7-25-2005

Expanding the science of successful aging: Older adults living in continuing care retirement communities (CCRCs)

Kathryn H. Petrossi
University of South Florida

Expanding the science of successful aging:

Older adults living in continuing care retirement communities (CCRCs)

by

Kathryn H. Petrossi

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Department of Aging Studies
College of Arts and Sciences
University of South Florida

Co-Major Professor: Kathryn Hyer, Ph.D.
Co-Major Professor: Cathy McEvoy, Ph.D.
Laurence Branch, Ph.D.
Robert Kahn, Ph.D.
Brent Small, Ph.D.

Date of Approval:
July 25, 2005

Keywords: physical health, social engagement, intellectual challenge, spiritual fulfillment, fruit and vegetable consumption, bmi, exercise, self-rated health, mobility, productive activities, volunteerism, social support

DEDICATION

I'd like to thank my mother, Bonnie B. Hammond, who raised me to balance intelligence and compassion. She has filled my life with love and support; always encouraging me to go after my dreams and reach for the stars. I'd also like to thank Jim Hammond and Marjorie Hammond for the analytical genes that made this quest possible. They have always instilled in me the importance of education, and that regardless of what life may bring, your education is uniquely yours and something that can never be taken away. A special thanks to my grandparents, Chester and Ruth Baylor. Their life is a shining example of the values we hold so dear: love, family, hard work, perseverance, and selflessness. This dissertation is also dedicated to my loving husband, Dan Petrossi. He has been a constant source of support and understanding throughout my doctoral education, and is thrilled to be "Dr. and Mr. Petrossi." I have been blessed with numerous positive influences in my life including friends and extended family; without their encouragement throughout the past five years, none of this would be possible.

ACKNOWLEDGEMENTS

I would like to acknowledge my committee members, Kathy Hyer, Cathy McEvoy, Larry Branch, Bob Kahn, and Brent Small. Without their support and expertise, my successful completion of the doctoral program would not be possible. I would also like to acknowledge Westport Advisors, Ltd., and particularly Roger Landry, M.D. for the opportunity to participate in the development of the Masterpiece Living program. Westport Advisors has been generous in their funding of my doctoral studies, and for that I am very appreciative.

TABLE OF CONTENTS

LIST OF TABLES iii

LIST OF FIGURES v

ABSTRACT vi

INTRODUCTION 1

Precursors of the Successful Aging Concept 1
Rowe and Kahn's Model of Successful Aging 2
Component #1: Minimizing Risk of Disease and Disability 8
Component #2: Maintaining High Physical and Cognitive Function 14
Component #3: Active Engagement with Life 18
Criticisms of Successful Aging Theory 23
Stages of Motivational Readiness to Change 24
Summary 25
Hypotheses 26
METHODS 30

Research Setting: CCRCs 30
The Masterpiece Living Program 32
Study Population 35
Data Collection 36
Instruments 37
Outcome Measures 38
Statistical Analyses 46
Power 50
RESULTS 54

Baseline Sample Characteristics 54
Mean Level Changes over Time on Outcome Measures 59
Successful Aging Component #1: Reducing Risk of Disease and Disability 63
Fruit and Vegetable Consumption 64
Stage of Change for Fruit and Vegetable Consumption 66
Exercise Participation 68
Light Exercise 69
Vigorous Exercise 71
Strength Training Exercise 73

Stage of Change for Exercise Participation 74
Body Mass Index 74
Stage of Change for Weight Loss 77
Discussion of Successful Aging Component #1 78
Successful Aging Component #2: Maintaining High Physical and Cognitive Function 87
Self-Rated Health 87
Mobility 90
Discussion of Successful Aging Component #2 92
Successful Aging Component #3: Active Engagement with Life 99
Formal Volunteerism 100
Volunteerism Inside the CCRC 100
Volunteerism Outside the CCRC 101
Informal Helping 102
Helping Inside the CCRC 102
Helping Outside the CCRC 104
Social Support 105
Giving Social Support 105
Receiving Social Support 106
Discussion of Successful Aging Component #3 108
Relationships Among Changing Outcome Variables 112
DISCUSSION 115

Summary of Findings 115
Limitations 119
Future Directions for Successful Aging Research 126
APPENDICES 148

Appendix A: Univariate Models in Chart Form 149
ABOUT THE AUTHOR ....End Page

LIST OF TABLES

Table 1	Outcomes for Successful Aging Component #1: Reducing the Risk of Disease and Disability	40
Table 2	Outcomes for Successful Aging Component #2: Maintaining High Physical and Cognitive Function	40
Table 3	Outcomes for Successful Aging Component #3: Active Engagement with Life	41
Table 4	Sample sizes needed for power = .80 in a single-group repeated measures design (adapted from Stevens, 2001)	52
Table 5	Number of Participants by Assessment Instrument and Data Collection Wave (2001 – 2003)	55
Table 6	Participation Rates and Reasons for Attrition (n=136)	56
Table 7	Baseline Characteristics of Masterpiece Living Participants	58
Table 8	Characteristics of Masterpiece Living Participants	58
Table 9	Fixed Effect Portion of Unconditional Growth Models	60
Table 10	Mean Level Change Over Time in Outcome Variables	62
Table 11	Unconditional Growth Models (Random Effects Only) for Component #1: Reducing Risk of Disease and Disability	64
Table 12	Multivariate Model for Fruit and Vegetable Consumption	66
Table 13	Multivariate Model for Fruit and Vegetable Stage of Change	68
Table 14	Multivariate Model for Light Exercise	71
Table 15	Multivariate Model for Vigorous Exercise	72
Table 16	Multivariate Model for Strength Training	73

Table 17	Multivariate Model for Body Mass Index	76
Table 18	Multivariate Model for Stage of Change for Weight Loss	78
Table 19	Unconditional Growth Models (Random Effects Only) for Component #2: Maintaining High Physical and Cognitive Function	87
Table 20	Multivariate Model for Physical Health	89
Table 21	Multivariate Model for Mental Health	89
Table 22	Multivariate Model for Mobility	92
Table 23	Unconditional Growth Models (Random Effects Only) for Component #3: Active Engagement with Life	99
Table 24	Multivariate Model for Volunteering Inside	101
Table 25	Multivariate Model for Volunteering Outside	102
Table 26	Multivariate Model for Helping Inside	104
Table 27	Multivariate Model for Helping Outside	105
Table 28	Multivariate Model for Giving Social Support	106
Table 29	Multivariate Model for Receiving Social Support	107
Table 30	Bivariate Correlations for Difference Scores	113

LIST OF FIGURES

Figure 1.	Rowe and Kahn's Model of Successful Aging	3
Figure 2.	Structure of Successful Aging Literature	7
Figure 3.	Gaps in Causal Sequence	33
Figure 4	Assessment Schedule for Masterpiece Living Participants	36
Figure 5	Effect of Marital Status on Baseline Fruit and Vegetable Consumption	65
Figure 6	Effect of Age on Light Exercise Participation Over Time	70
Figure 7	Comparison of Masterpiece Data to National Norms for SF-8	93
Figure 8	National Trend of Decline in Functional Capacity	95

Expanding the science of successful aging: Older adults living in continuing care retirement communities (CCRCs)

Kathryn H. Petrossi

ABSTRACT

Rowe and Kahn's theory of successful aging identifies three main components of aging successfully: reducing the risk of disease and disability, maintaining high cognitive and physical function, and engagement with life. While there is compelling evidence that suggests the legitimacy of this concept in the 50 – 75 year old community dwelling population, three areas of expansion are necessary: 1.) programmatic research; 2.) extending the existing research samples to include older samples and those living in continuing care retirement communities (CCRCs); and 3.) the integration of data collection and analysis to move beyond investigation of just one successful aging outcome to include elements of all three components of successful aging. Longitudinal analysis utilizing hierarchical linear modeling (HLM) was conducted on a convenience sample of 136 older adults (mean age = 80.8 years at baseline) participating in a pilot community-wide successful aging program over a 26-month period. Results indicate the sample reported exercising frequently, ate recommended levels of fruits and vegetables, had healthy BMIs, had positive ratings of health, were highly involved in productive activities, and were satisfied with their ability to give and receive social support at baseline. High levels of mobility were measured in the sample. Participants maintained this picture of successful aging over time for the majority of outcome variables, though

significant declines in self-reported health were observed. Participants also reported improvements in their satisfaction with receiving social support. Results support four major conclusions: 1.) The three criteria of successful aging identified by Rowe and Kahn (1997) were observed among older adults living in CCRCs who were enrolled in a successful aging program. 2.) Stability was observed on a number of the outcomes over 26 months in this convenience sample, which has implications for intervention/programmatic research. Despite the traditional improvement-oriented focus of programmatic research, stability or maintenance of well-being over time should be viewed as a positive outcome in older age, particularly when compared to national data depicting trends of decline. 3.) The interdependence of current results support the notion that successful aging programming needs to include multi-disciplinary intervention strategies, as supported by the finding that modifiers of physical, social, and intellectual well-being include constructs from each of the components of successful aging. 4.) Participants of the current study were largely in the precontemplation and contemplation stages of change. Readiness to change needs to be factored into the design of any successful aging program, as the Transtheoretical Model could be a powerful tool for the identification of readiness to change and the development of appropriate and effective successful aging programming.

INTRODUCTION

Precursors of the Successful Aging Concept

The first discussions of successful aging can be traced to 1948, when the World Health Organization defined health as not just the absence of disease, but also a fuller sense of wellbeing, including physical, mental, and social health. This is one of the first records of a slow and gradual departure from a narrow, medical conceptualization of health, and from classic gerontological theories such as disengagement theory (Henry & Cummings, 1961) and activity theory (Havighurst, 1957). The first quantitative conceptualizations of successful aging can be seen in the work of Fries' (1980) compression of morbidity and Katz et al.'s (1983) active life expectancy. "Successful Aging" as a model was prompted by Rowe and Kahn in their 1987 *Science* article describing the need to distinguish usual and successful aging, then presented formally in 1997 with an article in *The Gerontologist*, which was followed by the publication of a book in 1998 with strong appeal to researchers and older adults alike. Successful aging (regardless of version/author) promotes person-driven continued participation in roles and activities through older age that promote a long and healthy life, thus keeping the process of final decline and death in as short a period as possible.

Rowe and Kahn's Model of Successful Aging

While this author feels that Rowe and Kahn's (1997) theory of successful aging is the most comprehensive, it is one of several. This dissertation will be limited to Rowe and Kahn's theory of successful aging however, as it was the conceptual basis for the successful aging program on which this dissertation dataset was collected.

Rowe and Kahn's conceptualization of successful aging represents a breakthrough in the way gerontologists and others looked at old age. Much of gerontology had been focused on the study of decline; distinguishing specifically between the "diseased" and the "normally" aging. While this type of approach has much utility for studying the disease process, it also has three distinct limitations: (1) It has ignored the heterogeneity among older adults, particularly among those who are non-diseased; (2) The existence of only two categories for the health of older adults assumes that someone is either diseased, or healthy and without risk; (3) Whatever is not formally diseased is therefore normal and natural, and not in need of modification (Rowe & Kahn, 1987). To challenge these assumptions about the current study of aging, Rowe and Kahn suggested an additional category that could be used when examining the health of older adults. Specifically, they suggested further breaking down the "normal" aging group into: (1) Those who are not diseased, yet at high risk for developing future health conditions, and (2) those who are not diseased and also at low risk for developing future health conditions: those aging successfully. This

distinction between the "usual" aging and the "successful" aging represents a new way to look at the heterogeneity of age in our society: what was once thought to be the effect of aging might now be the result of lifestyle choices (Rowe & Kahn, 1987).

As a result of investigating this heterogeneity among older adults to make the distinction among pathological, usual, and successful, Rowe and Kahn developed a conceptual model that details three components of successful aging: (1) Minimizing the risk of disease and disability (2) Maintaining physical and cognitive function and (3) Engagement with life.

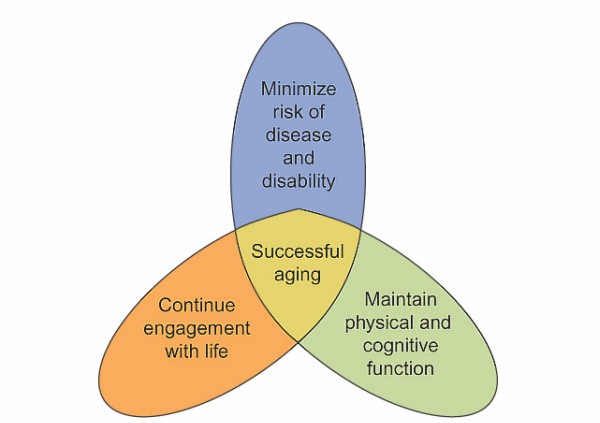


Figure 1. Rowe and Kahn's Model of Successful Aging

The body of knowledge on successful aging has grown rapidly over the past 18 years, but there are three main areas in which more knowledge is necessary, which this dissertation will address:

1. Expanding the age range of studies on successful aging
2. Integrative intervention research agendas that incorporate all three components of successful aging
3. Research on residents of CCRCs.

Perhaps the most easily identifiable and remediable area of expansion pertains to age: the vast majority of the successful aging research to date has been conducted on 50-75 year olds. At the other end of the spectrum, considerable attention has been paid to the characteristics of centenarians. As a scientific community that recognizes the population explosion in the oldest-old, there is a need to begin to test the saliency of currently accepted research findings by extending the age range studied to include those over age 75 years. Research advances in this older age group present a true opportunity for advancement of the field. This area for expansion suggests a multitude of potential analyses and publications that would answer the following: What do adults whose average age is 80 years look like in terms of variables known to be important to successful aging? How does their performance on these variables change over the course of twenty-six months? Do the predictors of successful aging currently seen in young-old adults remain salient for this older age group?

The second area where the research could be expanded is the need for integrated research programs. To date, the majority of successful aging research has taken place in isolated, tightly controlled, and narrowly-focused interventions. The next step must be the extension and application of this research to additional types of environments that older adults live in, and the development of programs and interventions that are as comprehensive and complex as the notion of successful aging itself and the older adults who hope to achieve it.

The third area for development in the successful aging field is research on residents of continuing care retirement communities (CCRCs). Residents of CCRCs are largely overlooked in the gerontological research, despite the fact that this population is growing larger every day, up from 700 CCRCs serving 100,000 older adults in 1986, to recent estimates of 2,200 CCRCs providing care to 613,000 residents (Cohen et al., 1998; American Association for Homes and Services for the Aged, 2003).

The impetus for research on this group of older adults goes beyond their rising population. CCRCs share some common traits with living in the community: adults live in a fully-functional home or apartment setting, maintain their freedom to drive if they choose, and can come and go as they please, participating (or not) in any number of activities both inside and outside the CCRC. Residents of CCRCs are distinguishable from older adults living in seniors-only communities or those living in their own homes throughout the country in their access to lifestyle and health care related services, if needed. Residents of CCRCs also stand to gain much from health promotion efforts, and the CCRC environment may even serve as a valuable microcosm for the larger aging population.

CCRCs provide efficient access to large numbers of older adults in a small physical location, thus streamlining some of the difficulties of participant recruitment, assessment, follow-up, and retention. The CCRC setting is also a supportive environment; a community-oriented culture offering a varying array of services, programs, and resources (AAHSA, 2003) that can be tailored to meet research needs.

It is this supportive nature of the CCRC that identifies it as a resource for addressing the second major area for development: the need for multi-dimensional, interdisciplinary research projects that are consistent with the whole-person approach to successful aging. Much of the successful aging research to date has been traditional research which involves baseline testing on a narrow concept that is a component of successful aging, followed by a uni-disciplinary clinical intervention, and follow-up testing. While this is appropriate for determining whether lower body strength increased, or depressive symptoms decreased, it is not a comprehensive measurement of the complex concept of successful aging. The research has not expanded beyond traditional protocols to include projects that address each of the three areas of successful aging together. Furthermore, while there has been much research on interventions to change specific behaviors, particularly exercise (Dun et al., 1999; King, 2001; Lazowski et al., 1999; Messier et al., 2000; Wolfson et al., 1996), none have tackled multi-faceted behavior changes such as those advocated by Rowe and Kahn's successful aging theory.

Figure 2 provides a pictorial representation of the rationale for the current analyses. The bolded text details the current research focus, indicating that there is much existing research on successful aging. The majority of this research is observational (non-intervention) in nature and has been conducted on community-dwelling samples (typically age 50 – 75 years). The italicized text indicates where research is lacking: successful aging programs and interventions, particularly those involving multiple components of the successful aging model, on adults living in

CCRCs (who, according to industry reports (Sanders, 1997), have an average age of 81.2 years). A search of the literature using PsycInfo revealed 272 journal articles containing the term "successful aging," but only 23 with the additional terms of "program" or "intervention." Only three of these articles examined multiple components of successful aging (vs. a single research goal such as sleep problems, depression, strength training, etc). Parker et al. (2002) describes a multi-church sponsored conference to educate older adults on successful topics related to physical, social, intellectual, and spiritual well-being, though no measures of behavior change were collected. Parker et al. (2001) applies Rowe and Kahn's (1997) model in military personnel and their families. The third multi-component article (Ramamurti, Jamuna, & Reddy, 1992) describes a small intervention study (n = 20) targeting older men.

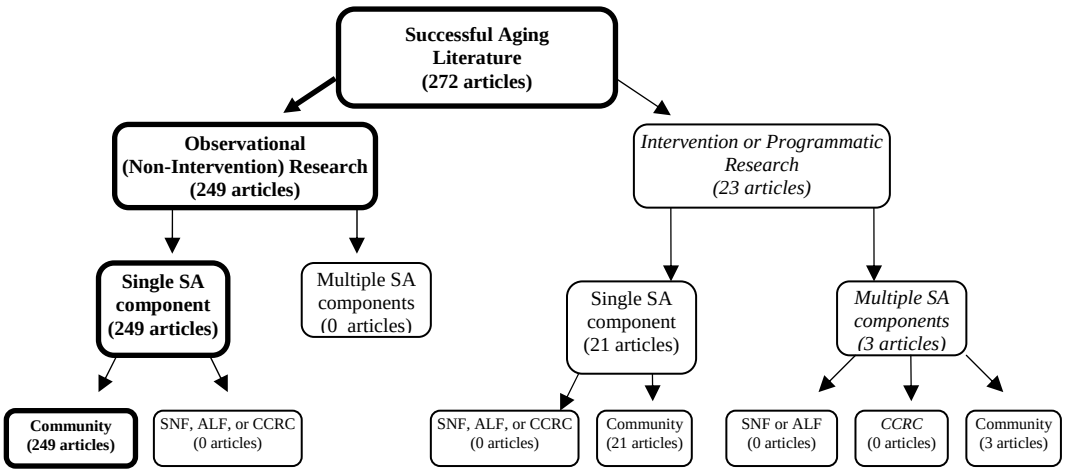


Figure 2. Structure of Successful Aging Literature

This dissertation utilizes data collected as part of a multi-faceted successful aging program for older adults living in CCRCs with an average age of 80 years – similar to the italicized path of Figure 2. The lack of a comparison group for the program prohibits its official labeling as an intervention and any formal evaluation of the program (attribution of any findings to the programs itself). Therefore, the context for the analysis and interpretation of the results will be more similar to the bolded path, as the sample is a convenience sample of older adults living in a CCRC who signed up for a successful aging program.

This dissertation examines a group of older adults living in a CCRC who have participated in a successful aging lifestyle program, referred to as Masterpiece Living. The sample for the dissertation will confound the effects of older age and residence in a CCRC, but this expansion of the research literature is worthwhile and critical to the implementation of successful aging principles.

Before beginning analysis, it is important to review the literature: the research conducted on one component of successful aging; on older adults aged 50 – 75 years; and on those living in the community (not in assisted living or skilled nursing).

Component #1: Minimizing Risk of Disease and Disability

Successful aging is somewhat hierarchical (Rowe & Kahn, 1997), with the most important of the three components being minimizing the risk of disease and disability, which includes reducing your risk factors for developing new health conditions. Disability is not an inevitable part of aging, evidenced by its relatively low

prevalence: between the ages of 75-84 years, 73% of adults report no disability, and after age 85 years, 40% remain functionally independent (Rowe & Kahn, 1998). Additionally, scientific research indicates that only 30-40% of differences in functioning with age are determined by genetics (Rowe & Kahn, 1997). They cite the Swedish Twin Study's use of heritability indexes to determine the proportion of variance attributable to genetics for the most common risk factors for disease: 66-70% of body mass index (BMI), 28-78% of cholesterol, and 34-44% of blood pressure values can be attributed to genetic factors.

While these percentages are not negligible, they point out the dramatic degree to which health as people age is determined by behavioral and lifestyle choices. Furthermore, there is evidence to suggest that the relative importance of genetics varies across the lifespan, usually decreasing in importance with age (Rowe & Kahn, 1997). This means the effect of lifestyle choices that promote good health such as varied and balanced nutrition (particularly lower in saturated fat), exercise, not smoking, and preventive health screenings become increasingly apparent as people age.

There are seven habits of healthy people, necessary to improve health and avoid disease and disability: regular exercise, weight management, proper nutrition, not smoking, adequate rest/sleep, stress management, and preventive health screenings (Belloc & Breslow, 1972; Peel, Roderick, & Bartlett, 2005). This dissertation will address the first three habits.

Exercise

Numerous research studies indicate that exercise is perhaps the most important behavior a person can engage in to promote health by preventing the development of chronic conditions and their associated risk factors (obesity, decreased muscle strength, cardiovascular non-fitness, poor balance, etc.) and lower the risk of mortality. Low levels of fitness are a predictor of dependence (Paterson, Govindasamy, Vidmar, Cunningham, & Koval, 2004) and can double the mortality risk (Blair, Kampert, Kohl, Barlow, Macers, Paffenbarger, & Gibbons, 1996), while high levels of fitness can protect against the impact of other risk factors such as smoking, high blood pressure, and poor perception of health (Blair et al 1996; Wei, Kampert, Barlow, Nichman, Gibbons, Paffenbarger Jr, & Blair, 1999). These findings suggest that it is never too late to start exercising, regardless of current health condition: even recent changes in physical activity can show positive health benefits (Gregg, Cauley, Stone, Thompson, Bauer, Cummings, & Ensrud, 2003).

Overall, the exercise message is positive. There is no age by exercise interaction, indicating that the inverse relationship between exercise and mortality is not dependent upon age: older people can demonstrate the benefits of exercise just like younger people can (Kushi, Fee, Folsom, Mink, Anderson, & Sellers, 1997). The benefits of exercising can be demonstrated through participation as infrequently as once per week doing moderate and strenuous levels of exercise (Kushi et al., 1997). Receiving benefits from exercising, even if infrequently, is important for those with chronic conditions that might prevent them from frequent participation in vigorous

activity. The evidence also suggests that exercise goes beyond keeping the healthy in their current state. There is an abundance of research that indicates that the effects of exercise can be manifested in non-healthy populations as well (Binder, Schechtman, Ehsani, Steger-May, Brown, Sinacore, Yarasheski, & Holloszy, 2002; Messier, Royers, Craven, O'Toole, Burns, & Ettinger, 2000).

Body Mass Index

Maintaining a healthy weight is another health promotion behavior, one that is closely tied to exercise. In fact, there has been a recent focus on the importance of "fitness" over "fatness." Nonetheless, controlling weight or Body Mass Index (BMI) is a worthy outcome for those attempting to age successfully. In both cross-sectional and longitudinal studies, high BMI among older adults has been associated with a greater likelihood of declining perceived health, a lower likelihood of improvement in mobility, a higher likelihood of mobility decline, and greater likelihood of functional limitation (Damush, Stump, & Clark, 2002; Krahnstoever-Davison, Ford, Cogswell, & Dietz 2002, Rahrig Jenkins, 2004; Zamboni, Turxcato, Santana, Maggi, Harris, Pietrobelli, Heymsfield, Micciollo, & Bosello, 1999). For children and younger adults, the primary goal is to prevent obesity or to determine avenues for lowering BMI. While this is still the case for obese older adults, there is an additional area of concern: a declining BMI is often indicative of an underlying disease process. In longitudinal studies, decreases in BMI are the predominant trend in older adults, and are associated with increasing chronic health conditions, functional disability, and

higher mortality risk. However, those who exhibited slower decreases in BMI also showed slower increases in chronic conditions and disability (Kahng, Dunkle & Jackson, 2004; Reynolds, Fredman, Langenberg, & Magaziner, 1999). These findings indicate maintaining a healthy BMI (neither too high or too low) is important for multiple measures of health and well-being. More longitudinal research is necessary to examine the impact of changes in BMI on health, as well as the reverse (the impact of changing health on BMI).

Nutrition

Nutrition is another important component of successful aging, although it has received less consideration in the gerontological literature. Nutrition influences the development of disease (e.g. cancer, cardiovascular disease, stroke; Hyson, 2002). For example, consuming three or more servings of vegetables per day has been associated with a 40% reduction in risk for Non-Hodgkins Lymphoma (Kelemen, 2004). More broadly, it is estimated that nearly 1/3 of cancers can be attributed to dietary intake (Kelemen, 2004). Keller, Ostbye, and Goy (2004) found an independent effect of nutritional risk on quality of life: those at high nutritional risk had consistently lower satisfaction with life over time, compared to their low and moderate risk counterparts, and reported an average of 31 fewer "good health days" per year (or approximately 2.5 fewer good health days per month).

Despite the demonstrated importance of eating a balanced and varied diet, those aged 71 years and older clearly need guidance achieving proper nutrition (Foote,

Giuliano & Harris, 2000). While almost 75% of older adults ate adequate meats/proteins, only 12% consumed the recommended daily servings of grains, only 40-50% ate enough fruits and vegetables, and less than 4% ate enough dairy (Foote, Giuliano & Harris, 2000). Studies demonstrate that interventions designed to improve nutrition in older adults can be successful, but may be influenced by lack of social support, distress, worry, type A personality, and competing behaviors (Danhauer et al, 2004; Sorensen, Stoddard & Macario, 1998). It is possible that nutrition influences quality of life through both physiological (nutrient absorption) and psychosocial (social support, self-efficacy) mechanisms, making it an issue that deserves more attention in social science research agendas.

The findings of Fraser and Shavlik (2001) summarize the impact of healthy behaviors on physical health and longevity. They found that those who are physically active, frequently consume nuts, are vegetarian, or have medium BMI show an increase in life expectancy of 1.5-2.5 years. The gap in life expectancy extension widens as you compound/multiply the positive health behaviors. These results are encouraging because life expectancy advantages were demonstrated in medium risk categories for most of the health behaviors measured, not just the low risk categories. Older people can be relieved by the notion that they do not have to be perfect in all areas simultaneously to experience extended life expectancy.

There is also evidence that psychological variables such as self-efficacy (one's self-confidence, or belief in their ability to complete a task; often involves elements of control) and positive affect can help reduce disease, disability, and mortality risk.

High self-efficacy protects against the perception of disability (self-rated disability), independent of actual physical incapacities (performance-based measures) (Seeman, Unger, McAvay, & Medes de Leon, 1999) and decreases mortality risk (Ostir, Markides, Black, & Goodwin, 2000). These findings are important because self-efficacy is generally seen as a modifiable variable. Increasing self-efficacy may be a key path to increasing the quality of life of older adults by expanding the array of functions they believe they can complete, and will subsequently engage in. These findings may indicate that those with high positive affect have an outlook on life that promotes healthy living, or maybe those with high positive affect have a strong social network, which has been shown to produce positive health benefits.

The massive body of literature (only briefly reviewed here) suggests three conclusions: (1) genetic factors alone do not account for risk in older age, lifestyle variables also play an important role in determining risk for disease and disability; (2) as people age, the relative contribution of genetics decreases and the role of lifestyle variables increases; (3) the risk factors that make up the "usual" aging segment of the population can be modified to produce positive health outcomes (Rowe & Kahn, 1997).

Component #2: Maintaining High Physical and Cognitive Function

The second component of Rowe and Kahn's (1997) model of successful aging is maintaining high physical and cognitive function, which can be viewed as one's ability to do the tasks that keep them independent. As in the case of disease and

disability, physical and cognitive impairments are not the norm for aging: the prevalence of ADL difficulty is estimated to be 20% in those 65 and older, and only 35% in those aged 70 years and older (Black & Rush, 2002). Cognitive impairment is estimated at 4% in those 65-69 years and 36% in those 85 and older (Black & Rush, 2002). While these prevalence rates do indicate an increase in impairment with age, the percentages who are impaired are still a minority.

Maintaining physical function pertains to the maintenance of strength, balance, and other measures of performance that allow older adults to carry out the tasks involved in their daily, independent lives. Age is not the only explanatory variable for functional decline in older age, disease and lifestyle choices also play an important role. There is much research on the predictors of functional illness. Predictors of declining physical function include: BMI (too low or too high), trouble walking, poor vision, low income (less than 10K annually), age (being older), high blood pressure, depression, dementia, and low baseline cognitive performance (Ferraro & Booth, 1999; Rowe & Kahn, 1997; Vaillant & Mukamal, 2001). Predictors of maintaining high physical function include participation in moderate and/or strenuous leisure activity, and emotional support from friends and family (Rowe & Kahn, 1997).

Maintaining physical function through physical fitness also has important implications for disease risk. Rogers et al. (1990) found that physical activity after retirement was associated with sustained cerebral blood flow (similar to that of when the individual is working for pay), compared to those who retired and became

sedentary (who experienced lessened flow). Sustained cerebral blood flow lowers the risk of stroke and Alzheimer's disease - both of which would impair physical and cognitive function over time (Rogers et al. (1990).

