability or illness has been cited as one of the major reasons for reduced activity levels in the older adult (Shephard, 1997; Emery, Hauk, & Blumenthal, 1992). Fozard (1999) reports that reasons for not exercising given by people aged 65 to 84 include primarily poor health (38%) and lack of interest (26%). Reasons given for participation were: health promotion (80%), social reasons (50%) and psychological satisfaction (30%). He also found that almost 99% of the participants

considered exercise as rather or extremely important, even though a much smaller percentage actually engaged in exercise.

Stephens and Craig (1990) report that the most common barriers perceived by middle-aged adults to regular exercise are work pressures, laziness and lack of time. Dishman (1994) stresses the need to diminish physical, environmental and psychological barriers to exercise. Old age undoubtedly influences the relative importance of many barriers to exercise. For example, time is more available, family commitments are perceived less as a barrier than younger groups and work is seen only as a barrier by 15% of those over 65 compared to 63% of those 25 to 44 (Shephard, 1994). Therefore, the barriers that stand out for the elderly population are illness, injury, and fear that exercise may induce problems (Shephard). Stephens and Craig (1990) found that 9% of women aged 25 to 44 perceived illness or injury as a barrier compared to 34% of women over the age of 65. In Mellilo et al. (1996) older adults reported that health status acted as a barrier to exercise. Kriska et al. (1986) found that the variable that best differentiated between compliers to a walking program from noncompliers was the frequency of reported illness over a two-year period.

A number of demographic variables are also associated with physical activity. Education, income, male gender and age (negative) are consistent correlates of physical activity habits (Dishman, 1994).

Summary

The existing literature has identified a number of factors that are correlated or predictive of exercise behavior. Research on exercise activity levels in community-dwelling older adults, as well as on the factors which enhance an individual's propensity to participate in health promoting behaviors, is sparse (Melillo et al., 1996). No theory stands out in its ability to predict a significant amount of the variance in exercise behavior. The social cognitive theories aim more to explain the decision process, but as Dishman (1994) states, there are other factors that contribute to the decision that are not related to social cognition such as the environment, type of exercise, seasonal variation or social support. For this study, it has been identified that there is a need to examine how illness factors affect exercise behavior in a population of older adults living with a chronic illness. It is important to examine exercise behavior because it is a behavioral goal that many individuals would like to achieve and it would impact the achieving health for all goal (Epp, 1986). Furthermore, there is a need to identify how exactly the Transtheoretical Model applies to exercise over time and what factors enable people to maintain regular exercise or move upwards towards exercise maintenance.

Purpose and Hypotheses

The purpose of this study is two-fold. One is to describe the natural pattern of exercise movement through the stages of change of the Transtheoretical Model, using a sample of older adults managing a chronic illness. An assumption about the TM is that adopting exercise behavior is a dynamic process that includes spiraling and moving

through the stages, but the exact movement patterns have not been studied for exercise behavior, and in particular, among chronically ill and older populations. A detailed description of the movement through the stages over the two years will be provided. This approach is unique because in the literature review no articles were found that identified movement patterns through the stages of exercise change with no intervention or exercise program specifically being offered. The intention is to have a better understanding of the patterns of exercise change among those with a chronic illness. The specific population being studied are adults aged 50-94 with arthritis, heart disease or high blood pressure.

The second part of the study entails testing hypotheses pertaining to persons deemed positive exercisers compared to negative exercisers. Table 1 (page 8) shows the formation of the positive and negative exercise stage change groups. The positive group are those who maintain regular exercise or move upwards towards exercise maintenance. The negative exercisers are those who do not exercise or those who move down towards precontemplation. The purpose of this comparison is to identify factors that enhance exercise adoption or maintenance, in particular, the impact of illness barriers. A framework will be offered based on self-efficacy, the theory of planned behavior, illness factors/barriers and key findings from the existing literature.

Working Hypotheses

The following hypotheses will be evaluated in this study of exercise among older adults with a chronic illness.

1 Positive exercise stage changers will score higher than the negative group on efficacy variables including: perceived health, importance of exercise, read up on condition and illness efficacy. (Bandura)

2 Positive exercise stage changers will score higher on attitude (importance of exercise), social norms (importance of exercise) and perceived behavioral control (illness efficacy). (Theory of Planned Behavior)

3 Positive exercise stage changers will have a history of high levels of exercise.

4 Positive exercisers will have less pain, fewer comborbidities, fewer hospital stays, longer duration of illness, fewer medications, be less restricted in the things they like to do, and be less likely to have arthritis.

Chapter III

Methodology

This chapter describes the strategy used to investigate the stages of exercise change among older adults, and to investigate the relationship among positive stage change, theory of planned behavior, self-efficacy and illness factors. A description of the data source and the variables to be used in the subsequent univariate, bivariate, and multivariate analyses is provided.

The study consists of two parts. The first part involves a description of the stages of exercise change over time, which has not been done for this population. Respondents who completed all three waves were included in this description (n=665). Tables and figures are used to illustrate the movement patterns over the two year period.

The second part of the study involves bivariate and multivariate analyses based on respondents from Time I and II (n=735) for the purpose of testing the formulated hypotheses. The following section will be based on these 735 respondents in order to describe the variables for the bivariate and multivariate analyses.

Data Source

The data for this research derive from a longitudinal study entitled "The Vancouver North Shore Self Care Study" (PIs Wister & Gutman). The study is part of a larger grant funded by the Seniors Independence Research Program, Health Canada, titled "Seniors Independence through Self-Care, Self-help and Mutual Aid: A

Collaborative Multimethod Research Program on Community Approaches" (PIs: Wister, Green, Gutman & McGowan). Three waves were conducted: wave I (November 1995-January 96), wave II (November 1996-January 1997), and wave III (November 1997-January 1998). Wave I consisted of phone interviews with 904 persons aged 50 to 95 years old, living in private households in North and West Vancouver, British Columbia. At wave II, 757 were interviewed and 681 at wave III. The data are unique in that they represent the only information available on self care practices among older adults who are coping with a chronic illness.

A variety of self care behaviors were measured such as meditation, nutrition, stress reduction, reading on the subject of their illness, and exercise. In addition, measures of health status, such as perceived health and stress, and healthcare utilization, including prescription medication and doctor visits were investigated in the study. Other measures included self-efficacy, sociodemographic information, well being and social support (see Appendix B for questionnaire). These measures provide the opportunity to address the research questions and their related hypotheses formulated in the previous chapters.

Collection of Data and Sample Description

Experienced interviewers conducted telephone surveys of older adults using random digit dialing. The major criterion for participating in the study was that participants must have been professionally diagnosed with one of four major chronic illnesses: arthritis or rheumatism, heart problems, high blood pressure or stroke.

Individuals were asked to identify the condition affecting them the most, since many older people have more than one chronic condition. For this thesis, however, an investigation of only three of the four chronic illnesses will be conducted, since the sample size for those reporting stroke as their major chronic condition was too small to permit any significant findings in a statistical analysis. These include arthritis/rheumatism (n=352, 47.9%), heart problems (n=182, 24.8%), and high blood pressure (n=201, 27.3%). Thus, a final sample of 735 is used for the multivariate analysis and 665 for the descriptive piece.

The age of the respondents ranged from 50 to 95, with 285 (32%) aged 50-64, 305 (35%) aged 65-74, and 289 (33%) aged 75+. There were 366 (42%) male and 513 (58%) female participants in the study. The sample approximately reflects the same characteristics of the National Population Health Survey, except for the higher proportion of highly educated older adults.

Measurement

This section describes the measurement of variables chosen for the bivariate and multivariate analyses (see Table 2).

Dependent Variable for Bivariate and Multivariate Analyses

The dichotomous dependent variable used in this study for the bivariate and multivariate analyses is 'exercise stage change'. Respondents were asked "In order to

cope with your condition, do you engage in regular exercise, sports or physical activity for 15 minutes or more, at least 3 times per week?". The possible responses were: 1) already been doing for 6 months or more, 2) tried for less than 6 months and still doing it, 3) tried for less than 6 months and stopped, 4) intending to try, 5) not intending to try, and 6) refused. Each response is the definition of one of the stages of change: maintenance, action, preparation, contemplation and precontemplation. The six people who refused to respond were omitted from the study. Single item measures of the stages of change have been found to have construct validity (Laforge et al., 1999). A reliability test was conducted, where responses to the stages of change question were compared to responses to another question in the study asking how much do you exercise. The comparison found the stages of change question to be reliable.

Table 1 (page 8) described the formation of this variable. Negative stage changers were coded '0' (n=189, 25.7%) and positive stage changers were coded '1' (n=546, 74.3%). A person is deemed a positive exerciser if they are in the maintenance stage at Time 1 and Time 2, or if they are at action at Time 1 and action or higher at Time 2, or if they are at preparation at Time 1 and preparation or higher at Time 2, or if they are at contemplation at Time 1 and higher at Time 2, or lastly if they are at precontemplation at Time 1 and higher at Time 2. A person is deemed a negative exerciser if they move from maintenance, action or preparation at Time 1 to a lower stage at Time 2, or if they move from contemplation at Time 1 to contemplation or lower at Time 2, or lastly if they are at precontemplation at Time 1 and Time 2.

Independent Variables

This section describes the 15 independent variables that were used in the bivariate and multivariate analyses. Thirteen variables are from wave 1 and two variables are from wave II (pain and exercise history) because they were only introduced at wave II. Past research has tended to use cross-sectional data to test hypotheses about the association between exercise and various independent variables. The present research uses independent variables measured at Time 1 to predict changes in exercise stage between Time 1 and Time 2, and therefore more clearly establishes sequence among independent and dependent variables. This provides a considerably stronger argument for causality for relationships found to be statistically significant.

Table 2 shows frequency distributions for the dependent variable (exercise stage change) and the independent variables (sociodemographic, efficacy, history, and illness factors). The independent variables will be described below in the order in which they were placed in blocks for the logistic regression. A rationale will be provided to explain why they were chosen as control variables in the multivariate analysis.

Table 2: Frequency distribution for dependent variable and independent variables

Variables	Coding	Frequency	Valid %
Dependent Variable:			
Exercise Stage Change	0=negative	189	25.7
	1=positive	546	74.3
Independent Variables:			
Sociodemographic Variables			
Age	1=50-64	235	32
	2=65-74	267	36.3
	3=75+	233	31.7
Sex	0=male	303	41.2
	1=female	432	58.8
Level of Education	1=elementary or less	11	1.5
	2=secondary	281	38.2
	3=more than secondary	443	60.3
Efficacy and TOPB			
Perceived Health	1=poor	38	5.2
	2=fair	131	17.8
	3=good	398	54.1
	4=excellent	168	22.9
Importance of Exercise	1=not at all	68	9.3
	2=a little	31	4.2
	3=moderately	168	22.9
	4=very	468	63.7
Read about condition	0=no	367	49.9
	1=yes	368	50.1
Illness Efficacy	1=one	1	0.1
	2=two	10	1.4
	3=three	109	14.8
	4=four	341	46.4
	5=five	274	37.3

Frequency distribution for dependent and independent variables continued

Variables	Coding	Frequency	Valid %
Exercise History			
Exercise History: age 50	1=<1 or never	33	4.5
	2=1-4x/week	264	35.9
	3=5-7x/week	438	59.6
Illness Factors			
Most Serious Health	1=arthritis	352	47.9
Condition	2=heart problems	182	24.8
	3=high blood pressure	201	27.3
Comorbidities	0=zero	194	26.6
	1=one	220	29.9
	2=two	174	23.7
	3=three	77	10.5
	4=four	43	5.9
	5=five +	27	3.7
Duration of Illness	1=one to three years	147	20
	2=four to six	123	16.7
	3=seven to nine	78	10.6
	4=ten to twelve	105	14.3
	5=thirteen to fifteen	63	8.6
	6=sixteen to eighteen	36	4.9
	7=nineteen to twenty-one	60	8.2
	8=twentytwo to twenty-four	21	2.9
	9=twentyfive to twenty-seven	24	3.3
	10=twentyeight +	78	10.6
Pain	0=no	350	47.6
	1=yes	385	52.4
Hospital Visit past 3 months	0=no	666	90.6
	1=yes	69	9.4
# of Medications	0=zero	104	14.1
	1=one	183	24.9
	2=two	181	24.6
	3=three	119	16.2
	4=four	63	8.6
	5=five	32	4.4
	6=six	28	3.8
	7=seven +	25	3.3
Restricted in things you like	0=seldom/never	393	53.5
to do	1=some/most of the time	342	46.5

Rationale for Choosing Variables

Sociodemographic Variables

Age. Age was determined by asking the respondents for their year of birth. The literature on exercise behavior clearly shows that there is an age related decline in regular physical activity.

Sex. It has been found that women exercise less than men.

Education. Education originally included ten categories that were recoded into three categories for the bivariate and multivariate analyses: elementary (n=11, 1.5%), secondary (n=281, 38.2%) and more than secondary, (n=443, 60.3%). The literature indicates that those with more education are more likely to exercise regularly.

Self Efficacy Theory and Theory of Planned Behavior

Perceived Health. Perceived health was determined by response to the question "In general, compared to other people your age, would you say that your health is poor (n=38, 5.2%), fair (n=131, 17.8%), good (n=398, 54.1%), or excellent (n=168, 22.9%)". Perceived health is used to measure the primary experience component of expectation efficacy. Exercise history is another major aspect of the primary experience

of efficacy. This variable is included in a later block in order to examine how it acts as a barrier to positive exercise behavior.

Importance of Exercise.   Importance of exercise was determined by response to the question "How important is exercising more or being more physically active in coping with your condition". The responses categories were: 'not at all important' (n=66, 9%), 'a little important' (n=31, 4.2%), 'moderately important' (n=168, 22.9%), and 'very important' (n=468, 63.7%). Those who did not respond were placed in the modal category very important. Importance of exercise is used to measure outcome efficacy, secondary experience of expectation efficacy, and social norm belief and attitude (TOPB).

Read up on condition.   Respondents were asked whether they do some reading on the subject of their illness. Responses were no (367, 49.9%) and yes (368, 50.1%). Those who did not respond were placed in the no group. This variable was included as a measure for outcome efficacy.

Illness Efficacy.   The illness self efficacy scale was based on Lorig et al.'s (1989) arthritis scale. The scale was modified to measure heart problem self efficacy, high blood pressure self efficacy, and arthritis self efficacy. The scale involved eleven questions pertaining to the respondents' confidence in controlling certain aspects of their condition. Each response was rated on a 5 point Likert scale ranging from 1 (not confident at all) to 5 (totally confident). For example, arthritis respondents were asked,

"On a scale of 1 to 5, where one is not at all confident, and 5 is totally confident, how confident are you that you can: control fatigue, regulate your activities so as to be active without aggravating your arthritis, do something to help yourself feel better if you are feeling blue, manage arthritis pain during your daily activities, manage your arthritis symptoms so that you can do the things you enjoy, deal with frustration of arthritis, decrease your pain quite a bit, continue most of your daily activities, keep arthritis pain from interfering with your sleep, make a small-to-moderate reduction in your arthritis pain by using methods other than taking extra medication, and make a large reduction in your arthritis pain by using methods other than taking extra medication." For heart problems, and high blood pressure groups there were nine and eight questions respectively. Cronbach's Alphas were computed for each scale: arthritis self efficacy = .89; heart problem self efficacy = .84; high blood pressure self efficacy = .74, indicating good reliability. For "illness efficacy" each specific illness scale was combined into one measure. The total Alpha reliability for illness efficacy was .80. The frequencies for the five categories are: 1 = not at all confident (n=1, 0.1%), 2 = a little (n=10, 1.4%), 3 = moderately (n=109, 14.8%), 4 = very (n=341, 46.4%), and 5 = totally confident (274, 37.3%).

Illness efficacy is included as an indirect measure for exercise efficacy and as a measure for perceived behavioral control (TOPB). It is assumed that those with higher scores on the illness efficacy scale are more likely to be in the positive exercise stage movement group.