So how do older adults maintain their physical functioning? The vast majority of intervention research indicates positive outcomes as a result of participation in group or individual exercise sessions designed to increase strength, cardiovascular function, and balance (Conn et al., 2002; Wolfson et al., 1996). It is important to make sure that physical activity interventions are designed to challenge the physical capabilities of older adults, however, and are not focused merely on range of motion exercises (Lazowski et al., 1999). Hortobagyi et al. (2003) suggests the mechanism by which physical activity interventions help older adults maintain physical function: older adults were found to be performing their ADLs at a higher level of effort in reference to their maximal capacity than are younger adults (presumably due to age- and mostly lifestyle-related declines in strength). Therefore, interventions that help to restore physical strength, balance, and endurance bring the level of effort exerted back down to a manageable/negligible level.

Physical activity is not the only factor that promotes maintenance of physical function. Psychological or personality characteristics may also play a role. Ostir et al. (2000) found that high positive affect scores were associated with decreased risk of developing ADL impairment at follow-up. Weak self-efficacy at baseline has also been shown to predict declines in self-rated function in men, regardless of their actual/objective functional status changes (Seeman, 1999). There is evidence

however that the impact of psychosocial variables on physical functioning is disease-specific (Seeman & Chen, 2002)

Maintenance of function is not just limited to the physical domain; it also includes maintenance of high cognitive function. As mentioned before, the prevalence of cognitive impairments increases with age, but the percentages remain a minority, particularly for Alzheimer's disease, a major area of worry for older adults. Speed of information processing and explicit memory show declines with age, but other cognitive skills, such as the ability to use words and numbers accurately, to see relationships between shapes, and to draw appropriate conclusions from sets of facts are maintained into extreme old age (Rowe & Kahn, 1998). Also, older adults maintain their ability to recognize and, to a lesser extent, recall information previously seen or heard. Despite the fact that some feel Rowe and Kahn (1998) interpret this research in an overly optimistic fashion, and some research casts doubts on elders' ability to increase cognitive performance in all spheres (Hultsch et al.,1999; Rebok & Plude, 2001), their intent is to assuage the fears that many elders have about losing their cognitive capacities. Rowe and Kahn focus on the positive (discussing the research in terms of how to prevent or reverse *incremental declines*, not painting a picture of *total losses*). Nonetheless, research suggests that older adults are right to fear cognitive loss, as it is associated with loss of independence, lowered quality of life, higher health care utilization, risk of institutionalization, and higher mortality (Black & Rush, 2002).

Research suggests that predictors of maintained cognitive function (across several domains) include education as the strongest predictor, strenuous activity, being white, high peak expiratory flow rate, fewer chronic conditions, and high self-efficacy (Rowe & Kahn, 1997; Whitfield et al., 2000). Predictors of increased cognitive function include physical activity (Rogers et al, 1990). Higher levels of cognitive activity have been associated with a 33% lower risk of Alzheimer's disease and slower/lower rates of cognitive decline over time (Wilson et al., 2002). The overlap between the reviewed predictors of physical and cognitive function support the findings of Black and Rush (2002), which indicate that the two domains are intricately intertwined. Their results indicate that baseline cognitive status predicts functional decline and baseline functional status predicts cognitive decline. These findings indicate both modifiable and non-modifiable risk factors for cognitive decline, which suggests that cognitive declines are not inevitable with age, and in some cases may be preventable.

Component #3: Active Engagement with Life

Rowe and Kahn's (1997) theory of successful aging represents a departure from disengagement theory and the activity theory of aging. They suggest that there are two components of active engagement with life: staying connected with others and participating in meaningful and productive activities.

The notion of connectedness with others is based on the premise that having social support and networks has positive impacts on health, while losing social support has negative impacts on health. Seeman et al. (1995) found that having high emotional

support is a predictor of increased physical performance, especially among those with low instrumental support. Rowe and Kahn's synopsis of the MacArthur Foundation studies indicates that marital status (presumably a source of emotional support) was protective against reductions in productive activity, while no significant associations were found for instrumental support. Perhaps it is the case that emotional forms of social support allow you to exercise the appropriate and desired amounts of control over daily tasks, whereas instrumental support may provide too much or too little assistance, thus taking away control or producing frustration as the effect of social support, not helpful and healthful outcomes.

Not having, or losing social support can be detrimental to health. The Alameda County Study (as cited by Rowe & Kahn, 1987) found that men and women with low social network index scores were at a 2.3 - 2.8 higher risk of death after nine years, compared to those with high social support scores. Bereavement, which can be conceptualized as the loss of a major source of social support, has also been associated with higher mortality for the surviving spouse (Rowe & Kahn, 1987). They also suggest that the relocation process, such as moving from the community to a long term care setting (which may involve dissolution of not only family networks, but also neighborhood and leisure networks) is also associated with higher mortality, although mediated by preparation for the move and the level of control the elder has over the move. Moen et al (2002) supports these findings, but indicates that changes in social support levels through relocation may be dependent upon the type and number of roles with which you identify.

With this evidence in mind, how should programs to help older adults increase their social networks and the resultant positive health outcomes be structured? What does it mean to "increase" social networks - does this imply quantity or quality? Does it vary by the person? The research literature suggests that these interventions should modify role perceptions as well as actual role-related behaviors (Moen et al., 2000). Furthermore, contact with network members and satisfaction are not necessarily connected (Lansford et al, 1998). It is possible that the importance of the quality of the social ties may be of the same importance as the overall number of social network members. Further support for this notion of quality comes from Jang (2002), which suggests that it is not the actual amount of social support but the subjective satisfaction with that support that mediates the relationship between disability and negative health outcomes such as depression. This evidence suggests that social network interventions need to try to match the support needs (objective and perceived) and the kinds of support needed (instrumental and/or emotional) to produce the strongest benefits for health and well-being.

Engagement with life is more than just staying connected with others. Having a strong social network connects older adults to other individuals, and to larger social entities such as the job market, opportunities to volunteer, and their extended families (Jackson, Antonucci, & Gibson, 1990, as reviewed by Glass et al., 1995) which makes it easier to participate in meaningful and productive activities. Meaningful activities are self-explanatory: activities that are fulfilling and rewarding to the individual participating in them. Rowe and Kahn (1997) provide a more structured

definition of productive activities, to include anything that produces goods or services of value. In early- and mid-life, people are likely to think of their careers (paid employment for most) as their primary productive activity. As people age and fewer people are working, it is important to re-conceptualize this concept as something more than paid activities, to include housework, childcare, providing assistance with personal care and transportation, and volunteer work, among other things.

The current body of research seems to divide meaningful and productive activities into two separate domains of study: participation in personal care and leisure activities, and volunteerism. Horgas et al. (1998) sought to describe in detail how older adults spend their day in terms of frequency, duration, and variety of activities. They found that older adults most frequently did activities related to personal care, but these activities did not take the most time in their day: TV watching and resting did. Successful aging recognizes the importance of personal care activities: without competence on these items, one cannot pursue other levels of meaningful and productive activities. However, successful aging seeks to promote a level of health and function that moves beyond a focus on obligatory activities, where one is free to pursue discretionary activities. Strain et al. (2002) suggests age and change in functional status (not baseline functional status) are predictors of leisure activity participation. Findings that changes in activity are the result of changes in functional status is further evidence for the interaction among the three components of successful aging: strength in one area promotes strength in the other areas, and vice versa.

Volunteering is a common source of meaningful and productive activities for the old and young alike. The Metropolitan Life Foundation and Independent Sector Research Report (2000) indicates that 48% of those age 55 years and older volunteered at least once in 1998, and that number remains high (43%) when considering only those aged 75 years and older. Older volunteers gave an average of 3.1 hours per week, totaling over 1.1 billion hours annually. Musick, Herzog, and House (1999) report slightly lower volunteerism rates at 35%, while Van Willigan (2000) reports 50% using ACL data. Of those who did not volunteer, 43% cited health-related reasons, while 18% cited age as the reason they chose not to volunteer (Met Life, 2000).

Rahrig Jenkins (2002) examined participation in three types of activities (passive, active, and outside community activities) in CCRCs and found that active activity participation was associated with good health on 7 of the 8 domains of the SF-36 (Ware & Sherbourne, 1992), while inactive activities were not significantly associated with good health on any of the domains of the SF-36. Volunteerism does more than just fill discretionary time or enhance social networks - it is also associated with health-related quality of life (although as in the case of intellectually stimulating activities, more longitudinal research utilizing randomization is necessary to determine more solidly the causal direction of the effect). Van Willigan's (2000) research is promising however, finding that although functional impairment was inversely related to volunteer *commitment*, psychological and physical well-being did not predict the *act of volunteering* itself. Glass et al. (1995) determined that among

high functioning older adults, some increased their productive activity, while others decreased over time (again demonstrating the heterogeneity among older adults). Predictors of improvement (higher levels) of productive activity included being African American, having high mastery, and high life satisfaction. Two of the three are modifiable. Predictors of decline in productive activity included hospitalization and a new occurrence of stroke, while being older, married, having a previous disability, and increasing mastery were protective against declines in productivity. Again, according to successful aging theory, many of these predictors are modifiable.

Other research suggests that there may be limits to the benefits of volunteerism, however. Musick et al. (1999) found that volunteering for a limited number of hours for one organization was protective against mortality, and Van Willigan (2000) discovered that the benefits of volunteering on perceived health diminish after approximately 100-140 hours per year, but there is no upper limit to the positive relationship between volunteer hours and life satisfaction.

Criticisms of Successful Aging Theory

Despite the compelling evidence presented about the heterogeneity of older adults and the impact of lifestyle and behavioral variables in determining health outcomes, there are critics of successful aging theory. The criticisms can be summarized into three main issues: (1) Prevalence and eligibility disapproval: what the criteria for successful aging are, who qualifies as a person who is successfully aging, and the impact of being labeled as aging successfully (or not aging successfully) (Vaillant & Mukamal, 2001; Binstock, 2002; Bootsma-van der Weil, 2002; Strawbridge,

Wallhagen, & Cohen, 2002); (2) Doubts about the underlying assumptions of the theory from a biological and spiritual perspective: Is it possible to make it to old age disease-free and without substantial physical deterioration? What role does genetic research play in successful aging? Does believing in successful aging facilitate denial of the humanity and finality of the last stages of life? (Masoro, 2001; Moody, 2002); and (3) Concern that the theory is overly focused on individuals, to the neglect of social/structural influences (Riley, 1998). The program (Masterpiece Living) from which the dissertation dataset originates hopes to address criticism #1 by broadening the available body of research on successful aging, thus identifying at least a larger age range of potential successful agers. Masterpiece Living's focus not only on the individual, but also on the culture of the CCRC, is one way to address criticism #3.

Stages of Motivational Readiness to Change

While Rowe and Kahn's model of successful aging provides the theoretical basis for this dissertation, the Stages of Motivational Readiness to Change, part of the Transtheoretical Model (Prochaska & DiClemente, 1986), provides an additional framework for studying the behavior change needed for successful aging. This framework is incorporated into the current analyses as both an outcome and as a potential moderator of change over time in successful aging behaviors. Individuals can be in one of five stages relative to making a specific behavior change: pre-contemplation (not doing target behavior and not intending to make changes), contemplation (considering change within next six months), preparation (having a plan or making small changes within the next 30 days), action (active engagement in

the new behavior, for less than 6 months), and maintenance (sustained action for more than six months). By knowing an individual's stage, one can better determine intervention appropriateness (what interventions they are likely to participate in and benefit from). People in the first two stages (precontemplation and contemplation), are best suited for cognitively-based interventions, while people in the latter three stages (preparation, action, and maintenance) are thought to have better success with behaviorally-based interventions. This approach also allows a more precise measure of intervention success than the dichotomous definition of did they change the behavior or not. It recognizes smaller successes and attempts to influence the precursors to change, such as changes in knowledge about the behavior, and recognizing barriers to change. The stages model was applied first to smoking cessation (Prochaska & DiClemente, 1986) and since been applied to diet, sun exposure, weight loss, alcohol abuse, screening mammography, reduction of stroke and osteoporosis risk, arthritis self-management, exercise, and case management in older adults (Bock, Marcus, Rossi, & Redding, 1998; Burbank, Reibe, Padula, & Nigg, 2002; Enguidanos, 2001; Godin, Lambert, Owen, Nolin, & Prud'homme, 2004; Keefe et al., 2000; LaForger et al, 1998; Lee, 1993; Miller & Spilker, 2003; Molaison, 2002; Nigg et al., 1999; Popa, 2005; Prochaska & Velicer, 1997; Resnick & Nigg, 2003; Zimmerman, Olsen, & Bosworth, 2000).

Summary

In summary, Rowe and Kahn's successful aging theory represents an advance in the gerontological vision of aging, emphasizing the need to go beyond distinguishing

between pathological and normal aging, to also distinguish between usual and successful aging. The qualities of successful aging include avoiding disease and disability, maintaining high cognitive and physical function, and active engagement with life. The vast majority of the research reviewed above was conducted on adults aged 50-75 years living in the community. This dissertation seeks to expand the literature by determining if the above factors known to be important to successful aging remain salient for a group of older adults living in CCRCs who were enrolled in a successful aging program.

Hypotheses

Based on the successful aging research reviewed previously, the following hypotheses are proposed for a group of older adults living in a CCRC who were enrolled in a successful aging program.

For reducing the risk of disease and disability, there are three outcomes or dependent variables of interest: 1) fruit and vegetable consumption, 2) exercise participation, and 3) body mass index (BMI). For fruit and vegetable consumption, it is hypothesized that consumption will increase over time among individuals enrolled in a successful aging program and those with lower baseline fruit and vegetable consumption, higher self-rated health and life satisfaction, more frequent exercisers, and those in the preparation or action stage of change will be more likely to increase their fruit and vegetable consumption (Belloc & Breslow, 1972; Danhauer et al, 2004;

Foote, Giuliano & Harris, 2000; Keller, Ostbye, & Goy, 2004; Peel, Roderick, & Bartlett, 2005; Rowe & Kahn, 1998; Sorensen, Stoddard & Macario, 1998).

For exercise participation, it is hypothesized that exercise frequency will increase among participants of a successful aging program. It is anticipated that those who exercise but do so infrequently, have higher baseline health, higher mobility scores, fewer chronic conditions, higher health-related self-efficacy, and are in the preparation or action stage of change will be more likely to increase their physical activity participation (Belloc & Breslow, 1972; Kushi et al., 1997; Peel, Roderick, & Bartlett, 2005; Rowe & Kahn, 1998).

For BMI, it is hypothesized that BMI will not change significantly over time in a group of people enrolled in a successful aging program. Those who have normal or slightly high BMIs, consume suggested servings of fruits and vegetables, have higher self-rated health, participate regularly in physical activity, have higher mobility scores, higher health-related self-efficacy, and are in the preparation or action stage of change will be more likely to maintain BMI over time (Belloc & Breslow, 1972; Damush, Stump, & Clark, 2002; Ferraro & Booth, 1999; Kahng, Dunkle & Jackson, 2004; Krahnstoever-Davison et al, 2002; Peel, Roderick, & Bartlett, 2005; Rahrig Jenkins, 2004; Reynolds, Fredman, Langenberg, & Magaziner, 1999; Rowe & Kahn, 1998; Zamboni et al, 1999).

The second set of outcome variables pertain to maintaining high physical function and include: 1) functional status, and 2) self-reported health. For functional status, it is hypothesized that mobility review scores will remain stable over time among

participants of a successful aging program. For self-reported health, it is hypothesized that SF-8 scores will remain stable over time. The predictors of both outcomes are quite similar, and it is anticipated that those with higher baseline health and mobility, fewer significant life events, normal BMI, fewer chronic conditions, more frequent exercise participation, higher levels of social support and self-efficacy, better diet, and those who drive will be more likely to maintain over time. (Belloc & Breslow, 1972; Krahnstoever-Davison et al, 2002; Paterson et al., 2004; Rahrig Jenkins, 2002; Rowe & Kahn, 1998; Seeman et al, 1995; Seeman, 1999; Strain et al., 2002; Vaillant & Mukamal, 2001).

The third set of outcome variables concentrate on active engagement with life, and include: 1) participation in productive activities, and 2) social connectedness. For participation in productive activities, it is hypothesized that participation will either improve or remain stable among participants of a successful aging program. It is anticipated that those with higher self-rated health, fewer significant life events, healthy BMI, fewer chronic conditions, normal blood pressure, regular exercisers, those who participate in many activities, have higher social support and self-efficacy, and consume healthy amounts of fruits and vegetables will be more likely to maintain their productive activities (Glass et al., 1995; Metropolitan Life Foundation & Independent Sector Research Report, 2000; Musick, Herzog, & House, 1999; Rahrig Jenkins, 2002; Rowe & Kahn, 1998; Van Willigan, 2000). For social connectedness, it is hypothesized that feelings of connectedness will increase in a group of people enrolled in a successful aging program. It is anticipated that those who have not

experienced a significant life event or hospitalization, those who are younger, married, have higher self-rated-health and mobility, have higher self-efficacy, and those who drive will be more likely to increase their social connectedness (Jang, 2002; Rowe & Kahn, 1998; Sorensen, Stoddard & Macario, 1998).

METHODS

Research Setting: CCRCs

Residents of continuing care retirement communities (CCRCs) are largely overlooked in the gerontological research, despite the fact that this population is growing larger every day. The number of CCRCs has grown from 700 CCRCs serving 100,000 older adults in 1986, to recent estimates of 2,200 CCRCs providing care to 613,000 residents (Cohen et al., 1998; American Association for Homes and Services for the Aged, 2003).

A CCRC is a type of long-term care that offers housing, residential services, and limited health care (a changing need over time) to its residents (AAHA definition, as cited in Spears, 1992). CCRCs meet the changing needs of their residents through multiple levels of care: independent living units (usually in the form of villas, condos, etc), and higher levels of care such as assisted living, skilled nursing, and possibly dementia care. Forty-three percent of CCRCs are "lifecare communities" (also known as an extensive contract), which guarantee to provide all necessary nursing care for little or no increase in the monthly payment (Sanders, 1997). Others offer a modified contract, whereby a specific amount of services is offered, after which the resident pays the full price for additional services. The remaining option is a fee-for-service contract that guarantees access to nursing care, but with no discounted rate for service delivery (Sanders, 1997; Spears, 1992). Access to care in a CCRC usually

involves paying a large entrance fee, and a monthly maintenance/rental fee for the unit occupied. Communities vary in the amount of the initial entrance fee that is returned to the estate upon death or otherwise leaving the community.

The data for the present analyses were collected at two CCRCs in Florida: Freedom Village in Bradenton, and University Village in Tampa. The communities are similar: both have approximately 500 independent living units, just over 100 assisted living rooms, 120 skilled nursing beds, and provide modified lifecare to their residents. Entrance fees average $159,000, with monthly fees of $1,500. Fees may vary according to the percentage of the entrance fee returned to the estate upon death. The two CCRCs participating in the current research provide options for either 40% or 90% to be returned, and the decision between the two return levels is made by the resident at the time the lifecare contract is executed.

Studying residents of CCRCs can offer additional insights into how older adults could gain from health promotion efforts. Similar to the customary practice of animal models preceding human experimentation to understand complex biological and behavioral processes, research conducted in the CCRC environment may serve as a precursor to larger scale research initiatives. As such, research in this setting may be valuable microcosm for the larger aging population. CCRC residents share some common traits with their counterparts living in the larger community: most live in a fully-functional home or apartment setting, maintain their freedom to drive if they choose, and can come and go as they please, participating (or not) in any number of activities both inside and outside the CCRC.

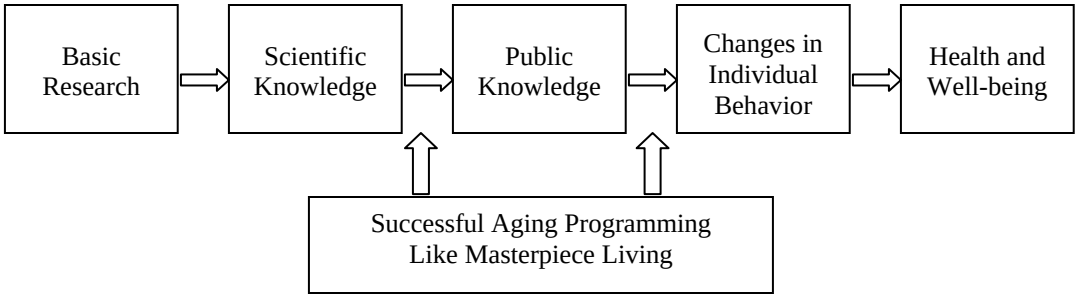
CCRCs provide researchers with efficient access to large numbers of older adults in a defined physical location, thus streamlining some of the difficulties of participant recruitment, assessment, follow-up, and retention. The CCRC setting is also a supportive environment; a community-oriented culture offering a varying array of services, programs, and resources (AAHSA, 2003) that can be tailored to meet research needs. These characteristics may encourage the piloting of intervention studies otherwise thought to be unfeasible in the larger community of older adults.

The Masterpiece Living Program

While the current research project is not a program evaluation of the successful aging programming (known as Masterpiece Living) at these CCRCs, a brief description of the program will inform the setting in which the data were collected and provide a context for interpretation of findings (though the program cannot define causation because there is no randomized design).

Masterpiece Living is based on the principles of Rowe and Kahn's Successful Aging (Random House, 1998), and seeks to achieve two main goals: change the culture of CCRCs, and encourage individual health/lifestyle behavior changes among residents living in those CCRCs. Masterpiece Living is an example of a successful aging program that attempts to bridge the gap between scientific knowledge and public knowledge, as well as the gap between public knowledge and individual behavior change (Figure 3).

Figure 3. Gaps in Causal Sequence



On an individual level, Masterpiece Living seeks to promote successful aging through education, assessment, feedback, and programs. Education begins with presentations on successful aging in general, and is continued throughout the study through a variety of mechanisms utilizing internal and external expertise. Masterpiece Living also raises awareness of successful aging through its comprehensive assessment of resident participants with the Lifestyle Review, Mobility Review, and the Mayo Clinic Health Risk Assessment. Additional details of the three assessment instruments are described later in this Methods section.

Participants then engage in small discussion groups (approximately 15 people), where they are given customized feedback to facilitate behavior change. Their responses on the assessment tools are reviewed and used to create feedback that identifies strengths and areas for improvement. Although not a planned part of the program, the discussion groups have served as an opportunity for the CCRC staff to review current programming and to get residents involved in creating and further defining program offerings that promote successful aging. Consistent with the notion of successful aging, many of these new programs are requested, organized, and run by residents for residents. Masterpiece Living also seeks to change individual

behaviors/lifestyle choices by providing programming in each of the four areas of health, to help individuals reach their successful aging goals.

Masterpiece Living goes beyond just individual behavior change. It changes the environment as well, in recognition that it is difficult to change one's behavior without a support system that values the principles of successful aging. The goal is to implement proactive programs and policies that maintain or improve resident functioning across multiple dimensions, not to use lifecare contracts to react to the increasing medical needs of residents. All direct-contact and administrative staff members are trained on the concept of successful aging and given the tools they need to facilitate the culture change and become an advocate for individuals participating in Masterpiece Living. Changes to the physical environment include new senior-friendly exercise rooms and equipment, healthy meal offerings, and a variety of programs targeted to promote the components of successful aging.

The Masterpiece Living program is not, nor is it intended to be, a tightly controlled research intervention with identical protocols across communities. If researchers manipulate only one variable at a time, the gain in knowledge is limited to this one area under isolated conditions, and the applicability of findings to the real world may be restricted. Instead, Masterpiece Living is a CCRC-wide community-based initiative, tailored to meet the needs of each participating community. This limits the current study to observational research that monitors the self-reported performance of a group of older adults participating in a successful aging program. This design also prohibits any inference of causality, and its limited participation

structure inhibits generalization for research purposes. Nonetheless, the successful aging program itself is beneficial for establishing the feasibility of such a wide-reaching initiative, even if the current research cannot address program evaluation or intervention research issues.

Study Population

Subjects participated in the Masterpiece Living pilot program for approximately 26-months beginning in 2001. Three CCRCs initially participated in the pilot study: University Village in Tampa, FL; Freedom Village in Bradenton, FL; and Lambeth House in New Orleans, LA. Lambeth House did not wish to continue its participation in the program and as a result their data will be excluded from the analyses.

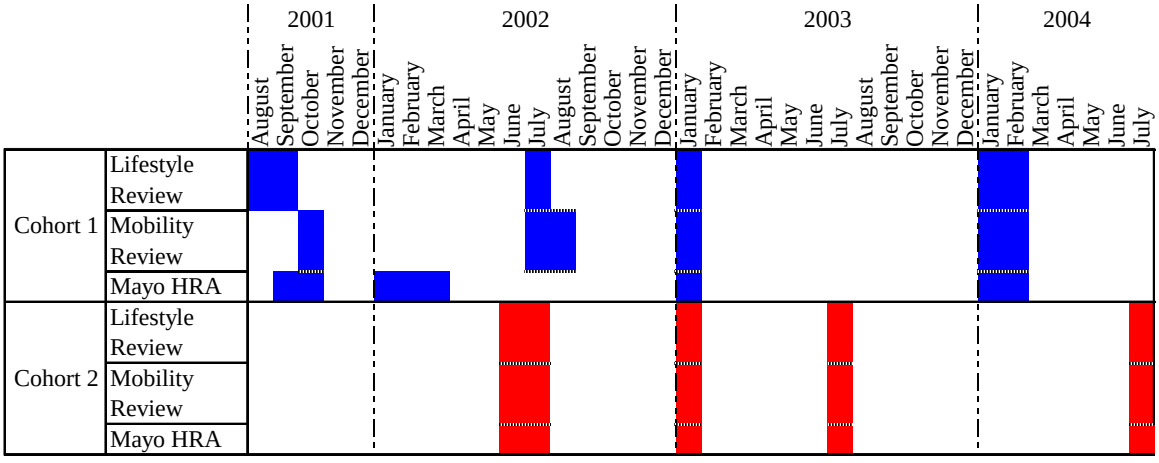
Study participants were a self-selected convenience sample of male and female residents in the independent living level of the CCRC, with an average age of 80.8 years (range 63 – 99 years). Participants were voluntarily enrolled in a successful aging program conducted at their CCRCs. They were recruited primarily through the resident board/council and their spouses, and then through volunteers after a community-wide presentation on successful aging. Roughly one-third of the volunteers were part of the resident council; the remaining two-thirds were spouses of the resident board members and other interested residents. To reduce the administrative burden on local staff, participants were enrolled in two cohorts (hereafter “cohort 1” and “cohort 2”), approximately 6-8 months apart. There were more volunteers than could be included in the pilot test. The names of the additional volunteers were noted by local staff and re-approached for enrollment approximately

one year later, when formal enrollment in Masterpiece Living was opened to the entire community. This author is unaware what percentage of those interested parties enrolled at a later date.

Data Collection

The Masterpiece dataset consists of data collected at four points over an approximately two year period: baseline (August - October 2001 for cohort 1, and June – July 2002 for cohort 2), with follow-up data collected at roughly 6-10 months (July and August 2002 for cohort 1, and January 2003 for cohort 2), just over one year (January 2003 for cohort 1 and July 2003 for cohort 2), and two years (January and February 2004 for cohort 1, and August and September 2004 for cohort 2). During these assessments, three instruments were used to collect data on successful aging: the Lifestyle Review, Mobility Review, and the Mayo Clinic Health Risk Assessment.

Figure 4. Assessment Schedule for Masterpiece Living Participants (2001 - 2004)



Instruments

The Lifestyle Review (LR) is a 134-item self-report questionnaire measuring demographic characteristics, health-related quality of life (using the SF-8 Health Survey, Ware et al., 2001), beliefs, paid and unpaid activities, social network/support, life overall, transportation, satisfaction with staff and services, moving and transitions, and additional health questions such as significant life events, memory, incontinence, sensory acuity, and advanced directives. This questionnaire is a subset of items from several established and validated instruments from resources such as the World Health Organization (WHOQOL-100), The John D. and Catherine T. MacArthur Foundation Research Network on Midlife Development (MIDMAC) and Midlife in the United States (MIDUS), the Americans Changing Lives Survey Research Center (ACL), The Multiphasic Environmental Assessment Procedure (MEAP; Moos & Lemke , 1996), The Short Form 8 (SF-8) Health Survey (Ware et al, 2001), and The Charlotte County Healthy Aging Study.

The Mobility Review (MR) is a 24-item instrument administered by a physical therapist (or other trained professional), measuring gait and balance (using the Tinetti Scale (Tinetti, 1986) and the functional reach test), speed of locomotion (using timed walk test), and upper body strength (using the timed bicep curl test).

The Mayo Clinic Health Risk Assessment (HRA) is an online, self-report assessment of health risk offered by the Mayo Clinic. It measures approximately 250 total variables, including demographic variables, medical risk factors (blood pressure,

cholesterol levels, triglycerides, blood glucose level, weight), medical conditions (arthritis, asthma, cancer, diabetes, heart disease, lung cancer, serious back problems, and migraine headaches), lifestyle risk factors (alcohol use, dietary fat, exercise, fruit and vegetable consumption, seatbelt use, stress/coping, tobacco use), and Prochaska and DiClemente's (1986) stages of readiness of change for each.

All three assessment tools were administered at each follow-up period. The Lifestyle Review, Mobility Review, and Mayo Clinic Health Risk Assessment are copyrighted materials. For more information about their availability, please contact Roger Landry, M.D. of Masterpiece Alliance Foundation at rlandry120@aol.com.

Outcome Measures

Indicators reviewed in the Introduction which were demonstrated to be important to successful aging in community-dwelling older adults aged 50 – 75 years were examined as outcomes to determine if they are relevant for those living in CCRCs with an average age of 80 years.

Exercise participation, stage of change for exercise, body mass index, stage of change for weight loss, fruit and vegetable consumption, and stage of change for fruit and vegetable consumption were measured to represent successful aging components #1: reducing risk of disease and disability (Belloc & Breslow, 1972; Damush, Stump, & Clark, 2002; Danhauer et al, 2004; Ferraro & Booth, 1999; Foote, Giuliano & Harris, 2000; Kahng, Dunkle & Jackson, 2004; Keller, Ostbye, & Goy, 2004; Krahnstoever-Davison et al, 2002; Kushi et al., 1997; Rahrig Jenkins, 2004;

Reynolds, Fredman, Langenberg, & Magaziner, 1999; Rowe & Kahn, 1998; Peel, Roderick, & Bartlett, 2005; Sorensen, Stoddard & Macario, 1998; Vaillant & Mukamal, 2001; Zamboni et al, 1999). A summary of the outcome variables for successful aging component #1, their calculation from the original instrument items, and response codes are presented in Table 1.

Self-rated health and mobility were measured as indicators of component #2: maintaining high physical and cognitive function (Belloc & Breslow, 1972; Paterson et al., 2004; Rahrig Jenkins, 2002; Rowe & Kahn, 1998; Seeman et al, 1995; Seeman, 1999; Strain et al., 2002). A summary of the outcome variables for successful aging component #2, their calculation from the original instruments, and response codes are presented in Table 2.

To examine component #3 (active engagement with life), productive activities were examined through helping and volunteerism, while social connectedness was measured via satisfaction with giving and receiving social support (Glass et al., 1995; Jang, 2002; Metropolitan Life Foundation & Independent Sector Research Report, 2000; Musick, Herzog, & House, 1999; Rahrig Jenkins, 2002; Rowe & Kahn, 1998; Sorensen, Stoddard & Macario, 1998; Van Willigan, 2000). A summary of the outcome variables for successful aging component #3, their calculation from the original instruments, and response codes are presented in Table 3.

The main effect of interest is change in the outcome variables over time, measured in months. On average, data were collected at 0.0 months (baseline), 7.2 months, 13.8 months, and 26.5 months.

Table 1. Outcomes for Successful Aging Component #1: Reducing Risk of Disease and Disability

Outcome	Scale or Item	Scale Construction	Coding of Responses
Exercise Participation	Light Exercise Participation	LR (single item scale): How frequently do you take walks or other light exercise?	1 = never 2 = once a month or less 3 = two or three times a month 4 = once or twice a week 5 = three times a week or more
	Vigorous Exercise Participation	LR (single item scale): How frequently do you take part in vigorous exercise?	1 = never 2 = once a month or less 3 = two or three times a month 4 = once or twice a week 5 = three times a week or more
	Strength Training Particiaption	LR (single item scale): How frequently do you take part in strength training exercises (lift heavy weights or use strength training equipment)?	1 = never 2 = once a month or less 3 = two or three times a month 4 = once or twice a week 5 = three times a week or more
Stage of Change for Exercise Participation	Stage of Change	HRA (single item scale): Which statemement best describes your plans for exercise participation?	0 = no plans 1 = thinking about exercising more within the next six months 2 = making plans to exercise more within the next 30 days 3 = currently involved in an exercise program to exercise more
Body Mass Index (BMI)	BMI	Standard formula for BMI, calculated using height and weight variables on HRA	continuous variable
Stage of Change for Weight Loss	Stage of Change	HRA (single item scale): Which statement best describes your plans for weight loss?	0 = no plans 1 = thinking about losing weight within the next six months 2 = making plans to lose weight within the next 30 days 3 = currently involved in a program to lose weight
Fruit and Vegetable Consumption	Fruit and Vegetable Consumption	HRA (sum of two items): servings of fruits per day + servings of vegetables per day	0 = no servings 1 = 1 serving 2 = 2 servings, etc.
Stage of Change for Fruit and Vegetable Consumption	Stage of Change	HRA (single item scale): Which statement best describes your plans for eating fruits and vegetables?	0 = no plans 1 = thinking about eating more fruits/vegetables within the next six months 2 = making plans to eat more fruits/vegetables within the next 30 days 3 = currently involved in a program to eat more fruits/vegetables

Table 2. Outcomes for Successful Aging Component #2: Maintaining High Physical and Cognitive Function

Outcome	Scale or Item	Scale Construction	Coding of Responses
Self-Rated Health	SF-8 Physical Score	Eight items summed and weighted using the Quality Metrics instructions	Continuous variable ranging from 19 - 58
	SF-8 Mental Score	Eight items summed and weighted using the Quality Metrics instructions	Continuous variable ranging from 19 - 58
Mobility	Mobility	Sum of Tinetti Gait and Balance Scale + functional reach score	Continuous variable ranging from 0 - 30

Table 3. Outcomes for Successful Aging Component #3: Active Enagagement With Life

Outcome	Scale or Item	Scale Construction	Coding of Responses
Productive Activities	Helping Inside CCRC	During the past four weeks, have you given any of the following kinds of help to residents inside this Masterpiece Community? Shop or run errands; provide transportation + help with housework/laundry + meal preparation + personal care + any other kind of help (4 item scale)	Summed and recoded into categories: 0 = no helping 1 = some helping 2 = a lot of helping 3 = a great deal of helping
	Helping Outside CCRC	During the past four weeks, have you given any of the following kinds of help to friends, relatives, or neighbors outside this Masterpiece Community? Shop or run errands; provide transportation + help with housework/laundry + childcare + meal preparation + personal care + any other kind of help (6 item scale)	Summed and recoded into categories: 0 = no helping 1 = some helping 2 = a lot of helping 3 = a great deal of helping
	Volunteering Inside CCRC	During the past four weeks, did you do any volunteer work inside this Masterpiece Community (such as committee memberships, elected office, library work, etc)? (single item scale)	0 = no 1 = yes
	Volunteering Outside CCRC	During the past four weeks, have you done any volunteer work outside this Masterpiece Community? For a church, synangogue or other religious organization + For a school or educational organization + For a senior group or similar organization + For any other organization (United Way, hospital, etc.) (4 item scale)	Summed and recoded into categories: 0 = not involved 1 = involved 2 = highly involved
Social Connectedness	Giving Social Support	How satisfied are you with your ability to help and give support to others? (single item scale)	1 = dissatisfied 2 = neither dissatisfied nor satisfied 3 = satisfied
	Receiving Social Support	How satisfied are you with your ability to get the kind of help and support from others that you need? (single item scale)	1 = dissatisfied 2 = neither dissatisfied nor satisfied 3 = satisfied

As Table 1 indicates, exercise participation was defined as the frequency of self-reported participation in light, vigorous, or strength training activities (1 = never, 2 = once a month or less, 3 = two or three times a month, 4 = once or twice a week, 5 = three times a week or more, as in the MIDMAC and ACL). Stages of motivational readiness to change for exercise were self-reported (0 = precontemplation [no plans to change], 1 = contemplation [considering change within next six months], 2 = preparation [making plans to change within 30 days], 3 = action [currently involved in a program]). Body mass index was calculated from self-reported height and

weight, analyzed as a continuous variable and interpreted where <18.5 is interpreted as underweight, 18.6 – 29.9 is interpreted as normal, and >30.0 is interpreted as obese (personal communication with Masterpiece Living Operations Workgroup, 2001). Such a classification combines the normal weight (18.5 – 24.9) and overweight (25.0 – 29.9) categories recommended by the World Health Organization (2004). Stages of motivational readiness to change for weight loss was self-reported (0 = precontemplation [no plans to change], 1 = contemplation [considering change within next six months], 2 = preparation [making plans to change within 30 days], 3 = action [currently involved in a program]). Fruit and vegetable consumption was defined as the self-reported number of servings of fruits and vegetables eaten on a typical day (1 = one serving, 2 = two servings, etc.). Stages of motivational readiness to change for fruit and vegetable consumption was self-reported (0 = precontemplation [no plans to change], 1 = contemplation [considering change within next six months], 2 = preparation [making plans to change within 30 days], 3 = action [currently involved in a program]).

As Table 2 indicates for successful aging component #2 (maintaining high physical and cognitive function), self-rated health was measured using the SF-8 (Ware, Kosinski, Dewey, & Gandek, 2001), yielding two sub-scales: physical and mental health (general population norms are 49.2 for physical health and mental health (range 19 - 58), while norms for the 75+ group were 45.5 for physical health and 52.0 for mental health. Standard deviations were less than 10 for all groups). Mobility was defined as the total of measured gait, balance, and functional reach scales, with a

range of 0 – 30 and a score below 20 considered at risk for a fall (Tinetti, 1986; personal communication with the Masterpiece Living Operations Workgroup, 2001).

As Table 3 indicates, successful aging component #3 (active engagement with life) was measured through productive activities and social connectedness. Productive activities were defined as helping and volunteering, while social connectedness was defined as satisfaction with giving and receiving social support. Informal helping was also conceptualized as two separate variables, depending on whether the helping was done inside or outside the CCRC. Helping inside the CCRC is the sum of five self-reported items asking about the type of helping (0 = no helping, 1 = some helping, 2 = a lot of helping, 3 = a great deal of helping). Helping outside the CCRC is the sum of six self-reported items asking about the type of helping done (0 = no helping, 1 = some helping, 2 = a lot of helping, 3 = a great deal of helping). Volunteering was conceptualized in two ways: self-reported volunteer activities done both inside and outside the CCRC. Volunteering inside the CCRC is a dichotomous variable (0 = no, 1 = yes), while volunteering outside the CCRC is the sum of four items asking about the location and type of volunteerism done (0 = not involved, 1 = involved, 2 = highly involved). Giving social support is defined as satisfaction with ability to help and give support to others (1 = dissatisfied; 2 = neither satisfied nor dissatisfied; 3 = satisfied). Receiving social support is defined as satisfaction with ability to get the support and help needed (1 = dissatisfied; 2 = neither satisfied nor dissatisfied; 3 = satisfied). Coding for all aggregate volunteerism, helping, and social

support outcome variables were the result of personal communication with the Masterpiece Living Operations Workgoup (2001).

Variables included in the analysis as potential predictors of baseline variability and change over time on the outcome variables include demographic characteristics, health status variables, and several additional variables previously demonstrated by the literature to be important to successful aging in younger, community dwelling elders as reviewed in the introduction (Belloc & Breslow, 1972; Damush, Stump, & Clark, 2002; Danhauer et al, 2004; Ferraro & Booth, 1999; Foote, Giuliano & Harris, 2000; Glass et al., 1995; Jang, 2002; Kahng, Dunkle & Jackson, 2004; Keller, Ostbye, & Goy, 2004; Krahnstoever-Davison et al, 2002; Kushi et al., 1997; Metropolitan Life Foundation & Independent Sector Research Report, 2000; Musick, Herzog, & House, 1999; Paterson et al., 2004; Peel, Roderick, & Bartlett, 2005; Rahrig Jenkins, 2002; Rahrig Jenkins, 2004; Reynolds, Fredman, Langenberg, & Magaziner, 1999; Rowe & Kahn, 1997; Rowe & Kahn, 1998; Seeman et al, 1995; Seeman, 1999; Sorensen, Stoddard & Macario, 1998; Strain et al, 2002; Vaillant & Mukamal, 2001; Van Willigan, 2000; Zamboni et al, 1999).

Demographic variables included age (measured in years at the baseline interview), gender (1 = female, 2 = male), marital status (1 = single, 2 = widowed, 3 = married), and community of residence (1 = University Village, 2 = Freedom Village). Health status variables include conditions (self-report of the number of conditions diagnosed by a physician), medications (total number of prescription medications reported), and blood pressure risk (BP over 140/90; Chobanian, Bakris, Black, Cushman, Green,

Izzo, Jones, Materson, Oparil, Wright Jr., Roccella, & the National High Blood Pressure Education Program Coordinating Committee, 2003). Additional variables included are health-related and non-health related self-efficacy (0 = no control of any areas, 1 = little control in some areas, 2 = moderate amount of control in some areas, 3 = control over most areas, 4 = control over all areas (based on personal communication with the Masterpiece Living Operations Workgroup, 2001), and significant life events. Significant life events were defined in two ways, one for use in the prediction of baseline values of the outcome variables, and one for use in the prediction of change over time in the outcome variables. For the baseline models, significant life events were defined as the total number of events reported in the past year at the time of the baseline interview. In the models examining change over time in the outcome variables, significant life events were defined as the total number of life events experienced within the past year, summed over the course of the study (personal communication with the Masterpiece Living Operations Workgroup, 2001). Driving status (0 = not driving, 1 = driving), life satisfaction (1 = very dissatisfied, 2 = dissatisfied, 3 = neither satisfied nor dissatisfied, 4 = satisfied, 5 = very satisfied), life happiness (1 = very unhappy, 2 = pretty unhappy, 3 = not too happy, 4 = pretty happy, 5 = very happy), and net change in physical or social activity participation (< 2 = net decline, 2 = no change, > 2 = net increase in participation) were also examined.

Statistical Analyses

To investigate successful aging among residents of CCRCs, hierarchical linear modeling (HLM; Bryk & Raudenbush, 1987, 1992) was chosen to estimate change in the physical, social, and intellectual well-being of 136 residents attempting to age successfully. Analyses include exploration of changes on the outcome variables of interest, and the correlates of those changes (predictors of intra- and inter- individual change variability). Using the proposed analysis on light exercise participation as an example, HLM allows researchers to seek answers to questions such as: What are the predictors of baseline light exercise participation (Are health, mobility, chronic conditions, self-efficacy, and stage of change predictors of baseline light exercise participation)? Did light exercise participation change over time? Did all who changed their level of participation do so uniformly, or did some improve while others declined? What are the predictors of improvement, stability, or decline in exercise participation over time (Did baseline exercise participation, health, mobility, chronic conditions, self-efficacy, and stage of change predict individual trajectories of light exercise participation over time)? Do changes in one outcome variable predict changes in another (for example, are declines in light exercise participation associated with changes in another outcome variable, such as social activity participation)?

HLM is the appropriate method to analyze data from a mixed models design, where two levels of data are of interest. Multilevel modeling is conceptually important when the study design is nested. Examples of nested designs are seen typically in education research, where students are nested within classrooms, and

there is a need to disentangle the effects of classroom from that of students. This is an example of between-subjects nesting. For this analysis, the nesting is within-subjects, where time is nested within each person, resulting in the need for a two level model where the effects of time, as well as person-level characteristics can be examined.

There are also statistical benefits to using HLM (Luke, 2004). Specifying multiple levels acknowledges that error terms for baseline and subsequent data are likely correlated; thus HLM allows the error term to be more precise than in a multiple regression model. HLM also allows the modeling of 3 or more time points, thus allowing one to see non-linear trajectories of change, if present. Another benefit of HLM is that, unlike traditional analyses that require choosing the appropriate variance-covariance matrix for the entire dataset, HLM allows each individual participant to specify its own matrix. More simply, this means that HLM allows each participant to have their own pattern of missing data, thus maximizing power. Following this same principle, HLM also allows for varying time intervals between assessments. This is particularly helpful for the Masterpiece Living dataset because people come and go from the community seasonally and may miss an assessment. There is also variability in the time between assessments for participants due to administrative lag between people and across cohorts, which HLM is able to accommodate.

Lastly, HLM pulls upon the strength of the existing data to estimate missing data for outcome variables (though cases are eliminated due to missing predictor data).

The estimation of data is based on the assumption that the data is missing at random (MAR), but it also quite robust to violations of this assumption (Bryk & Raudenbush, 1987; Raudenbush, 2001). The reality of most research is that while some data is MAR, there can be also data that are not missing at random (i.e. incomplete longitudinal data that results from the death of a participant are not MAR). So while it may be reasonable from a statistical perspective to estimate their missing data, conceptually this may seem troublesome.

In order to explore the impact of estimating missing data for participants, particularly those who died during the course of the study, the author examined differences in baseline performance between those who were alive for the whole study (n = 128) and those who participated but later died (n=8). There were no age or community of residence differences, nor were there baseline differences in 11 of the 14 outcome variables examined. The three areas where significant differences were observed were mobility, fruit and vegetable consumption, and satisfaction with one's ability to give social support to others. At baseline, those who eventually died were less mobile ($F = 10.27$, $p < .01$), ate more servings of fruits and vegetables ($F = 4.07$, $p = .05$), and were less satisfied with their ability to give social support to others ($F = 4.18$, $p = .04$). While the alive and eventually deceased subjects were more similar than different at the beginning of the study, the exercise was continued to determine whether inclusion of the eventually deceased participants impacted the mean-level growth trajectory on these outcome variables. Two outcomes were selected as tests: fruit and vegetable consumption (because the eventually deceased out-performed the

survivors) and giving social support (because the eventually deceased under-performed when compared to the surviving participants). For fruit and vegetable consumption, the results remained the same: a non-significant decline in consumption over time, with significant variability in intercept and slope (baseline score and rate of change over time). For satisfaction with giving and receiving social support the results also remained the same: a non-significant improvement over time, with significant variability in intercept and slope. Since those who eventually died were for the most part similar to those who survived at baseline, and the differences observed did not impact the growth trajectory of the sample over time, it is reasonable to conclude that the estimation of data for subjects who eventually die is both statistically and conceptually sound. Therefore, data for these eight participants were included in the present analysis.

Initially, unconditional growth models are specified to determine whether there is growth over time on the outcome variable of interest, and to determine if there is variability in the baseline score and the rate of change over time. The level one model is specified first, and models the within-subjects effect of time (changes in individuals over time on a particular outcome variable). The level 2 model is the between subjects model, where the intercept and slope in the level 1 model are allowed to vary as a function of the level 2 units.

If the unconditional growth model establishes variability in the intercept and slope, then growth models can be specified to model inter-individual (predicting baseline

scores) and intra- individual (predicting slope) variability. Essentially, there will be a different level one model estimated for each of the values of the level 2 predictors.

Level 1 Model:

$$Y = P_0 + P_1 (Time) + e$$

Level 2 Model:

$$P_0 = B_{00} + B_{01}(Predictor) + R_O$$

$$P_1 = B_{10} + B_{11}(Predictor) + R_1$$

Where Y is the outcome variable, P_0 is the intercept, P_1 is the effect of time, and e is error. In the level 2 model, P_0 and P_1 are further specified where B_{00} is the mean value of the outcome variable, controlling for the level 2 predictor, B_{01} is the effect of the level 2 predictor, R_0 is error associated with the level 2 predictor, B_{10} is the mean value of the level 1 slope, controlling for the level 2 predictor, B_{11} is the effect of the level 2 predictor, and R_1 is error associated with the level 2 predictor.

Power

Power is the term used to describe the probability of correctly rejecting the null hypothesis if an alternative hypothesis is true. Calculating power before collecting data is advisable to ensure that an adequate sample size has been obtained to reduce the risk of committing a Type II error (failing to reject the null hypothesis when it is indeed false). Another reason to calculate power is to determine if there is adequate sample size to find the effect sizes previously demonstrated in the research literature.

Most simply, statistical power means making sure that you have enough subjects to detect an effect if it occurs.

Because this dissertation involves analysis of an existing dataset, power is being calculated after the fact. Furthermore, literature on successful aging in older samples is limited, so there is no established effect size for the outcomes included in this dissertation. To provide some context, however, the effect sizes from literature on successful aging in 50 – 75 year old community-dwelling elders (as reviewed in the Introduction) were found to vary widely, ranging from .01 to .74 (Glass et al., 1995; Seeman et al., 1995).

Stevens (2001) provides a table to determine sample sizes needed for 80% power for repeated measures, which takes into account the correlation between observations over time and the anticipated effect size. A portion of that table has been adapted below (Table 4). In the current project, correlations range from .21 for satisfaction with receiving social support from others to .95 for BMI, and there are four repeated measures.

Table 4. Sample sizes needed for power = .80 (two tailed, p = .05) in a single-group repeated measures design (adapted from Stevens, 2001)

Average Correlation	Effect Size	Number of repeated measures					
		2	3	4	5	6	7
0.30	0.12	268	223	192	170	154	141
	0.30	45	39	36	32	30	29
	0.49	19	17	16	16	16	16
0.50	0.14	199	165	142	126	114	106
	0.35	34	30	27	25	24	23
	0.57	14	14	13	13	13	14
0.80	0.22	82	69	60	54	50	47
	0.56	15	14	13	13	14	14
	0.89	8	8	8	9	10	10

For example, for an average correlation of .30 over time, and a medium effect size of .30 with four repeated measures, a sample size of 36 subjects is needed. At the other end of the spectrum, if the correlation between observations over time is higher (.80), and the effect size is .22, a sample size of 60 is needed. But, if the effect size is .56, then only 13 subjects are necessary.

The sample sizes of the multivariate model range from n = 42 to n = 130. While there should be sufficient power for most of proposed analysis, each of the predictors in the multivariate models described below will be examined first in a univariate model to determine significance. The multivariate model will be built from the univariate predictors that were significant. This research project is a pilot study, and despite the possibility of being underpowered on some outcomes, these analyses can yield important results on the salience of successful aging in an older sample with an average age of 80.8 years living in CCRCs. It is important to note that the current

HLM analysis will interpret the direction of the effect only, not the magnitude, so outcome-specific determinations of power adequacy are not necessary or relevant.

RESULTS

Baseline Sample Characteristics

There are 136 participants in the current study. Because hierarchical linear modeling is able to estimate missing data for the outcome (dependent) variables, the inclusion criteria for participants in the present analyses is all people with *any* data. If participants completed any one assessment instrument across any of the four waves of data collection, their data was included in the analysis, resulting in a sample size of 136. At any given point in the study, participants could have completed one of more of the three assessment tools, but not all of them. The number of completed assessment instruments at each wave of data collection (and combinations thereof) is displayed in Table 5. Of those 136 participants, 133 completed a Lifestyle Review and 121 completed a Mobility Review at baseline. As the fourth column indicates, there were only 120 participants who completed both a Lifestyle Review *and* a Mobility Review at baseline. Therefore, 13 participants completed a Lifestyle Review but no Mobility Review, and one person completed a Mobility Review but not a Lifestyle Review. Table 5 is intended only to be a reference tool for those interested in understanding how much data was estimated. The HLM approach eliminates the bias in results due to attrition. While HLM is able to estimate outcome

variable data, it does not estimate predictor data. As a result, sample size for the predictive models will vary throughout the analyses but be clearly marked in the multivariate tables.

Table 5. Number of Participants with Completed Assessments Over Four Waves of Data Collection (2001-2003)

	Lifestyle Review	Mobility Review	Mayo Clinic HRA	LR & MR	LR & HRA	MR & HRA	All THREE assessments
Baseline	133	121	89	120	88	84	83
Six Months	106	101	53	96	51	50	49
One Year	103	99	76	98	75	72	71
Two Years	67	67	55	65	50	49	48
All Four Waves of Data	67	56	21	54	21	18	18

Table 6 displays the participation and attrition rate of participants in the study. There was a high attrition rate among participants, just short of 50% by time four. There were many causes for withdrawal from the study, including health-related concerns (10.3%), non-health related reasons such as being "too busy to take the assessments" (15.4%), moving out of the Masterpiece Community (3.0%), transitioning to a higher level of care (1.5%), and death (5.9%). The independence of CCRC residents has resulted in much interrupted participation in the successful aging program and as a result, the distinction between those who have withdrawn permanently from those who have done so temporarily (are merely missing a data point) can be difficult to delineate. By time four, 12.6% of the sample falls into this interrupted participation category. As mentioned in the Methods section, HLM estimates the missing data for the 136 participants on the outcome variables, regardless of the reason cited (interrupted participation, withdrawal, death, etc).

Table 6. Participation Rates and Reasons for Attrition (n=136)

Enrollment Status	Time 1		Time 2		Time 3		Time 4	
	n =	%	n =	%	n =	%	n =	%
Enrolled and Participating	136	100.0	108	79.4	102	75.0	69	50.7
Withdrew								
Health Reasons			12	8.8	14	10.3	14	10.3
Non-Health Reasons			7	5.2	11	8.1	21	15.4
Left CCRC (Moved Out)			2	1.5	2	1.5	4	3.0
Transitioned to Higher Care			0	0.0	0	0.0	2	1.5
Interrupted Participation			4	2.9	3	2.2	18	12.6
Deceased			3	2.2	4	2.9	8	5.9

Table 7 presents demographic and other baseline characteristics of participants included in the current analyses (n=136). The sample had a mean age of 80.8 years (52.0% of whom were octogenarians at baseline), 62.2% were female, 56.4% were married, and 60.9% of the sample had college or advanced degrees. Participants reported on average 3.2 chronic conditions at baseline and reported taking 2.6 prescription medications. Thirty-seven percent had high blood pressure (above 140/90). Just over eighty percent reported driving at baseline, and they reported moderate amounts of perceived self-efficacy and control over most health and non-health related matters. Life happiness and satisfaction were high at baselines (M = 4.2 for both, on a five point scale). Participants reported an average of 0.7 significant life events within the past year at the beginning of the study.

The second column of Table 7 indicates that at baseline, participants reported eating on average 6.0 servings of fruits and vegetables per day, and reported participating in light exercise multiple times per week (M = 4.7, SD = 0.8). While participation in vigorous and strength training exercises were less frequent Masterpiece participants still reported engaging in these activities on at least a

monthly basis (M = 3.3, SD = 1.6 and M = 2.3, SD = 1.7, respectively). The body mass index of participants was within healthy limits at baseline (M = 25.6, SD = 5.5). Participants rated their physical and mental health and mobility as high at baseline (M = 49.3 and 52.6, respectively). Participants had few mobility problems (M=26.3, SD = 3.4, range = 0 - 30). Nearly two out of three (62%) of participants reported being involved in formal volunteerism activities inside their CCRC (including committee membership, elected office, library work, etc.), whereas 40% of participants reported being involved in formal volunteerism outside their CCRC. Participants reported doing small amounts of informal helping, doing equal amounts outside their CCRC (M = 0.8, SD = 0.8) and inside their CCRC (M = 0.8, SD = 0.8). Satisfaction with ability to both give and receive social support was reported quite high at baseline (M = 2.8, SD = 0.4 and M= 2.8, SD = 0.3, respectively). With regard to the stages of change, participants were between the contemplation and preparation phase for exercise participation (M = 1.4, SD = 0.8), but between the precontemplation and contemplation phases for fruit and vegetable consumption (M = 0.5, SD = 1.0) and weight loss (M = 0.9, SD = 1.4).

Table 7. Baseline Characteristics of Masterpiece Living Participants (n = 136)

Variable	*M* (SD) or %	Variable	*M* (SD) or %
Demographic Characteristics		Outcome Variables at Baseline	
Age (in years)	80.8 (6.1)	Fruit and Vegetable Consumption	6.0 (2.7)
Gender (% female)	62.2	Exercise Participation	
Marital Status (% married)	56.4	Light	4.7(0.8)
Education		Vigorous	3.3 (1.6)
High School (%)	39.1	Strength Training	2.3 (1.7)
College (%)	35.9	Body Mass Index (BMI)	25.6 (5.5)
Graduate School (%)	25.0	Self-Rated Health	
		SF-8 Physical	49.3 (9.0)
Other Baseline Characteristics		SF-8 Mental	52.6 (7.2)
Chronic Conditions	3.2 (1.8)	Mobility	26.3 (3.4)
Medications	2.6 (1.5)	Formal Volunteerism	
Blood Pressure Risk (% at risk)	37.1	Inside CCRC	0.6 (0.5)
Driving Status (% driving)	81.4	Outside CCRC	0.5 (0.7)
Self-Efficacy		Informal Helping	
Health Related	2.8 (0.5)	Inside CCRC	0.8 (0.8)
Non-Health Related	2.5 (0.6)	Outside CCRC	0.8 (0.8)
Life Happiness	4.2 (0.7)	Social Support	
Life Satisfaction	4.2 (0.8)	Giving	2.8 (0.4)
Significant Life Events	0.7 (1.1)	Receiving	2.8 (0.3)
		Stages of Change	
		Exercise	1.4 (0.8)
		Fruit/Vegetable	0.5 (1.0)
		Weight Loss	0.9 (1.4)

Table 8 displays information about significant life events and changes in self-reported activity participation, variables that were aggregated over the four time periods of the study. Roughly one-third of the sample reported increasing their physical, social, or intellectual activities during their participation in the successful aging program. Participants also reported an average of 2.1 significant life events (death of spouse or child, accident or illness requiring hospitalization, other accident or illness, or spouse accident/illness) within the scope of the 26 month study.

Table 8. Characteristics of Masterpiece Living Participants (n = 136)

Variable	*M* (SD) or %
Net Change in Activity Participation (% increasing)	
Physical Activity Levels	37.6
Social Activity Levels	26.6
Intellectual Activity Levels	31.1
Significant Life Events (during study)	2.1 (1.7)

Mean Level Changes over Time on Outcome Measures

Table 9 displays the fixed effects portions of the unconditional growth models, where the intercept represents the mean score on the outcome variable at the midpoint of the study due to time being centered in the models. The slope displays the change per month on the outcome variable and determines whether this change is statistically significant.