Lifestyle: Exercise History

Exercise at age 50.   Exercise at age 50 was determined by response to the question "Thinking back to when you were 50 years old, how many times per week were you physically active for at least 15 minutes?"   The variable originally included six categories that were recoded into three: 5-7 times per week (n=438, 59.6%), 1-4 times per week (n=264, 35.9%), and less than once per week or never (n=33, 4.5%). Those who did not know there past exercise level were placed in the 1-4 category rather than the mode because of the larger range for this category. The literature indicates that past history of exercise has an effect on current exercise patterns. History of exercise is also being used as a measure for primary experience, an aspect of expectation efficacy. It is likely that people will overestimate their past activity levels, therefore findings based on this variable must be interpreted with caution.

Illness Factors

Seven illness factors are introduced as the final block in order to determine the independent effects of illness factors on positive and negative stage change. It is assumed that illness factors will have a greater impact than all other variables because of the nature of the sample being studied.

Most Serious Health Condition.   Most serious health condition included three major chronic conditions: arthritis (n=352, 47.9%), heart problems (n=182, 24.8%), and

high blood pressure (n=201, 27.3%). It is expected that those with more overt symptomology such as arthritic pain would be less likely to exercise regularly.

Comorbidity. Comorbidity was computed based on the question: "Please tell me if you have been professionally diagnosed as currently having any of the following health problems: asthma/emphysema, anxiety, depression, cancer, diabetes, neurological diseases, Alzheimer's or related condition, osteoporosis, vision problems, hearing problems, or other." It is an additive scale comprising the total number of conditions reported. The number of comorbidities ranged from zero (n=194, 26.6%), one (n=220, 29.9%), two (n=174, 23.7%), three (n=77, 10.5%), four (n=43, 5.9%), and five or more (n=27, 3.7%). One would expect that those with a higher number of comorbidities would be less likely to engage in regular exercise.

Duration of Illness. Duration is an interval variable consisting of the length of time since diagnosis of the chronic condition. The question asked was "Could you please tell me when you were first professionally diagnosed with arthritis/heart problem/high blood pressure?" The month and year or do not recall was recorded. The year specified was subtracted from the present year of the study (1995) in order to obtain "time since diagnosis". For the bivariate analysis duration was divided into four categories: < 6 years (n=270, 36.7%), >6 years and <18 years (n=282, 38.4%), and 18+ (n=183, 24.9%). One would expect that those who experience a longer duration would be more likely to exercise regularly because of a longer adjustment period.

Pain.   Pain was determined by response to the question "Do you feel pain associated with your health problem?" Responses were no (n=350, 47.6%) and yes (385, 52.4%).

Hospital Visit Past 3 Months.   Hospital visits was determined by response to the question "In the last three months, were you admitted to a hospital?" Responses were no (n=666, 90.6%) and yes (n=69, 9.4%).

Number of Medications.   The number of medications was determined by the question: "How many prescription medications are you presently taking on a regular basis?" For the bivariate analysis, this variable was recoded into seven categories: zero (n=104, 14.1%), one (n=183, 24.9%), two (n=181, 24.6%), three (n=119, 16.2%), four (n=63, 8.6%), five (n=32, 4.4%), six (n=28, 3.8%) and seven or more (n=25, 3.3%). One would expect that those who take more prescription medication would be less likely to exercise.

Restricted in things you like to do.   This variable was determined by response to the question "Are you restricted in the things that you like to do?" There were originally four categories that were recoded into two categories: 0=seldom or never (n=393, 53.5%) and 1=some or most of the time (n=342, 46.5%). Those who did not respond were recoded into the mode (0=seldom or never).

Stages of Exercise Change.   At each wave of the North Shore Self-Care study (1995-1998) participants were asked whether they engage in regular exercise, sports or physical activity for 15 minutes or more, at least three times per week to cope with their condition. The response set is as follows: 1) already been doing for six months or more; 2) tried for less than six months and still doing it; 3) tried for less than six months and stopped (or tried a bit); 4) intending to try; and 5) not intending to try. These discrete categories are identical to those used in previous TM research. Based on their responses the participants were classified into the five stages of behavior change from the Transtheoretical Model (Prochaska and DiClemente, 1986).

Missing Data

Due to small number of missing cases for all variables mean or modal substitution was used to recode these cases for categorical and continuous variables, respectively. For the variable exercise at age 50 those who replied 'don't know' were placed into the category with the largest range rather than the mode.

Chapter IV

Results

The analysis on stages of exercise change is presented here. This chapter also presents and interprets results related to the hypotheses stated in Chapter 2. A review of the bivariate analysis conducted to test the hypotheses is presented, followed by a multivariate analysis conducted for the purposes of determining which variables provide predictive power in positive exercise stage change. The Statistical Package for Social Sciences (SPSS for MS WINDOWS 8.0) provided statistical programs for the univariate (descriptive), bivariate and multivariate analyses.

Attrition Analysis

There were 879 original participants, 735 completed the Time 2 questionnaire, and 665 completed the entire study (24% attrition). Analyses were conducted comparing the dropouts to those who completed the study in order to evaluate possible biases imposed on the Time 1 and Time 2 samples due to attrition. The only statistically significant difference was between those who were lost from Time 2 to Time 3 (n=70). The attrition group (n=70) had a higher probability of experiencing a hospital stay and of having more comorbidities at Time 1. When all 214 dropouts are compared to the study sample there are no statistically significant differences. Thus, we can assume that the attrition did not bias the sample.

Cross Sectional Information

Table 3 shows the distribution at each wave over the two-year period. The maintenance and precontemplation stages are the two largest groups with the majority of the sample in the maintenance stage (66% to 75%). This is consistent at each wave of the study.

Table 3: Distribution into the stages of change at Time 1, 2 and 3

Stage	Time 1 N/%	Time 2 N/%	Time 3 N/%
Maintenance	**438** **66%**	**498** **75%**	**490** **74%**
Action	33 5%	24 4%	26 4%
Preparation	11 1.6%	2 0.3%	11 2%
Contemplation	60 9%	51 7.7%	50 7%
Precontemplation	**117** **17.5%**	**88** **13%**	**84** **13%**
Missing*	6 0.9%	1 0.1%	4 0.5%
Total	665 100%	665 100%	665 100%

*did not respond to the stages of change question

The cross sectional data (using Time 2) shows 79% (75+4) of the sample exercising regularly (maintenance and action) and 20.7% (7.7+13) being sedentary (contemplation and precontemplation). The 1996 Canadian Census data reports that 54.2% of people aged 55 and over, exercise regularly and 25% exercise less than once a week or never (Statistics Canada, 1999). The definition of exercise used for the census is 'vigorous activity such as jogging, dancing or brisk walking for a period of at least 15 minutes'. In the present study the word 'vigorous' was not included in the definition of exercise. The sedentary rates are similar for both studies but the rate for regular exercising is 48% higher than the rate for the Canadian general population of those aged 55 and older. The higher education level of the sample may contribute to this difference.

The cross sectional data do not show the percentage of people maintaining or changing stages. For example, at Time 1 there were 117 precontemplators and at Time 2 there were 88 but we do not know what percentage of the precontemplators at Time 2 were precontemplators at Time 1. Table 4 disaggregates the changers versus the nonchangers by stage. There is 81% to 100% movement from each stage except for maintenance which only has 23% movement. The table shows that there were 338 people who exercised regularly (maintenance) over the entire study (50.9% of entire sample) and 22 who remained at the precontemplation stage for the entire study (3.3%). There were 368 people who did not change stages, and 291 who did change stages between Times 1, 2 and 3. Of the 368 people who did <u>not</u> change stages, 92% (338) came from the maintenance stage, 6% from precontemplation, 2% from contemplation, 0.2% from action and 0% from preparation. Of the 291 people who <u>did</u> change stages, 34% came from maintenance, 11% from action, 4% from preparation, 18% from

contemplation and 33% from precontemplation. It is important to note that the majority of people who did not change stages were those who exercise, and that 81% of those with no intention of exercising (precontemplators) did change stages. The longitudinal data indicates that 50.9% (338/664) maintained regular exercise over the two years. This is 24% less than the cross sectional data from Time 2 that reports 75% in the maintenance stage. Similarly, the longitudinal data reports that 4.3% of the sample are sedentary (contemplation and precontemplation) for the entire study. This is significantly less (16%) than the cross sectional data that reports 20.7% (7.7 and 13) being sedentary at Time 2.

Table 4: Percentage of people from each stage that change or do not change stages

Stage	No Change		Change		
	N (row %)	% of total sample/664	N (row %)	% of total sample/664	Total N/(%)
Maintenance	338 (77)	51	100 (23)	15	438 (100)
Action	1 (3)	0.1	32 (97)	5	33 (100)
Preparation	0 (0)	0	11 (100)	2	11 (100)
Contemplation	7 (12)	1	53 (88)	8	60 (100)
Precontemplation	22 (19)	3.3	95 (81)	14	117 (100)
Total	368	56	291	44	659 (100)

Stage Changes Over Time

Tables 5, 6 and 7 show the forward movement from Time 1 to Time 2, Time 2 to

Time 3, and Time 1 to Time 3. The changes are fairly similar for each table. If one looks

at the maintainers one will see that from Time 1 to Time 2 there are 87% who remain at

the maintenance phase, and that 7% move to precontemplation. From Time 2 to 3, 87%

stay at maintenance, and 6% move to precontemplation. And for Time 1 to 3, 85% stay

at maintenance, and 7% move to precontemplation. The changes are more drastic for the

preparation stage, but this is likely due to the small n size in this category (n=11).

Table 5: Forward movement from Time 1 to Time2

Stage	Time 1	Time 2				
	Total	Maintenance	Action	Preparation	Contemp	Precont
Maintenance	438	382	8	0	17	31
	→	87%	2%	0%	4%	7%
Action	33	21	4	0	7	1
	→	63%	12%	0%	21%	3%
Preparation	11	4	0	0	2	5
	→	36%	0%	0%	18%	45%
Contemplation	60	32	6	0	12	10
	→	53%	10%	0%	20%	16%
Precontemplation	117	56	6	3	13	39
	→	48%	5%	1.7%	11%	33%
Total *6 missing	659					

Table 6: Forward movement from Time 2 to Time 3

Stage	Time 2	Time 3				
	Total	Maintenance	Action	Preparation	Contemp	Precont
Maintenance	498 →	419 84%	14 3%	7 1.4%	25 5%	31 6%
Action	24 →	16 67%	3 12%	0 0%	0 0%	5 21%
Preparation	2 →	1 50%	0 0%	0 0%	1 50%	0 0%
Contemplation	51 →	22 43%	4 8%	2 4%	14 27%	8 16%
Precontemplation	88 →	32 36%	5 6%	2 2%	10 11%	39 44%
Total *2 missing	663					

Table 7: Forward movement from Time 1 to Time 3

Stage	Time 1	Time 3				
	Total	Maintenance	Action	Preparation	Contemp	Precont
Maintenance	438 →	372 85%	10 2%	4 1%	21 5%	30 7%
Action	33 →	20 61%	4 12%	0 0%	5 15%	3 9%
Preparation	11 →	9 82%	0 0%	0 0%	0 0%	2 18%
Contemplation	60 →	30 50%	6 10%	3 5%	13 22%	8 13%
Precontemplation	117 →	57 49%	6 5%	4 8.5%	11 9.5%	39 33%
Total *6 missing	659					

Looking at table 7 (Time 1 to 3) it is observed that the majority move upwards towards exercise maintenance. A total of 63% of the precontemplators move up, 65% of the contemplators move up, 82% of those at the preparation stage move up, 61% of those at the action stage move up, and 85% of the maintainers remain at maintenance. The table also shows that 33% of the precontemplators remain at precontemplation despite the fact that only 18% (22/117) are at precontemplation for the entire study (waves 1, 2 and 3). There are 8 (13%) contemplators who move down to precontemplation, 18% of the preparation stage move down, 9% of those in action move down and 15% of those at maintenance move down to precontemplation.

The following three figures (4, 5 and 6) show the probability of being active versus being sedentary based on the previous three tables. The maintenance and action stages have been grouped together to create an active group, and the sedentary group consists of those in the precontemplation or contemplation stages. There is a noticeable linear trend when the preparation stage is omitted, whereby the probability of becoming active decreases from maintenance to precontemplation, and the probability of becoming sedentary increases from maintenance to precontemplation. Figure 6 (Time 1 to 3) shows that at all stages there is a greater probability of being active than sedentary, despite an increase in probability of being sedentary from maintenance to precontemplation.

Figure 3: Probability of becoming active or sedentary from Time 1 to Time 2
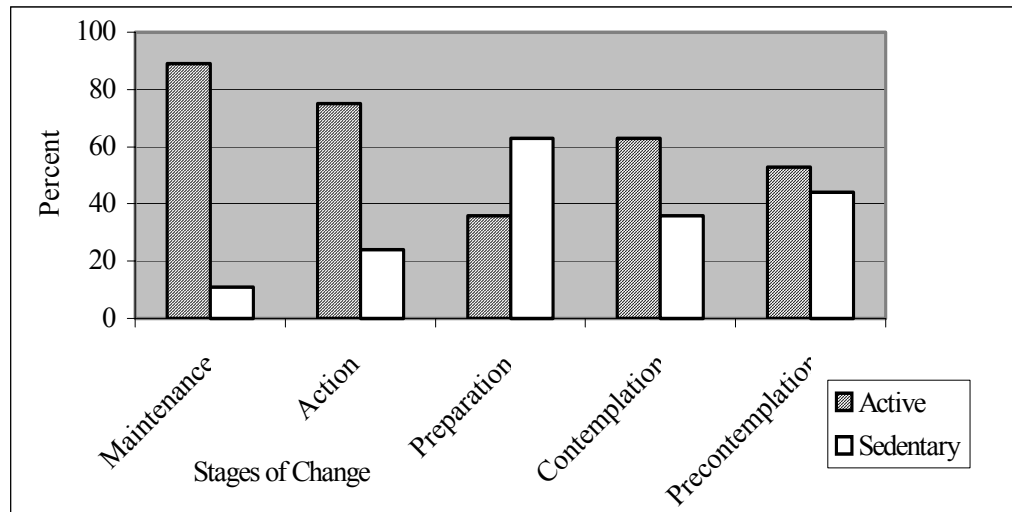
Figure 4: Probability of becoming active or sedentary from Time 2 to Time 3
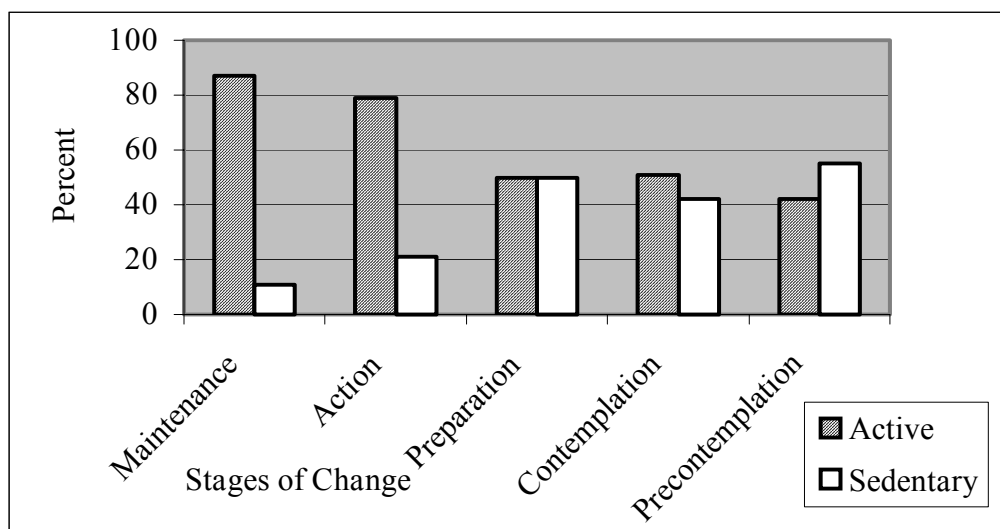
Figure 5: Probability of becoming active or sedentary from Time 1 to Time 3
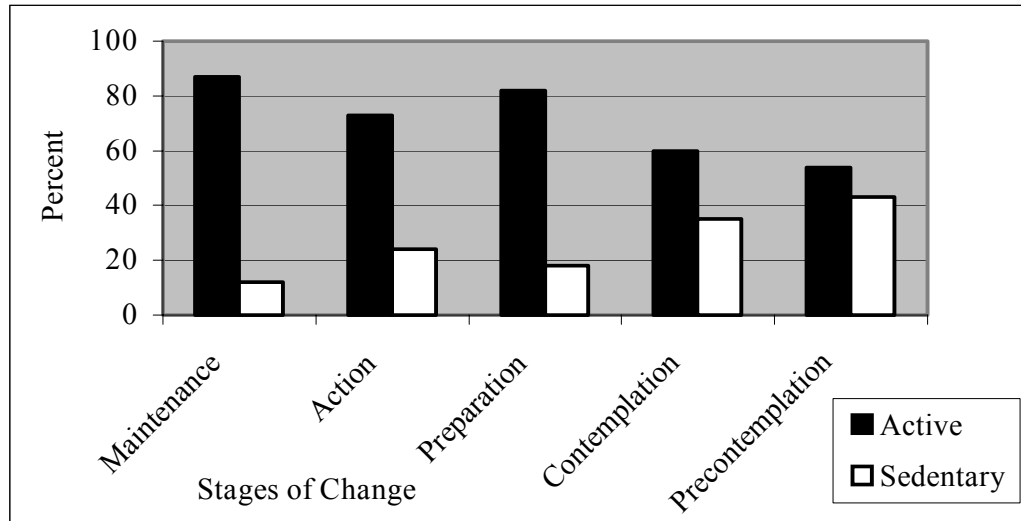
Tables 8, 9 and 10 show the stage prior to Time 2 or 3. For example, of the 498 people in the maintenance stage at Time 2, 76% came from maintenance at Time 1, 4% from action, 4% from preparation, 6% from contemplation and 11% from precontemplation. The patterns of movement show that a large percentage of the maintainers come from maintenance but there were some people making significant stage changes over time such as the 17% that came from contemplation and precontemplation (sedentary stages). Similarly, 50% of the action group at Time 2 were sedentary at Time 1. The two people at the preparation stage both (100%) came from the sedentary stages. For the contemplators, 48% came from sedentary stages, but 47% came from exercising stages. For the precontemplators, 55% came from sedentary stages and 36% came from exercising stages. In conclusion, one can see that there is a trend for the prior stage to be

similar to the present stage, but there are also a significant number of people moving from one extreme of precontemplation to the other extreme of exercise maintenance.

Table 8: Stage prior to Time 2 stage

Stage	Time 1					Time 2
	Maintenance	Action	Preparation	Contemp	Precontemp	Total
Maintenance →	382 (76%)	21 (4%)	4 (1%)	32 (6%)	56 (11%)	498 (100%)
Action →	8 (33%)	4 (16%)	0 (0%)	6 (25%)	6 (25%)	24 (100%)
Preparation →	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	2 (100%)
Contemplation →	17 (33%)	7 (14%)	2 (4%)	12 (23%)	13 (25%)	51 (100%)
Precontemplation →	31 (35%)	1 (1%)	5 (6%)	10 (11%)	39 (44%)	88 (100%)

Table 9: Stage prior to Time 3 from Time 2

Stage	Time 2					Time 3
	Maintenance	Action	Preparation	Contemp	Precontemp	Total
Maintenance →	419 86%	16 3%	1 0.2%	22 4%	32 7%	490 **100%**
Action →	14 54%	3 11%	0 0%	4 15%	5 19%	**26** **100%**
Preparation →	7 63%	0 0%	0 0%	2 18%	2 18%	**11** **100%**
Contemplation →	25 50%	0 0%	1 2%	14 28%	10 20%	**50** **100%**
Precontemplation →	31 37%	5 6%	1 1%	8 10%	39 46%	**84** **100%**

Table 10: Stage prior to Time 3 from Time 1

Stage	Time 1					Time 3
	Maintenance	Action	Preparation	Contemp	Precont	Total
Maintenance	372	20	9	30	57	**490**
→	76%	4%	2%	6%	12%	**100%**
Action	10	4	0	6	6	**26**
→	38%	15%	0%	23%	23%	**100%**
Preparation	4	0	0	3	4	**11**
→	36%	0%	0%	27%	36%	**100%**
Contemplation	21	5	0	13	11	**50**
→	42%	10%	0%	26%	22%	**100%**
Precontemplation	30	3	2	8	39	**84**
→	36%	4%	2%	10%	46%	**100%**

Based on the above tables, figures 7, 8 and 9 show the probability of having been active or sedentary prior to Time 2 and Time 3. The same linear trend as in the previous figures is found, where there is an increase in the likelihood of having been active prior to Time 2 or 3, from precontemplation to maintenance. And there is a linear increase in the likelihood of having been sedentary prior to Time 2 or 3, from maintenance to precontemplation.

Figure 6: Probability of being active or sedentary prior to Time 2
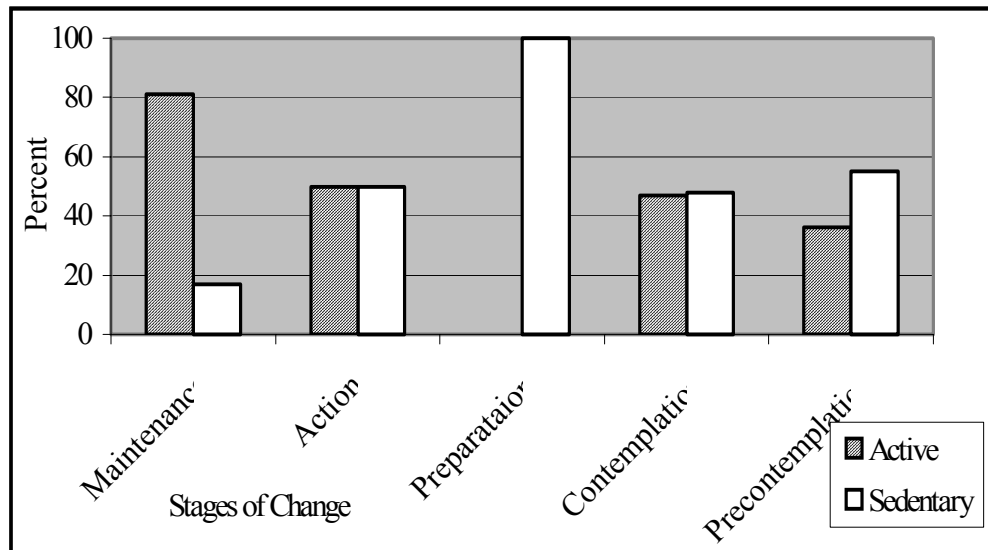
Figure 7: Probability of being active or sedentary prior to Time 3 from Time 2
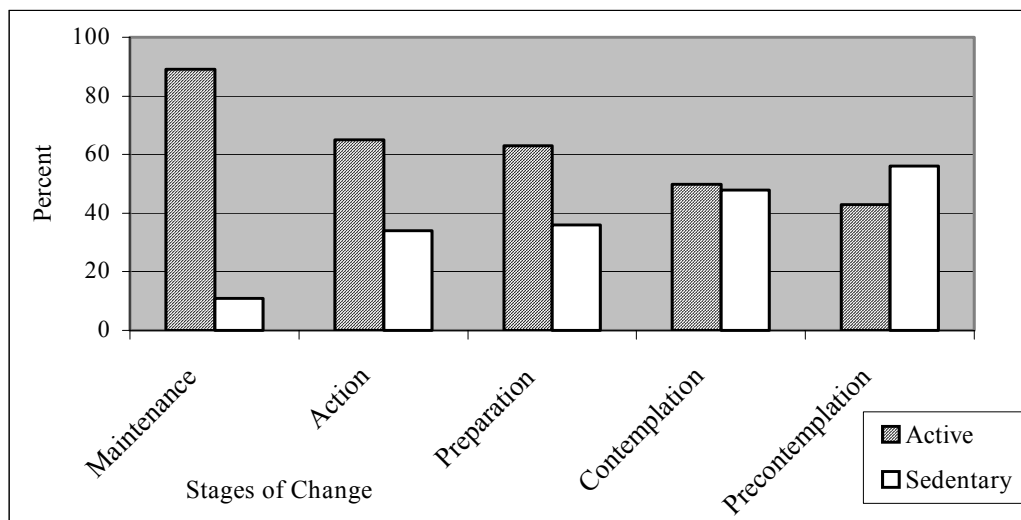
Figure 8: Probability of being active or sedentary prior to Time 3 from Time 1
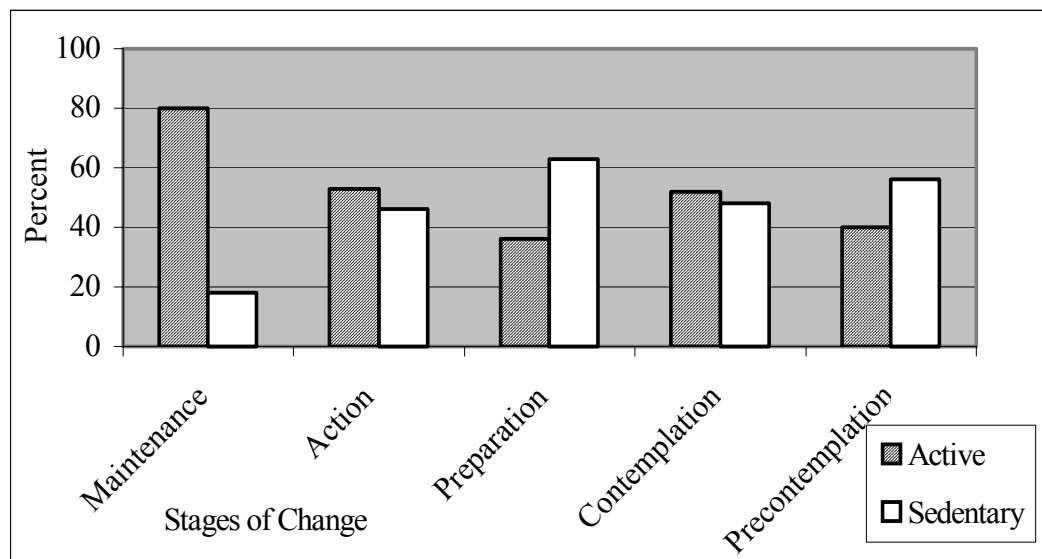
Detailed Description of the Movement Patterns for Precontemplators and

Maintainers

The majority of the people in the present study fall into the maintenance or precontemplation stage at all three waves of the study. The following section will provide a detailed description of the movement patterns from these two stages. Exercise is a recommended activity for the management of arthritis, heart disease and high blood pressure (O'Brien Cousins, 1996). Therefore, it is of interest to gain a greater

understanding of the exercise patterns for this population of older adults living with a chronic illness.

Precontemplators

At Time 1 there were 117 precontemplators (17.6% of 665) and 81% of these people changed stages at a later time. It is this movement that will be examined in the following section. There are 22 who remain at the precontemplation stage for the entire study (18.8%). Table 11 shows that there is a significant number of people who move towards exercise maintenance. For example, by Time 2 there are 62 (56+6 or 53%) people who are in the action or maintenance stage. Of the 39 people who are precontemplators at Time 1 and Time 2, there are 10 (9 +1 or 25.6%) who move to maintenance or action by Time 3. We can conclude that people are able to increase their exercise behavior significantly without a specific intervention offered. However, it is possible and likely that people were in exercise programs or self-management programs offering information on how to exercise regularly. The North Shore Self-Care Study did not offer any specific interventions but this does not mean that the respondents were not involved in any programs.

Table 11: Movement pattern of the Time 1 precontemplators (n=117)

Row	Movement	Main	Action	Prep	Cont	Precont
A	Time 1 to 2 (1 year) (n=117) →	56 48%	6 5%	3 2.5%	13 11%	39 33%
B	Time 1 to 3 (2 years) (n=117) →	57 49%	6 5%	4 3%	11 9%	39 33%
C	Time 2 maintainers to Time 3 (n= 56) →	38 68%	2 3.5%	3 5%	3 5%	10 18%
D	Time 2 contemplation to Time 3 (n =13) →	5 38.5%	2 15.4%	0 0%	1 7.6%	4 31%
E	Time 2 precontemplation to Time 3 (n = 39) →	9 23%	1 2.5%	1 2.5%	6 15%	22 56%

There are a number of people going through major stage changes over Time. There are 10 (8.5%) of the 117 that go from precontemplation to maintenance and back to precontemplation over the two year period (row C). The table shows that 48% (56) go from precontemplation to maintenance from Time 1 to 2 (row A), and 68% of these are still maintainers at Time 3 (row C). There are 39 (33%) people who are precontemplators at Time 1 and 2, and then 9 (23%) move to maintenance at Time 3 (row E).

A few people seem to go through the stages in a linear fashion. For example, there are 13 people that moved from precontemplation to contemplation from Time 1 to 2. And of these 13, two moved to action and five to maintenance at Time 3 (row D). But overall the trend seems to be that the majority of the people fall into the maintenance and

precontemplation stages and that the majority of the movement is between these two stages.

Maintainers

Only 22.8% (100) of those in the maintenance stage change stages (Table 2). Table 12 shows the stage changes of these 100 people from Time 1. There are 34 who have a relapse at Time 2 and then are back at maintenance for Time 3 (12 relapse to contemplation, 15 to precontemplation and 7 to action: row G). There are 43 who are maintainers at Time 1 and Time 2, and regress at Time 3 (row C). And there are 23 who begin the study at maintenance and regress for the entire study (row H). Row A shows that 44% of the maintainers remain at maintenance at Time 2. Row C shows where these 44% regress to at Time 3: 37% regress to precontemplation and 39.5% to contemplation. Row E shows those who regressed to contemplation at Time 2 (17%) and where they move to at Time 3, 70.5% move to maintenance and 17.5% move down to precontemplation. Row F shows that 48% of the precontemplators at Time 2 move to maintenance, 10% to action and 35% remain at precontemplation. There are only 22 people (22%) who regress at Time 2 and Time 3. Rows H and I show that 16 people regress to precontemplation at Time 2, and 69% of these 16 remain at precontemplation at Time 3. The 22 who regress for the entire study tend to remain sedentary. It would be interesting to know what caused eleven people to begin the study as maintainers and then become precontemplators for Time 2 and 3.

Row G shows the 34 people who relapsed. That is they started as a maintainer and then regressed at Time 2, but were back to maintenance at Time 3. The most common stage to regress to was precontemplation 44%, followed by contemplation (35%) and action (20.5%). It is interesting to note that 34 people are able to resolve their break in regular exercise and return to maintenance.

Table 12: Movement of the 100 maintainers from Time 1 who change stages over the two year study

		Main	Action	Prep	Cont	Precont	Total
A	Time 1 to Time 2 (n=100) →	44 44%	8 8%	0 0%	17 17%	31 31%	100 100%
B	Time 1 to Time 3 (n=99) → *1 missing	34 34%	10 10%	4 4%	21 21%	30 30%	99 100%
C	Maintenance Time 2 to Time 3 (n=43)*1missing →	/	7 16%	3 7%	17 39.5%	16 37%	43 100%
D	Action Time 2 to Time 3 (n=8) (n=8) →	7 87.5%	0 0%	0 0%	0 0%	1 12.5%	8 100%
E	Contemplation Time 2 to Time 3 (n=17) →	12 70.5%	0 0%	1 6%	2 12%	3 17.5%	17 100%
F	Precontemplation Time 2 to Time (n=31) →	15 48%	3 10%	0 0%	2 6%	11 35%	31 100%
G	Relapse (main Time 1 and 3) (n=34)→	/	7 20.5%	0 0%	12 35%	15 44%	34 100%
H	Time 1 to Time 2 for those who regress Time 2 and Time 3 (n=22) →	/	1 4.5%	0 0%	5 23%	**16** 72.5%	22 100%
I	Precontemplation from row H Time 2 to 3 (n=16) →	/	3 19%	0 0%	2 12%	11 69%	16 100%

Summary

Cross sectional and longitudinal findings were compared. It was found that the cross sectional data reports more regular exercisers and more sedentary individuals than the longitudinal data. The majority of the maintainers at Time 1 remain at maintenance for the entire study, while 80% to 100% of those in the other four stages change over time. The forward and retrospective analysis of the movement patterns illustrates that there is significant stage movement but that the majority of the sample falls into the maintenance and precontemplation stages. The figures show a linear trend, whereby there is a decrease in the probability of being active from maintenance to precontemplation.