Table 9: Fixed Effects Portion of Unconditional Growth Models

		Fixed Effects		
		Estimate	SE	P
Fruit and Vegetable Consumption	Intercept	5.88	0.17	< .001
	Slope	-0.02	0.01	0.202
Stage of Change for Fruit & Vegetable Consumption	Intercept	0.63	0.07	< .001
	Slope	0.02	0.01	0.016
Light Exercise	Intercept	4.60	0.06	< .001
	Slope	-0.01	0.00	0.118
Vigorous Exercise	Intercept	3.20	0.12	< .001
	Slope	-0.01	0.01	0.126
Strength Training	Intercept	2.22	0.13	< .001
	Slope	-0.01	0.01	0.283
Stage of Change for Exercise	Intercept	N/A	N/A	N/A
	Slope	N/A	N/A	N/A
BMI	Intercept	25.12	0.35	< .001
	Slope	-0.04	-0.02	0.054
Stage of Change for Weight Loss	Intercept	0.88	0.09	< .001
	Slope	-0.00	0.01	0.636
Self-Rated Health: Physical Scale	Intercept	48.60	0.76	< .001
	Slope	-0.07	0.03	0.023
Self-Rated Health: Mental Scale	Intercept	52.47	0.51	< .001
	Slope	-0.01	0.04	0.727
Mobility	Intercept	26.49	0.35	< .001
	Slope	0.02	0.02	0.426
Volunteering Inside CCRC	Intercept	0.62	0.04	< .001
	Slope	0.00	0.00	0.982
Volunteering Outside CCRC	Intercept	0.48	0.05	< .001
	Slope	-0.00	0.00	0.560
Helping Inside CCRC	Intercept	0.78	0.06	< .001
	Slope	0.00	0.00	0.847
Helping Outside CCRC	Intercept	0.81	0.06	< .001
	Slope	-0.00	0.00	0.809
Giving Social Support	Intercept	2.75	0.04	< .001
	Slope	-0.00	0.00	0.246
Receiving Social Support	Intercept	2.83	0.03	< .001
	Slope	0.00	0.00	0.035

Table 9 is the basis for Table 10, a calculated table that displays the mean values for each outcome variable at the four time points measured in the study. In general, there was no change over the 26 months, as evidenced by non-significant improvements or declines in fruit and vegetable consumption, exercise participation, BMI, the mental health scale of the SF-8, mobility, volunteerism, helping, satisfaction with giving social support to others, and stages of change for exercise and weight loss. Significant changes over time included a decline in self-rated physical health ($p = .023$) and an increase in satisfaction with receiving social support ($p = .035$). Participants also progressed through the stages of change for fruit and vegetable consumption ($p = .016$).

Table 10. Mean Level Change Over Time for Outcome Variables

Variable	Time 1 (0.0 months)	Time 2 (7.2 months)	Time 3 (13.8 months)	Time 4 (26.5 months)	P
SA Component #1:					
Reducing Risk of Disease and Disability					
Fruit and Vegetable Consumption	6.0	5.9	5.8	5.6	n.s.
Exercise Participation					
Light	4.7	4.6	4.6	4.5	n.s.
Vigorous	3.3	3.2	3.2	3.0	n.s.
Strength Training	2.3	2.2	2.2	2.1	n.s.
Body Mass Index (BMI)	25.6	25.2	25.0	24.4	n.s.
SA Component #2:					
Maintaining High Physical Function					
Self-Rated Health					
SF-8 Physical	49.3	48.8	48.3	47.4	0.023
SF-8 Mental	52.6	52.5	52.4	52.2	n.s.
Mobility	26.3	26.4	26.6	26.8	n.s.
SA Component #3:					
Engagement with Life					
Formal Volunteerism					
Inside CCRC	0.6	0.6	0.6	0.6	n.s.
Outside CCRC	0.5	0.5	0.5	0.5	n.s.
Informal Helping					
Inside CCRC	0.8	0.8	0.8	0.8	n.s.
Outside CCRC	0.8	0.8	0.8	0.8	n.s.
Social Support					
Giving	2.8	2.8	2.7	2.7	n.s.
Receiving	2.8	2.9	2.9	2.9	0.035
Stages of Change					
Exercise	1.4	1.4	1.4	1.4	n.s.
Fruit/Vegetable	0.5	0.6	0.7	0.9	0.016
Weight Loss	0.9	0.9	0.9	0.8	n.s.

After examining mean level changes over time, outcome variables were analyzed using HLM. The following results are presented in three clusters, corresponding to the three components of Rowe and Kahn's (1997) model of successful aging: 1.) reducing the risk of disease and disability, 2.) maintaining high physical and cognitive function, and 3.) active engagement with life. Within each component of successful aging, results will be broken down further by outcome variables. For each outcome variable, baseline performance will be reviewed (using baseline scores from Table

10). Next, results of random effects portion of the unconditional growth models will be presented to demonstrate the mean-level changes over time, and establish variability in the intercept (baseline performance) and slope (performance over time). Results of the unconditional growth models are presented in Tables 11, 19, and 23 (one table for each component of successful aging: Table 11 corresponds to component #1, Table 19 to component #2, and Table 23 to component #3). If there was significant variability in either intercept or slope, results of the predictive models will be presented (univariate models followed by multivariate models).

Successful Aging Component #1: Reducing Risk of Disease and Disability

Fruit and vegetable consumption, exercise participation, and body mass index (BMI) were chosen as the outcome variables to measure successful aging component #1: reducing the risk of disease and disability. Stage of change for fruit and vegetable consumption, exercise participation, and weight loss were also measured.

Table 11. Unconditional Growth Models (Random Effects Only) for Component #1: Reducing Risk of Disease and Disability

		Random Effects		
		Estimate	SD	P
Fruit and Vegetable Consumption	Intercept	1.73	1.32	< .001
	Slope	0.00	0.06	0.004
Stage of Change for Fruit & Vegetable Consumption	Intercept	0.18	0.42	< .001
	Slope	0.00	0.02	0.194
Light Exercise	Intercept	0.37	0.61	< .001
	Slope	0.00	0.02	0.003
Vigorous Exercise	Intercept	1.49	1.22	< .001
	Slope	0.00	0.02	0.144
Strength Training	Intercept	1.43	1.19	< .001
	Slope	0.00	0	> .500
Stage of Change for Exercise	Intercept	N/A	N/A	N/A
	Slope	N/A	N/A	N/A
BMI	Intercept	11.28	3.36	< .001
	Slope	0.03	0.17	< .001
Stage of Change for Weight Loss	Intercept	0.47	0.69	< .001
	Slope	0.00	0.03	0.110

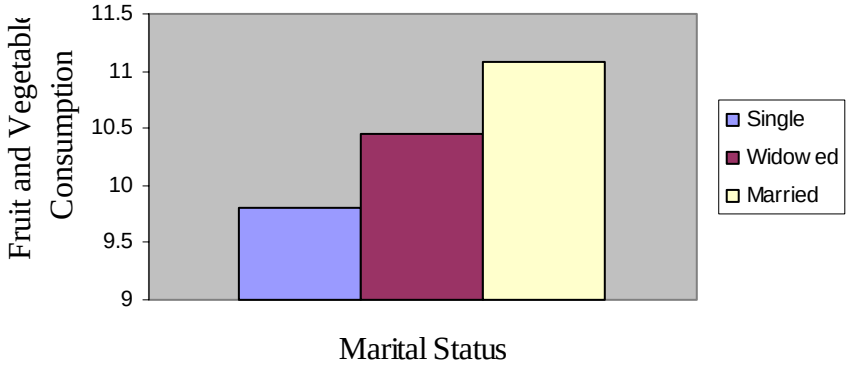
Fruit and Vegetable Consumption

At baseline, participants consumed an average 6.0 servings of fruits and vegetables per day, a healthy level of consumption that did not change significantly over 26 months. The unconditional growth model (top panel, Table 11) indicates significant variability in the intercept (baseline consumption, est. = 1.73, $p < .001$) and slope (change in consumption over time, est. = 0.00, $p = .004$). These statistics reveal that participants in a successful aging program ate significantly different amounts of fruits and vegetables at baseline, and although there was no mean-level change in fruit and vegetable consumption, individual participants had varied patterns of fruit and

vegetable consumption over time (some increased participation while others decreased). This variability was investigated initially with univariate predictive models to maximize sample size, followed by multivariate predictive models using only those variables that achieved statistical significance in the univariate predictive models.

At the univariate level, baseline fruit and vegetable consumption was predicted by marital status only (est. = 0.57, p = .043), with married participants eating more fruits and vegetables at baseline than their counterparts (Appendix A). As an example, Figure 5 displays the impact of marital status on baseline fruit and vegetable consumption. The influence of age, participation in light, vigorous, and strength training exercise activities, BMI, community of residence, gender, recent significant life events and stage of change for fruit and vegetable consumption were examined but not significant. As there was only one significant predictor of baseline fruit and vegetable consumption, a multivariate model is not necessary.

Figure 5 . Impact of Marital Status on Baseline Fruit and Vegetable Consumption



Variability in the slope for fruit and vegetable consumption was predicted by baseline consumption (est. = -0.04, $p < .001$) and life events (est. = -0.02, $p = .014$) in the univariate predictive models (Appendix A), with those eating more fruits and vegetables at baseline and those experiencing more significant life events during their participation showing greater than average declines in consumption. The influence of age, exercise participation, BMI, community, gender, marital status, net change in activity participation, and stage of change were examined but found to be non-significant.

For the multivariate model predicting changes in fruit and vegetable consumption over time, results are presented in Table 12. Only baseline fruit and vegetable consumption remained significant (est. = -0.07, $p < .001$): those who ate more at baseline showed greater than average declines in consumption over time.

Table 12. Multivariate Model for Fruit and Vegetable Consumption (n = 77)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	5.5	0.56	< .001
Marital Status	0.14	0.21	0.520
Slope			
Intercept	0.44	0.03	< .001
Baseline Fruit and Vegetable Consumption	-0.07	0.01	< .001
Life Events	-0.01	0.01	0.243

Stage of Change for Fruit and Vegetable Consumption

While there was no increase in fruit and vegetable consumption, measured by the number of servings per day, there is evidence of progress/effort on this important

health promotion variable: there was significant progression through the stages of change for fruit and vegetable consumption (Table 10). Mean stage at baseline was 0.5 (halfway between precontemplation and contemplation), with a small but statistically significant advancement through the stages of change over time (est. = 0.02, p = .016). The unconditional growth model (top panel, Table 11) suggests there was significant variability in the intercept (est. = 0.18, p < .001). The variability in slope was not significant (est. = 0.00, p = .194).

In the univariate predictive models (Appendix A), baseline stage of change was predicted by age (est. = -0.03, p = .019), BMI (est. = 0.03, p = .051), community of residence (est. = -0.33, p = .016), health-related self-efficacy (est. = 0.44, p = .051), self-reported physical health (est. = -0.02, p = .040), and stage of change for other behaviors such as exercise participation and weight loss (est. = 0.18, p = .027 and est. = 0.20, p = .003 respectively). Participants with higher BMIs, more health-related self-efficacy, and those who were further along in the stages of change were more likely to be in higher stages for fruit and vegetable consumption, while older participants, those living at Freedom Village, and those who reported poorer physical health were more likely to be early on in the stages of change. The influence of baseline fruit and vegetable consumption, gender, social support, exercise participation, mobility, and non-health related self-efficacy were tested but were not significant.

Table 13. Multivariate Model for Fruit and Vegetable Stage of Change (n = 77)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	1.24	1.70	0.467
Age	-0.01	0.02	0.614
Community	-0.23	0.16	0.144
Exercise Stage	0.11	0.08	0.191
Weight Loss Stage	0.09	0.08	0.244
BMI	0.00	0.02	0.994
Physical Health	-0.02	0.01	0.050
Health Self-Efficacy	0.39	0.14	0.006

Significant predictors from the univariate model were entered into a multivariate model to predict stage of change for fruit and vegetable consumption at baseline (Table 13). In the multivariate model, only self-rated physical health (est. = -0.02, p = .050) and health self-efficacy remained significant (est. = 0.39, p = .006). Those rating their health higher were more likely to be in the earlier stages of change, whereas those reporting higher health self-efficacy were more likely to progress further along in the stages of change for fruit and vegetable consumption.

Due to the lack of variability in the slope (Table 11), there is no need to model inter-individual differences in progression through the stages of change for fruit and vegetable consumption.

Exercise Participation

Exercise participation was defined in three ways: light exercise, vigorous exercise, and strength training exercise.

Light Exercise

Participants reported engaging in light exercise multiple times per week at baseline (M = 4.7, SD = 0.8), which is more frequently than the response of "once or twice a week" but just short of the "three times a week or more" response, and this participation level did not change significantly over time. The unconditional growth model (middle panel, Table 11) indicates significant variability in the intercept (baseline participation; est. = 0.37, $p < .001$), and slope (change in participation in light exercise over time, est. = 0.00, p = 0.003).

In the univariate models (Appendix A), higher baseline participation in light exercise was predicted by greater frequency of vigorous activity participation (est. = 0.18, $p < .001$), higher health self-efficacy (est. = 0.44, p = .001), better mobility (est. = 0.05, p = .001) and higher self-rated health (est. = 0.02, p = .019). Additionally, those with more chronic conditions reported less light activity at baseline than their counterparts (est. = -0.09, p = .045). The influence of age, strength training, gender, and stage of change, and recent significant life events were examined but were not significant.

In the univariate analyses (Appendix A), participants who reported doing more baseline light exercise (est. = -0.01, p = .001) and those who were older (est. = -0.002, p = .002) experienced greater than average declines in light exercise participation, while higher health-related self-efficacy (est. = 0.02, p = .007) and better mobility (est. = 0.004, p = .001) were protective against declines in light exercise participation. As an example, Figure 6 displays the effect of age on light exercise participation over

time. The influence of baseline strength training and vigorous exercise, chronic conditions, gender, marital status, net change in physical activity participation, self-rated health, significant life events, and stage of change for exercise participation were examined but were non-significant moderators of changes in self-reported light exercise over time.

Figure 6. Effect of Age on Light Exercise Participation Over Time

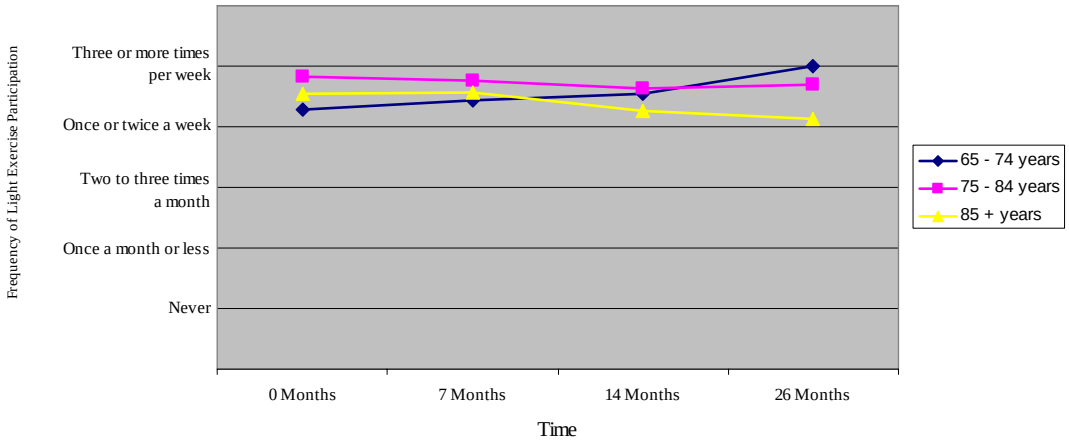


Table 14 displays the results of the multivariate model, indicating that only vigorous exercise (est. = 0.09, p = 0.017) and health self-efficacy (est. = 0.45, p = 0.006) remained as predictors of baseline light exercise. Those who did more vigorous exercise more frequently and had higher health self-efficacy did more light exercise at baseline. Simply, those who exercise do multiple types of exercise (light and vigorous).

Based on the results of the univariate models (Appendix A), a multivariate model was created to examine modifiers of light exercise participation over time. At the multivariate level, all variables remained significant except age (Table 14). Those

who were more mobile (est. = 0.01, p = 0.007) and had higher health self-efficacy (est. = 0.03, p = 0.019) showed less decline in light exercise participation over time, whereas participants who did more frequent light exercise at baseline were more likely to decrease their participation over time (est. = -0.05, p < .001).

Table 14. Multivariate Model for Light Exercise (n = 69)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	1.21	0.76	0.117
Vigorous Exercise	0.09	0.04	0.017
Chronic Conditions	0.01	0.03	0.778
Health Self-Efficacy	0.45	0.15	0.006
Mobility	0.04	0.03	0.094
Physical Health	0.01	0.01	0.098
Slope			
Intercept	0.12	0.10	0.242
Age	-0.00	0.00	0.060
Baseline Light Exercise	-0.05	0.01	< .001
Health Self-Efficacy	0.03	0.01	0.019
Mobility	0.01	0.00	0.007

Vigorous Exercise

Participants reported engaging in vigorous exercise slightly less than once per week (M = 3.3, SD = 1.6), which is slightly more frequently than "two or three times a month" but short of "once or twice a week," a level that remained constant over time. The unconditional growth model for vigorous exercise (middle panel, Table 11) indicates significant variability in the intercept (baseline participation in vigorous exercise, est. = 1.49, p < .001), but not for slope (est. = 0.00, p = .144). Therefore, the intercept will be modeled, but modeling the slope is not appropriate.

In the univariate models for the intercept (Appendix A), married participants (est. = 0.47, p = .025), those who also do more light exercises (est. = 0.51, p < .001) and strength exercises (est. = 0.33, p < .001), rate their health as better (est. = 0.04, p = .002), suffer from fewer chronic conditions (est. = -0.17, p = .034) and are more mobile (est. = 0.10, p = .003) reported doing more vigorous exercise at baseline than their counterparts. The influence of age, gender, health-related self-efficacy, recent significant life events, and stage of change for exercise participation were examined but found to be non-significant.

Multivariate analyses (Table 15) show that only strength training participation (est. = 0.26, p = .009) and mobility (est. = 0.15, p = .002) remained significant predictors of baseline participation in vigorous exercise. Those who did more strength training and were more mobile at baseline engaged in vigorous exercise more frequently than did their counterparts.

Table 15. Multivariate Model for Vigorous Exercise (n = 42)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	-2.55	1.65	0.131
Light Exercise	-0.03	0.24	0.891
Strength	0.26	0.09	0.009
Chronic Conditions	-0.03	0.09	0.777
Marital Status	0.11	0.29	0.709
Mobility	0.15	0.04	0.002
Physical Health	0.02	0.02	0.418

Strength Training Exercise

Participants reported doing strength training exercises monthly (M = 2.3, SD = 1.7), at a rate that is more frequently than "once a month or less" but not as frequent as "two or three times a month," and did not significantly change this level of participation over the 26 months studied. The unconditional growth model for strength training participation (middle panel, Table 11) suggests significant variability in the intercept (est. = 1.43, $p < .001$), but not slope (est. = 0.00, $p > .500$). Therefore, models will be created for the intercept, but no further modeling of the slope will be pursued.

Univariate predictive modeling (Table 16) revealed that more frequent participation in strength training at baseline was predicted only by frequent vigorous activity participation (est. = 0.39 $p < .001$). Participants who participated in vigorous exercise frequently at baseline also did strength training exercises more frequently than the rest of the participants. Age, baseline exercise participation, conditions, gender, health-related self-efficacy, marital status, mobility, net change in physical activity participation, self-reported health, recent significant life events, and stage of change for exercise participation were examined but found to be non-significant. As there was only one significant predictor, a multivariate model is not needed.

Table 16. Univariate Model for Strength Training (n = 125)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	0.95	0.26	0.001
Vigorous Exercise	0.39	0.07	< .001

Stage of Change for Exercise Participation

While the maintenance of physical activity in older adults is in itself a positive outcome, stage of motivational readiness to change for exercise participation was examined to determine if there were participants who were not changing their activity but increased their knowledge about why exercise is important, weighed the pros and cons of activity vs. inactivity, or developed strategies to become active that simply were not yet acted upon. Mean stage of readiness to change at baseline was 1.40 (halfway between contemplation and preparation). The no-growth model, a precursor to the unconditional growth model which examines variability collapsed across time, did not find any variability in exercise stage scores over time. This suggests that scores were similar at baseline and over time and therefore no additional analysis was conducted on this variable.

Body Mass Index

At the beginning of the successful aging program, the average participant reported a healthy body mass index (BMI) of 25.6, which declined but not significantly over 26 months to 24.4 ($p = .054$; Table 10). The unconditional growth model for BMI (bottom panel, Table 11) yields significant variability in the intercept (est. = 11.28, $p < .001$) and slope (est. = 0.03, $p < .001$).

Univariate models (Appendix A) examining baseline variability demonstrated that lower baseline BMIs were reported by older participants (est. = -0.21, $p < .001$), those with lower health self-efficacy (est. = 6.53, $p < .001$), those with higher ratings of

health (est. = -0.18, $p < .001$), and those in the earlier stages of change for weight loss (est. = 1.54, $p < .001$). Community of residence, fruit and vegetable consumption, gender, exercise participation, marital status, mobility, and recent significant life events were examined but found to be non-significant.

Variability in slope for BMI was predicted by self-reported health (est. = 0.01, $p = .002$), mobility (est. = 0.01, $p = .030$), and exercise participation (light est. = 0.02, $p = .052$; vigorous est. = 0.02, $p = .052$; net change in participation (est. = 0.10, $p = .005$). Healthier, more mobile adults, those who did more light and vigorous exercise at baseline, and those who increased their physical activity levels experienced slower than average rates of decline in BMI. Participants with higher baseline BMIs (est. = -0.03, $p < .001$), who consumed more fruits and vegetables at baseline (est. = -0.02, $p = .014$), those with higher health self-efficacy (est. = -0.41, $p < .001$), and those who were further along in the stages of readiness to change (est. = -0.06, $p = .002$) experienced greater than average declines in BMI. The influence of age, community of residence, gender, strength training, marital status, and significant life events were examined but deemed non-significant.

Table 17. Multivariate Model for Body Mass Index (n = 63)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	36.04	4.03	< .001
Age	-0.02	0.04	0.511
Health Self-Efficacy	-0.04	0.68	0.951
Physical Health	-0.20	0.04	< .001
Stage of Change	1.25	0.35	0.001
Slope			
Intercept	3.01	0.38	< .001
Baseline BMI	-0.09	0.01	< .001
Fruit and Vegetable Consumption	-0.01	0.01	0.182
Health Self-Efficacy	0.03	0.06	0.599
Light Exercise	-0.01	0.02	0.666
Mobility	0.00	0.01	0.815
Physical Activity Participation	0.04	0.03	0.301
Physical Health	-0.02	0.00	< .001
Stage of Change	0.12	0.04	0.002
Vigorous Exercise	0.00	0.01	0.690

The results of the multivariate models are presented in Table 17. Baseline self-reported physical health (est. = -0.20, $p < .001$) and stage of change for weight loss (est. = 1.25, $p = 0.001$) remained significant predictors of baseline body mass index. Participants reporting better health had lower BMIs at the beginning of the study, while those in the higher stages of change (preparation or action vs. precontemplation or contemplation) had higher BMIs at baseline. Modifiers of change in BMI over time were similar: self-reported physical health (est. = -0.02, $p < .001$), stage of change for weight loss (est. = 0.12, $p = 0.002$), and baseline BMI (est. = -0.09, $p < .001$). Those in the higher stages of change showed a slower decline in BMI than their counterparts, an unexpected finding. Those with higher baseline BMIs and

those who reported better health showed steeper declines in BMI over time than did those with lower baseline BMI.

Stage of Change for Weight Loss

Despite the slight but non-significant overall decline in BMI, there was no significant progression through the stages of motivational readiness to change for weight loss (Table 10). Mean stage score at baseline was 0.9 (mostly contemplators), and participants did not change significantly over time. The unconditional growth model (bottom panel, Table 11) indicates that there was significant variability in the intercept (est. = 0.47, $p < .001$), but not the slope (est. = 0.00, $p = .110$).

The univariate models (Appendix A) revealed that stage of change at baseline can be predicted by age (est. = -0.06, $p < .001$), BMI (est. = 0.12, $p < .001$), stage of change for fruit and vegetable consumption and exercise (est. = 0.44, $p = 0.000$ and est. = 0.31, $p = .002$, respectively), health self-efficacy (est. = 0.97, $p = .001$), and self-rated health (est. = -0.02, $p = .048$). Participants who were older and had lower self-rated health were more likely to be in the earlier stages of change for weight loss, whereas those with higher BMIs, those who were further along in the stages of change for other behaviors like fruit and vegetable consumption and exercise, and those who had higher health self-efficacy were more likely to more likely to be in the higher stages of change. Community of residence, baseline fruit and vegetable consumption, gender, social support, exercise participation, marital status, mobility, and non-health related self-efficacy were examined but were not significant predictors of baseline stage of change for weight loss.

Table 18. Multivariate Model for Stage of Change for Weight Loss (n = 77)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	-0.17	1.68	0.921
Age	-0.03	0.01	0.026
Stage of Change for Exercise	0.14	0.08	0.087
Stage of Change for Fruits and Vegetables	0.18	0.10	0.088
BMI	0.11	0.02	< .001
Physical Health	0.01	0.01	0.527
Health Self-Efficacy	0.22	0.14	0.118

The multivariate model was constructed using the significant univariate predictors (Table 18), indicating that age (est. = -0.03, p = .026) and BMI (est. = 0.11, p < .001) were the only variables that predicted baseline stage of change for weight loss after controlling for the other variables. Older participants were more likely to be in the earlier stages of change, while those with higher BMIs were more likely to be in the later stages of change.

Discussion of Successful Aging Component #1

The findings for successful aging component #1 (reducing risk of disease and disability) revealed a trend of non-significant changes in all three outcomes, fruit and vegetable consumption, exercise participation, and BMI among older adults with a mean age of 80.8 years living in a CCRC and enrolled in a successful aging program. For the stages of readiness to change, there was significant progression through the stages for fruit and vegetable consumption, but no significant change over time for exercise participation or weight loss.

The findings for fruit and vegetable consumption were not consistent with the hypothesis. The finding that baseline consumption is the main predictor of change in

consumption over time is consistent with Danhauer et al. (2004), who found greater rates of intervention success (defined as increasing fruit and vegetable intake or maintaining intake if it was at a healthy level at baseline) among those who ate fewer fruits and vegetables at baseline.

Daily fruit and vegetable consumption at baseline is similar to that of Foote, Guiliano, and Harris (2000), who found that among males and females aged 71 – 85 years, average consumption was 5.2 to 5.7 servings (respectively). Larger studies using NHANES II and Behavioral Risk Factor Surveillance System Data indicated that less than a third of older adults reported eating enough vegetables, and less than one half reported eating enough fruit for optimum health (Patterson, Block, Rosenberger, Pee, & Kahlee, 1990 (as reviewed by Wakimoto & Block, 2001); National Center for Chronic Disease Prevention and Health Promotion Centers for Disease Control and Prevention, 2005). In the current sample, approximately 70% of participants are consuming five or more servings per day.

The present findings support the pilot research of Cluskey (2001), who found that the majority of CCRC residents reported consuming adequate amounts of fruits and vegetables each day. She asserts that the nutritional deficits and weight loss reported as common among older adults should be clarified because much of the research documenting these deficits has taken place among community-dwelling elders who may not have the access and variety in foods that CCRCs residents have, or among nursing home residents, who may have significant health problems that dictate nutritional habits.

Meeting or exceeding recommended guidelines for fruit and vegetable consumption has important health benefits. A review of the health benefits of fruit and vegetable consumption (Hyson, 2002) details that consumption has been inversely related to lung, esophageal, ovarian, bladder, and oral forms of cancer. This review also reported that consumption of fruits and vegetables, as a rich source of antioxidants, folate, fiber, potassium, and flavinoids, have been consistently linked to reduced mortality and morbidity from cardiovascular disease, maintenance of health, normal blood pressure, lowered incidence of stroke, helpful for weight control and the prevention of obesity, better bone health. The relationship between fruit and vegetable consumption and cognition (including neurodegenerative diseases) has been promising in non-human research (as reviewed by Hyson, 2002).

The findings for fruit and vegetable stage of change indicated that perhaps there was a change in individuals' internal thought process about fruit and vegetable consumption, which is presumed to be a precursor of behavior change. It has been suggested that our social support network is our primary social environment, influencing what one does, the goals one sets, and what one achieves (Sorensen et al., 1998). The absence of social support as a predictor of baseline stage of change for fruit and vegetable consumption is inconsistent with Sorensen et al.'s (1998) findings that there is a significant relationship between some types of social support and being in the preparation phase. The cross-sectional nature of their study leaves one to wonder whether a person receives more support in the preparation phase, or is just more receptive to hearing the support at that time. Health-self-efficacy was a

significant predictor of fruit and vegetable stage of change in the current sample of CCRC residents, a finding which expands upon the research of Keefe et al., (2000) and Resnick & Nigg (2003) who found self-efficacy to be associated with stage of change for arthritis self-management and exercise.

For those who consumed fewer than five servings of fruits and vegetables per day, the distribution of participants across the stages of readiness to change was as follows: 54% reported being in precontemplation, 27% were in contemplation, 15% were in preparation, and only 4% reported being in the action stage. This distribution suggests that this group would be receptive to a more direct effort to educate about nutrition and impact consumption. Sorensen et al's (1998) findings reinforce the impact that environment has on an individual's attempts to change behavior. Successful aging programs such as Masterpiece Living recognize this and are attempting to change the culture of CCRCs to be more supportive of individuals' behavior change goals.

The findings for exercise participation support the possible explanation that those who are in better physical condition (better self-reported health, more mobile) and those who have higher health self-efficacy are more likely to participate in physical activities because they are physically and mentally/emotionally more capable. For light exercise, it was also demonstrated that those who were most active to begin with were the most likely to decline over time.

Interestingly enough, baseline self-reported health was not a predictor of change in light exercise participation over time, suggesting that people with varying levels of

health can maintain regular light exercise participation (though only 10.6% of the current sample reported their health as fair or poor at baseline). The importance of health self-efficacy suggests feeling more in control, more confident, and more optimistic may encourage an older adult to continue exercising despite small fluctuations in health. Also of note is the non-significant age predictor, suggesting that there may be other factors more critical to sustained participation in exercise.

Predictors of participation in strength training exercises were different from those of light and vigorous exercise, which could be attributable to the lower prevalence of participation in this activity. It is also possible that this sample of predominantly older women were less interested in strength training as a form of physical activity, which is consistent with the absence of health-related variables in the prediction of baseline participation (participation based on interest rather than ability).

The findings for exercise participation over time were not consistent with the hypothesis of increased participation. One explanation could be measurement inadequacy. Given the high rate of participation in all three types of exercise (particularly light exercise), there may be an instrument-induced ceiling effect. It is possible that the participants *are* doing more exercise, but the coding of the instrument (with "three or more times per week" being the highest frequency response option) is not able to capture these increases. For example, if an older adult was engaging in light exercise three days per week at baseline, then increased to five days – this would be improvement/increased participation, but the instrument would not be able to record this change in behavior.

The research on weight gain in later life as a result of decreased metabolic rate (and often compounded by sedentary lifestyle) is well established (Wakimoto & Block, 2001). The findings that nutritional intake (measured by fruit and vegetable consumption) did not change significantly over time but BMI did not increase (in fact, it decreased slightly but not significantly) could make a case for a real but undetected increase in activity over time. Measurement inadequacy as an explanation is reinforced by the finding that self-reported change in physical activity participation variable did not predict any of the variability in light exercise participation over time. One would expect that there would be a relationship between self-reported change in physical activity participation and changes in the self-reported frequency of exercise participation.

King (2001) suggests that the determinants of physical activity participation among older adults can be classified into three categories: personal characteristics, program factors, and environmental factors. Personal characteristics include demographic and health variables, as well as knowledge, attitudes and beliefs about physical activity, and behaviors and skills that encourage and form barriers to participation. Program factors include program structure, complexity, format, intensity, convenience, and the cost of participation, both financially and psychologically (the amount of competitiveness involved, fear of social embarrassment and self-consciousness). Environmental factors include social support from friends, family, program staff, and other exercisers – both to begin and to maintain physical activity participation, physical activity advice from physicians, and

the use of environmental cues, prompts, and incentives to promote activity participation. This and any other successful aging program will need to examine these factors, if the goal is to provide effective programming and a supportive environment for older adults to age successfully.

The importance of maintenance should not be overlooked. This sample was active in multiple types of physical activity, and their maintenance of this activity over time should be applauded. Exercise could possibly be the single most important health promotion behavior (Rowe & Kahn, 1998), as exercise participation impacts not only the avoidance of disease and disability and the maintenance of physical function, but also facilitates active engagement with life if performed in a group/social setting. Since these CCRCs increased the number of group exercise classes over the 26 month study, and added fitness equipment to the common areas, it is likely that exercise in these communities is occurring in a group setting and facilitating active engagement.

Comparison of these findings to national data is not straightforward, as most research on exercise participation examines the physical benefits of exercise, not self-reported frequency of participation. What can be garnered from the existing research, however, is that that older adults can increase their cardiorespiratory fitness, strength, and balance by participating in exercise, as infrequently as twice per week (Lazowski et al, 1999; Messier et al, 2000; Wolfson et al, 1996), and that this participation and resultant fitness can reduce mortality risk substantially (Blair et al, 1996; Kushi et al, 1997, Wei et al, 1999).

When this sample is compared to BRFSS data (National Center for Chronic Disease Prevention and Health Promotion Centers for Disease Control and Prevention, 2005), it appears this group is more active than the average Floridian over age 65 years, which may help explain why self-reported exercise participation did not increase as hypothesized. BRFSS data from 2003 indicates that 61.6% of those aged 65 and older do not meet recommended guidelines for physical activity (30 minutes per day, five or more days per week). Fifty-five percent of participants with a mean age of 80.8 years in the successful aging program were considered at risk for their failure to meet this suggested exercise guideline. It is possible that this successful aging program self-selected the more active portion of the CCRC resident population, but it is also possible that the CCRC environment is somehow more supportive of exercise habits. Without a comparison group, this explanation cannot be explored further.

The lack of progression through the stages of motivational readiness to change, coupled with the trend of consistent exercise participation over time, suggests that the participants recruited into the successful aging program were distributed across the stages of readiness to change (not clustered in preparation or action), and that the programs of the successful aging initiative may not have been stage appropriate. This is not surprising, given that the current successful aging program exemplified traditional intervention and programmatic research by focusing on interventions with action-oriented indicators of success.

The non-significant decline in BMI over time was consistent with the hypothesis of non-significant change over time. The hypothesis was based on two factors: most of the longitudinal literature on BMI spans time periods more lengthy than the current 26 month study (Himes, 2004), and the supposition that no change, perhaps even modest increases in BMI represent the positive/successful aging outcome. Though some have suggested that the optimal BMI for older adults is higher for older adults than younger adults (i.e. 24 – 29 kg/m^2) (as reviewed in Pedersen, Ovesen, Schroll, Avlund & Era, 2002), additional research is necessary to determine benchmarks for healthy BMI in this group of adults aged 80 years and older, and the implication of changes over time. Comparison of these findings to larger datasets such as the BRFSS indicate that obesity (defined as a BMI of 30.0 or greater) is 17.2% among Floridians aged 65 years and older, but slightly lower at 12.1% in the current sample.

The lack of progression through the stages of change for weight loss is likely attributable to the profile of residents participating in the pilot program. For the 53% of participants who reported being in the precontemplation stage (by indicating that they have no plans to lose weight), the slower rate of decline is predictable: There were no stage-appropriate programs for these participants, so there was no reason to expect they would report changes in BMI or progress through the stages of change. For the 15% of participants who were in the action phase (already involved in a weight loss program), the slight but non-significant decline in BMI would be achieved without progression to another stage.

Self-rated health and mobility were chosen as the outcomes to measure successful aging component #2: maintaining high physical and cognitive function.

Table 19. Unconditional Growth Models (Random Effects Only) for Component #2: Maintaining High Physical and Cognitive Function

		Random Effects		
		Estimate	SD	P
Self-Rated Health: Physical Scale	Intercept	60.91	7.80	< .001
	Slope	0.00	0.03	> .500
Self-Rated Health: Mental Scale	Intercept	18.44	4.29	< .001
	Slope	0.00	0.06	> .500
Mobility	Intercept	9.73	3.12	< .001
	Slope	0.02	0.13	0.025

Self-Rated Health

Baseline self-reported physical health scores were on average 49.3 (SD = 9.0), declining significantly and uniformly over time to 47.4 (p = .023). The unconditional growth models (top panel, Table 19) indicate significant variability in the intercept (baseline self-reported health score; est. = 60.91, p < .001) but not slope (change in self-reported health over time, est. = 0.00, p > .500). This means that participants had significant differences in their baseline self-reported health score, but over time nearly all participants declined in a similar fashion.

Univariate models of baseline variability (Appendix A) demonstrated self-reported physical health to be predicted by a number of health and social factors. Participants with higher BMIs (est. = -0.88, p < .001), higher health self-efficacy (est. = -7.50, p =

.007), those who reported being diagnosed with more chronic conditions (est. = -1.86, $p < .001$), and those who took more medications (est. = -1.52, $p = .014$) reported their physical health at baseline as lower than their counterparts, while those who were more satisfied with their ability to give social support to others (est. = 4.59, $p = .003$), those who are more mobile (est. = 0.65, $p = .001$), and those who did more light exercise (est. = 1.62, $p = .051$) or vigorous exercise (est. = 1.13, $p = .013$) reported themselves in better physical health than the rest of the sample. Age, blood pressure risk, community of residence, fruit and vegetable consumption, gender, participation in group or solitary activities, marital status, satisfaction with receiving social support, recent significant life events, and strength training were examined but found to be non-significant.

Multivariate analyses including all significant variables from the univariate predictive models suggest that only BMI (est. = -0.67, $p = .001$) and chronic conditions
(est. = -1.25, $p = .032$) influenced self-reported physical health (Table 20). Those with higher baseline BMI and more chronic conditions reported poorer health than did their counterparts.

Table 20. Multivariate Model for Physical Health (n = 75)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	49.26	10.88	< .001
BMI	-0.67	0.19	0.001
Chronic Conditions	-1.25	0.57	0.032
Giving Social Support	0.85	2.06	0.682
Health Self-Efficacy	0.24	1.48	0.871
Light Exercise	0.98	0.93	0.294
Medications	-0.34	0.69	0.626
Mobility	0.44	0.24	0.067
Vigorous Exercise	0.52	0.52	0.322

Analysis of self-reported mental health (using the mental health subscale of the SF-8) was conducted only to complement the SF-8 physical health subscale, and was not considered in the hypotheses for the study. Univariate predictive models (Appendix A) indicated that mobility, vigorous exercise participation, and giving social support were potential predictors of baseline self-reported mental health. Multivariate analysis (Table 21) revealed that only giving social support remained significant (est. = 2.37, p = .045). Participants who were more satisfied with their ability to give social support to others reported better mental health at baseline than those who were less satisfied with their abilities.

Table 21. Multivariate Model for Mental Health (n = 114)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	40.15	3.81	< .001
Giving Social Support	2.37	1.17	0.045
Mobility	0.19	0.14	0.182
Vigorous Exercise	0.27	0.32	0.413

Mobility

Participants in the successful aging program were highly mobile at baseline (M = 26.3, SD = 3.4), and this mobility did not change significantly over the 26 month study. The unconditional growth model (bottom panel, Table 19) indicated significant variability in intercept (est. = 9.73, $p < .001$) and slope (est. = 0.02, $p = .025$).

Univariate models (Appendix A) revealed that older (est. = -0.16, $p = .006$) and non-driving (est. = 2.80, $p = .003$) participants reported lower baseline mobility than did younger and driving participants, while greater mobility at baseline was observed among those who reported better health (est. = 0.16, $p < .001$), did more vigorous exercise (est. = 0.69, $p = .002$), and were more satisfied with their ability to give (est. = 2.39, $p = .001$) and receive (est. = 1.73, $p = .041$) social support. The influence of BMI, blood pressure risk, community, conditions, gender, self-efficacy, exercise participation, marital status, medications, and recent significant life events were examined but determined to be non-significant.

When investigating sources of variance in the slope for mobility, univariate models (Appendix A) indicated that older participants (est. = -0.01, $p = .003$) and those living at Freedom Village (est. = -0.21, $p < .001$) showed less improvement in mobility over time, while drivers (est. = 0.12, $p = .046$), those rating their physical health higher (est. = 0.01, $p = .011$), and people who reported doing more vigorous exercise (est. = 0.03, $p = .027$) showed more improvement than their counterparts. BMI, blood pressure risk, conditions, gender, giving and receiving social support,

self-efficacy, exercise participation, marital status, medications, net change in physical activity, and significant life events were examined but determined non-significant.

Multivariate analysis of baseline mobility indicated that age (est. = -0.14, p = .013), giving social support (est. = 2.15, p = .002), and self-reported physical health (est. = 0.10, p = .006), remained significant predictors of baseline mobility (Table 22). Younger participants, those who reported better physical health, and those who were more satisfied with their ability to give social support to others had better mobility scores at baseline.

Multivariate analysis of mobility over time revealed that only community of residence remained significant at the multivariate level (est. = -0.18, p < .001). Residents of Freedom Village showed less improvement in mobility over time than did University Village residents (Table 22).

Table 22. Multivariate Model for Mobility (n = 108)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	23.43	5.32	< .001
Age	-0.14	0.05	0.013
Driving	0.58	0.97	0.552
Giving Social Support	2.15	0.67	0.002
Receiving Social Support	0.64	0.73	0.386
Physical Health	0.10	0.04	0.006
Vigorous Exercise	0.32	0.19	0.104
Slope			
Intercept	0.46	0.41	0.271
Age	-0.00	0.01	0.443
Community	-0.18	0.05	< .001
Driving Status	0.07	0.08	0.431
Physical Health	0.00	0.00	0.642
Vigorous Exercise	0.01	0.02	0.497

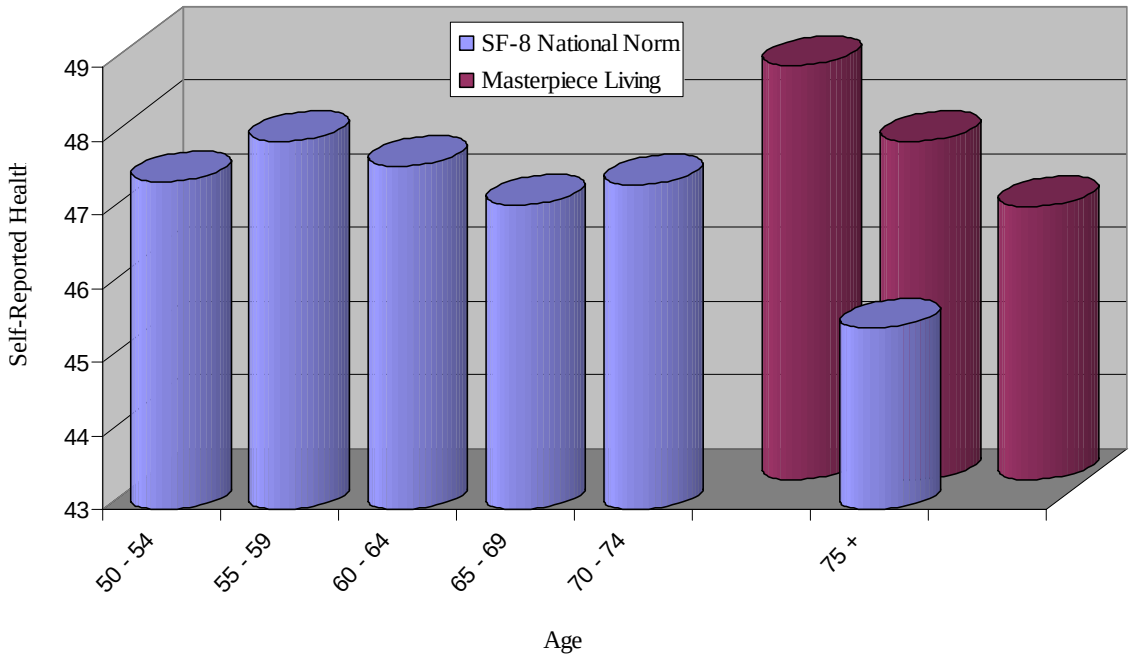
Discussion of Successful Aging Component #2

The declines in self-reported physical health were contrary to the hypothesis that health would not change significantly over time. It is possible that the author was overly-optimistic with regard to this outcome variable, and a more appropriate (yet still successful aging-friendly) hypothesis would have been that declines in self-reported health would be less dramatic than the national trends demonstrate.

When compared to national norms (Figure 7), participants in the successful aging program reported better health to begin with, more akin with that of adults 10 or more years their junior (The three darker bars in the background represent their self-rated health scores at 0 months, 14 months, and 26 months). The national data for SF-8 scores cannot be disaggregated into smaller age groups after age 75 years due to small sample size (personal communication with Quality Metrics, Inc., June, 2005). As a

result, one can conclude that the current sample rates their health high, and is similar to the national norms in their trend of declining self-rated health over time. However, one cannot determine whether the *rate* of decline in self-reported health is less steep than the rate of decline seen in the national study.

Figure 7. Self Reported Health:
Comparison of Masterpiece Data to National Norms for SF-8



It was also hypothesized that fruit and vegetable consumption would be a significant predictor of self-reported physical health at baseline and over time, similar to that of Keller, Ostbye, and Goy (2004) who found that nutritional risk was a significant predictor of good health days at baseline and follow-up. While the present study did not replicate these findings, this is possibly due to differences in measurement (a broader measure of nutritional risk versus fruit and vegetable

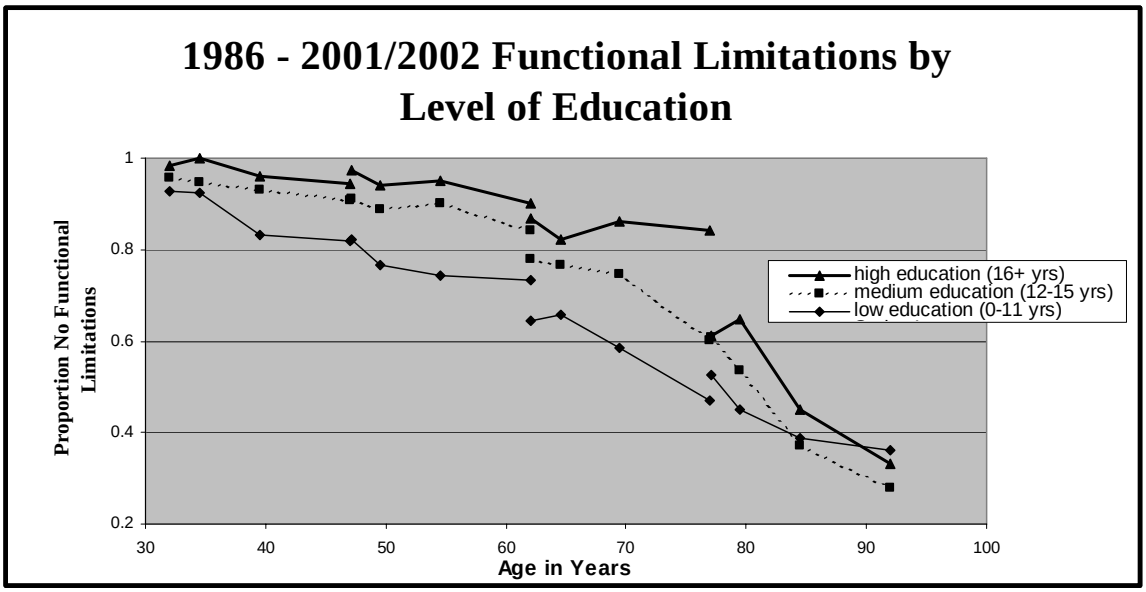
consumption, and good health days versus self-reported health). Nutritional risk may be better able to predict health than fruit and vegetable consumption due to its association with dependency, disability, social isolation, acute and chronic diseases, medication, and poverty (Saxon & Etten, 2002). The concept of nutrition, regardless of how it is measured, should not be overlooked as a potential primary or secondary health promotion program, given its potential health benefits (Hyson, 2002).

The maintenance of health, functional abilities, and ultimately independence is the over-arching goal of successful aging programs such as Masterpiece Living. The current findings suggest a number of avenues for programming to influence self-reported health (programs targeting BMI, chronic disease prevention, and mobility), but the lack of variability in the slope of self-reported health over time leaves a void as to which one has the most impact on the trajectory of health over time and should therefore be the priority for program development and evaluation.

The finding of no significant change in mobility supported the original hypothesis. The research literature, based on both large and small studies, suggested that the predominant trend is decline in functional capacity after age 80 (Figure 8, House, 2003; Black & Rush, 2002). This study explored functional capacity with a measure of gait and balance rather than ADLs/IADLs, so a direct comparison is not possible. The broader interpretation that both ADLs/IADLs and gait and balance are indicators of functional capacity is quite valuable, however. It has been suggested that changes in gait and balance may precede changes in ADL/IADL capability (personal communication with Masterpiece Living Operations Workgroup, 2001 – 2005).

Maintaining higher physical function is a major part of successful aging, and it was anticipated that a successful aging program such as Masterpiece Living would encourage exercise participation, rehabilitation therapy, and learned *in*dependence that would do much to help older adults maintain their mobility (and implied, function).

Figure 8. National Trend of Decline in Functional



Source: Americans Changing Lives

The results of Seeman et al (1995), using a subsample of the MacArthur Research Network on Successful Aging data, has measures similar to that of the current study. The findings are similar in the demonstration of maintenance of physical performance over time, with sub-groups of individuals improving and declining over time. The MacArthur sample observed 23% of the sample declining and 22% improving on the

physical performance measure. In the current sample, 28% of the current sample declined and 57% improved their mobility. The larger percentage reporting improvement in the current sample was not surprising. The goal of the MacArthur studies was to follow their sample over time and observe changes in the upper one-third (successful agers) versus all others. Since the current sample is composed of CCRC residents enrolled in a successful aging program, so one could reasonably conclude that there was a climate for change and/or an individual desire to influence this outcome variable. Seeman et al. (1995) found that moderate and/or strenuous exercise was an independent predictor of improving mobility. This was replicated in the current study in the univariate model but exercise became non-significant after controlling for the other variables in the multivariate model. Satisfaction with giving and receiving social support were significant predictors of baseline performance in the current study, but not changes in performance, as reported in Seeman et al (1995). Small sample sizes and differences in measurement of social support may be potential sources of these discrepancies.

The Seeman et al. (1999) data revealed discrepancies between the predictors of perceived and observed functional impairments, finding no relationship between baseline self-efficacy and the development of observed functional impairments. There was, however, a relationship between instrumental self-efficacy and perceived disability (as measured with self-reported Nagi and Katz items). The current study further reinforces the findings for observed functional impairments, but did not measure perceived disability. This discrepancy between perceived and observed

disability is exactly the gap that successful aging programs are attempting to address, by encouraging individuals to take more control over their health and well-being. With greater self-efficacy may come greater willingness to participate in new activities. Success at these endeavors further builds self-confidence and life experience and creates an upward self-fulfilling prophecy.

The effect of community on change in mobility is an unexpected finding, which may be attributable to differences in personnel continuity and qualifications. It is possible that residents of University Village showed greater improvements in mobility over time because their Masterpiece Coordinator is a physical therapist, and was the sole rater of performance on the Mobility Review. At Freedom Village, Mobility Reviews were conducted by a variety of individuals, including physical therapists not otherwise involved in the successful aging program, and Activities department personnel who did not have any formal physical therapy training.

Ferraro and Booth (1999) suggested that age is not the cause of onset of functional impairment in later life. Instead, they attribute functional impairment at follow-up to unhealthy BMI (either too high or too low). While the current study also did not observe any significant relationship between increasing impairment (measured by mobility) and age, these data do not show an effect of BMI on mobility. The lack of relationship between age and functional impairment has important implications, as the basic science research has long taught that advancing age is the major cause of decreasing muscle fibers over time, which leads to sarcopenia and eventually functional impairment (Saxon & Etten, 2002). The lack of a relationship between age

and functional ability is consistent with the empowering message of successful aging theory that it is never too late to begin health promotion efforts. Black and Rush (2002) found marriage to be protective against functional decline over time, though this finding was not supported in the current analysis. The mechanism through which marriage is thought to encourage health promotion is its assumption of built-in, constantly available social support. Satisfaction with giving and receiving social support were significant predictors of mobility in the univariate models, but not once other variables were controlled for in the multivariate model.

Successful Aging Component #3: Active Engagement with Life

Successful aging component #3 (active engagement with life) can be divided into two sub-parts: participation in productive activities and maintenance of strong social networks (Rowe & Kahn, 1997). Participation in productive activities was measured using four variables: formal volunteering (both inside and outside the CCRC), and helping (both inside and outside the CCRC). Maintenance of strong social ties was measured through two variables: satisfaction with giving and receiving social support.

Table 23. Unconditional Growth Models (Random Effects Oly) for Component #3: Active Engagement with Life

		Random Effects		
		Estimate	SD	P
Volunteering Inside CCRC	Intercept	0.12	0.35	< .001
	Slope	0.00	0.01	0.063
Volunteering Outside CCRC	Intercept	0.25	0.50	< .001
	Slope	0.00	0.01	0.116
Helping Inside CCRC	Intercept	0.29	0.54	< .001
	Slope	0.00	0.01	0.032
Helping Outside CCRC	Intercept	0.25	0.50	< .001
	Slope	0.00	0.02	0.289
Giving Social Support	Intercept	0.17	0.41	< .001
	Slope	0.00	0.00	> .500
Receiving Social Support	Intercept	0.04	0.20	< .001
	Slope	0.00	0.00	> .500

Formal Volunteerism

Formal volunteerism was separated into two types: volunteerism for people or groups inside the CCRC, and volunteerism for agencies and people outside the CCRC.

Volunteerism Inside the CCRC

Volunteerism inside the CCRC was quite common, with 62% of participants reporting volunteer activities at baseline, a level of involvement that remained high over the course of the study. Unconditional growth models (top panel, Table 23) revealed significant variability in the intercept (baseline volunteerism; est. = 0.12, $p < .001$) but not slope (change in volunteerism over time, est. = 0.00, $p = .063$). This means that although some participants reported more volunteering than others at the beginning of the study, all maintained their volunteerism efforts similarly over time. Predicting the sources of variance for baseline volunteerism was conducted univariately first, then multivariate models using only those variables that achieved statistical significance in the univariate predictive models.

The univariate analysis (Appendix A) revealed that predictors of volunteerism inside the CCRC included driving status (est. = 0.27, $p = .007$), self-reported health (est. 0.01, $p = .015$), mobility (est. = 0.03, $p = .007$), giving and receiving social support (est. = 0.23, $p = .002$ and est. = 0.16 $p = .059$ respectively), life happiness (est. = 0.17, $p = .026$), and life satisfaction (est. = 0.11, $p = .012$). People who drove, reported better health, were more mobile, satisfied with their ability to give and receive the social support they need, and those who were happy and satisfied with

their lives did more volunteerism inside their community. The influence of age, marital status, community, gender, and recent significant life events were examined but found to be non-significant.

All significant variables from the univariate predictive models were entered into the multivariate model, and only mobility remained significant (est. = .05, p = .004): those with better mobility reported doing more types of volunteerism inside the CCRC than did the less mobile (Table 24).

Table 24. Multivariate Model for Volunteering Inside (n = 53)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	-1.41	0.53	0.011
Driving	-0.06	0.18	0.738
Giving Social Support	-0.14	0.16	0.362
Life Happiness	-0.04	0.15	0.752
Life Satisfaction	0.15	0.12	0.252
Receiving Social Support	0.14	0.13	0.288
Mobility	0.05	0.02	0.004
Physical Health	0.01	0.01	0.392

Volunteerism Outside the CCRC

Approximately 40% of residents report volunteering for organizations that operate outside their CCRC (i.e. for religious, educational, senior, or other community organization), and this level of involvement did not change significantly over time. The unconditional growth model (top panel, Table 23) shows significant variability in the intercept (est. = 0.25, p < .001) but not slope (est. = 0.00, p = .116).

Univariate predictive models (Appendix A) indicate that baseline volunteerism outside the CCRC can be predicted by giving and receiving social support (est. =

0.24, p = .014 and est. = .35, p = .003, respectively), life happiness (est. = 0.20, p = .043), and life satisfaction (est. = 0.16, p = .010). People who were more satisfied with their ability to give and receive the social support they need and those who were happy and satisfied with their lives did more volunteerism outside their community. Age, community, driving, gender, marital status, mobility, recent significant life events, and self-rated health were examined but deemed non-significant.

In the multivariate model (Table 25), only satisfaction with receiving social support (est. = 0.33, p = 0.011) remained a significant predictor of baseline volunteerism outside the CCRC. The more satisfied participants were with their ability to receive the social support they need, the more volunteerism they did for those not living in their CCRC community.

Table 25. Multivariate Model for Volunteering Outside (n = 68)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	-1.32	0.48	0.009
Giving Social Support	0.23	0.13	0.074
Life Happiness	0.07	0.17	0.679
Life Satisfaction	-0.02	0.14	0.892
Receiving Social Support	0.33	0.12	0.011

Informal Helping

Helping Inside the CCRC

Over 60% of participants reported helping other residents inside their CCRC, a level of helping that did not change significantly over time. Unconditional growth models

(middle panel, Table 23) indicate significant variability in intercept (est. = 0.29, p < .001) and slope (est. = 0.00, p = .032).

Univariate analysis of baseline variability (Appendix A) indicated that widowed/single people (est. = -0.23, p = .025), drivers (est. = 0.33, p = .043), people who were more satisfied with their ability to give social support (est. = 0.41, p = .001) and receive social support (est. = 0.33, p = .015), and happier/more satisfied people (est. = 0.23, p = .034 and est. = 0.17, p = .020, respectively) did more helping of those living inside the CCRC. The influence of age, community, gender, mobility, recent significant life events and self-rated physical health were examined but were non-significant.

Multivariate analysis of baseline helping inside the CCRC (Table 26) indicated that only receiving social support (est. = 0.44, p = .011) and marital status (est. = -0.26, p = .040) remained significant. Those who were more satisfied with their ability to get the kind of support they need from others did more types of helping inside the CCRC than those who were less satisfied. Married participants did fewer types of helping than did single or widowed participants.

When examining variability in slope at the univariate level, people reporting better health were more likely to increase the scope of their helping behaviors inside the CCRC (est. = 0.00, p = .023). Age, community, driving, gender, giving and receiving social support, life happiness and satisfaction, marital status, mobility, significant life events, and net change in social activity participation were examined but were non-significant. Because there was only one predictor of changing helping behavior over

time, a multivariate model for slope is unnecessary. As Table 26 indicates, those reporting better health were more likely to increase the scope of their helping behaviors inside the CCRC (est. = 0.00, p = .036).

Table 26. Multivariate Model for Helping Inside (n = 61)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	-0.43	0.69	0.541
Driving	0.07	0.22	0.755
Giving Social Support	0.15	0.17	0.378
Life Happiness	0.24	0.19	0.215
Life Satisfaction	-0.21	0.18	0.242
Marital Status	-0.26	0.12	0.040
Receiving Social Support	0.44	0.17	0.011
Slope			
Intercept	-0.07	0.04	0.051
Physical Health	0.00	0.00	0.036

Helping Outside the CCRC

Sixty-four percent of participants reported some level of helping those outside their CCRC at baseline, and this level of helping did not change significantly over time. Unconditional growth models (middle panel, Table 23) indicated significant variability in intercept (est. = 0.25, p < .001), but not slope (est. = 0.00, p = .289).

Univariate analysis (Appendix A) indicated that non-drivers (est. = 0.41, p = .010) reported less helping outside at baseline than their counterparts. Participants who were more mobile (est. = 0.03, p = .028), happier with their life (est. = 0.37, p = .002), and those who were more satisfied with their ability to give and receive social support to others (est. = 0.33, p = .004 and est. = 0.35, p = .011, respectively) reported giving more help to people outside the CCRC. The influence of age, community,

gender, life satisfaction, marital status, recent significant life events, and self-rated health were examined but were not significant predictors of baseline helping.