The detailed description of the precontemplators shows that a significant number of people do exercise at one point despite being sedentary during the study. The precontemplation stage appears to be a temporary stage for most people rather than a static stage.

The detailed description of the movement patterns of the maintainers indicates that of the 100 who do change stages, 34 have a relapse, 33 are maintainers for Time 1 and Time 2, and 22 regress for Time 2 and Time 3. The important factor to notice is that of the 438 who were maintainers at Time 1 only 100 (22.8%) change stage. Those who achieved exercise maintenance were extremely likely to maintain regular exercise for the two year period.

There are a significant number of people moving from one extreme to the other and a small portion moving linearly through the stages. Although the above findings shed light onto the natural exercise stage movement we must be careful about generalizations based on small numbers. The following section will test hypotheses pertaining to the prediction of exercise stage movement.

Bivariate Analyses

Bivariate analyses permit the investigation of the direction and magnitude of association between the dependent variable and the independent variables. As a rule of thumb, correlations ranging from zero to .20 are considered weak, those between .20 and .40 are considered moderate, and those over .40 are considered moderate to strong. A negative sign before the correlation indicates an inverse relationship. Positive scores, on the other hand, indicate a positive relationship. For this thesis, the dependent variable is exercise stage change which is coded as 0=negative and 1=positive. Thus, a positive correlation would indicate higher scores for those who are positive stage changers. The independent variables used to test the hypotheses are nominal, ordinal or interval. Kendall's Tau C and Pearson's r have been used to indicate the magnitude of association between the independent and dependent variables. Kendall's Tau C is used for ordinal variables, when the number of rows and columns cells are unequal. Pearson's r is used when both the dependent and independent variables are interval.

To test the 4 hypotheses developed in Chapter 2, crosstabulations were performed between the dependent variable and the independent variables.

Hypothesis 1

      Positive exercise stage changers will score higher on efficacy variables.

      This hypothesis states that positive exercisers are more likely than negative exercisers to score higher on perceived health, importance of exercise, reading up on their condition, and illness efficacy.

      First, for the independent variable 'perceived health', a statistically significant weak to moderate positive relationship was found (Tau c= .07, p<.05). Those who are positive exercise stage changers are more likely to report having better health than the negative exercise stage changers.

Table 13: Crosstabultation of Perceived Health and Exercise Stage Change

Stage Change	Perceived Health							
	Excellent		Good		Fair		Poor	
	N	%	N	%	N	%	N	%
Negative	35	20.8	102	25.6	37	28.2	15	39.5
Positive	133	79.2	296	74.4	94	71.8	23	60.5
Total	168	100	398	100	131	100	38	100

Tau c=.07, p<.05

      Second, the independent variable 'importance of exercise' was also found to be statistically significant. The crosstabulation resulted in a weak positive relationship (Tau c=.10, p<.01) where positive exercise stage changers are more likely to rate exercise as more important than the negative exercise stage changers. However, it is evident from Table 14 that this relationship is curvilinear, with higher percentages of positive exercise stage movers reporting the extreme categories of importance of exercise.

Table 14: Crosstabulation of Importance of Exercise and Exercise Stage Change

Stage	Importance of Exercise							
	Very Important		Moderately		A little		Not at all	
	N	%	N	%	N	%	N	%
Negative	99	21.2	63	37.5	14	45.2	13	19.1
Positive	369	78.8	105	62.5	17	54.8	55	80.9
Total	468	100	168	100	31	100	68	100

Tau c = .10, p<.01

Third, the crosstabulation between reading up on condition and exercise stage change was found to be not statistically significant (Tau c=.02, ns).

Table 15: Crosstabulation of Reading up on condition and Exercise Stage Change

Stage	Yes		No	
	N	%	N	%
Negative	90	24.5	99	26.9
Positive	277	75.5	269	73.1
Total	367	100	368	100

r = .02, ns

Fourth, the association between illness efficacy and exercise stage change was found to be not statistically significant (r=.06, ns).

Table 16: Crosstabulation of Illness Efficacy and Exercise Stage Change

Stage	Illness Efficacy									
	1 (low)		2		3		4		5 (high)	
	N	%	N	%	N	%	N	%	N	%
Negative	0	0	3	30	29	26.6	100	29.3	57	20.8
Positive	1	100	7	70	80	73.4	241	70.7	217	79.2
Total	1	100	10	100	109	100	341	100	274	100

r=.06, ns

Hypothesis 2

Positive exercise stage changers will score higher on attitude, social norms and perceived behavioral control.

It is hypothesized that attitude (importance of exercise), social norms (importance of exercise) and perceived behavioral control (illness efficacy) impact exercise behavior. For importance of exercise a statistically significant weak positive relationship was found (Tau c = .10, p<.01). And for illness efficacy the association was found to be not statistically significant (r= .06, ns).

Hypothesis 3

Positive exercise stage changers will have a history of regular exercise.

This hypothesis states that those who exercised regularly at age 50 are more likely to be positive exercise stage changers. A statistically significant weak positive relationship was found for exercise history (Tau c=.08, p<.05).

Table 17: Crosstabulation of Exercise at age 50 and Exercise Stage Movement

Stage	Exercise at age 50					
	5-7x/week		1-4x/week		<1x/week or never	
	N	%	N	%	N	%
Negative	98	22	80	30	11	33
Positive	341	78	183	70	22	67
Total	439	100	263	100	33	100

Tau c =.08, p=.01

Hypothesis 4

Positive exercise stage changers will be less likely to have arthritis, will have less pain, fewer comorbidities, be less likely to have been hospitalized, a longer duration of illness, fewer medications and be less likely to feel restricted in the things they like to do.

First, the association between most serious condition and exercise stage change was found to be not statistically significant (Chi-square = .965, ns).

Table 18: Crosstabulation of Most Serious Condition and Exercise Stage Change

Stage	Most Serious Condition					
	Arthritis		Heart Problems		High Blood Pressure	
	N	%	N	%	N	%
Negative	95	27	42	23	52	26
Positive	257	73	140	77	149	74
Total	352	100	182	100	201	100

Chi-square=.964, ns

Second, for the independent variable comorbidity, a statistically significant weak negative relationship was found (r=-.114, p<.001). Those who are positive exercise stage changers are more likely to report fewer comorbidities than the negative exercise stage changers.

Table 19: Crosstabulation of Comorbidity and Exercise Stage Change

Stage	Comorbidity							
	0	1	2	3	4	5	6	7
	N	N	N	N	N	N	N	N
	%	%	%	%	%	%	%	%
Negative	30	55	59	23	16	5	1	0
	15.5%	25%	33.9%	29.9%	37.2%	25%	20%	0%
Positive	164	165	115	54	27	15	4	2
	84.5%	75%	66.1%	70.1%	62.8%	75%	80%	100%
Total	194	220	174	77	43	20	5	2
	100%	100%	100%	100%	100%	100%	100%	100%

r=-.114, p<.001

Third, the crosstabulation of duration of illness and exercise stage change was found to be not statistically significant (Tau c = .065, p=.067, ns).

Table 20: Crosstabulation of Duration of Illness and Exercise Stage Change

Stage	Duration of Illness					
	< 5 years		5 to 15 years		> 15 years	
	N	%	N	%	N	%
Negative	68	30.5	71	24.2	50	22.8
Positive	155	69.5	222	75.8	169	77.2
Total	223	100	293	100	219	100

Tau c = .065, p=.07, ns

Fourth, the association between pain and exercise stage change was found to be not statistically significant (r=.005, ns).

Table 21: Crosstabulation Pain and Exercise Stage Change

Stage	Pain			
	Yes		No	
	N	%	N	%
Negative	98	25	91	26
Positive	288	75	258	74
Total	386	100	349	100

r=.005, ns

Fifth, the association between number of medications and exercise stage change was found to be not statistically significant (r=-.047, ns).

Table 22: Crosstabulation of Number of Medications and Exercise Stage Change

Stage	Number of Medications									
	Zero		One		Two		Three		Four +	
	N	%	N	%	N	%	N	%	N	%
Negative	16	15.8	52	28.9	48	25.4	33	28.2	40	27
Positive	85	84.2	128	71.1	141	74.6	84	71.8	108	73
Total	101	100	180	100	189	100	117	100	148	100

Tau c = -.047, ns

Sixth, the association between hospital stay in last three months and exercise stage change was found to be not statistically significant (r=-.016, ns).

Table 23: Crosstabulation of Hospital Stay and Exercise Stage Change

Stage	Hospital Stay			
	Yes		No	
	N	%	N	%
Negative	19	27.9	170	25.5
Positive	49	72.1	497	74.5
Total	68	100	667	100

r= -.016, ns

Lastly, for the independent variable 'restricted in things you like to do', a statistically significant weak negative relationship was found (r=-.113, p<.05). Those who are positive exercise stage changers are less likely to be restricted in the things they like to do, than negative exercise stage changers.

Table 24: Crosstabulation of Restricted in things you like to do and Exercise Stage Change

Stage	Restricted in things you like to do			
	Some/Most of the Time		Never/Seldom	
	N	%	N	%
Negative	106	31	83	21
Positive	236	69	310	79
Total	342	100	393	100

r=.-113, p<.05

<u>Sociodemographic Variables</u>

Age, sex and education were all found to be not statistically significant. Table 25 shows the statistical findings.

Table 25: Association between Exercise Stage Change and Sociodemographic Variables

Age	r= -.07, p=.08, ns
Sex	r= -.03, ns
Education	Tau c = .024, ns

ns= not significant

Summary

The previous section accepted or rejected hypotheses according to statistically significant differences in association found between the dependent variable (exercise

stage change) and fifteen independent variables. Overall, all hypotheses were supported.
The major findings were that:

1   For hypothesis 1 the variables perceived health and importance of exercise were
         found to be statistically significant and in the expected direction. This lends
         support for expectation and outcome efficacy.

2   The theory of planned behavior (hypothesis 2) received some support. Both
         attitude and social norms were supported in the expected direction. However,
         perceived behavioral control (illness efficacy) was not statistically significant.

3   Exercise history (hypothesis 3) was found to be statistically significant in the
         expected direction.

4   Three illness factors from hypothesis 4 were found to be statistically significant:
         comorbidity, duration of illness and restricted in things you like to do.

Multivariate Analysis

Multivariate analysis is required to examine the independent effects of each
explanatory variable under study, while controlling for the effects of others. A logistic
regression is a suitable statistical technique since it uses a variety of independent
variables with one dichotomous dependent variable (Howell, 1992). The dependent
variable in this study is dichotomous (exercise stage change: 0=negative stage change,
1=positive stage change).

This thesis investigated the application of efficacy theory and the theory of
planned behavior to exercise stage change. Also, it was hypothesized that exercise

history and illness factors would act as barriers to positive exercise behavior. Therefore, fifteen independent variables (1. Perceived health, 2. Importance of exercise, 3. Read up on condition, 4. Illness efficacy, 5. Exercise history, 6. Most serious condition, 7. Comorbidities, 8. Duration of illness, 9. Pain, 10. Hospital stay, 11. Restricted in things you like to do 12. Exercise history, 13. Age, 14. Sex and 15. Education) were chosen as potentially relevant factors involved in exercise stage movement.

Five hierarchical models were performed (see Appendix C). Model 1 included the three sociodemographic variables and Model 2 examined the efficacy and theory of planned behavior variables in addition to the sociodemographic variables. Model 3 entailed the seven variables from Model 2, and the illness efficacy variable. Model 4, entailed all the variables from Model 3, and the exercise history variable (exercise at age 50). Finally, Model 4, involved the seven variables representing illness factors/barriers, in addition to the eight variables from Model 4. The rationale for the ordering of the variables lay in the antecedent nature of the sociodemographic variables, and the theoretical relationship between efficacy and exercise, and TOPB and exercise. Exercise history and illness factors are included lastly to examine how they act as barriers to exercise behavior.

The logistic regression beta coefficient, its standard error, its odds ratio, and the level of significance are presented. The logistic regression beta coefficient (B) represents the change in the log odds of being in the positive exercise stage change group (compared to the negative group) for a one-unit change in an independent variable, while statistically controlling for all others. The odds ratio is "the estimated odds ratio for those who are a unit apart on a given explanatory variable, after other variables in the model have been

statistically controlled" (DeMaris, 1995). For this thesis, the odds ratio is the probability of being in the positive exercise stage change group for one category of an explanatory variable compared to the reference category. A positive value for an odds ratio ranges between 1 and infinity, while a negative value ranges between singularity and zero (but never reaches zero) (DeMaris). For example, an odds ratio of 1.5 for an explanatory variable would indicate that the probability of being in the positive exercise stage movement group is one and a half times larger for the specified category of that variable compared to the reference category, while statistically controlling for all other explanatory variables (DeMaris). The level of significance is reported by using the Log Likelihood Chi Square. A statistically significant result indicates that "the overall model does not significantly differ from the 'perfect' model using all of the independent variables" (Wister, 1995). In this study, model 1 was found to be not statistically significant, while models 2, 3, 4, and 5 were found to be statistically significant. Blocks 2, 4, and 5 were observed to be statistically significant while blocks 1 and 3 were not statistically significant (see Table 26).

Table 26: Logistic Regression Model Significance

	Block Chi-Square	Block Significance	Model Chi-Square	Model Significance
Model 1	3.77	.44, ns	3.77	.44, ns
Model 2	30.60	.0001	34.37	.0003
Model 3	.017	.90, ns	34.39	.0006
Model 4	9.15	.01	43.53	.0001
Model 5	20.69	.008	64.23	.0000

Table 27: Logistic Regression for Exercise Stage Movement and Independent Variables

	Model 1			Model 2		
	B	S.E.	Odds Ratio	B	S.E.	Odds Ratio
Age	-.01	.01	-	-.01	.01	-
Sex	-.10	.17	-	-.14	.18	-
Education						
Elementary (ref)						
Secondary	-.06	.69	-	-.03	.71	-
> Secondary	.01	.69	-	-.02	.70	-
Perceived Health						
Poor (ref)						
Fair				.77*	.39	2.17
Good				.86*	.35	2.38
Excellent				1.06**	.39	2.89
Importance of Exercise						
Not at all important				-1.15	.38	-
A little important				.82**	.20	.31
Moderately important				-.15**	.33	.43
Very important (ref)						
Read up on condition				.15	.17	-

*p<.05
**p<.01
Model Chi-Square = 3.78, ns (Model 1)
Model Chi-Square = 34.37, p<.001 (Model 2)

Logistic Regression for Exercise Stage Movement and Independent Variables continued

	Model 3			Model 4		
	B	S.E.	Odds Ratio	B	S.E.	Odds Ratio
Age	-.01	.01	-	-.02*	.01	.97
Sex	-.14	.18	-	-.21	.18	-
Education						
Elementary (ref)						
Secondary	-.03	.71	-	-.07	.71	-
> Secondary	-.02	.71	-	-.02	.71	-
Perceived Health						
Poor (ref)						
Fair	.76*	.40	2.1	.68	.40	-
Good	.85*	.38	2.3	.77*	.38	2.17
Excellent	1.03*	.42	2.8	.92*	.43	2.52
Importance of Exercise						
Not at all important	.15	.33	-	.08	.33	-
A little important	-1.15**	.38	.31	-1.21**	.38	.29
Moderately important	-.82**	.20	.44	-.79**	.20	.45
Very important (ref)						
Read up on condition	.14	.17	-	.14	.18	-
Illness Efficacy	.01	.13	-	.04	.13	-
Exercise age 50						
5-7x/week (ref)						
1-4x/week				-.54**	.19	.58
<1/week or never				.70	.41	-

*p<.05
**p<.01
Model Chi-Square =34.38, p<.001 (Model 3)
Model Chi-Square = 43.54, p<.001 (Model 4)

Logistic Regression for Exercise Stage Movement and Independent Variables continued

	Model 5		
	B	S.E.	Odds Ratio
Age	-.02*	.01	.97
Sex	-.05	.20	-
Education			
Elementary (ref)			
Secondary	-.24	.74	-
> Secondary	-.14	.73	-
Perceived Health			
Poor (ref)			
Fair	.55	.42	-
Good	.50	.42	-
Excellent	.58	.47	-
Importance of Exercise			
Not at all important	.06	.35	-
A little important	-1.26**	.39	.28
Moderately important	-.79**	.21	.45
Very important (ref)			
Read up on condition	.13	.18	-
Illness Efficacy	-.02	.14	-
Exercise age 50			
5-7x/week (ref)			
1-4x/week	-.60**	.19	.54
<1/week or never	-.75	.41	-
Most Serious Condition			
Arthritis (ref)			
Heart Problems	.63*	.30	1.89
High Blood Pressure	.13	.31	-
Comorbidities	-.14*	.07	.86
Duration of Illness	.01*	.01	1.02
Pain	.41	.27	-
Hospital Stay	.06	.31	-
# of medications	-.01	.05	-
Restricted in things you like to do	-.49*	.21	.61

*p<.05
**p<.01
Model Chi-Square =64.23, p<.001 (Model 5)

Model 1 was not statistically significant. In Model 2, when the efficacy and theory of planned behavior variables were included it was found that perceived health and importance of exercise were statistically significant. The likelihood of positive exercise change compared to negative exercise change is 2.89 times higher for people reporting excellent health than poor health, after controlling for all other variables. The likelihood of positive exercise change is 2.38 times higher for those reporting good health and 2.17 times higher for those reporting fair health than poor health, after controlling for all other variables. For the 'importance of exercise' variable the odds ratio indicates that those rating exercise as 'not at all important" are 69% less likely to be positive stage changers than those who rate exercise as 'very important'.

Model 3 introduced illness efficacy and the block was found to be not statistically significant. The overall model remained statistically significant and the findings from Model 2 did not change. In Model 4 exercise at age 50 was included. The block and the overall model were found to be statistically significant. The odds ratio indicates that people who exercised 1-4x/week at age 50 compared to 5-7x/week are 42% less likely to be positive stage changers than negative stage changers, after controlling for all other variables. With the introduction of exercise history the odds ratio for perceived health changed. The odds ratio comparing fair and poor health was found to be no longer statistically significant. However, with the inclusion of exercise history, age was found to be statistically significant. For every unit increase in age a person is 3% less likely to be a positive exercise stage changer. For example, a 60 year old person would be 30% less likely than a 50 year old to be a positive exerciser than a negative exerciser.

In model 5, seven variables resulted in statistically significant relationships. Support was found for 4 illness factor variables, age, importance of exercise and exercise at age 50. The inclusion of the illness variables resulted in perceived health no longer being statistically significant. The illness variables that were found to be statistically significant are: most serious illness, comorbidity, duration of illness and restricted in things you like to do. The odds of being a positive exerciser are 1.89 times as large for those with heart problems as they are for those with arthritis, after controlling for all other variables. The odds ratio for comorbidity indicates that for every unit increase in number of comorbidities one is 14% less likely to be a positive exercise stage changer. The odds of being a positive stage changer are 1.02 larger for each additional tenth of a year that one has had the illness. And lastly, the odds ratio for being restricted in the things you like to do indicates that those who are restricted in the things they like to do are 39% less likely to be in the positive exercise group.

Chapter V

Discussion

The first part of the thesis entailed a description of the movement through the stages of exercise change over a two-year period. A discussion of the findings and implications for the Transtheoretical Model follows. The second part of the thesis investigated the theory of self-efficacy, the theory of planned behavior, and illness factors in predicting positive or negative exercise stage change. The discussion presents a summary of the research issues followed by a discussion of the results as they pertain to the applied theories. And lastly, the implications and limitations of the research, as well as directions for future research are presented.

Research Issues

The literature has shown that there is a progressive reduction of physical activity with age and an increase in chronic illness and disability with age (Shephard, 1994). Exercise has been demonstrated to have a significant positive impact on functional ability and independence (Shephard, 1997). There is concern that the majority of the seniors population is not engaged in sufficient exercise to experience many of the health benefits. Exercise is a self-care management tool recommended for arthritis, heart problems and high blood pressure (Carlson et al., 1999). A sedentary lifestyle is the most prevalent and modifiable risk factor for the majority of chronic illnesses (Carlson et al.). The process of enabling people to increase control over their health is a major component of the health

promotion framework. Self-management of a chronic illness, a process where people actively manage their own health, is important for the seniors population because it promotes independence. Self care activities, such as exercise, have also been demonstrated to be cost effective (Omenn, 1990). The aim of this study was to determine the exercise patterns of a group of older adults living with a chronic illness and to determine the predictors of positive exercise change.

The theories of planned behavior and self-efficacy were examined in terms of their ability to predict exercise change. The following variables were used to measure these two theories: perceived health, importance of exercise, reading up on condition, and illness efficacy. Because the theories were not designed with a seniors population in mind we hypothesized that there would be variables that act as either facilitators or barriers to positive exercise behavior. Exercise history and illness factors were included to test how they affect and impact the above two theories. The following variables were chosen to examine facilitators and barriers: exercise at age 50, most serious condition, comorbidities, duration of illness, pain, hospital stay, number of medications and restricted in things you like to do. The multivariate analysis included the above variables as well as three sociodemographic variables that were selected as relevant based on a review of the literature.

Part I

Description of exercise movement and implications for the Transtheoretical Model and Health Promotion

The descriptive analysis began with a comparison of the cross sectional data to the longitudinal data. The cross sectional information indicates greater amounts of people in the maintenance and precontemplation groups than the longitudinal data. At Time 1 there are 27% reporting sedentary behavior, but only 4.3% of the sample are sedentary for the entire study. Because the majority of the information available on exercise behavior is cross sectional it is valuable to have longitudinal data to indicate the length of sedentary patterns.

In this study of older adults with a chronic illness the people reporting sedentary behavior are for the most part only sedentary temporarily. For example, 36% of the 84 who were precontemplators at Time 3 were maintainers at Time 1. There is an observable pattern indicating that people move from regular exercise to no exercise, and vice versa. An explanation for this pattern may lie in the type of person sampled, whereby having a chronic illness may cause individuals who exercise regularly to have sedentary breaks due to illness factors such as hospital stays or physical limitations.

The most stable stage is maintenance, where it is observed that 77% of those who are in maintenance at Time 1 remain at maintenance for Time 2 and Time 3. For the other stages the majority (81% to 100%) change stages at Time 2 and/or Time 3. Although the precontemplators are the least likely to change stages, it is observed that 81% of them do change stages. These findings are important in that they demonstrate that health promotion programs should be aiming to have an impact on supporting those

to maintain regular exercise rather than solely focusing on sedentary individuals. It is often assumed that people who are sedentary require more information about the benefits of exercising. For the present sample it appears that it is not lack of information about exercising that is causing sedentary lifestyles, since the majority of the sample exercise at one point or another. Of the 665 people in the study 616 (92.6%) exercise at one point in the study. Based on the amount of people exercising it is safe to conclude that there is not a lack of interest to exercise but nonetheless there is a significant number that do move in and out of the precontemplation and contemplation stages (sedentary stages). There are factors that must be displacing one's ability to maintain regular exercise.

One of the main benefits of applying the TM is that one can design programs that are stage matched. Exercise promotion programs have had a tendency to be designed for those in the preparation or action stage (Marcus, Bock & Pinto, 1997). It has been suggested that it would be beneficial to design programs specifically for those in the other stages. Little research has been done on the effectiveness of stage matched interventions. Marcus, Bock and Pinto suggest that interventions for early stages of change (precontemplation and contemplation) should focus on increasing awareness of the benefits of exercise and should encourage thinking about becoming active. However, for the sample in the present study it would <u>not</u> necessarily be beneficial to design stage matched programs. The reason to design stage matched interventions is based on the assumption that people at different stages have different readiness potential for exercising. The psychological and physical preparedness varies at each stage and it is ineffective to provide an action-based intervention to a person who is not even considering an exercise program. For the current sample the movement through the

stages may be more related to illness factors than attitude or intention to exercise, therefore exercise interventions should take this into account. For example, the movement from maintenance to precontemplation demonstrates a drastic change in exercise behavior. The change is probably not related solely to a change in one's attitude towards exercise, but rather reflects factors related to having a chronic illness that may be acting as exercise barriers. In addition, those who are in precontemplation are not individuals, for the most part, who have never exercised or have no future intention to exercise. Those in the precontemplation stage have responded they have no intention to exercise in the next six months but the longitudinal data indicates that the majority of those in the precontemplation stage are regular exercisers in the future. In order to reach the maximum number of people with a health promotion program it would be useful to inquire into how the illness factors are acting as barriers to regular exercise. It may be that seniors do not receive enough specific information on how to design an exercise routine with a chronic illness in mind or receive conflicting information when diagnosed with more than one chronic illness. Lastly, it may be that expecting people with a chronic illness to exercise regularly is an unrealistic goal.

The descriptive analysis also showed that there is a linear trend, in which the likelihood of becoming active from Time 1 to Time 3 decreases from maintenance to precontemplation. Although one is more likely to become active than sedentary at each stage the likelihood of being active is higher for maintainers than precontemplators. Similarly, the likelihood of becoming or remaining sedentary is highest for those in the precontemplation stage. Therefore, in terms of designing health promotion programs it is important to be aware that exercise is the most likely outcome but that the lower one is on

the stages of exercise change the more at risk one is for becoming sedentary. These findings support the TM in that it is logical to assume that those already exercising are more likely to be exercising in the future than those who are sedentary.

The detailed descriptions of the maintainers and precontemplators demonstrated that there is movement through the stages but it is very difficult to predict what stage a person will be at in the future. One of the main reasons for the difficulty in prediction is due to the large number of people moving from one extreme of no exercise to the other extreme of maintaining regular exercise. Only a few people moved linearly through the stages towards exercise maintenance. What the descriptive patterns do not show is what factors are causing the extreme movement. Based on the above, we can assume that illness factors will have an effect on the stages of exercise change in the multivariate analyses. For example, it may be the case that a restriction in activity due to illness is causing a regular exerciser to report no intention to exercise in the future at Time 2 of the study.

The description provides insight into exercise patterns over two years. The importance to health promotion is that the majority of people are exercising regularly, a very small minority are consistently sedentary, and the rest are mainly moving between maintenance and sedentary patterns. Using the stages of change allowed for greater detail to be captured regarding the natural history of exercise movement. It has been suggested that there is minimal stage movement without specific exercise interventions (Cardinal, 1997), however, the data from this study indicates that a large amount of movement occurs naturally. Lastly, the benefit of designing stage matched exercise promotion programs is questioned based on the fact that the type of movement occurring

does not seem to reflect a need for programs based on the stages. Programs that address relapse and exercise routines for people with one or more chronic illnesses would be more beneficial than programs based solely on the intention factor of the stages of change.

Part II

Main Findings

The purpose of this section was to test hypotheses pertaining to the prediction of positive or negative exercise stage change over a one-year period. The theory of planned behavior suggests that attitudes, social norms and perceived behavioral control determine one's decision to exercise. Two variables were used to apply the theory: importance of exercise and illness efficacy. Bandura's (1979) self-efficacy theory suggests that self-efficacy is the main factor determining one's decision to exercise. Self-efficacy has a variety of components including expectation efficacy and outcome efficacy. Expectation efficacy refers to a personal judgement of one's ability to exercise. Outcome efficacy refers to beliefs regarding the benefits of exercise. The following variables were included to measure the different components: perceived health, importance of exercise, reading up on condition and illness efficacy. It was further hypothesized that there would be barriers intervening between one's decision to exercise and the performance of the actual behavior. The barriers included for investigation were exercise history and illness factors.

Hypothesis 1 tested the relationship between efficacy variables and exercise stage change. The hypothesis stated that those who are positive exercisers are more likely to score higher on perceived health, importance of exercise, illness efficacy and are more likely to read up on their condition. Bivariate analyses indicated statistically significant weak positive associations for two variables: perceived health and importance of exercise. Illness efficacy and reading up on condition were found to be not statistically significant. Multivariate analyses partially supported the hypothesis. 'Perceived health' and 'importance of exercise' were statistically significant in models 2, 3 and 4. But only 'importance of exercise' remained statistically significant when the illness factors were included in model 5. In Model 2 the odds of being a positive exerciser were 2.89 times as large for those who reported excellent health compared to those who reported poor health. This relationship was weakened when exercise history was included and disappeared in Model 5 with the inclusion of illness factors. It appears that perceived health a component of expectation efficacy play a role in exercise behavior, but the effect does not hold when illness factors are included. The odds ratio for 'importance of exercise' remained consistent for all models.

The lack of statistically significant relationships found in the multivariate analyses for reading up on condition and illness efficacy may be explained by the fact that the measures are not directly linked to exercise behavior. Reading up on condition does not guarantee that the information being read consists of exercise promotion material. Illness efficacy was designed to measure control over one's illness and was included as a measure for exercise efficacy. The literature on exercise efficacy generally uses a scale

that measures specifically one's control over ability to exercise. It may be the case that one has control over one's illness but is still unable to exercise.

Hypothesis 2 stated that positive exercise stage changers will score higher on attitude, social norms and perceived behavioral control. At the bivariate level, only 'importance of exercise' (attitude and social norm) was statistically significant. At the multivariate level 'importance of exercise' was statistically significant for Models 2, 3, 4 and 5. Literature on the theory of planned behavior has found that attitude is the main factor related to exercise. For this sample, we hypothesized that all three components would be relevant since control is important for people with a chronic illness and that social norms for the older population may be a source of exercise reduction. However, the measure for social norms is indirect and is a better measure of attitude. The lack of statistical significance for perceived behavioral control (illness efficacy) might be explained by the fact that the measure was not directly measuring perceived control over exercise but over the illness. We assumed that this measure would capture the perceived control component but it may be the case that illness control is not synonymous with exercise control.

Hypothesis 3 stated that positive exercisers would have a history of regular exercise. At the bivariate level the association between exercise at age 50 and exercise stage change was weak, positive and statistically significant. At the multivariate level the association was statistically significant when introduced in model 4, and remained statistically significant in model 5. The odds ratio indicates that exercising 1-4 times per week at age 50 rather than 5-7 times per week decreased the odds of being a positive exerciser by 42%. And in model 5 the percentage changed to 46%. The comparison

between those who exercised less than once per week and 5-7 times per week was found to be not statistically significant at the multivariate level. It may be the case that some of the people who never exercised prior to their diagnosis become motivated to exercise in order to maintain a higher quality of life. Interestingly, when exercise history is included age becomes statistically significant. Each unit increase in age reduces the odds of being a positive exerciser by 3%. It would appear that if one controls for past exercise, then the age effect becomes a bit stronger perhaps because exercise history has a protection effect. Exercise at age 50 was included as a measure that would act as a barrier/facilitator to exercise. It is important to note that exercise history is a component of self-efficacy in that habit or past successes can increase self-efficacy.

The fourth hypothesis stated that positive exercise stage changers will be less likely to have arthritis, will have less pain, fewer comorbidities, be less likely to have been hospitalized, will have a longer duration of illness, fewer medications and be less likely to feel restricted in the things they like to do. Testing the illness factors at the bivariate level resulted in two factors being statistically significant in the expected direction: comorbidity and restricted in the things you like to do. At the multivariate level there were four statistically significant variables: most serious condition, comorbidity, duration of illness and restricted in the things you like to do. The odds of being a positive exerciser are 1.89 times as large for those with heart problems as they are for those with arthritis. Originally it was hypothesized that this would be the case because of the pain element of arthritis but the pain variable was not statistically significant. It may be the case that those with heart problems receive more input to exercise from health professionals. Each unit increase in number of comorbidities

reduces the odds of being a positive exerciser by 14%. Therefore the odds of being a positive exerciser is reduced by 56% for those with four comorbidities compared to those with zero comorbidities. Having more than one illness means you are more likely to be restricted in your ability to exercise, or you may be overwhelmed with the complications of having four illnesses.

For duration of illness it was found that the odds of being a positive exerciser is 1.02 times as large for each tenth of a year that one has had the condition. Therefore if you have had an illness for ten years the odds of being a positive exerciser would be 2.0 times as large compared to those who have only been diagnosed for one year. Time may allow an individual to adapt to having an illness and find effective ways to cope. This finding is interesting because it indicates that when someone is first diagnosed they may require support to maintain an exercise pattern but over time they will learn to cope.