Multivariate analysis (Table 27) indicated that none of the variables examined in this study remained significant predictors of baseline helping behaviors for those living outside the CCRC.

Table 27. Multivariate Model for Helping Outside (n = 57)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	-1.00	0.72	0.168
Driving	0.33	0.27	0.223
Giving Social Support	0.02	0.21	0.909
Life Happiness	0.23	0.15	0.131
Mobility	0.00	0.03	0.987
Receiving Social Support	0.19	0.18	0.303

Social Support

Social support was measured with two outcome variables: satisfaction with giving and receiving social support.

Giving Social Support

Satisfaction with one's ability to give social support to others was high at baseline and remained high over time. Unconditional growth modeling (bottom panel, Table 23) revealed significant variability in intercept (est. = 0.17, $p < .001$), but not slope (est. = 0.00 $p > .500$).

Univariate predictive models (Appendix A) indicated that baseline satisfaction varied among participants, with older participants (est. = -0.02, $p = .017$) and non-drivers (est. = 0.44, $p < .001$) being less satisfied with their ability to give social

support to others. People reporting better health (est. = 0.02, p < .001), higher mobility (est. = 0.04, p < .001), and those with greater non-health related self-efficacy (est. = 0.02, p = .025) were more satisfied with their ability to give social support to others at baseline. Community of residence, gender, marital status, and recent significant life events were also examined but were found to be non-significant.

Significant predictors from the univariate analysis were entered into the multivariate model (Table 28) revealing that only driving status and self-reported physical health remained significant. Drivers (est. = 0.43, p = 0.003) and those reporting better physical health (est. = 0.02, p = 0.001) were more satisfied with their ability to give social support to others at the beginning of the study.

Table 28. Multivariate Model for Giving Social Support (n = 87)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	0.99	0.79	0.219
Age	0.00	0.01	0.936
Driving	0.43	0.14	0.003
Non-Health Self-Efficacy	0.06	0.08	0.445
Physical Health	0.02	0.00	0.001
Mobility	0.02	0.01	0.178

Receiving Social Support

Participants were satisfied with their ability to receive the kind of social support they need from others at the beginning of the successful aging program, and this level of satisfaction increased over time (p = .035). Unconditional growth models (bottom

panel, Table 23) showed significant variability in baseline satisfaction (est. = 0.04, p < .001), but not slope (est. = 0.00, p > .500).

Univariate models (Appendix A) attributed variability in baseline satisfaction to community of residence (Freedom Village residents were more satisfied with receiving social support than were University Village residents, est. = 0.13, p = .007), mobility (greater mobility was linked to greater satisfaction, est. = 0.02, p = .019), and non-health related self-efficacy (those with greater self-efficacy were more satisfied with their ability to receive the social support they needed than were participants with lower self-efficacy, est. = 0.11, p = .007). Age, driving status, gender, marital status, recent significant life events, and self-rated health were examined also but found to be non-significant.

Only community (est. = 0.10, p = .038) and non-health related self-efficacy (est. = 0.13, p = .005) remained significant in the multivariate model (Table 29). Freedom Village participants and those with higher non-health related self-efficacy were more satisfied with their ability to receive the social support they need.

Table 29. Multivariate Model for Receiving Social Support (n = 117)

Fixed Effects	Estimate	SE	P
Intercept			
Intercept	2.19	0.18	< .001
Community	0.10	0.05	0.038
Non-Health Self-Efficacy	0.13	0.04	0.005
Mobility	0.01	0.01	0.220

Discussion of Successful Aging Component #3

The results for successful aging component #3 (active engagement with life) indicated that the sample of older adults with a mean age of 80.8 years living in a CCRC and enrolled in a successful aging program were active in meaningful and productive activities and were building or maintaining their social networks, as evidenced by their satisfaction with their ability to give and receive social support.

These findings were consistent with the hypothesis that participation in productive activities will remain constant or potentially increase over time. Sixty-two percent of participants reported volunteering inside the CCRC, while 40% volunteer for outside organizations. The literature on the prevalence of formal volunteerism varies from 35 - 50% in studies with mean ages around 70 years (Musick, Herzog, & House, 1999; Van Willigen, 2000) to 43% in those aged 75 years and older (Metropolitan Life, 2000). High baseline performance on the outcome variables may have created little room for increased participation. Some studies have found that there is a curvilinear effect of the benefits of civic engagement on health and well-being: some involvement produces positive outcomes, while too many hours or too much commitment to too many organizations can actually be detrimental to health (Musick et al, 1999; Van Willigan, 2000). Due to measurement restrictions, it is not possible to determine where these participants are on this curve.

In the univariate models, there was considerable overlap in the predictors of baseline participation in productive activities. Satisfaction with social support, particularly satisfaction with receiving social support, was an important predictor of

baseline engagement in productive activities. Perhaps satisfaction with receiving social support created a need to give back by helping others. It is also possible that the helping behaviors created relationships and access to support networks that increased satisfaction with receiving of social support.

Differences in the predictors of volunteering at the multivariate level could be attributable to different levels of physical demand or time commitment when volunteering inside versus outside the CCRC community. Volunteerism inside was predicted by mobility while volunteerism outside the CCRC was predicted by satisfaction with receiving social support. This finding is undocumented in the literature. The opposite relationship is more common, such as Rahrig Jenkins et al. (2002), who found a positive relationship between health-related quality of life and participation in activities outside the CCRC. It is possible that residents who are more mobile attend more activities, are witness to more of the daily operation of the CCRC, and as a result are more interested and able to volunteer inside their CCRC in capacities such as the resident board of directors. If this logic is plausible, however, it is surprising that self-reported physical health was not also a significant predictor of volunteerism inside. The role of mobility on volunteerism inside the CCRC could be explained by the policies of these communities. For example, both CCRCs in the study prohibit mobility aids in the dining rooms. These restrictions are not imposed formally by the CCRC management for other public spaces in the CCRC, but are often subtly imposed by residents. Such restrictions, whether objective or perceived, could have discouraged participation by those with mobility concerns.

Unfortunately, the lack of variability in the slope for three of the four measures of productive activities over time prevents a comprehensive examination of prediction of changes in volunteerism over time. As a result, findings cannot be compared to Glass et al. (1995) who found that being older, married, disabled, and increasing mastery were protective against declines in productive activity, while hospitalizations and stroke predicted declines in productivity. They also found that being African American, having high mastery, and high life satisfaction increased the likelihood of increasing productive activities over time. Variability in slope was significant for helping inside the CCRC however, where higher self-rated health predicted increases in the types of helping behaviors done. While causality cannot be determined in this design, this result builds on the work of Rahrig Jenkins et al. (2002) who speculate that health self-selects participation in productive activities.

Engagement in productive activities has been associated with a variety of positive outcomes such as better health, higher life satisfaction, lower mortality risk, higher self-efficacy and higher role definition and satisfaction (Musick et al., 1999; Moen et al., 2000; Van Willigen, 2000) and explains why Rowe and Kahn's (1997) model and the current successful aging program include this component.

The results for social support indicate that the sample of older adults with a mean age of 80.8 years residing in a CCRC and participating in a successful aging program were satisfied with their ability to give and receive social support, and this satisfaction remained high over time. There were different factors associated with satisfaction with one's ability to give and receive social support at baseline. For

satisfaction with giving social support, it is plausible that those who perceive themselves as healthier and those who (through their ability to drive) have better access to the outside community are more satisfied with their ability to give social support to others. However, driving status was not a significant predictor in the multivariate models for actually giving social support in the form of volunteerism and helping inside and outside the CCRC. Furthermore, it is conceivable that much social support is given to those inside the CCRC, where the ability to drive is inconsequential. It is possible that participants conceptualize their giving of social support in ways other than helping and volunteerism (largely instrumental), including emotional supports such as visiting, encouraging, talking, and listening to those in need of support.

Satisfaction with receiving social support was associated with the CCRC of residence and non-health related self-efficacy in the multivariate model. Why Freedom Village residents would feel more satisfied with their ability to receive social support is unknown. The qualities of the Masterpiece Coordinator may explain this finding, if participants interpreted this item to include CCRC staff in the term "friends and family." University Village has had two Masterpiece Coordinators during the pilot study, each with their own unique style of encouragement and program implementation, while Freedom Village has had the same Coordinator over the entire study period. The presence of self-efficacy in predicting satisfaction with giving and receiving social support (at the univariate level) reinforces the role of

modifiable risk factors in determining the health and well-being of older adults (Rowe & Kahn, 1998).

Relationships Among Changing Outcome Variables

To answer the question about whether changes in one variable are related to another (i.e. are declines in health over time related to changes in physical activity participation or volunteerism?), bivariate correlations were performed. Ideally, HLM would be used to model these relationships, but the process to do this analysis correctly is quite complicated and beyond the scope of the current project. As a result of not estimating missing data, the sample size for these analyses are smaller than the n=136 for the larger study. Change over time on each outcome variable was calculated by subtracting responses at baseline from responses at two years. Correlations between the outcome variables are presented in Table 30.

Table 30: Bivariate Correlations for Difference Scores

	Self-Reported Physical Health	Fruit and Vegetable Consumption	BMI	Light Exercise	Vigorous Exercise	Strength Training	Mobility	Volunteering Inside CCRC	Volunteering Outside CCRC	Helping Inside CCRC	Helping Outside CCRC	Giving Social Support	Receiving Social Support
Self-Reported Physical Health	1.00	0.18	-0.01	0.18	0.08	0.50**	0.08	0.09	0.18	-0.20	-0.06	0.10	0.00
Fruit and Vegetable Consumption		1.00	-0.14	1.00**	0.29*	0.35*	0.03	-0.04	0.09	0.08	0.05	0.20	0.15
BMI			1.00	-0.14	0.11	0.12	0.16	-0.08	-0.05	0.10	-0.15	0.04	0.04
Light Exercise				1.00	0.29*	0.35*	0.03	-0.04	0.09	0.08	0.05	0.20	0.15
Vigorous Exercise					1.00	0.46**	-0.31*	0.10	0.24	-0.24	-0.48**	-0.10	0.22
Strength Training						1.00	-0.07	0.12	0.19	-0.10	0.03	0.11	0.28
Mobility							1.00	-0.10	0.03	0.34*	0.28	0.29*	-0.22
Volunteering Inside CCRC								1.00	0.36*	0.15	-0.29	0.09	-0.05
Volunteering Outside CCRC									1.00	-0.10	-0.35*	-0.04	-0.22
Helping Inside CCRC										1.00	.37*	0.09	0.01
Helping Outside CCRC											1.00	0.16	-0.01
Giving Social Support												1.00	0.07
Receiving Social Support													1.00

** p < .01
* p < .05

Relationships between changes over time on the outcome variables suggest that older adults residing in a CCRC and enrolled in a successful aging program were involved in multiple forms of behavior change simultaneously, and that changes were not confined to one component of successful aging. For example, participants who reported increasing their participation in vigorous exercise activities also reported changing other behaviors important for the avoidance of disease and disability such as light exercise participation and fruit and vegetable consumption ($r = .29$, $p < .05$ for both). Unfortunately, the improvements seen for component #1 may have been at the expense of component #3, active engagement with life: increases in vigorous activity participation were associated with decreases in helping behaviors outside the CCRC ($r = -.48$, $p < .01$). There were also a number of significant relationships that suggest multiple types of behavior change within the same component of successful aging.

DISCUSSION

Summary of Findings

In a sample of older adults with a mean age of 80.8 years living in CCRCs and enrolled in a successful aging program for 26 months, analyses examined multiple outcome measures for each of the three components of Rowe and Kahn's (1997) model of successful aging. Results indicate that at baseline the participants exercised frequently, ate recommended levels of fruits and vegetables, had healthy BMIs, had positive ratings of health, were mobile, were involved in productive activities, and were satisfied with their ability to give and receive social support at baseline. Participants maintained this picture of successful aging over time for the majority of outcome variables, though significant declines in self-reported health and BMI were observed. Participants also reported improvements in their satisfaction with receiving social support.

There are four major conclusions of this dissertation. First, the results support Rowe and Kahn's (1997) model of successful aging by addressing one of the criticisms of the theory suggested that are limited numbers of people who can meet the criterion (Vaillant & Mukamal, 2001; Binstock, 2002; Bootsma-van der Weil, 2002; Strawbridge, Wallhagen, & Cohen, 2002). The results suggest that, among a convenience sample of older adults living in CCRCs, there are individuals meeting

the criteria set forth for successful aging as defined by Rowe & Kahn's three components. The sample's frequent participation in exercise, healthy consumption of fruits and vegetables, and achievement of a healthy BMI indicate that they are taking steps to reduce their risk of disease and disability. Participants' reports of good health and their high mobility scores suggest that they are maintaining high physical function, one part of successful aging component #2 (maintaining high physical and cognitive function). This sample, through their participation in numerous types of productive activities and satisfaction with social support, is an indication of their active engagement with life (successful aging component #3). This dissertation contributes to the literature on successful aging by expanding the age range and residential setting of research.

Second, stability was inferred on a number of outcome variables over the 26 month study period by virtue of a lack of significant change. While the current analysis was neither an intervention study nor a program evaluation, and therefore interpretation of these findings is limited, the broader implications of stability deserve discussion. Despite the traditional improvement-oriented focus of programmatic research, stability or maintenance of well-being over time should be viewed as a positive outcome in older age, particularly when compared to national data depicting trends of decline. Oftentimes, programmatic/intervention research focuses on improvement in the outcome variables as the sole indicator of the effectiveness of the intervention. While this is certainly appropriate in many designs, there are situations where this approach is not appropriate. For most research, the null hypothesis is no

change (stability), so demonstration of improvement is necessary to label a program successful. But for a group with an average age of 80.8 years, where at least two examples of national data indicate a trend of decline in health and function at this age, the null hypothesis may be more appropriately thought of as decline, rather than no change. As a result, demonstration of stability over time, or even a slower rate of decline represents a deviation from the null hypothesis and is therefore a successful outcome. Stability in the form of maintenance of good dietary habits, exercise participation, healthy BMI, mobility, social support, and productive activities was observed in this sample of older adults living in a CCRC, and though it cannot be interpreted as intervention research or a program evaluation, the results are meaningful and should not be overlooked.

The third conclusion is that physical, social, and intellectual well-being is predicted by a mix of physical, social, and intellectual variables. For example, the univariate models for exercise participation demonstrated that there were more than just health-related variables (i.e. self-rated health and mobility) but also non-health related variables such as self-efficacy and marital status involved in participation. The models for physical functioning demonstrate that self-reported health is an important predictor of mobility (and vice versa) but they also suggest the importance of satisfaction with giving and receiving social support. Prediction of participation in productive activities was explained by access variables such as driving status, health variables such as mobility, but also interpersonal variables such as satisfaction with

receiving social support and life satisfaction. This interdependence reinforces the three overlapping components of Rowe and Kahn's (1997) model of successful aging.

The fourth and last major conclusion is that readiness to change may play a role in successful aging, particularly in future attempts to apply the principles of Rowe and Kahn's (1997) theory. Results of the current study suggested that most participants were in the early stages of change for weight loss, exercise participation, and fruit and vegetable consumption. Stage of change was a moderator of BMI trajectory over time only, but the findings of no significant change on the other two outcomes for which stages data were available (exercise participation and fruit and vegetable consumption) may have impacted the role of stages of change in these models. The implication for the results is that the Stages of Motivational Readiness to Change Model could be a powerful tool to identify the readiness of older adults to change behaviors important to successful aging, which can inform the development of an effective and therefore successful program. Though incorporating the stages of change model further complicates the vast array of assessment and programming required for a whole person successful aging program by requiring multiple intervention strategies be created for each behavior, such an approach could have tremendous impact in terms of the number of older adults involved and impacted by the program. Furthermore, there is limited evidence that lifestyle interventions using the stages of motivational readiness to change can generate similar improvements in cholesterol, blood pressure, increased physical activity participation, and body fat percentage as structured exercise groups (Dunn et al., 1999).

Limitations

While this study represents an important expansion of the research literature on successful aging, there are three main limitations which deserve acknowledgement and discussion: limitations of the sample, the lack of either a comparison or control group, and the scope of measurement of Rowe and Kahn's (1997) model of successful aging.

The first limitation is the sample. The sample used in the current study is a small, non-representative convenience sample of residents living in CCRCs. Both Freedom Village and University Village are located in Florida, so generalizability to other geographic regions is questionable. Both are lifecare communities with similar entrance and monthly fees, so generalizability to CCRCs with different business models cannot be established. Recruiting CCRCs from across the country would do much to improve the generalizability of the findings, as well as enable analyses on the impact of community age, size, location, and fee structure on successful aging programming. These limitations to generalizability do not negate the findings for this sample however, and this research represents a necessary first step in understanding the feasibility and effectiveness of a multi-faceted successful aging program for older adults living in CCRCs.

Another sample-related limitation is the potential of a bias that early adopters of new programs often exhibit. Early adopters are commonly characterized as people who easily accept new ideas and run with them. These people see the "new" as

advancement and often become invested in promoting its success. One can speculate that the initial participants of the successful aging program, being voluntary participants and members of the resident board, are likely early adopters. If this is the case, they may have been more likely than the rest of the CCRC population to enroll in the program, participate in its activities, and perhaps even report positive outcomes. This is known as the social desirability bias and is a theoretical risk of any intervention that relies on self-report measures. The early adopter bias does not present a problem for the current results, but should be considered when attempting to expand any successful aging program beyond the initial enrollees. It is possible that it will be more difficult to recruit participants, assess them, encourage them to participate and change their behavior. To ensure the long-term viability and widespread effectiveness, a protocol that accounts for different types of potential participants should be developed. Strategies for this will be discussed in the section on future directions.

On a more positive note, there are benefits to the early adopter bias. Jacobsen (1998) reports that "because early adopters are not too far ahead of the average individual in innovativeness, they serve as a role model for many other members of a social system. The early adopter is respected by peers, embodies successful, discrete uses of new ideas, and makes judicious innovation-decisions (p. 20)" For this reason, the use of early adopters to pilot a successful aging intervention may actually do much to promote its long-term validity and viability in the larger CCRC population.

The significance of this early adopter limitation should not be inflated however. In actuality, this is typical of the medical model approach to health programming, whereby health professionals wait for interested individuals to seek out their services. These individuals are often the most motivated to make changes and may already be active in the promotion of their health. The field of public health is more aggressive in their needs assessment and recruitment of populations, and the development of tailored interventions to address the needs of specific sub-groups.

Independent of the early adopter theory, is also possible that these participants represent the most functional and motivated residents in a CCRC. As a result, there may be a ceiling effect that minimizes variance and therefore underestimates the effect sizes demonstrated. This undesirable situation is further exacerbated by small sample size, which detracts from power to reliably detect these smaller effect sizes.

The second major limitation of this research is the lack of either a comparison or a control group. It is important to acknowledge that the Masterpiece Living program was intended to be *based on* successful aging research, not *be* research. It was designed to pilot a community-wide successful aging program, with resources available to everyone in the CCRC. Therefore, there were no plans to have a either a randomized control group or a non-randomized but comparable comparison group to compare the participant results with. While this idea is now under consideration, the original design does not permit any comparison of results to non-participants.

One danger of not having a control or comparison group is the Hawthorne effect, whereby individual behavior may be altered because it is being studied. A control or

comparison group is necessary to separate this effect from that of a program or intervention. For example, in a study of successful aging, one might find that participants reported increased satisfaction with their ability to receive social support, or declines in BMI. A researcher could conclude that these changes were more than a Hawthorne Effect and a result of the successful aging program if there was a control group or comparison group for comparison purposes. If there was a Hawthorne effect, both groups might report these changes, but the magnitude of the change would be greater for those in the intervention group if the program had an effect.

A control or comparison group would also be helpful to assuage suspicions that the comprehensive assessment of the multiple domains of successful aging is somehow part of the successful aging program. Assessment should be independent from the customized feedback, group interactions, and participation in successful aging activities offered at the CCRC. Without this distinction, the design of the program would be flawed and the cause of any changes demonstrated could not be attributed to the intervention (Campbell & Stanley, 1963). To separate the effect of assessment from the successful aging program, a comparison group of non-participators within each community offering the successful aging program is necessary. This comparison group would fill out the assessments, but not receive feedback or group interaction. In such a design, differences over time on the health promotion variables could be attributed solely to the customized feedback and group interactions of the successful aging program.

The decision to incorporate a within-community comparison group of non-participators needs to be weighed carefully, however. While better than no comparison group at all, the notion of non-participators should be inherently contrary to any successful aging program, as a well-designed program of this type is attempting to change not just individual behavior but also change at the community level to impact the culture and environment. To achieve this, any successful aging program should be made available to all members of the community, independent of their participation in the formal assessment protocol. As such, a person could take part in the programming and experience improvements on the successful aging outcome of interest, but not be formally enrolled in the program. From a research perspective, this would contaminate the comparison between the experimental participants and the within-community controls. From a programmatic perspective however this represents diffusion of the innovation, which is a positive outcome.

To overcome this issue, the comparison group could also be collecting control data using a between-CCRC design, by randomizing CCRCs into two groups: those who receive the successful aging assessments and programs immediately, and a second group that would serve as a control for a specified period of time before implementing the successful aging program. With such a control group, one could attribute the cause of changes (or lack thereof) to participation in the successful aging program consisting of individualized feedback, group interaction, and goal setting – without compromising the larger community goal of culture change.

Since such a control group does not exist in this dissertation, the next best approach is to compare any results found to national data – does this sample look like the national sample at baseline? How does their trajectory over time differ from national studies? While this does not establish causality to the successful aging program, it provides some context for the findings observed.

The self-reported participation measure represented another strategy to work within the limitations associated with the absence of a comparisonl group. As previously mentioned, participation in the successful aging program offerings is conceptually different from participation in the surveys. It has been hypothesized that there will be a dose-response relationship between level of participation in programs and successful aging outcomes. The current assessment protocol includes a relatively simple, self-reported measure of participation in programs. In one question with four sub-parts, participants are asked to self-report whether their physical, social, intellectual, or spiritual activities have increased, decreased, or stayed the same in the past six months. While better than no measure of participation, the content and criterion/construct validity of this item is questionable. Content validity is a measure of whether item measures what it claims to. It is possible that the question is too broad (a naming fallacy) and therefore validity is compromised because the question could be interpreted as something larger than exercise participation. Criterion or concurrent validity is a measure of the correlation between the item and other known or accepted measures. If the participation variable had good criterion validity, it

should have been correlated with the self-reported frequency of exercise participation over time. None of the correlations were significant.

Ideally, an objective yet unobtrusive system to measure participation on a variety of levels would be available to test the dose-response hypothesis. Suggestions for unobtrusive measurement of participation include a laser to count the number of individuals entering the CCRC walking trail, analysis of food and beverage orders at the community level to approximate the popularity of successful aging-endorsed meals and monitor fruit and vegetable consumption at the community level, and motion detection or magnetic devices (similar to those used in daily resident check-ins) to monitor the number of users of community resources such as the weight training room.

The third limitation of the current study is the limited measurement of Rowe and Kahn's (1997) model of successful aging. While this dissertation represents an expansion of the research by measuring outcomes for all three components within the same study (and including potential modifiers of change over time from all three components), the outcomes measured are certainly not all-encompassing. For example, fruit and vegetable consumption, exercise participation, and BMI were selected as the variables to represent component #1: reducing risk of disease and disability. While using three outcomes for a particular construct has greater validity than using one outcome, it is not prudent to conclude that the results of these three variables accurately represent the total phenomenon of reducing disease and

disability. Additionally, nearly all of the data collected is self-reported, and subject to biases including socially desirable responses and poor recall of past behavior.

Future Directions for Successful Aging Research

This research represents one of the first attempts to track a convenience sample of older adults living in CCRCs who participated in a successful aging program over a 26 month timeframe. Two future directions for successful aging research have been described already in the limitations of the current study: the need for research on larger and more representative samples, and the need for a comparison group or randomized design to determine the impact of the successful aging program being implemented at these two CCRCs. There are four additional areas that the research on successful aging should examine: 1.) improving recruitment and programming strategies, 2.) better use of technology to collect data, 3.) incorporating community and structural level variables into the analysis of successful aging, and 4.) the process of translating research findings into effective programs.

Future successful aging research (particularly intervention studies) should attempt to improve recruitment and programming strategies. The sample enrolled in the successful aging program which was the basis for the current analyses, though it was not an intervention study, was typical of much research where a program is involved. The participants were potentially above average in terms of health, socialization, and eagerness to participate in successful aging activities. Though this group's participation and support of the program was necessary to get the new program

started, future studies need improved recruitment techniques so that a more accurate picture of the community can be analyzed. If residents who are not early adopters – those who may have more health concerns, less support, and less contact with those outside the CCRC - can be encouraged to participate formally in community-wide programs (including the assessments), the possibility of seeing even greater gains and more occurrences of stability exists. It has been suggested that use of the community leaders in the pilot study might have actually underestimated the potential effect sizes seen.

Most programmatic research and public health programming is designed for people who are in stages 3 and 4 (preparation and action) of the stages of motivational readiness to change model. Though the current research is neither an intervention study nor a program evaluation, it can be used to illustrate this issue of stage-appropriate programming. For example, offering an additional fitness class at a CCRC is an excellent program for those who need help overcoming the obstacles of getting active such as availability of classes, or need something new and different to help them stay active. However, such a program would have the potential to impact only 31% of the CCRC residents in the current study, because it is inappropriate for those in stages 1 and 2 (pre-contemplation and contemplation), which represented approximately 70% of the participants. People in these initial stages (and all stages) need stage-appropriate programming. Those in the precontemplation stage need education-oriented programs designed to raise awareness of the benefits of physical fitness. Once knowledge is raised and a person moves into the contemplation phase,

programs should focus on barriers to participation, weighing the advantages of getting active versus the risks of remaining inactive, and learning to set reasonable goals. Rather than measuring success traditionally (pre-post testing maximum repetitions, VO_2 max, etc.), successful programs for early stages can be measured by changes in knowledge, changes in decisional balance for activity/inactivity, as well as using statistical techniques to model individual growth patterns through the stages of change.

The second future direction for successful aging research is the effective use of technology to collect data. Data collection is a classic struggle for applied programmatic and intervention research. Academic research standards often call for lengthy and obtrusive data collection protocols which are can be seen as unrealistic in an applied setting, particularly when researching a complex, multi-faceted concept such as successful aging. As a result, a top priority for the future of successful aging must be new technology for unobtrusive measurement of reliable and valid data. For example, barcode software used to track medical supplies could be adapted for use in resident services such as exercise classes, consultations, meal plan utilization, etc. This system is helpful for research as a measure of participation/utilization, while simultaneously allowing the CCRC to generate reports that establish a quantifiable value for the services offered as part of the monthly maintenance fee. Another option for using technology smartly to collect data is the use of motion sensors. For example, a motion detector that would count the number of times the door to the fitness center or chapel is opened or the walking trail is entered. This technology is

quite similar to the daily "check-in" systems used at many retirement communities, and may not cause additional expense to a community. While this method does not allow individual-level analysis of participation, it enables a community-level investigation into the use of services and amenities over time.

Some types of technology have already been incorporated into research. Many organizations leverage user-friendly, web-based interfaces to facilitate seamless data collection across large numbers of research sites. Affordable products such as optically scan-able paper forms, touch-screen computer monitors, and tablet PCs can reduce the psychological and administrative burden of electronic data collection. The redundant workload of data collection and entry into local databases could be greatly reduced by better utilizing this technology. With less time spent on these tasks, more staff time can be dedicated to components of the successful aging program such as resident consultation on feedback, goal-setting, and programming. This strategy of combining cognitive and behavioral strategies to produce behavior change has determined to be more successful than either approach alone (as reviewed by King, 2001) and should be the primary focus of Masterpiece Living Coordinators, not data collection and management.

The third area that future successful aging research should address is the collection of community and structural level data. The current research project on successful aging is typical of the field in its focus on individual level statistics, a criticism noted by Riley (1998). While the above paragraphs discuss the collection of community-level participation levels, future successful aging research will need to incorporate

additional community-level statistics such as staff satisfaction and turnover rates, length of stay at each level of care, etc. Only when this data is collected can the impact of the successful aging program on the community, not just individual residents, be determined. The two must evolve simultaneously to achieve the goal of culture change.

These community-level statistics are crucial to determining the larger policy implications of successful aging programming. Newcomer, Preston, and Shock Roderick (1995) report that residents live in Baptist-run CCRCs an average of 7.75 years and 66% of these residents will need assisted living or skilled nursing care. Masterpiece Living reports that industry standards for CCRC residence is closer to 10 years, with 6 years spent in independent living, 2 years in assisted living, and 2 years in skilled nursing (personal communication with Masterpiece Living, 2005). It has been hypothesized that successful aging programming could save the senior living industry tens of thousands of dollars per resident if the combined length of stay in ALF and SNF can be reduced from four years to one year, due to the fact that lifecare residents receive subsidized care when they enter the ALF and SNF (personal communication with Masterpiece Living, 2005).

Data collection at the community level also increases the potential that a link can be established between successful aging programs in the CCRC setting and resident and staff satisfaction rates. Resident satisfaction may be impacted by participation in successful aging programs, which could lead to fewer non-health related

vacancies/move-outs, coupled by the highly coveted marketing advantage of higher rates of resident referrals for new residents.

Successful aging programs may impact staff satisfaction as well, as the theme of culture change in the two CCRCs in the current study contained messages of personal growth, possibility, and definition of staff role in the successful aging of older adults. Higher staff satisfaction rates, job involvement, and organizational commitment (including role clarity) has been associated with lower staff turnover rates (Hatton et al., 2000; Kiyak, Namazi, & Kahana, 1997; Sjoberg & Sverke, 2000). Collection of community-level data may help determine whether these findings generalizable to the independent living portion of CCRCs. Lower turnover rates could save money by reducing training costs (Waxman, Carner, & Berkenstock, 1984). Other benefits of lower turnover include creating a continuity of care not possible with higher turnover (Hatton et al., 2000), and the retention of experienced staff, which is an advantage to both the community and the residents (Hatton et al., 2000). While the industry data to create these benchmarks require additional analysis, the potential implications are obvious.