The variable restricted in things you like to do is a basic measure for activities of daily living. The coefficient suggests that being restricted in the things you like to do decreases the odds of being a positive exerciser by 39%.

The illness factors that were not statistically significant were: pain, hospital stay and number of medications. Surprisingly, pain was not found to be statistically significant at the bivariate or multivariate levels. It may be the case that some people with pain are using exercise to control their pain while others remain inactive. Hospital stay may not be statistically significant because the numbers in the yes category were too small. Number of medications was expected to affect exercise behavior but was not statistically significant at the bivariate or multivariate levels. This result indicates that comorbidity impacts exercise behavior but number of medications does not, suggesting

that it is the actual physical aspect of the illness that is causing exercise reduction rather than the taking of the medications.

Age remained statistically significant when the illness factors were included. This result is consistent with other research that consistently reports that age is related to a decline in exercise behavior (O'Brien Cousins, 1995; Stephens & Craig, 1990).

Gender nor education were found to be statistically significant in the analyses. This is contradictory to the majority of the research on exercise behavior that has found women to exercise less than men at all ages, and that those with more education have higher rates of physical activity (Shephard, 1994).

Theoretical Integration

The multivariate analysis lends support to the hypothesis that exercise history and illness factors act as barriers between the intention to exercise and the overt behavior of exercising. The perceived health variable (expectation efficacy) which has a strong relationship to exercise behavior in models 2 and 3 is reduced in model 4 with the inclusion of exercise history, and disappears with the inclusion of illness factors in model 5. The results indicate that the theory of planned behavior and self-efficacy theory do explain a portion of exercise behavior but that exercise history and illness factors have the greatest impact on exercise behavior. Both exercise history and illness factors are components of the concept of efficacy (primary experience and physiological state).

Although females are reported to generally exercise less than men this was not supported in the analysis. Similarly, having more education was not predictive of positive exercise stage change. The fact that gender and education were not found to be

predictive of exercise in this sample lends support to the hypothesis that illness factors are extremely relevant to the older population with a chronic illness.

Theory of Planned Behavior

The theory of planned behavior was designed to predict a specific behavior, but was not designed with a seniors population in mind. It has been applied to exercise behavior and the research indicates that attitude is a strong predictive component of exercise. In this study, we examined whether there are barriers beyond attitude, social norms and perceived behavioral control that affect exercise behavior. The findings indicate that exercise history and four illness factors are predictive of exercise stage change. The research literature has generally found that social norms belief are relatively low in importance compared to the other two aspects of the theory of planned behavior (attitude and perceived behavioral control). The multivariate analysis indicates that only the attitude and social norm aspects are statistically significant. These components were measured with the same variable (importance of exercise). The theory postulates that a person's intention to perform a behavior is the central determinant of behavior because it captures certain motivational factors such as how hard one is willing to try (Courneya, 1995). The present study lends support to the theory of planned behavior but it indicates strongly that there are barriers to the decision to exercise related to illness factors. Based on the findings from this study it was found that the predictive value of the theory of planned behavior is modest compared to the predictive power of illness factors and exercise history. What remains to be examined are more detailed aspects of attitude and

social norms, such as advantages and disadvantages of exercising and beliefs about social norms from media, health professionals and peers. But it would appear for this sample that even with strong social norms towards exercise and a positive attitude towards exercise, illness factors would act as strong barriers to exercise behavior.

Self-Efficacy Theory

Self-efficacy theory states that all behavioral changes are mediated by a common cognitive mechanism termed self-efficacy, a belief that one can successfully perform the desired action. A variety of components of the theory were tested in this study. The results indicate that outcome and expectation efficacy are partial predictors of exercise behavior. However, the overall measure of efficacy (illness efficacy) was statistically not significant. It appears that although efficacy may be important, the illness factors have a stronger influence on exercise behavior. One component of expectation efficacy is physiological factors; the illness factors represent this component and the analysis indicates that this component is the most predictive of exercise behavior. Also, exercise history represents the primary experience component of expectation efficacy. Exercise history resulted in a statistically significant odds ratio. Self-efficacy refers to a judgement regarding one's capabilities to execute a specific behavior (Courneya, 1995). The efficacy measures in this study were not directly asking the respondents about exercise behavior but nonetheless they tap into the concept indirectly. Therefore, we can conclude that although the main measure of efficacy (illness efficacy) was not statistically significant there were three major aspects of self-efficacy that were statistically

significant: importance of exercise (secondary experience and outcome efficacy), exercise history (primary experience) and physiological aspects (illness factors). When examining efficacy and older adults it may be important to not only look at general efficacy but rather to focus on the physiological aspect of efficacy.

Barriers to Exercise Behavior

The study attempted to investigate how exercise history and illness factors act as barriers to exercise behavior. Of the fifteen variables included in the study, eight were found to be statistically significant and seven in the final model. Of these seven, 5 were related to barriers (four illness factors and exercise history). In the literature barriers have often been studied in terms of environmental or cognitive barriers and then perceived or actual barriers (Marcus, Bock & Pinto, 1997). However, for the elderly it is important to acknowledge how illness becomes an ever-increasing barrier to physical participation (Shephard, 1994). O'Neill and Reid (1991) classified the likely explanations for reduced activity levels for older adults into four barrier types: 1) physical health, 2) psychological health, 3) knowledge and 4) administrative (cost, transportation). They found that physical health accounted for 53% of the reduced activity. They also found that those with an illness reported more perceived barriers than those without an illness. The findings from this thesis support the existing research that has found that illness factors play an important role in determining physical activity levels.

The Transtheoretical Model states that behavior change appears to be dependent upon the readiness of the individual for change to occur (Dishman, 1994). The barriers identified in this study add a new dimension to the understanding of exercise behavior, where even if an individual is ready to change, there may be barriers beyond their control that inhibit exercise behavior.

Implications

The descriptive analysis indicates that the majority of people are exercising, suggesting that the health promotion dissemination of the importance of exercise has had a positive impact. The majority of those in precontemplation move to maintenance or action, it seems odd that they would move from no intention to exercise to action or maintenance over a one-year period. One explanation for this finding is that there are illness factors that dominate causing one to say "I have no intention to exercise" but what is left unsaid is "until I feel better or get a better handle on this illness(es)". So in reality they would like to exercise but there are factors prohibiting the intention. The TM originally designed the precontemplation stage for people who did not believe that a change in behavior was necessary, important or required (denial of a need to change) (Prochaska & DiClemente, 1982). It appears that for the sample studied only 4.3% of those in the precontemplation stage truly have no intention to exercise.

The results of this research reveal that there is a relationship between illness factors and exercise behavior in the older adult population with a chronic illness.

Research on barriers to exercise often tends to focus on environmental factors such as transportation or cost. The study illustrates the importance of examining barriers related to having a chronic illness. This is very important considering that over 85% of older adults have at least one chronic illness (Padula, 1992).

Limitations of the research

One of the major limitations of this study is that people tend to overestimate their exercise behavior (Dishman, 1994). Research has found that physiological measures of exercise effort are lower than reported effort (Dishman). In this study exercise was not objectively measured. This means that there may be an overestimation of the exercisers. Nonetheless the rates of exercisers would remain high even with this consideration taken into account.

Second, the sample consisted of an elderly population that resided on the North Shore of Vancouver, British Columbia. This particular population is considered predominantly Caucasian with higher than average education levels. The North Shore region has a life expectancy of 80.30 from birth compared to 78.79 for the province of British Columbia (BC Facts, 1999). This creates problems regarding generalizability to other populations. For example, one cannot generalize the results of this study to elderly populations living in small rural towns, or in areas in which there is a diversity in ethnic backgrounds and income levels.

Third, this research is based on a secondary analysis in which all ideal variables were not available for the analysis. For example, the measure for exercise efficacy was

replaced with illness efficacy. Also the theory of planned behavior could have been applied in a more rigorous manner had more direct variables been available. However, the variables in this data set were sufficient for hypotheses testing.

Because the majority of the people were in the precontemplation or maintenance stage it was statistically not possible to test other hypotheses because of the small number of people in the other stages. A larger sample size would allow for the ability to test specific hypotheses related to differences within each stage.

Lastly, although longitudinal data was used for the descriptive piece it would have been interesting to have more data points closer in time, in order to identify whether or not there is more detailed stage movement occurring.

Future Research

Future research should overcome the limitations outlined above. Ideally, a study with a larger sample size including a variation of ethnic backgrounds and socioeconomic status would be useful in terms of the study's generalizability. A larger sample size would also allow for the testing of hypotheses comparing people who move up or down from one specific stage. For example, an analysis of the maintainers who remain at maintenance throughout the study compared to those who regress or relapse could provide a greater understanding of the process of personal motivation for maintaining physical activity.

A study that addressed specifically how illness affects exercise could help determine how exactly the illness factors are impacting exercise behavior. It would also be valuable to examine what the maintainers are doing right over time since there was 51% of the sample that exercised regularly over the two-year period.

In terms of health promotion it remains to be determined whether or not it is a feasible goal to expect people with a chronic illness to maintain regular exercise. The aim of the health promotion framework is to enable people to have greater control over their health. For people living with a chronic illness they may require support to help them have shorter relapse periods rather than no relapse at all from exercise. Theories on relapse prevention may be beneficial in this area of research.

Social support was not examined in this study, however it is an area that remains to be examined. We all rely on social support networks but the relevance to the seniors population stands out. Having friends, family and health care professionals support one's attempt to exercise regularly could have a significant impact on maintaining a regular exercise program.

Chapter VI

Summary and Conclusion

The principal goals of this thesis were to describe the movement patterns in the stages of change, and secondly to investigate the role of self-efficacy, theory of planned behavior, exercise history and illness factors in exercise stage change. Of particular interest was the role of illness factors that were hypothesized to act as barriers between the intention to exercise and exercise behavior.

The review of the literature (Chapter 1) clearly demonstrated the benefits of exercise and the benefits of the promotion of self-care. Chapter 2 presented a review of the Transtheoretical Model , the theory of planned behavior and self-efficacy theory. Four main hypotheses were developed from this review.

Chapter 3 described the research methodology including the data source, and sample. Information about measurement, frequencies and missing data were presented.

Chapter 4 described the bivariate and multivariate analyses. At the bivariate level the main findings were that 1) perceived health and importance of exercise were positively related to exercise stage change, 2) exercise history was positively associated with exercise stage movement, and 3) comorbidity and restricted in things you like to do were associated with exercise stage change. Multivariate analyses revealed that seven variables were statistically significant in the final model. These were: age, importance of exercise, exercise history, most serious condition, comorbidity, duration of illness and

activity restriction. Perceived health was statistically significant in models 2, 3 and 4 but became not statistically significant when illness factors were included in model 5.

A discussion of the results and their integration into the TM, theory of planned behavior and self-efficacy theory were provided in Chapter 5. The results of this thesis indicate modest support for the generated hypotheses. Both the theory of planned behavior and self-efficacy theory received some support indicating that perceived health and rating on importance of exercise have an effect on exercise behavior. However, the hypotheses pertaining to barriers received the most support. Exercise history and illness factors were found to be predictive of exercise behavior after controlling for all other variables.

Limitations of the research as well as suggestions for future research were also discussed. It was suggested that a study with a larger sample and more frequent data points be conducted in order to increase generalizability and gain a more detailed understanding of stage change. This thesis attempted provide a greater understanding of the role of illness factors and exercise behavior in order to create the optimal way to promote positive lifestyle changes for older adults with a chronic illness.

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Appendix A: Health Promotion Framework

Aim		Achieving Health For All	
Health Challenges	Reducing Inequities	Increasing Prevention	Enhancing Coping
Health Promotion Mechanisms	Self Care	Mutual Aid	Healthy Environments
Implementation Strategies	Fostering Public Participation	Strengthening Community Health Services	Coordinating Healthy Public Policy
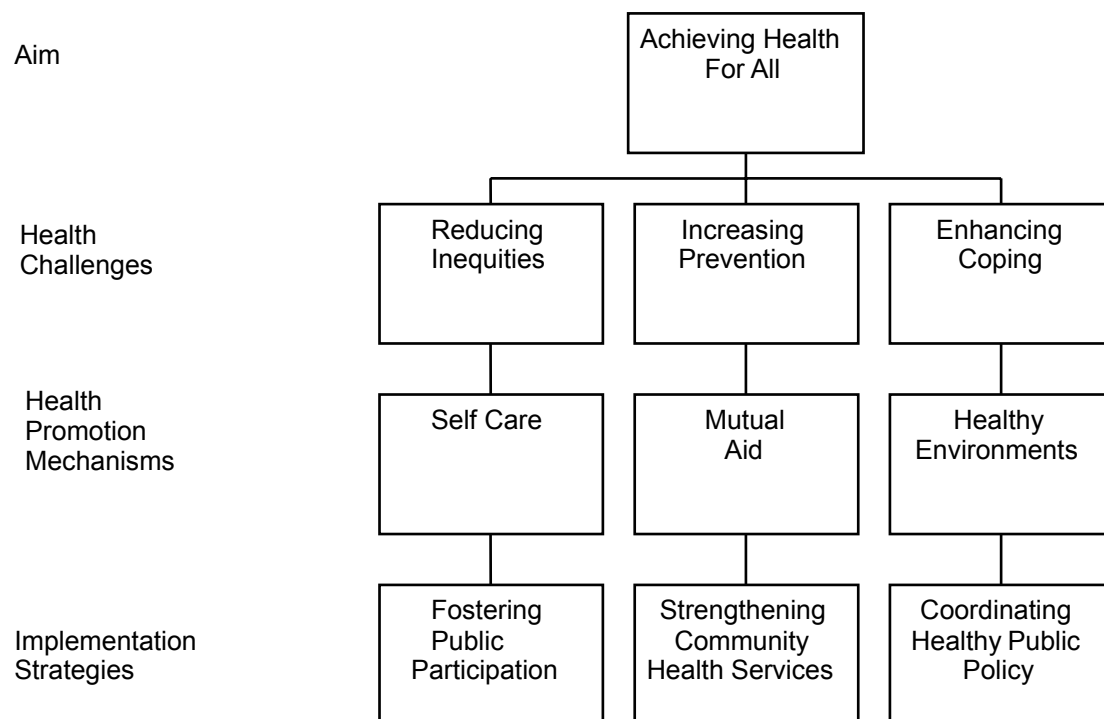
Appendix B: North Shore Self Care Study Questionnaire Wave II

INITIAL CALL/PITCH

Hello, my name is _____and I work for Points of View Research Inc. May I please speak with Mr./Mrs. _____ [no proxies].

On behalf of North Shore Health and Simon Fraser University, we would like to conduct the second telephone survey to find out how you have been managing with your chronic health problem. This interview will be similar to the first one conducted about one year ago because we want to observe patterns of managing a chronic condition over time. The accuracy of your responses is extremely important.

Any information that you give us will be kept strictly confidential. Your name will not appear on any written reports. We will use a numbering system to link your answers to the three phone calls. For example, you might be number 27. Also, no one will be given your name or personal information. You may withdraw from the study at any time and you may refuse to answer any question that you do not feel comfortable in answering.

Would this be a convenient time for you to do the second 1/2 hour phone interview? **[IF NOT, MAKE APPOINTMENT]**

Name, Phone Number, Date and time of Interview:

_____

_____

_____

_____

_____

_____

1a. Did you receive the purple and white North Shore Self-Care Study Newsletter that was sent out in September, 1996?

1 Yes

☐

2 No
3 Uncertain

[IF NO, INFORM THEM THAT IT WILL BE SENT SOON AND FLAG QUESTIONNAIRE]

1b. Just to confirm, what is the month and year of your birth?

_____month _____year

☐☐ ☐☐

month   year

2. Since the first phone interview, have you been told by a health professional (such as a doctor, nurse, or physiotherapist) that you have arthritis or rheumatism?

1 Yes

☐

2 No

3. Since the first phone interview last year, have you been told by a health professional (such as a doctor, nurse, or physiotherapist) that you have any of the following specific heart problems?

_____ angina

☐

_____ irregular heart beat (rhythmic heart beat, heart murmur, valve problem)

☐

_____ heart attack (ischemic)

☐

_____ congestive heart failure (CHF)

☐

_____ stroke

☐

_____ other (specify)

_____   ☐

4. Since the last interview, have you been told by a health professional (such as a doctor, nurse or physiotherapist) that you have high blood pressure?

1 Yes

□

2 No

[ASK: "WHICH CONDITION (ARTHRITIS/HEART PROBLEMS/STROKE/HIGH BLOOD PRESSURE) IS THE MOST LIMITING IN YOUR DAY-TO-DAY ACTIVITIES/WHICH HEALTH PROBLEM DO YOU FEEL IS MORE SERIOUS?"] [IF NECESSARY: "WHICH ONE DO YOU FEEL COULD POTENTIALLY BE THE MOST SERIOUS?"]

5. Most serious health problem now [EVERYONE] (Circle One)**:**
ARTHRITIS   STROKE   HEART PROBLEMS   HIGH

BLOOD PRESSURE □

SECTION A: STAGES OF CHANGE MEASUREMENT
IF AN APPOINTMENT WAS MADE: [REPEAT MOST SERIOUS HEALTH PROBLEM]

1. I'm going to read you a list of specific things that some people do to cope with their _____ . Please tell me if you are already doing it, or you are seriously intending to try each of the following things to cope with your (ARTHRITIS/HEART PROBLEM/STROKE/HIGH BLOOD PRESSURE)? USE ANSWER #6 ONLY IF ABSOLUTELY NECESSARY [READ and MARK ALL THAT APPLY AND PROBE: "Anything else?"

1 Already been doing for six months or more

2 Tried for less than six months and still doing it

3 Tried for less than six months and stopped (or tried a bit)

4 Intending to try
5 Not intending to try
6 NA
7 Refused

1 Engage in regular exercise, sports or physical activity for 15 minutes or more, at least 3
          times per week ₁□

2 Increase exercise, sports or physical activity

                ₂□

3 Lose weight

                ₃□

4 Change diet or eating habits

                ₄□

5 Quit smoking/reduce amount smoked

$\square$ 5

6 Reduce drug/medication use

$\square$ 6

7 Drink less alcohol

$\square$ 7

8 Manage or reduce cholesterol

$\square$ 8

9 Learn to manage or reduce stress, such as relaxation

$\square$ 9

10 Change physical environment, such as install a grab bar or railings

$\square$ 10

11 Receive medical treatment, not including medication

$\square$ 11

12 Sleep more

$\square$ 12

13 Begin to meditate

$\square$ 13

14 Increase or change amount of meditation

$\square$ 14

15 Get more social/emotional support from friends, family or others

$\square$ 15

16 Try herbal medicine

$\square$ 16

17 Try alternative therapies, such as acupuncture or hypnosis

$\square$ 17

18 Nothing

$\square$ 18

19 Other (specify) _____

$\square$ 19

20 Other (specify) _____

$\square$ 20

2. [INTERVIEWER: REPEAT CODE 1 AND 2 ANSWERS FROM #4 AND ASK:] Which <u>one</u> of these health behaviours do you believe is the <u>most</u> important one for you to cope with or improve your condition? (98 = Don't Know/No Answer)

_____ (number)

☐☐

3. How serious do you think that your condition is at the present time?

1 Not at all serious

☐

2 Slightly serious
3 Moderately serious
4 Extremely serious
5 Refused

4. Thinking back to when you were diagnosed with your condition, how serious did you think it was then?

1 Not at all serious

☐

2 Slightly serious
3 Moderately serious
4 Extremely serious
5 Refused

<u>SECTION B: SELF-HELP, SELF CARE, MUTUAL AID,</u>

**1. The next questions are about self-help groups of any kind. By self-help group, we mean a
community group where people voluntarily come together to share and discuss a common interest,
or experience. For example, groups for people who have had a stroke, groups for recently widowed
or divorced people, or Alcoholic Anonymous, and so on. Are <u>you</u> aware of <u>any</u> of self-help groups
in your community?**

1 Yes

☐

2 No (Go to #8)

3 Refused
9 Don't Know/Not

Sure

Once again, I want to ask you:
2. Have you ever belonged to a self-help group?

<div style="text-align: right;">1 Yes (Go to #3)</div>

☐

2 No (Go to #8)

<div style="text-align: right;">3 Refused
9 Don't Know/Not</div>

Sure

3. If YES: Could you please tell me the name of the group, and when you joined the group? [INTERVIEWER: PROBE - "Were there any other groups? Use two digits each to
identify month/year]

Organization	**Start Date**	**End Date**	**Start Month/Year**
End Month/Year			

#1 _____   _____   _____ ☐☐☐☐

☐☐☐☐
month/year

month/year

#2 _____   _____   _____ ☐☐☐☐

☐☐☐☐

month/year   month/year

#3 _____   _____   _____ ☐☐☐☐

☐☐☐☐

month/year   month/year

4a. Are any of these groups new ones that you have joined since last year's interview?

<div style="text-align: right;">1 Yes (Go to #4b)</div>

☐

<div style="text-align: right;">2 No (Go to #11)
3 Refused
9 Don't Know/Not</div>

Sure

4b. Were any of these groups specifically joined to cope with your condition? Which were they?
[CHECK ANY THAT APPLY TO Q3]

1. Yes   #1 ☐

2. No   #2 ☐

3. Refused   #3 ☐

5. What initially led you to join _____?
[REPEAT NAME OF GROUP ONE AT A TIME] [CHOOSE ONE ANSWER ONLY]

                                    #1   **#2**   **#3**

1 Friend/neighbour/family member referred me to the

group ₁☐ ☐ ☐

2 A health professional recommended it

₂☐ ☐ ☐

3 Read about the group in the paper and called for further information/attended a meeting

₃☐ ☐ ☐

4 Made a decision to join the group after exhausting other

options₄☐ ☐ ☐

5

Other_____ ₅☐ ☐ ☐

6

Refused_____ ₆☐ ☐ ☐

6. Do you plan on continuing or resuming participation in
_____?
[READ NAME OF EACH GROUP]
      #1   **#2** **#3**

1 Yes

☐ ☐ ☐

2 No (Go to #11)

☐ ☐ ☐

3 Not sure/Maybe   ☐ ☐ ☐

4 Refused

☐ ☐ ☐

7. For how long? [READ NAME OF EACH GROUP]

   #1   #2 #3

   ☐ ☐ ☐   1 Indefinitely

   ☐ ☐ ☐   2 Until condition improves

   ☐ ☐ ☐   3 As long as the group meets

   ☐ ☐ ☐   4 Not sure (Go to #12)

   ☐ ☐ ☐   5 Refused

GO TO #12

8. Are you <u>seriously considering</u> joining any self-help group to help improve your _____ (ARTHRITIS/HEART PROBLEM/STROKE/HIGH BLOOD PRESSURE)?

             ☐   1 Yes

                               2 No (Go to #10)
                               3 Refused

9. IF YES,

What has kept you from participating? [PROBE FOR DETAILS]

_____

   ☐ ☐

_____

   ☐ ☐

[GO TO #11]

10. For what reason(s) did you <u>not</u> seriously consider joining a self-help group?

_____

   ☐ ☐

_____

   ☐ ☐

11. Do you <u>seriously</u> plan to join a self-help group in the next year?

1 Yes

☐

2 No
3 Maybe
4 Refused
9 Don't Know

12. "I'm going to read you a list of services or organizations and then ask you some questions about them, which you can answer with a yes or no. Have you heard of..." [INTERVIEWER]:

1 Yes
2 No
3 Refused

	a	b	c	d
e **Do You Think** **Seriously That They** **To Could (Have)** **(Again)? Help(ed)You?**	**Have You** **Heard of?** **(If No, Go** **To Next** **Service)**	**Do You** **Know What** **They Do?** **(If No, Go** **To Next** **Service)**	**Have You** **Used** **Since The** **First** **Interview?**	**Do You** **Intend** **Use**
Type of Organization/Service a. Handy Dart	____	____	____	____
____				
b. North Shore Health	____	____	____	____
____				
c. North Shore Home Support Services	____	____	____	____
____				
d. North Shore Keep Well Society	____	____	____	____
____				
e. North Shore Meals on Wheels	____	____	____	____
____				

f. North Shore Neighbourhood
   House

     ____   ____   ____   ____

g. North Shore Seniors' Peer
   Counsellors

     ____   ____   ____   ____

h. North Shore Stroke Recovery
   Centre (CVA)

     ____   ____   ____   ____

i. North Shore Volunteers for
   Residents In Care Facilities

     ____   ____   ____   ____

j. S.A.F.E.R.

     ____   ____   ____   ____

k. Seniors' Hub

     ____   ____   ____   ____

l. Seniors' One-Stop Info Line

     ____   ____   ____   ____

m. West Vancouver Seniors'
   Special Services

     ____   ____   ____   ____

n. Silver Harbour Centre

     ____   ____   ____   ____

o. West Vancouver Seniors' Activity
   Centre

     ____   ____   ____   ____

     ____

SECTION C: HEALTH STATUS AND HEALTH CARE UTILIZATION
"Now I would like to ask you a few questions about your health"

1. In general, compared to other people your age, would you say that your health is...

1 Excellent

☐

2 Good
3 Fair
4 Poor
5 Refused

**2a. On average over the last 6 months, how many times per week were you
      physically active for at least
15 minutes, such as brisk walking, jogging, dance classes, and weight lifting?**

1 Daily

☐

2 (5 -6 times a week)
3 (3 - 4 times a week)
4 (1 - 2 times a week)
5 (5 Less than once a week)
6 (Never)
7 (Don't Know)
8 (Refused)

2b. Thinking back to when you were 50 years old, how many times per week were you physically active for at least 15 minutes?

1 Daily

☐

2 (5 -6 times a week)
3 (3 - 4 times a week)
4 (1 - 2 times a week)
5 (5 Less than once a week)
6 (Never)
7 (Don't Know)
8 (Refused)

2c. Thinking back to when you were 40, how active were you?

1 Daily

☐

2 (5 -6 times a week)
3 (3 - 4 times a week)
4 (1 - 2 times a week)
5 (5 Less than once a week)
6 (Never)
7 (Don't Know)
8 (Refused)

2d. And finally, thinking back to when you were 15, how active were you?

1 Daily

☐

2 (5 -6 times a week)
3 (3 - 4 times a week)
4 (1 - 2 times a week)
5 (5 Less than once a week)
6 (Never)
7 (Don't Know)
8 (Refused)

3a. How often do you smoke cigarettes?

☐

1 Regularly

2 Occasionally

3 Never

4 Refused

[If 1 or 2 , go to #3b]

3b. In total, how many years have you been a regular smoker?

☐☐

4. On average, how many drinks do you have per week, or month?
[IF IN WEEKS, CONVERT TO MONTHS = MULTIPLY BY 4.3 AND AVERAGE TO WHOLE NUMBER]

☐☐

5. How stressful is your life in your opinion?

☐

1 Not stressful at all

2 A little stressful
3 Moderately stressful
4 Very stressful
5 Refused

6. How much control do you think you currently have over your _____ (ARTHRITIS/HEART PROBLEM/STROKE/HIGH BLOOD PRESSURE)?

☐

1 No control

2 A little control
3 Moderate control
4 Complete control
5 Refused

7. I'm going to read you a list of <u>health problems</u>. Please tell me if you have been professionally diagnosed as <u>currently</u> having any of these conditions.

> 1 Yes
> 2 No
> 3 Refused

1. Asthma/Emphysema

₁ ☐

2. Anxiety

₂ ☐

3. Depression

₃ ☐

4. Cancer

₄ ☐

5. Diabetes

₅ ☐

6. Neurological Diseases, such as Parkinson's Disease, M.S. or Cerebral Palsy ₆ ☐

7. Alzheimer's or Related Condition.

₇ ☐

8. Osteoporosis

₈ ☐

9. Vision Problems

₉ ☐

10. Hearing Problems

₁₀ ☐

11. Other (Specify)_____

₁₁ ☐

12. Other (Specify)_____

₁₂ ☐

"Now I would like to ask you about your use of medicines and pills"

8. How many prescription medications are you presently taking on a regular basis?
[Circle Correct Number]

eleven ☐☐

twelve

thirteen

fourteen

fifteen

sixteen

seventeen

eighteen

nineteen

twenty

0 none	11		
1 one	12		
2 two	13		
3 three	14		
4 four	15		
5 five	16		
6 six	17		
7 seven	18		
8 eight	19		
9 nine	20		
10 ten	99 DK		

9. In the past <u>three months</u> have you regularly used....

1 Yes
2 No
3 Refused

a) Tranquilizers such as Valium?

a ☐

b) Diet pills or stimulants?

b ☐

c) Anti-depressants?

c ☐

d) Codeine, Demerol or Morphine?

d ☐

e) Sleeping pills?

e ☐

f) Aspirin or Tylenol?

f ☐

g) Entrophine

g ☐

h) other anti-inflammatories

h ☐

i) diuretics

i ☐

j) other _____

j ☐

k) other _____

k ☐

10a. In the past <u>three months</u>, how many medical visits did you make to:

a. any health professional

a ☐☐

b. doctors

b ☐☐

c. How many of these visits were specifically for your _____

(CONDITION)   c ☐☐

10b. In the last <u>three months,</u> how many visits did you make for:

d. rehabilitation, physiotherapy, or occupational therapy (but not massage therapy) with regards to your specific condition?

d ☐☐

e. Massage therapy for your condition?

e ☐☐

11. In the last <u>three months</u>, were you admitted to a hospital?

1 Yes

☐

2 No (Go to #13)

3 Refused

12. If yes, for what reason and for how long?

Reason #1

_____   ₁☐☐

Number of Days

_____   ☐☐

Reason #2

_____   ₂☐☐

Number of Days

_____   ☐☐

Reason #3

_____   ₃☐☐

Number of Days

_____   ☐☐

13. In the last <u>three months</u>, how many days were you away from work or unable to do the things you normally do because you were sick, or disabled? (Don't Know = 98)

_____#days

☐☐

14. Are you restricted in the things that you like to do? Would you say[READ]:

1 Most of the time

☐

2 Some of the time
3 Seldom
4 Never

5 Refused

15. Overall, how well do you feel that you are coping with your_____ (ARTHRITIS/HEART PROBLEM/STROKE/HIGH BLOOD PRESSURE)?

⬜

1 Not at all successful

2 A little successful
3 Moderately successful
4 Very successful
5 Refused

16. Do you feel pain associated with your health problem?

⬜

1 Yes

2 No
3 Refused

[1 to #17]

17. How strong is your pain?

⬜

1 Weak

2 Mild
3 Moderate
4 Strong
5 Severe
6 Refused
9 OK

18. Please tell us how much help you need, or if you are unable to do the following seven tasks:

1 No help needed
2 Help needed
3 Unable to do
5 Refused

18a. Walking across a small room

⬜

18b. Bathing

☐

18c. Take care of your appearance

☐

18d. Dressing and undressing

☐

18e. Eating

☐

18f. Transferring in and out of bed

☐

18g. Going to the bathroom, that is toileting

☐

18h. Use the telephone

☐

18i. Get to places out of walking distance

☐

18j Go shopping for groceries or clothes

☐

18k Prepare you own meals

☐

18l. Do your housework

☐

18m. Take your own medicine

☐

18n. Handle your own money

☐

SELF-MANAGEMENT OF ILLNESS

1. I am going to ask you how important you feel each of the following things are in coping with your _____(ARTHRITIS/HEART PROBLEM/STROKE/HIGH BLOOD PRESSURE)?
How important is/are:

1 Not at all important
2 A little bit
3 Moderately important
4 Very important
5 Refused
9 = NA

a ☐   a) Medical treatment that you receive?

b ☐   b) Your family or friends?

c ☐   c) Your general state of health?

d ☐   d) Your own determination?

e ☐   e) Prayer or spiritual help?

acupuncture

f ☐   f) Alternative remedies or medicines, such as herbs, and hypnosis

g ☐   g) A positive attitude?

h ☐   h) A higher income?

I ☐   i) Exercising more or being more physically active?

j ☐   j) Losing weight?

k ☐   k) Stopping smoking?

l ☐   l) Cutting down on drinking?

m ☐   m) Changing drug use or medications?

n ☐   n) Learning to relax more and worry less?

o) Joining a self-help group?