Lastly, future research on successful aging should place a high priority on effectively translating research findings into programs that can affect the lives of older adults. The available data on successful aging, though much of it is not intervention research (as is the case for the current research project), contain important implications for the design of future successful aging programs. The discussion of this issue will be limited to the implications of the current research on

future programming efforts, and cover three themes: the need to match successful aging outcomes of interest with the variables measured, the need to focus on modifiable risk factors for aging successfully, and the need to consider the importance of stability when designing programs.

The first priority for translation is the need to match outcomes of interest with the variables measured. The outcome of good nutrition as one of the actions necessary to reduce one's risk of disease and disability is a good example from the current analyses. Participants involved in the successful aging program (which was the source of the data collection efforts on which these analyses were based) were encouraged to lower their salt intake, monitor fat consumption, and eat more fruits and vegetables. Data was collected for each of these components of proper nutrition, but only fruit and vegetable consumption was prioritized for internal examination of the program, and for the current analyses. A broader definition of nutrition that includes multiple measures not only increases the validity of the measurement, but may also allow for more informed analysis and interpretation of the concept.

The second priority for translating research into programming is the focus on modifiable risk factors over those that are non-modifiable. This is consistent with the empowering message of Rowe & Kahn's (1997) theory of successful aging, which suggests that 60 - 70% of the variability in the way people age is due to lifestyle choices. There are examples of modifiable risk factors throughout the current research, particularly self-efficacy and social support. In the univariate models, both social support and self-efficacy were modifiers of baseline performance or change

over time in seven of the sixteen outcomes measured. Resnick and Nigg's (2003) work is consistent with social cognitive theory (Bandura, 1997) which suggests that self-efficacy may mediate the relationship between social support and behavior change (exercise was their focus). Programs that recognize the interplay between these two concepts could be tremendously effective at changing behavior.

Also important is the absence of non-modifiable risk factors. Gender was not a significant predictor in any of the models. Age was not a modifier of baseline exercise participation, fruit and vegetable consumption, self-rated health, satisfaction with receiving social support, and three of the four measures of productive activity participation. Age did not modify fruit and vegetable consumption over time or the amount of helping done inside the CCRC. Unfortunately, age was a significant modifier of BMI and mobility at both baseline and change over time.

Lastly, researchers hoping to encourage successful aging should consider the importance of stability in older adults when designing programs and conducting analyses. Programs with objectives to keep adults active and engaged over time are as important as those that hope to increase performance. As mentioned before, consideration should be given to whether the null hypothesis is most appropriately described as no change or decline over time.

REFERENCES

American Association of Homes and Services for the Aged (personal communication, 2003).

Anandarajah, G. (2002). Spirituality & Medical Practice. *The Newsletter of the Rhode Island Geriatric Education Center*, 1-6.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: W.H. Freeman.

Belloc, N.B., & Breslow, L. (1972). Relationship of physical health status and health practices. *Preventive Medicine, 1*, 409 – 421.

Binder, E.F., Schechtman, K.B., Ehsani, A.A., Steger-May, K., Brown, M., Sinacore, D.R., Yarasheski KE, & Holloszy JO. (2002). Effects of exercise training on frailty in community-dwelling older adults : Results of a randomized, controlled trial. *Journal of the American Geriatrics Society, 50,* 1921-1928.

Binstock, R.H. (Ed.). (2002) Book Reviews: Challenges and opportunities in the search for new models of aging. *The Gerontologist, 42(5),* 705-709.

Black, S.A., & Rush, R.D. (2002). Cognitive and functional decline in adults aged 75 and older. *Journal of the American Geriatrics Society, 50,* 1978-1986.

Blair, S.N., Kampert, J.B., Kohl, H.W., Barlow, C.E., Macers, C.A., Paffenbarger, R.S., & Gibbons, LW. (1996). Influences of cardiorespiratory fitness and other precursors on cardiovascular disease and all-cause mortality on men and women. *Journal of the American Medical Association, 276,* 205-210.

Bock, B.C., Marcus, B.H., Rossi, J.S., Redding, C.A. (1998). Motivational readiness for change: Diet, exercise, and smoking. *American Journal of Health Behavior, 22(4),* 248-258.

Bootsma-van der Weil, A., & Von Faber, M. (2002). Successful aging in the oldest old: who can be characterized as successfully aged? *The Journal of the American Medical Association, 287,* 1249.

Bryk, A.S., & Raudenbush, S.W. (1987). Application of hierarchical linear models to assessing change. *Psychological Bulletin, 101(1),* 147-158.

Burbank, P.M., Reibe, D., Padula, C.A., Nigg, C. (2002). Exercise and older adults: changing behavior with the transtheoretical model. Orthopaedic Nursing, 21(4), 51-63.

Campbell, D. T. & Stanley, J. C. (1963). *Experimental and Quasi-Experimental Designs for Research.* Chicago: Rand McNally.

Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright Jr., J.T., Roccella, E.J., & the National High Blood Pressure Education Program Coordinating Committee (2003). The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: The JNC 7 complete version. *Hypertension, 42,* 1206 – 1252.

Cluskey, M. (2001). A preliminary investigation of the food intake patterns and beliefs among independent living elderly residents in a continuing care retirement center. *Journal of Nutrition for the Elderly, 20(3),* 29-38.

Cohen MA, Tell EJ, Batten HL, & Larson MJ. (1988). Attitudes toward joining continuing care retirement communities**,** *Gerontologist, 28(5),* 637-643.

Cohen, M.A., Tell, E.J., Bishop, C.E., Wallack, S.S., & Branch, L.G. (1989). Patterns of nursing home use in a prepaid managed care system: The continuing care retirement community, *The Gerontologist, 29,* 74-80.

Conn, V.S., Valentine, J.C., & Cooper, H.M. (2002). Interventions to increase physical activity among aging adults: A meta-analysis. *Annals of Behavioral Medicine, 24,* 190-200.

Crowther, M.R., Parker, M.W., Achenbaum, W.A., Larimore, W.L., & Koenig, H.G. (2002). Rowe and Kahn's model of successful aging revisited: Positive spirituality - The forgotten factor. *The Gerontologist, 42,* 613-620.

Damush, T.M., Stump, T.E., & Clark, D.O. (2002). Body mass index and 4-year change in health-related quality of life. *Journal of Aging and Health, 14,* 195-210.

Danhauer, S.C., Oliveira, B., Myll, J., Berra, K., & Haskell, W. (2004). Successful dietary changes in a cardiovascular risk reduction intervention are differentially predicted by biopsychosocial characteristics. *Preventive* Medicine, 39, 783-790.

Dunn, A.L., Marcus, B.H., Kampert, J.B., Garcia, M.E., Kohl, H.W., Blair, S.N. (1999). Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: A randomized trial. *Journal of the American Medical Association, 218(4),* 327-334.

Enguidanos, S. (2001). Integrating behavior change theory into geriatric case management practice. *Home Health Care Services Quarterly, 20(1),* 67-83.

Ferraro, K.F., & Booth, T.L. (1999). Age, body mass index, and functional illness. *Journal of Gerontology: Social* Sciences, 54B, S339-S348.

Foote, J.A., Giuliano, A.R., & Harris, R.B. (2000). Older adults need guidance to meet nutritional recommendations. *Journal of the American College of Nutrition, 19,* 628-640.

Fowler, S.B. (1997). Health Promotion in chronically ill older adults. *Journal of Neuroscience Nursing, 29,* 39-43.

Fraser, G.E., & Shavlik, D.J. (2001). Ten years of life: Is it a matter of choice? *Archives of Internal Medicine, 161,* 1645-1652.

Freund, A.M., &Baltes, P.B. (1998). Selection, optimization, and compensation as strategies of life management: Correlations with subjective indicators of successful aging. *Psychology & Aging, 13,* 531-543.

Friedrich, D.D. (2001). *Successful aging: Integrating contemporary ideas, research findings, and intervention strategies*. Springfield, IL: Charles C. Thomas Publisher, LTD.

Fries, J.F. (1980). Aging, natural death, and the compression of morbidity. *The New England Journal of Medicine, 303,* 130-135.

Garfein, A.J., & Herzog, A.R. (1995). Robust aging among the young-old, old-old, and oldest-old. *Journal of Gerontology: Psychological and Social Sciences, 50B,* S77-S87.

Glass, T.A., Seeman, T.E., Herzog, A.R., Kahn, R., & Berkman, L.F. (1995). Change in productive activity in late adulthood: MacArthur studies of successful aging. *Journal of Gerontology: Psychological and Social Sciences, 50B,* S65-S76.

Godin, G., Lambert, L.D., Owen, N., Nolin, B., Prud'homme, D. (2004). Stages of motivational readiness for physical activity: A comparison of different algorithms of classification. *British Journal of Health Psychology, 9,* 253-267.

Gregg, E.W., Cauley, J.A., Stone, K., Thompson, T.J., Bauer, D.C., Cummings, S.R., & Ensrud, K.E. (2003). Relationship of changes in physical activity and mortality among older women. *Journal of the American Medical Association, 289,* 2379-2386.

Hatton, C., Emerson, E., Rivers, M., Mason, H., Swarbick, L., Mason, L., Kiernan, C., Reeves, D., & Alborz, A. (2001). *Journal of Intellectual Disability Research ,45(3),* 258-270.

Hill, P.C., & Pargament, K.I. (2003). Advances in the conceptualization and measurement of religion and spirituality: Implications for physical and mental health research. *American Psychologist, 58,* 64-74.

Horgas, A.L., Wilms, H.U., & Baltes, M.M. (1998). Daily life in very old age: everyday activities as expression of successful living**,** *The Gerontologist, 38,* 556-568.

Hortobagyi, T., Mizelle, C., Beam, S., & DeVita, P. (2003). Old adults perform activities of daily living near their maximal capacities. *The Journals of Gerontology: Medical Sciences, 58A,* 453-460.

House, James S. AMERICANS' CHANGING LIVES: WAVES I, II, AND III, 1968, 1989, and 1994 [Computer file]. ICPSR version. Ann Arbor, MI: University of Michigan, Institute for Social Research, Survey Research Center [producer], 2002. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2003.

Hyson, D. (2002). The health benefits of fruits and vegetables: A scientific overview for health professionals. Produce for Better Health Foundation. Available at http://www.5aday.org/pdfs/research/health_benefits.pdf. Accessed June 2005.

Jacobsen, D.M. (1998). Adoption Patterns and Characteristics of Faculty Who Integrate Computer Technology for Teaching and Learning in Higher Education. Dissertation. Available at http://www.ucalgary.ca/~dmjacobs/phd/diss/index.html Accessed June 3, 2005.

Jang, Y., Haley, W.E., Small, B.J., & Mortimer, J.A. (2002). The role of mastery and social resources in the associations between disability and depression in later life. *The Gerontologist, 42,* 807-813.

Kahng, S.K., Dunkle, R.E., & Jackson, J.S. (2004). The relationship between the trajectory of body mass index and health trajectory among older adults: Multilevel modeling analyses. *Research on Aging, 26(1),* 31-61.

Katz ,S., Branch, L.G., & Branson, M.H. (1983). Active life expectancy. *New England Journal of Medicine, 309,* 1218-1224.

Kaplan, R.M. (1994). Presidential Address: The ziggy theorem: Toward an outcomes-focused health psychology. *Health Psychology, 13,* 451-460.

Keefe, F.J., Lefebvre, J.C., Kerns, R.D., Rosenberg, R., Beaupre, P., Prochaska, J., Prochaska, J.O., & Caldwell, D.S. (2000). Understanding the adoption of arthritis self-management: Stages of change profiles among arthritis patients. *Pain, 87,* 303-313.

Kelemen, L. (2004). *Association of vegetables, fruits, and anti-oxidant vitamins with non-hodgkins lymphoma: A population-based case control study.* Presented at the annual meeting for the American Association for Cancer Research, Seattle, WA.

Keller, H.H., Ostbye, T., & Goy, R. (2004). Nutritional risk predicts quality of life in elderly community-living Canadians. *The Journals of Gerontology: Medical Sciences, 59A,* 68-74.

King, A.C. (2001). Interventions to promote physical activity by older adults. *Journals of Gerontology Series A, Special Issue 2, 56,* 36 – 46.

Kiyak, H.A., Namazi, K.H., & Kahana, E.F. (1997). Job commitment and turnover among women working in facilities serving older persons. *Research on Aging, 19(2),* 223-246.

Krahnstoever Davison, K., Ford, E.S., Cogswell, M.E., & Dietz, W.H. (2002). Percentage of body fat and body mass index are associated with mobility limitations in people aged 70 and older from NHANES III. *Journal of the American Geriatrics Society, 50,* 1802-1809.

Krout, J. A., Oggins, J., & Holmes, H.H. (2000). Patterns of service use in a continuing care retirement community. *The Gerontologist, 40(6),* 698-705.

Kushi, L.H., Fee, R.M., Folsom, A.R., Mink, P.J., Anderson, K.E., & Sellers, T.A. (1997). Physical activity and mortality in postmenopausal women. *Journal of the American Medical Association, 277,* 1287-1292.

Laforge, R.G., Rossi, J.S., Prochaska, J.O., Velicer, W.F., Levesque, D.A., & McHorney, C.A. (1999). Stage of regular exercise and health-related quality of life. *Preventive Medicine, 28,* 349-360.

Lansford, J.E., Sherman, A.M., & Antonucci, T.C. (1998). Satisfaction with social networks: an examination of socioemotional selectivity theory across cohorts. *Psychology and Aging, 13,* 544-552.

Lazowski, D.A., Ecclestone, N.A., Myers, A.M., Paterson, D.H., Tudor-Locke, C., Fitzgerald, C., Jones, G., Shima, N., & Cunningham, D.A. (1999). A randomized outcome evaluation of group exercise programs in long-term care institutions. *The Journals of Gerontology: Medical Sciences, 54A,* M621-M628.

Lee, C. (1993). Attitudes, knowledge, and stages of change: A survey of exercise patterns in older Australian women. *Health Psychology, 12(6),* 476-480.

Luchetti, M., & Cerasa, F. (2002). Performance evaluation of health promotion in aging. *Educational Gerontology, 28,* 1-13.

Luke, D.A. (2004). Multilevel modeling. Series: Quantitative applications in the social sciences. Thousand Oaks, CA: Sage Publications.

Marcus, B.H. & Forsyth, L.H. (2003). *Physical Activity Intervention Series: Motivating People to Be Physically Active*. Champaign, Il: Human Kinetics.

Masoro, E.J. (2001). Successful aging - useful or misleading concept? *The Gerontologist, 41,* 415-418.

Metropolitan Life Foundation & Independent Sector. America's Senior Volunteers. 2000: Available at www.independentsector.org. Accessed October 10, 2004.

Messier, P., Royers, T.D., Craven, T.E., O'Toole, L., Burns, R., & Ettinger, W.H. (2000). Long- term exercise and its effect on balance in older, osteoarthritic adults: Results from the fitness, arthritis, and seniors trial (FAST). *Journal of the American Geriatrics Society, 48,* 131-137.

Miller, E.T., & Spilker, J. (2003). Readiness to change and brief educational interventions: Successful strategies to reduce stroke risk. *Journal of Neuroscience Nursing, 35(4),* 215-222.

Moen, P., Erickson, M.A., & Dempster-McClain, D. (2000). Social role identities among older adults in a continuing care retirement community. *Research on Aging, 22,* 559-579.

Molaison, E.F. (2002). Stages of change in clinical nutrition practice. *Nutrition in Clinical Care*, 5(5), 251-257.

Moody, H.R. (2002). The soul of gerontology: Reconciling science and religion. *The Gerontologist, 42,* 713-716.

Moos, R.H., & Lemke, S. (1996). *Evaluating residential facilities: The multiphasic environmental assessment procedure.* Thousand Oaks, CA: Sage Publications.

Musick, M.A., Herzog, A.R., & House, J.S. (1999). Volunteering and mortality among older adults: findings from a national sample. *The Journals of Gerontology: Social Sciences, 54B,* S173-S180.

National Center for Chronic Disease Prevention and Health Promotion Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System: technical information and data. Available at: http://www.cdc.gov/brfss and http://apps.nccd.cdc.gov/brfss/age.asp?cat=FV&yr=2003&qkey=4415&state=FL. Accessed June 1, 2005.

Newcomer, R., Preston, S., & Schock Roderick, S. (1995). Assisted living and nursing unit use among continuing care retirement community residents. *Research on Aging, 17(2),* 149 – 167.

Neugarten, B.L., & Havinghurst, R.J., Tobin, S.S. (1961). The measurement of life satisfaction. *The Journals of Gerontology, 16,* 134-143.

Nigg, C.R., Burbank, P.M., Padula, C., Dufresne, R., Rossi, J.S., Velicer, W.F., Laforge, R.G., & Prochaska, J.O. (1999). Stages of change across ten health risk behaviors for older adults. *The Gerontologist, 39,* 473-482.

Ostir, G.V., Markides, K.S., Black, S.A., & Goodwin, J.S. (2000). Emotional well-being predicts subsequent functional independence and survival. *Journal of the American Geriatrics Society, 48,* 473-378.

Parker, M.W., Bellis, J.M., Bishop, P., Harper, M., Allman, R.M., Moore, C., & Thompson, P. (2002). A multidisciplinary model of health promotion incorporating spirituality into a successful aging intervention with african american and white elderly groups. *Gerontologist, 42(3),* 406 – 415.

Parker, M.W., Fuller, G.F., Koenig, H.G., Bellis, J.M., Vaitkus, M.A., Barko, W.F., Eitzen, J. (2001). Soldier and family wellness across the life course: A developmental model of successful aging, spirituality, and health promotion, Part II. *Military Medicine, 166(7),* 561-570.

Paterson, D.H., Govindasamy, D., Vidmar, M., Cunningham, D.A., & Koval, J.J. (2004). Longitudinal study of determinants of dependence in an elerly population. *Journal of the American Geriatrics Society, 52,* 1632-1638.

Patterson B.H., Block, G., Rosenberger W.F., Pee, D., & Kahle, L.L. (1990). Fruit and vegetables in the American diet: Data from NHANES II survey. *American Journal of Public Health, 80,* 1443-1449.

Pedersen, A.N., Ovesen, L., Schroll, M., Avlund, K., & Era, P. (2002). Body composition of 80-years old men and women and its relation to muscle strength, physical activity and functional ability. *The Journal of Nutrition, Health & Aging, 6(6),* 413-420.

Peel, N.M., Roderick, R.J., & Bartlett, H.P. (2005). Behavioral determinants of healthy aging. *American Journal of Preventive Medicine, 28(3),* 298 – 304.

Popa, M.A. (2005). Stages of change for osteoporosis preventive behaviors: A construct validation study. *Journal of Aging and Health, 17(3),* 336-350.

Prochaska, J.O., & DiClemente, C.C. (1986). Towards a comprehensive model of change. In W.R. Miller & N. Heather (Eds.), *Treating addictive behaviors: Processes of change* (pp 3-27). New York: Wiley.

Prochaska, J.O., & Velicer, W.F. (1997). The transtheoretical model of health model of health behavior change. *American Journal of Health Promotion, 12(1),* 38-48.

Rahrig Jenkins, K.A., & Mehraban, P. (2002). "Activity and health-related quality of life in continuing care retirement communities." *Research on Aging, 24,* 124-149.

Rahrig Jenkins, K. (2004). Body-weight change and physical functioning among young old adults. *Journal of Aging and Health, 16,* 248-266.

Ramamurti, P.V., Jamuna, D., Reddy, L.K. (1992). Improving human resources among the elderly: Effect of an intervention. *Journal of Personality & Clinical Studies, 8(1-2),* 77-79.

Raudenbush, S.W. (2001). Comparing personal trajectories and drawing causal inferences from longitudinal data. *Annual Review of Psychology, 52,* 501-525.

Rebok, G.W., & Plude, D.J. (2001). Relation of physical activity to memory functioning in older adults: The memory workout program. *Educational Gerontology, 27,* 241-259.

Resnick, B., & Nigg, C. (2003). Testing a transtheoretical model of exercise behavior for older adults. *Nursing Research,* 52(2), 80-88.

Reynolds, M.W., Fredman, L., Langenberg, P., & Magaziner, J. (1999). Weight, weight change, and mortality in a random sample of older community dwelling women. *Journalof the American Geriatrics Society, 47,* 1409-1414.

Riley, M.W. (1998). Successful aging**,** *Gerontologist 38,* 151.

Rogers, R.L., Meyer, J.S., & Mortel, K.F. (1990). After reaching retirement age physical activity sustains cerebral perfusion and cognition. *Journal of the American Geriatrics Society, 38,* 123-128.

Rowe, J.W., & Kahn, R.L. (1987). Human aging: usual and successful. *Science, 237,* 143-149.

Rowe, J.W., & Kahn, R.L. (1997) Successful aging, *The Gerontologist, 37,* 433-440.

Rowe, J.W. & Kahn, R.L. (1998). *Successful Aging*. New York, NY: Pantheon Books.

Rowe, J.W., & Seeman, T. (2000). The effect of race and health-related factors on naming and memory: The MacArthur studies of successful aging. *Journal of Aging & Health, 12,* 69-89.

Ruchlin, H.S., Morris, J., & Morris, S. (1993). Resident medical care utilization patterns in continuous care retirement communities. *Health Care Financing Review, 14(4):* 151-67.

Ryff, C.D. (1982). Successful aging: a developmental approach, *The Gerontologist, 22,* 209-214.

Sanders, J. (1997). Continuing Care Retirement Communities: A Background and A Summary of Current Issues. U.S. Department of Health and Human Services, 1-24.

Saxon, S.V., & Etten, M.J. (2002). *Physical Change and Aging: A Guide for the Helping Professions* (4th Ed.). New York, NY: The Tiresias Press.

Schonfield, D. (1967). Geronting: reflections on successful aging. *The Gerontologist, 7,* 270-273.

Seeman, T., & Chen, X. (2002**).** Risk and protective factors for physical functioning in older adults with and without chronic conditions: MacArthur studies of successful aging. *Journals of Gerontology, Series B, 57,* S135-S144.

Seeman, T.E., & Berkman, L.F. (1995). Behavioral and psychsocial predictors of physical performance: MacArthur studies of successful aging. *The Journals of Gerontology: Medical Sciences 50A,* M177-M183.

Seeman, T.E., Unger, J.B., McAvay, G., & Mendes de Leon, C.F. (1999). Self-efficacy beliefs and perceived declines in functional ability: Macarthur studies of successful aging. *The Journals of Gerontology, Series B, 54,* 214-222.

Sjoberg, A. & Sverke, M. (2000). The interactive effect of job involvement and organizational commitment on job turnover revisited: A note on the mediating role of turnover intention. *Scandinavian Journal of Psychology, 41,* 247-252.

Sloan FA. Shayne MW. & Conover CJ. (1995). Continuing care retirement communities: prospects for reducing institutional long-term care. *Journal of Health Politics, Policy & Law. 20(1),* 75-98.

Sorensen, G., Stoddard, A., & Macario, E. (1998). Social support and readiness to make dietary changes. *Health Education and Behavior, 25,* 586-598.

Strain**,** L.A., Grabusic, C.C., Searle, M.S., & Dunn, M.J. (2002**).** Continuing and ceasing leisure activities in later life: A longitudinal study. *The Gerontologist, 42,* 217-223.

Strawbridge, W.J., Wallhagen, M.I., & Cohen, R.D. (2002). Successful aging and well-being: Self-rated compared with Rowe and Kahn. *The Gerontologist, 42,* 727-733.

Stewart A.L., Mills, K.M., & Sepsis, P.G. et al. (1997). Evaluation of CHAMPS, a physical activity promotion program for seniors. *Annals of Behavioral Medicine, 19,* 353-361.

Stevens, J.P. (2001). *Applied Multivariate Statistics for the Social Sciences, 4th Ed.* Mahwah, NJ: Laurence Erlbaum Associates.

Tell, E.J., Cohen, M.A., Larson, M.J., & Batten, H.L. (1987). Assessing the elderly's preferences for lifecare retirement options. *The Gerontologist, 27(4),* 503-509.

Tinetti, M.E. (1986). Performance-oriented assessment of mobility problems in elderly patients. *Journal of the American Geriatrics Society, 34,* 119-126.

Vaillant, G.E., & Mukamal, K. (2001). Successful aging. *American Journal of Psychiatry, 158,* 839-847.

Van Willigen, M. (2000). Differential benefits of volunteering across the life course. *Journals of Gerontology: Social Sciences, 55B,* S308-S318.

Wakimoto, P., & Block, G. (2001). Dietary intake, dietary patterns, and changes with age: An epidemiological perspective. *Journals of Gerontology: Series A Special Issue, 56,* 65-80.

Ware, J.E., Kosinski, M., Dewey, J.E., & Gandek, B. (2001). *How to score and interpret single-item health status measures: A manual for users of the SF-8 Health Survey.* Lincoln, RI: QualityMetric, Incorporated.

Waxman, H.M.**,** Carner, E.A., and Berkenstock, G. (1984). Job turnover and job satisfaction among nursing home aides. *The Gerontologist, 24,* 503-509.

Wei, M., Kampert, J.B., Barlow, C.E., Nichman, M.Z., Gibbons, L.W., Paffenbarger, R.S., & Blair, S.N. (1999). Relationship between low cardiorespiratory fitness and mortality in normal-weight, overweight, and obese men. *Journal of the American Medical Association, 282,* 1547-1553.

Whitfield, K.E., Fillenbaum, G.G., Pieper, C.; Albert, M.S. Berkman, L.F., Blazer, D.G., Wilson, R.S., Mendes de Leon, C.F., Barnes, L.L., Schneider, J.A., Bienias, J.L., Evans, D.A., & Bennett, D.A. (2002). Participation in cognitively stimulating activities and risk of incident Alzheimer Disease. *Journal of the American Medical Association, 287,* 742-748.

WHO Expert Consultation. (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet, 363,* 157-163.

Wolfson, L., Whipple, R., Derby, C., Judge, J., King, M., Amerman, P., Schmidt, J., & Smyers, D. (1996). Balance and strength training in older adults: intervention gains and tai chi maintenance. *Journal of the American Geriatrics Society, 44,* 498-506.

Zamboni, M., Turxcato, E., Santana, H., Maggi, S., Harris, T.B., Pietrobelli, A., Heymsfield, S.B., Micciollo, R., & Bosello, O. (1999). The relationship between body composition and physical performance in older women. *Journal of the American Geriatrics Society, 47,* 1403-1408.

Zimmerman, G.L., Olsen, C.G., & Bosworth, M.F. (2000). A stages of change approach to helping patients change behavior. *American Family Physician, 61(5),* 1409- 1416.