₀ ☐

2. People try various things to improve their health problem. Which of the following are you specifically doing now? [READ LIST BELOW, THEN ASK 3, 4, 5, & 6 ON NEXT PAGE]

1 Yes
2 No
3 Refused

1   take any non-prescription medications, such as ASA

☐

2   take someone else's prescribed medications

☐

3   take medications as prescribed by your doctor

☐

4   try alternative remedies, such as herbs, acupuncture and hypnosis

☐

5   consult friends/relatives

☐

6   consult anyone who has the same condition as you

☐

7   reading on the subject

☐

8   exercise, or become physically active

☐

9   change your physical environment, such as add railings

☐

10   change your diet

☐

11   reduce your salt intake

☐

12   lose or gain weight

☐

13   join a self-help group

☐

14   try meditation or praying

☐

15   reduce your alcohol consumption **[9 = DON'T DRINK]**

☐

16   cut back on smoking **[9 = DON'T SMOKE]**

☐

17   quit smoking **[9 = DON'T SMOKE]**

☐

18   try to reduce stress

☐

19   sleep or rest more

☐

20   wait to see if it will improve

☐

[READ BACK ALL YES ANSWERS FOR '#2']

3. Which of these did you do <u>first</u>?

☐☐

   (98 = Don't Know, 99 = NA, 30 = About Same)

4. Which did you do <u>second</u>?

☐☐

   (98 = Don't Know, 99 = NA, 30 = About Same)

5. Which did you do <u>third</u>?

☐☐

   (98 = Don't Know, 99 = NA, 30 = About Same)

6. What or who prompted you to do the first of these? [VERBATIM]

_____

_____

☐☐

SELF-CARE:

1a. Regarding your blood pressure, did you have your blood pressure checked, since the first phone interview last year?

☐

      1 Yes

      2 No
      3 Refused

1b. If yes [to 1a], how long ago?

☐☐

_____#months

[88 = less than 1 month]

[99 = missing]

2. Do you take your own blood pressure either at home or at the drug store?

☐

      1 Yes

      2 No
      3 Refused

MUTUAL AID

1. About how often do you discuss your condition with another person who also has _____(ARTHRITIS/HEART PROBLEM/STROKE/HIGH BLOOD PRESSURE)?

1 daily

□

2 at least once a week
3 every two weeks
4 at least once a month
5 every couple of months
6 few times a year
7 never (Go to #4)
8 Refused

2. In what ways would you say this person helped you to improve your
_____

(ARTHRITIS/HEART PROBLEM/STROKE/HIGH BLOOD PRESSURE)?
[VERBATIM]

_____
_____
_____

□□

3. How helpful is this person in managing your condition?

1 Not helpful

□

2 A little helpful
3 Moderately helpful
4 Extremely helpful
5 Refused

4. How good a job do you feel that you are doing in taking care of your condition? Would you say...

1 Excellent

□□

2 Good

3 Fair
4 Poor
5 Refused

SECTION D: SOCIAL SUPPORT

1. There are many ways in which people help one another with tasks. How often do you provide help to someone else inside or out of your household, such as housework, shopping, driving, money management, or personal care?

1 Never

☐

2 A few times per year
3 Monthly
4 A few times per month
5 Weekly
6 A few times per week
7 Daily
8 Refused

2. I am now going to ask you about help you have <u>received</u> on a regular basis.

How often do you receive help with such things as housework, shopping, driving, money
management, or personal care?

1 Never

☐

2 A few times per year
3 Monthly
4 A few times per month
5 Weekly
6 A few times per week
7 Daily
8 Refused

3. How many people do you have with whom you can confide about personal

matters?   ☐☐

4a. Does family or a friend regularly help you with your condition?

1 Yes

☐

2 No
3 Refused

4b. How often do you receive this assistance?

1 Never

☐

2 A few times per year
3 Monthly
4 A few Times per month
5 Weekly
6 A few times per week
7 Daily
8 Refused

[ARTHRITIS ONLY, (HEART PROBLEMS GO TO #6, STROKE GO TO #7, HIGH BLOOD PRESSURE GO TO #8)]

5. I am going to ask you how confident you are about your ability to control different aspects of your condition. On a scale of 1 to 5, where 1 is not at all confident, and 5 is totally confident, how confident are you that you can... [9 = NOT APPLICABLE] [6 = REFUSED] (Circle Number)

5a) Control your fatigue?

```
|_____|_____|
1                3                5
```

☐
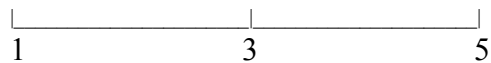
Not At All   Totally
Confident   Confident

5b) Regulate your activities so as to be active without aggravating your arthritis?

```
|_____|_____|
1                3                5
```

☐

Not At All   Totally
Confident   Confident

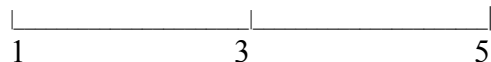5c) Do something to help yourself feel
better if you are feeling blue?

☐

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

5d) Manage arthritis pain during your
daily activities (compared to other
people with arthritis like yours)?

☐

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

5e) Manage your arthritis symptoms
so that you can do the things you
enjoy doing?

☐

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

5f) Deal with the frustration of
arthritis?

☐

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

5g) Decrease your pain quite a bit?

☐

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

5h) Continue most of your daily
activities?

☐

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

5i) Keep arthritis pain from interfering
with your sleep?

```
|_____|_____|
```

1   3   5

☐

Not At All
Confident
         Totally
Confident

5j) Make a small-to-moderate
reduction in your arthritis pain
by using methods other than
taking extra medication?

|_____|_____|
1   3   5

☐

Not At All
Confident
         Totally
Confident

5k) Make a large reduction in your
arthritis pain by using methods other
than taking extra medications?

|_____|_____|
1   3   5

☐

Not At All
Confident
         Totally
Confident

[Go to #9]

**[HEART PROBLEMS ONLY, (STROKE GO TO #7, HIGH BLOOD PRESSURE
GO TO #8)]**

**6. I am going to ask you how confident you are about your ability to control
different aspects of your condition. On a scale of 1 to 5, where 1 is not at all
confident and 5 is totally confident, how confident are you that you can... [9 = NOT
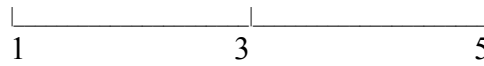APPLICABLE] [6 = REFUSED]** (Circle Number)

6a) Control your fatigue?

|_____|_____|
1   3   5

☐

Not At All
Confident
         Totally
Confident

6b) Regulate your activity so as
to be active without aggravating
your heart problem?

|_____|_____|
1   3   5

☐

Not At All
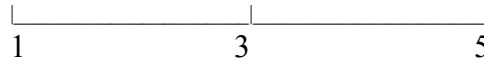Confident
         Totally
Confident

6c) Do something to help yourself feel better if you are feeling blue?

□

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

6d) Manage your heart problem symptoms so that you can do the things you enjoy doing?

□

```
|_____|_____|
1                3                5
```
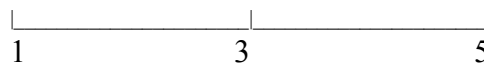
Not At All   Totally
Confident   Confident

6e) Deal with the frustration of heart problems?

□

```
|_____|_____|
1                3                5
```
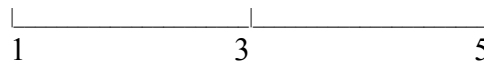
Not At All   Totally
Confident   Confident

6f) Continue most of your daily activities?

□

```
|_____|_____|
1                3                5
```

Not At All   Totally
Confident   Confident

6g) Keep your heart problems from interfering with your sleep?

□

```
|_____|_____|
1                3                5
```
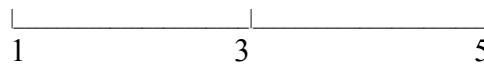
Not At All   Totally
Confident   Confident

6h) Make a small-to-moderate reduction in your heart problems by using methods other than taking extra medication?

□

```
|_____|_____|
1                3                5
```
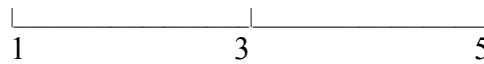
Not At All   Totally
Confident   Confident

6i) Make a large reduction in your heart problems by using methods other than taking extra medication?

```
|_____|_____|
```

| | 1 | 3 | 5 |

☐

Not At All
Confident

Totally
Confident

[Go to #9]

[STROKE ONLY, (HIGH BLOOD PRESSURE GO TO #8)]

7. I am going to ask you how confident you are about your ability to control certain aspects of your condition. On a scale of 1 to 5, where 1 is not at all confident and 5 is totally confident, how confident are you that you can... [9 = NOT APPLICABLE] [6 = REFUSED] (Circle Number)

7a) Control your fatigue?

|_____|_____|
1   3   5

☐

Not At All
Confident

Totally
Confident

7b) Regulate your activity so as to be active without bringing on another stroke?

|_____|_____|
1   3   5

☐

Not At All
Confident

Totally
Confident

7c) Do something to help yourself feel better if you are feeling blue?

|_____|_____|
1   3   5

☐

Not At All
Confident

Totally
Confident

7d) Manage your stroke symptoms so that you can do the things you enjoy doing?

|_____|_____|
1   3   5

☐

Not At All
Confident

Totally
Confident

7e) Deal with the frustration of stroke problems?

|_____|_____|

☐

<div style="text-align:center">1   3   5</div>

Not At All   Totally
Confident   Confident

7f) Continue most of your daily activities?

1   3   5

☐

Not At All   Totally
Confident   Confident

7g) Keep your stroke problems from interfering with your sleep?

1   3   5

☐

Not At All   Totally
Confident   Confident

7h) Make a small-to-moderate reduction in problems related to your stroke by using methods other than taking extra medication?

1   3   5

☐

Not At All   Totally
Confident   Confident

7i) Make a large reduction in the problems that resulted from your stroke by using methods other than taking extra medication?

1   3   5

☐

Not At All   Totally
Confident   Confident

[Go to #9]

HIGH BLOOD PRESSURE

8. I am going to ask you how confident you are about your ability to control certain aspects of your condition. On a scale of 1 to 5, where 1 is not at all confident and 5 is totally confident, how confident are you that you can... [9 = NOT APPLICABLE] [6 = REFUSED]
(Circle Number)
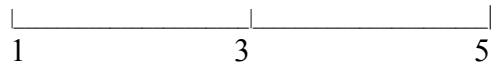
8a) Control your fatigue?

|_____|_____|
1   3   5

☐
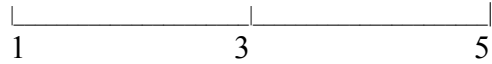
Not At All   Totally
Confident   Confident

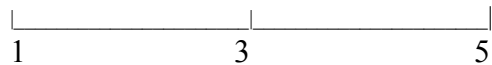8b) Regulate your activity so as to be active without aggravating your high blood pressure?

|_____|_____|
1   3   5

☐
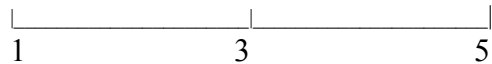
Not At All   Totally
Confident   Confident

8c) Do something to help yourself feel better if you are feeling blue?

|_____|_____|
1   3   5

☐

Not At All   Totally
Confident   Confident

8d) Manage your high blood pressure symptoms so that you can do the things you enjoy doing?

|_____|_____|
1   3   5

☐

Not At All   Totally
Confident   Confident

8e) Deal with the frustration of high blood pressure?

|_____|_____|
1   3   5

☐
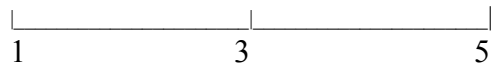
Not At All   Totally
Confident   Confident

8f) Continue most of your daily activities?

|_____|_____|
1   3   5

☐
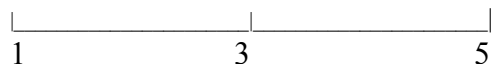
Not At All   Totally
Confident   Confident

8g) Make a small-to-moderate reduction in your high blood pressure by using methods other than taking extra medication?

|_____|_____|

□

	1	3	5

Not At All   Totally
Confident   Confident

8h) Make a large reduction in your
high blood pressure by using methods
other than taking extra medication? |_____|_____|

	1	3	5

□

Not At All   Totally
Confident   Confident

ASK EVERYONE:

9. These questions are about how you feel and how things have been with you during the past month.

How much time during the past month.... [PROBE FOR LEVEL] [5 = REFUSED]

None of the time (1)
Little/ some of the time (2)
Most of the time (3)
All of the time (4)

9a) Did you feel depressed?   ____   ____   ____

____

ₐ □

9b) Have you been in firm control
of your behaviour, thoughts,
emotions and feeling?   ____   ____   ____

____

ᵦ □

9c) Did you feel that you had
nothing to look forward to?   ____   ____   ____

____

ᵧ □

9d) Have you felt emotionally
stable?

_____   _____   _____   _____

d☐

9e) Were you generally
satisfied with your life?

_____   _____   _____   _____

e☐

9f) Did you have enough energy to
do the things you wanted to do?

_____   _____   _____   _____

f☐

9g) Has your daily life been full
of things that were interesting
to you?

_____   _____   _____   _____

g☐

SECTION E: BACKGROUND INFORMATION

"I would like to finish by asking you some background questions."

1a. Has your marital status changed since the first interview last year? [If No, go to #2]

☐

1. Yes

2. No
3. Refused

1b. [If Yes to 1a] What is your current marital status?

1 Married/common law

☐

2 Separated
3 Divorced
4 Widowed
5 Single, never married
6 Refused

2a. Are you currently living alone?

1. Yes

☐

2. No
3. Refused

2b. Is this the same living arrangement as last year? [If yes, go to #3]

1. Yes

☐

2. No
3. Refused

2c. [If no to 2b] who do you live with now?.

a)A spouse/partner   1 yes ____ 0

no ____   a☐

b)A son or daughter
(or son/daughter in law)   1 yes ____ 0

no ____   b☐

c)A sibling (sister/brother)   1 yes ____ 0

no ____   c☐

d)Other (specify)

_____   d☐

3. What type of home do you live in?

☐☐

1 Your own, single detached house

2 Your own condominium
3 A rented single, detached house
4 A rented apartment
5 Townhouse
6 Suite in someone else's home

7 Long term care facility
8. Other (specify)

_____

9 Refused

4. Which of the following best describes your main activity during the last <u>three months</u>?
Were you mainly...

☐☐

1 Working at a job or business

2 Looking for work

3 A student
4 Retired?
5 Keeping house
6 Other
7 Refused

5. How many weeks did you work at a, paid or unpaid, job or business during the last <u>three months</u>? (Include paid and unpaid work e.g. volunteer, homemaking, etc.)

_____Weeks

☐☐

6. What kind of work do (did) you do during that Time?

_____

☐☐

_____

7. Are you retired?

1 Yes

☐

2 No
3 Refused

[If 2, go to #9]

8. What was your main occupation when you worked?

_____

☐☐

_____

9. Finally, are you currently participating in any other research studies? If so, could you please tell me the name of the study (or a little bit about the study/who is carrying out/sponsoring)? [99 = NOT APPLICABLE]

Name of Study _____

☐☐

Purpose _____

☐☐

10. [INTERVIEWER INFORMATION] DATE AND TIME OF INTERVIEW

TIME _____

☐☐☐☐☐☐

Month   **Year**   **(Do not code)**   **Day**

Thank-you for your participation. We will be sending you the second participant
newsletter in the spring or early summer.

Appendix C: Multivariate Analysis

Logistic Regression				
Dependent Variable: Positive or Negative stage change movement				
Independent Variable:				
Block 1	**Block 2**	**Block 3**	**Block 4**	**Block 5**
Demographics: Age Sex Education	Demographics: Age Sex Education	Demographics: Age Sex Education	Demographics: Age Sex Education	Demographics: Age Sex Education
	Efficacy and TOPB: Perceived health Importance of exercise Read up on condition	Efficacy and TOPB: Perceived health Importance of exercise Read up on condition	Efficacy and TOPB: Perceived health Importance of exercise Read up on condition	Efficacy and TOPB: Perceived health Importance of exercise Read up on condition
		Illness Efficacy	Illness Efficacy	Illness Efficacy
			Exercise age 50	Exercise age 50
				Illness factors: Most serious condition Comorbidity Duration of illness Pain Hospital stay # of medications Restricted in things you like to do