APPENDICES

Appendix A: Univariate Models in Chart Form

Fruit and Vegetable Consumption

Stage of Change for Fruit and Vegetable Consumption

Light Exercise Participation

Vigorous Exercise Participation

Strength Training Exercise Participation

Body Mass Index (BMI)

Stage of Change for Weight Loss

Self-Reported Health (Physical)

Self-Reported Health (Mental)

Mobility

Volunteering Inside

Volunteering Outside

Helping Inside

Helping Outside

Giving Social Support

Receiving Social Support

APPENDIX A: UNIVARIATE RESULTS

FRUIT AND VEGETABLE CONSUMPTION

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	6.109906	2.449432	2.494	129	0.014
AGE, B01	-0.003194	0.030131	-0.106	129	0.916
For TIME slope, P1					
INTRCPT2, B10	0.206400	0.201078	1.026	257	0.306
AGE, B11	-0.002712	0.002458	-1.103	257	0.271

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.403617	0.292898	8.206	87	0.000
B/L FRUITVEG, B01	0.578034	0.046918	12.320	87	0.000
For TIME slope, P1					
INTRCPT2, B10	0.192878	0.027600	6.988	228	0.000
B/L FRUITVEG, B11	-0.035886	0.004322	-8.302	228	0.000

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	5.950625	0.856251	6.950	128	0.000
LIGHT EX, B01	-0.012576	0.181050	-0.069	128	0.945

For TIME slope, P1					
INTRCPT2, B10	0.008165	0.061273	0.133	258	0.895
LIGHT EX, B11	-0.005289	0.013007	-0.407	258	0.684

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	5.651687	0.394536	14.325	64	0.000
STRENGTH, B01	0.061764	0.127426	0.485	64	0.629
For TIME slope, P1					
INTRCPT2, B10	-0.015004	0.028454	-0.527	158	0.598
STRENGTH, B11	0.003735	0.009464	0.395	158	0.693

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	5.890759	0.381313	15.449	124	0.000
VIG EX, B01	0.008575	0.103619	0.083	124	0.935
For TIME slope, P1					
INTRCPT2, B10	-0.012588	0.028733	-0.438	245	0.661
VIG EX, B11	-0.002011	0.007676	-0.262	245	0.794

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	5.720414	0.195134	29.315	134	0.000
B/L SIG EVENT, B01	0.255420	0.141408	1.806	134	0.073

For TIME slope, P1

INTRCPT2, B10	0.030441	0.024521	1.241	262	0.216
SIG EVENTS, B11	-0.019358	0.007823	-2.475	262	0.014

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.633249	1.072204	4.321	87	0.000
BMI, B01	0.042554	0.041639	1.022	87	0.310
For TIME slope, P1					
INTRCPT2, B10	0.029603	0.075130	0.394	228	0.694
BMI, B11	-0.001815	0.002933	-0.619	228	0.536

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	6.113161	0.556091	10.993	133	0.000
COMMUNITY, B01	-0.153187	0.338949	-0.452	133	0.652
For TIME slope, P1					
INTRCPT2, B10	-0.006889	0.045997	-0.150	261	0.881
COMMUNITY, B11	-0.005699	0.026596	-0.214	261	0.831

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	6.044193	0.505411	11.959	133	0.000
GENDER, B01	-0.125464	0.346337	-0.362	133	0.717
For TIME slope, P1					
INTRCPT2, B10	-0.003373	0.037867	-0.089	261	0.930
GENDER, B11	-0.009596	0.025861	-0.371	261	0.711

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.415148	0.722537	6.111	131	0.000
MARITAL, B01	0.572922	0.280967	2.039	131	0.043
For TIME slope, P1					
INTRCPT2, B10	0.015730	0.054367	0.289	256	0.772
MARITAL, B11	-0.012075	0.021362	-0.565	256	0.572

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.561683	0.624077	7.309	107	0.000
PHYS PARTICIP, B01	0.656322	0.297154	2.209	107	0.029
For TIME slope, P1					
INTRCPT2, B10	0.046274	0.048949	0.945	251	0.346
PHYS PARTICIP, B11	-0.032154	0.023515	-1.367	251	0.173

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	5.870665	0.203116	28.903	87	0.000
FV STAGE, B01	-0.377593	0.245959	-1.535	87	0.128
For TIME slope, P1					
INTRCPT2, B10	-0.020260	0.014519	-1.395	228	0.164
FV STAGE, B11	0.009082	0.018275	0.497	228	0.619

FRUIT AND VEGETABLE STAGE OF CHANGE

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.977574	0.986311	3.019	129	0.004
AGE, B01	-0.028897	0.012129	-2.383	129	0.019
For TIME slope, P1					
INTRCPT2, B10	0.015702	0.006285	2.498	130	0.014

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.817542	0.198853	4.111	87	0.000
FRUITVEG, B01	-0.039215	0.031865	-1.231	87	0.222
For TIME slope, P1					
INTRCPT2, B10	0.014870	0.006456	2.303	88	0.024

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.234607	0.424119	-0.553	87	0.581
BMI, B01	0.032489	0.016461	1.974	87	0.051
For TIME slope, P1					
INTRCPT2, B10	0.014944	0.006466	2.311	88	0.023

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.155810	0.223466	5.172	133	0.000
COMMUNITY, B01	-0.331233	0.135138	-2.451	133	0.016
For TIME slope, P1					
INTRCPT2, B10	0.017472	0.006362	2.746	134	0.007

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.438705	0.098769	4.442	87	0.000
EXERCISE STAGE, B01	0.175889	0.078087	2.252	87	0.027
For TIME slope, P1					
INTRCPT2, B10	0.014886	0.006463	2.303	88	0.024

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					

INTRCPT2, B00	0.779671	0.208046	3.748	133	0.000
GENDER, B01	-0.106282	0.142629	-0.745	133	0.457
For TIME slope, P1					
INTRCPT2, B10	0.017114	0.006377	2.684	134	0.009

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.835340	0.375848	2.223	129	0.028
GIVING SS, B01	-0.077315	0.133607	-0.579	129	0.563
For TIME slope, P1					
INTRCPT2, B10	0.014865	0.006239	2.383	130	0.019

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.333219	0.472470	-0.705	87	0.482
HEALTH SE, B01	0.436248	0.220546	1.978	87	0.051
For TIME slope, P1					
INTRCPT2, B10	0.014714	0.006473	2.273	88	0.025

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.520319	0.355623	1.463	128	0.146
LIGHT EX, B01	0.025496	0.075205	0.339	128	0.735
For TIME slope, P1					
INTRCPT2, B10	0.017564	0.006493	2.705	129	0.008

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.159363	0.302445	3.833	131	0.000
MARITAL, B01	-0.207517	0.117574	-1.765	131	0.079
For TIME slope, P1					
INTRCPT2, B10	0.016629	0.006437	2.583	132	0.011

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.157557	0.535088	2.163	121	0.032
MOBILITY, B01	-0.020306	0.020533	-0.989	121	0.325
For TIME slope, P1					
INTRCPT2, B10	0.013955	0.006366	2.192	122	0.030

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.491670	0.310348	1.584	127	0.115
NONHEALTH SE, B01	0.045072	0.123305	0.366	127	0.715
For TIME slope, P1					
INTRCPT2, B10	0.015728	0.006335	2.483	128	0.015

Final estimation of fixed effects:

		Standard		Approx.	

Univariate Models all in one file

Fixed Effect	Coefficient	Error	T-ratio	d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.808068	0.424474	1.904	129	0.059
RECEIVING SS, B01	-0.061610	0.152238	-0.405	129	0.686
For TIME slope, P1					
INTRCPT2, B10	0.015418	0.006295	2.449	130	0.016

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.580010	0.549329	2.876	120	0.005
SF8 MENTAL, B01	-0.017661	0.010224	-1.727	120	0.086
For TIME slope, P1					
INTRCPT2, B10	0.011979	0.006289	1.905	121	0.059

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.447152	0.396768	3.647	120	0.001
SF8 PHYSICAL, B01	-0.016179	0.007814	-2.071	120	0.040
For TIME slope, P1					
INTRCPT2, B10	0.012171	0.006312	1.928	121	0.056

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.582415	0.157262	3.703	64	0.001
STRENGTH, B01	0.041192	0.050799	0.811	64	0.421

For TIME slope, P1					
INTRCPT2, B10	0.027427	0.009707	2.826	65	0.007

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.356495	0.149706	2.381	124	0.019
VIGOR EX, B01	0.072799	0.040807	1.784	124	0.076
For TIME slope, P1					
INTRCPT2, B10	0.015486	0.006493	2.385	125	0.019

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.423833	0.088510	4.789	87	0.000
WEIGHT STAGE, B01	0.199062	0.063751	3.122	87	0.003
For TIME slope, P1					
INTRCPT2, B10	0.015735	0.006500	2.421	88	0.018

LIGHT EXERCISE PARTICIPATION

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	5.778811	0.880722	6.561	129	0.000
AGE, B01	-0.014507	0.010879	-1.333	129	0.185
For TIME slope, P1					
INTRCPT2, B10	0.167478	0.054568	3.069	390	0.003
AGE, B11	-0.002139	0.000671	-3.187	390	0.002

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.508508	0.204911	7.362	128	0.000
LIGHT EX, B01	0.664625	0.043174	15.394	128	0.000
For TIME slope, P1					
INTRCPT2, B10	0.059714	0.018640	3.203	397	0.002
LIGHT EX, B11	-0.013951	0.003917	-3.562	397	0.001

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.610777	0.075175	61.334	134	0.000
B/L SIGEVENT, B01	-0.001096	0.057915	-0.019	134	0.985
For TIME slope, P1					
INTRCPT2, B10	-0.010819	0.007395	-1.463	400	0.144
SIGEVENT, B11	0.001758	0.002318	0.758	400	0.449

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	3.991453	0.135945	29.361	124	0.000
VIGOR EX, B01	0.178651	0.035614	5.016	124	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.010637	0.008913	-1.193	380	0.234
VIGOR EX, B11	0.001211	0.002331	0.519	380	0.603

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.450967	0.144952	30.707	64	0.000
STRENGTH, B01	0.062594	0.046540	1.345	64	0.184
For TIME slope, P1					
INTRCPT2, B10	-0.011453	0.008973	-1.276	202	0.204
STRENGTH, B11	0.001688	0.002826	0.598	202	0.550

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.840444	0.162646	29.761	87	0.000
CONDITIONS, B01	-0.089219	0.043899	-2.032	87	0.045
For TIME slope, P1					
INTRCPT2, B10	-0.013427	0.009309	-1.442	286	0.150
CONDITIONS, B11	0.001764	0.002547	0.693	286	0.489

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.475143	0.188225	23.775	133	0.000
GENDER, B01	0.099211	0.127845	0.776	133	0.439
For TIME slope, P1					
INTRCPT2, B10	0.003661	0.011288	0.324	400	0.746
GENDER, B11	-0.006943	0.007655	-0.907	400	0.365

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	3.377286	0.355862	9.490	128	0.000
HEALTH SE, B01	0.438995	0.124792	3.518	128	0.001
For TIME slope, P1					
INTRCPT2, B10	-0.064453	0.021708	-2.969	392	0.004
HEALTH SE, B11	0.020983	0.007664	2.738	392	0.007

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.647421	0.279081	16.653	131	0.000
MARITAL, B01	-0.014258	0.108162	-0.132	131	0.896
For TIME slope, P1					
INTRCPT2, B10	-0.012530	0.016942	-0.740	393	0.460
MARITAL, B11	0.002500	0.006610	0.378	393	0.705

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	3.233787	0.408151	7.923	121	0.000
MOBILITY, B01	0.053561	0.015747	3.401	121	0.001
For TIME slope, P1					
INTRCPT2, B10	-0.105663	0.029148	-3.625	370	0.001
MOBILITY, B11	0.003814	0.001113	3.426	370	0.001

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.885285	0.263701	18.526	107	0.000
PHYS PARTICIP, B01	-0.149554	0.124665	-1.200	107	0.233
For TIME slope, P1					
INTRCPT2, B10	-0.005084	0.015178	-0.335	378	0.738
PHYS PARTICIP, B1	0.000034	0.007206	0.005	378	0.996

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.561049	0.450047	10.135	120	0.000
SF8 MENTAL, B01	0.000807	0.008431	0.096	120	0.924
For TIME slope, P1					
INTRCPT2, B10	-0.040674	0.029708	-1.369	366	0.172
SF8 MENTAL, B11	0.000627	0.000555	1.129	366	0.260

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					

INTRCPT2, B00	3.780812	0.352843	10.715	120	0.000
SF8 PHYSICAL, B01	0.016359	0.006898	2.371	120	0.019
For TIME slope, P1					
INTRCPT2, B10	-0.001631	0.022786	-0.072	366	0.943
SF8 PHYSICAL, B11	-0.000114	0.000443	-0.257	366	0.797

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.492410	0.113691	39.514	87	0.000
EXER STAGE, B01	0.068787	0.091315	0.753	87	0.453
For TIME slope, P1					
INTRCPT2, B10	-0.006382	0.006081	-1.049	286	0.295
EXER STAGE, B11	-0.001636	0.005155	-0.317	286	0.751

VIGOROUS EXERCISE PARTICIPATION

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	3.195079	0.149075	21.433	134	0.000
B/L SIGEVENTS, B0	0.022692	0.115105	0.197	134	0.844
For TIME slope, P1					
INTRCPT2, B10	-0.011649	0.013393	-0.870	386	0.385
SIG EVENTS, B11	0.000324	0.004150	0.078	386	0.938

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	5.895371	1.703739	3.460	129	0.001
AGE, B01	-0.033346	0.021071	-1.583	129	0.116
For TIME slope, P1					
INTRCPT2, B10	0.082184	0.097723	0.841	376	0.401
AGE, B11	-0.001141	0.001203	-0.949	376	0.344

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.864029	0.644381	1.341	128	0.182
LIGHT EX, B01	0.507264	0.135858	3.734	128	0.000
For TIME slope, P1					
INTRCPT2, B10	0.051082	0.034191	1.494	381	0.136
LIGHT EX, B11	-0.013260	0.007189	-1.844	381	0.065

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					

INTRCPT2, B00	2.179019	0.284859	7.649	64	0.000
STRENGTH, B01	0.327885	0.091745	3.574	64	0.001
For TIME slope, P1					
INTRCPT2, B10	0.030049	0.017654	1.702	194	0.090
STRENGTH, B11	-0.010605	0.005499	-1.929	194	0.055

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.298208	0.211239	1.412	124	0.161
VIGOR EX, B01	0.889180	0.055666	15.974	124	0.000
For TIME slope, P1					
INTRCPT2, B10	0.057414	0.013704	4.190	374	0.000
VIGOR EX, B11	-0.020059	0.003569	-5.621	374	0.000

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	3.549589	0.294433	12.056	87	0.000
CONDITIONS, B01	-0.170025	0.079172	-2.148	87	0.034
For TIME slope, P1					
INTRCPT2, B10	-0.016204	0.016444	-0.985	271	0.326
CONDITIONS, B11	0.002084	0.004447	0.469	271	0.639

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.828119	0.373661	7.569	133	0.000
GENDER, B01	0.274688	0.253611	1.083	133	0.281

For TIME slope, P1					
INTRCPT2, B10	0.014382	0.019920	0.722	386	0.471
GENDER, B11	-0.017874	0.013457	-1.328	386	0.185

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.997795	0.733865	2.722	128	0.008
HEALTH SE, B01	0.425847	0.256678	1.659	128	0.099
For TIME slope, P1					
INTRCPT2, B10	-0.005018	0.037856	-0.133	380	0.895
HEALTH SE, B11	-0.001931	0.013382	-0.144	380	0.886

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.030222	0.535415	3.792	131	0.000
MARITAL, B01	0.469962	0.206699	2.274	131	0.025
For TIME slope, P1					
INTRCPT2, B10	-0.014868	0.029945	-0.497	379	0.619
MARITAL, B11	0.001825	0.011682	0.156	379	0.876

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.744502	0.803332	0.927	121	0.356
MOBILITY, B01	0.095567	0.031113	3.072	121	0.003
For TIME slope, P1					
INTRCPT2, B10	-0.039885	0.052776	-0.756	357	0.450

MOBILITY, B11	0.001111	0.002011	0.552	357	0.581

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	3.082383	0.392091	7.861	107	0.000
PHYS PARTICIP, B01	0.021040	0.070437	0.299	107	0.766
For TIME slope, P1					
INTRCPT2, B10	-0.033573	0.022872	-1.468	363	0.143
PHYS PARTICIP, B11	0.003966	0.003804	1.042	363	0.298

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.972716	0.891729	2.212	120	0.029
SF8 MENTAL, B01	0.024098	0.016729	1.440	120	0.152
For TIME slope, P1					
INTRCPT2, B10	-0.012262	0.049642	-0.247	353	0.805
SF8 MENTAL, B11	-0.000009	0.000930	-0.009	353	0.993

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.036467	0.676737	1.532	120	0.128
SF8 PHYSICAL, B01	0.044169	0.013303	3.320	120	0.002
For TIME slope, P1					
INTRCPT2, B10	0.004069	0.039346	0.103	353	0.918
SF8 PHYSICAL, B11	-0.000333	0.000764	-0.435	353	0.663

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.799149	0.208570	13.421	87	0.000
EXER STAGE, B01	0.215104	0.165211	1.302	87	0.197
For TIME slope, P1					
INTRCPT2, B10	0.001300	0.010736	0.121	271	0.904
EXER STAGE, B11	-0.012565	0.008898	-1.412	271	0.159

STRENGTH TRAINING EXERCISE PARTICIPATION

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.255017	1.793216	2.373	129	0.019
AGE, B01	-0.025224	0.022235	-1.134	129	0.259
For TIME slope, P1					
INTRCPT2, B10	0.128267	0.110590	1.160	326	0.247

AGE, B11	-0.001666	0.001360	-1.225	326	0.222

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.043025	0.693716	1.504	128	0.135
LIGHT EX, B01	0.258207	0.146358	1.764	128	0.080
For TIME slope, P1					
INTRCPT2, B10	0.035120	0.041936	0.837	328	0.403
LIGHT EX, B11	-0.009256	0.008765	-1.056	328	0.292

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.667325	0.170375	3.917	64	0.000
STRENGTH, B01	0.624393	0.055184	11.315	64	0.000
For TIME slope, P1					
INTRCPT2, B10	0.032854	0.014615	2.248	201	0.026
STRENGTH, B11	-0.018921	0.004655	-4.065	201	0.000

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.010212	0.265876	3.800	124	0.000
VIGOR EX, B01	0.375456	0.070962	5.291	124	0.000
For TIME slope, P1					
INTRCPT2, B10	0.026729	0.015986	1.672	316	0.095
VIGOR EX, B11	-0.011251	0.004334	-2.596	316	0.010

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.320764	0.295294	7.859	87	0.000
CONDITIONS, B01	-0.060355	0.078983	-0.764	87	0.447
For TIME slope, P1					
INTRCPT2, B10	-0.009822	0.016380	-0.600	247	0.549
CONDITIONS, B11	0.000904	0.004433	0.204	247	0.839

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.818361	0.380028	4.785	133	0.000
GENDER, B01	0.292009	0.255677	1.142	133	0.256
For TIME slope, P1					
INTRCPT2, B10	-0.004935	0.021958	-0.225	333	0.822
GENDER, B11	-0.002491	0.014974	-0.166	333	0.868

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.142215	0.770487	2.780	128	0.007
HEALTH SE, B01	0.026647	0.270401	0.099	128	0.922
For TIME slope, P1					
INTRCPT2, B10	-0.000110	0.042524	-0.003	327	0.998
HEALTH SE, B11	-0.002411	0.015042	-0.160	327	0.873

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.356829	0.560762	2.420	131	0.017
MARITAL , B01	0.342186	0.214632	1.594	131	0.113
For TIME slope, P1					
INTRCPT2, B10	0.026455	0.032626	0.811	327	0.418
MARITAL , B11	-0.013590	0.012672	-1.073	327	0.285

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.168449	0.879735	1.328	121	0.187
MOBILITY, B01	0.039162	0.034010	1.151	121	0.252
For TIME slope, P1					
INTRCPT2, B10	-0.061119	0.055853	-1.094	307	0.275
MOBILITY, B11	0.002030	0.002136	0.950	307	0.343

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.094745	0.488688	4.286	107	0.000
PHYS PARTICIP, B01	0.063555	0.232040	0.274	107	0.785
For TIME slope, P1					
INTRCPT2, B10	-0.006698	0.028064	-0.239	323	0.812
PHYS PARTICIP, B11	-0.000998	0.013541	-0.074	323	0.942

Final estimation of fixed effects:

Univariate Models all in one file

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.886879	0.886868	1.000	120	0.320
SF8 MENTAL, B01	0.025991	0.016615	1.564	120	0.120
For TIME slope, P1					
INTRCPT2, B10	-0.056119	0.058940	-0.952	306	0.342
SF8 MENTAL, B11	0.000867	0.001098	0.790	306	0.430

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.708614	0.689176	2.479	120	0.015
SF8 PHYSICAL, B01	0.011110	0.013611	0.816	120	0.416
For TIME slope, P1					
INTRCPT2, B10	0.012837	0.042546	0.302	306	0.763
SF8 PHYSICAL, B11	-0.000457	0.000831	-0.550	306	0.582

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.135608	0.149302	14.304	134	0.000
B/L SIGEVENT, B01	0.130666	0.114580	1.140	134	0.257
For TIME slope, P1					
INTRCPT2, B10	-0.011822	0.013912	-0.850	333	0.396
SIG EVENT, B11	0.000739	0.004445	0.166	333	0.868

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.995843	0.200460	9.956	87	0.000
EXER STAGE, B01	0.147038	0.162510	0.905	87	0.368
For TIME slope, P1					
INTRCPT2, B10	0.000958	0.010947	0.088	247	0.931
EXER STAGE, B11	-0.009410	0.009094	-1.035	247	0.302

BODY MASS INDEX

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	42.152571	4.719740	8.931	129	0.000
AGE, B01	-0.210680	0.058127	-3.624	129	0.001
For TIME slope, P1					
INTRCPT2, B10	-0.619854	0.299592	-2.069	257	0.039
AGE, B11	0.007081	0.003660	1.935	257	0.054

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	5.842069	0.803784	7.268	87	0.000
BMI, B01	0.760295	0.031305	24.287	87	0.000
For TIME slope, P1					
INTRCPT2, B10	0.818181	0.077799	10.517	228	0.000
BMI, B11	-0.033781	0.003030	-11.150	228	0.000

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.146664	1.114246	23.466	133	0.000
COMMUNITY, B01	-0.689312	0.686759	-1.004	133	0.318
For TIME slope, P1					
INTRCPT2, B10	-0.121438	0.069848	-1.739	261	0.083
COMMUNITY, B11	0.047782	0.040059	1.193	261	0.234

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	25.640165	1.078090	23.783	87	0.000
FRUITVEG, B01	-0.067576	0.172976	-0.391	87	0.697
For TIME slope, P1					
INTRCPT2, B10	0.086615	0.053306	1.625	228	0.105
FRUITVEG, B11	-0.020633	0.008309	-2.483	228	0.014

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	24.460902	1.039026	23.542	133	0.000

GENDER, B01	0.459850	0.711337	0.646	133	0.519
For TIME slope, P1					
INTRCPT2, B10	0.019909	0.056130	0.355	261	0.723
GENDER, B11	-0.044479	0.038379	-1.159	261	0.248

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	11.344779	1.956651	5.798	87	0.000
HEALTH SE, B01	6.530917	0.913198	7.152	87	0.000
For TIME slope, P1					
INTRCPT2, B10	0.833542	0.110011	7.577	228	0.000
HEALTH SE, B11	-0.411061	0.051415	-7.995	228	0.000

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.654081	1.641241	16.240	34	0.000
LIGHT EX, B01	-0.303600	0.315731	-0.962	34	0.343
For TIME slope, P1					
INTRCPT2, B10	-0.197310	0.065791	-2.999	95	0.004
LIGHT EX, B11	0.024927	0.012685	1.965	95	0.052

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.194836	1.530835	17.111	131	0.000
MARITAL, B01	-0.421152	0.593836	-0.709	131	0.479
For TIME slope, P1					

INTRCPT2, B10	0.016723	0.081867	0.204	256	0.839
MARITAL, B11	-0.022310	0.032206	-0.693	256	0.489

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	25.789775	2.629700	9.807	121	0.000
MOBILITY, B01	-0.025762	0.101379	-0.254	121	0.800
For TIME slope, P1					
INTRCPT2, B10	-0.400861	0.169976	-2.358	245	0.019
MOBILITY, B11	0.013958	0.006402	2.180	245	0.030

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.175416	1.352277	19.357	107	0.000
PHYS PARTICIP, B01	-0.553587	0.642318	-0.862	107	0.391
For TIME slope, P1					
INTRCPT2, B10	-0.237911	0.071414	-3.331	251	0.001
PHYS PARTICIP, B1	0.097960	0.034237	2.861	251	0.005

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	25.225420	2.643058	9.544	120	0.000
SF8 MENTAL, B01	0.000498	0.049334	0.010	120	0.992
For TIME slope, P1					
INTRCPT2, B10	-0.151506	0.172681	-0.877	239	0.381
SF8 MENTAL, B11	0.002003	0.003185	0.629	239	0.530

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	34.073335	1.777686	19.167	120	0.000
SF8 PHYSICAL, B01	-0.176774	0.034943	-5.059	120	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.385633	0.107907	-3.574	239	0.001
SF8 PHYSICAl, B11	0.006828	0.002120	3.220	239	0.002

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	24.745111	0.400414	61.799	134	0.000
B/L SIG EVENT, B0	0.458271	0.289197	1.585	134	0.115
For TIME slope, P1					
INTRCPT2, B10	-0.016761	0.037633	-0.445	262	0.656
SIG EVENTs, B11	-0.010443	0.011926	-0.876	262	0.382

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	23.830623	0.427964	55.684	87	0.000
WEIGHT STAGE, B01	1.538847	0.313721	4.905	87	0.000
For TIME slope, P1					
INTRCPT2, B10	0.011910	0.023504	0.507	228	0.612

WEIGHT STAGE, B11	-0.063603	0.019320	-3.292	228	0.002

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	25.122607	0.809657	31.029	64	0.000
STRENGTH, B01	0.098778	0.260188	0.380	64	0.705
For TIME slope, P1					
INTRCPT2, B10	-0.086057	0.040826	-2.108	158	0.036
STRENGTH, B11	0.024231	0.013635	1.777	158	0.077

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.654081	1.641241	16.240	34	0.000
VIG EX, B01	-0.303600	0.315731	-0.962	34	0.343
For TIME slope, P1					
INTRCPT2, B10	-0.197310	0.065791	-2.999	95	0.004
VIG EX, B11	0.024927	0.012685	1.965	95	0.052

WEIGHT LOSS STAGE OF CHANGE

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	6.027363	1.184648	5.088	129	0.000
AGE, B01	-0.063457	0.014576	-4.353	129	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.002288	0.006639	-0.345	130	0.731

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-2.210759	0.441165	-5.011	87	0.000
BMI, B01	0.120237	0.017135	7.017	87	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.003118	0.006906	-0.452	88	0.652

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.335492	0.281377	4.746	133	0.000
COMMUNITY, B01	-0.293281	0.171573	-1.709	133	0.089
For TIME slope, P1					
INTRCPT2, B10	-0.001488	0.006677	-0.223	134	0.824

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.577166	0.119909	4.813	87	0.000
EXERCISE STAGE, B01	0.307078	0.095518	3.215	87	0.002
For TIME slope, P1					
INTRCPT2, B10	-0.003504	0.006839	-0.512	88	0.609

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.726767	0.252240	2.881	87	0.005
FRUITVEG, B01	0.020262	0.040401	0.502	87	0.617
For TIME slope, P1					
INTRCPT2, B10	-0.003664	0.006845	-0.535	88	0.593

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.666839	0.097462	6.842	87	0.000
FRUIT VEG STAGE, B01	0.443021	0.117391	3.774	87	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.003373	0.006793	-0.497	88	0.620

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	0.821244	0.258525	3.177	133	0.002
GENDER, B01	0.040847	0.177081	0.231	133	0.818
For TIME slope, P1					
INTRCPT2, B10	-0.002101	0.006673	-0.315	134	0.753

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.852320	0.469938	1.814	129	0.072
GIVING SS, B01	0.003518	0.166945	0.021	129	0.983
For TIME slope, P1					
INTRCPT2, B10	-0.003874	0.006627	-0.585	130	0.559

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-1.201753	0.570680	-2.106	87	0.038
HEALTH SE, B01	0.965090	0.266281	3.624	87	0.001
For TIME slope, P1					
INTRCPT2, B10	-0.003749	0.006839	-0.548	88	0.585

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.790427	0.431212	1.833	128	0.069
LIGHT EX, B01	0.020753	0.091100	0.228	128	0.820
For TIME slope, P1					

INTRCPT2, B10	-0.001898	0.006777	-0.280	129	0.780

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.836472	0.383053	2.184	131	0.031
MARITAL , B01	0.020328	0.148824	0.137	131	0.892
For TIME slope, P1					
INTRCPT2, B10	-0.001517	0.006763	-0.224	132	0.823

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.065432	0.670081	1.590	121	0.114
MOBILITY, B01	-0.007498	0.025772	-0.291	121	0.772
For TIME slope, P1					
INTRCPT2, B10	-0.002503	0.006896	-0.363	122	0.717

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.400177	0.390435	1.025	127	0.308
NONHEALTH SE, B01	0.185702	0.154788	1.200	127	0.233
For TIME slope, P1					
INTRCPT2, B10	-0.000908	0.006678	-0.136	128	0.892

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.263593	0.526912	2.398	129	0.018
RECEIVING SS, B01	-0.133530	0.188515	-0.708	129	0.480
For TIME slope, P1					
INTRCPT2, B10	-0.002259	0.006791	-0.333	130	0.740

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.358833	0.648400	3.638	120	0.001
SF8 MENTAL, B01	-0.027194	0.012067	-2.254	120	0.026
For TIME slope, P1					
INTRCPT2, B10	-0.003286	0.007057	-0.466	121	0.642

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.873255	0.489628	3.826	120	0.000
SF8 PHYSICAL, B01	-0.019226	0.009634	-1.995	120	0.048
For TIME slope, P1					
INTRCPT2, B10	-0.002686	0.007079	-0.379	121	0.705

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	1.163461	0.192832	6.034	64	0.000
STRENGTH, B01	-0.076362	0.061972	-1.232	64	0.223
For TIME slope, P1					
INTRCPT2, B10	-0.000950	0.008742	-0.109	65	0.914

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.017253	0.194777	5.223	124	0.000
VIGOR EX, B01	-0.043488	0.052510	-0.828	124	0.409
For TIME slope, P1					
INTRCPT2, B10	-0.002938	0.006763	-0.434	125	0.664

SELF-RATED HEALTH: PHYSICAL HEALTH SUBSCALE

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	46.432266	10.393230	4.468	129	0.000

AGE, B01	0.027055	0.128602	0.210	129	0.834
For TIME slope, P1					
INTRCPT2, B10	0.437835	0.513564	0.853	375	0.395
AGE, B11	-0.006330	0.006356	-0.996	375	0.320

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	49.358578	0.893365	55.250	134	0.000
B/L SIGEVENTS, B01	-0.863682	0.698176	-1.237	134	0.219
For TIME slope, P1					
INTRCPT2, B10	0.026042	0.070015	0.372	384	0.710
SIG EVENTS, B11	-0.032589	0.022047	-1.478	384	0.140

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	9.359059	2.175180	4.303	120	0.000
BASESF8P, B01	0.784315	0.042629	18.399	120	0.000
For TIME slope, P1					
INTRCPT2, B10	0.454413	0.186690	2.434	362	0.016
BASESF8P, B11	-0.010730	0.003625	-2.960	362	0.004

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	70.744353	5.017157	14.100	87	0.000
BMI, B01	-0.879074	0.193257	-4.549	87	0.000

For TIME slope, P1					
INTRCPT2, B10	-0.267628	0.228709	-1.170	87	0.246
BMI, B11	0.007876	0.008780	0.897	87	0.372

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	48.940698	1.187609	41.209	87	0.000
BP RISK, B01	-1.851035	1.959016	-0.945	87	0.348
For TIME slope, P1					
INTRCPT2, B10	-0.028747	0.046897	-0.613	271	0.540
BP RISK, B11	-0.101164	0.082406	-1.228	271	0.221

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	48.418870	2.380420	20.340	133	0.000
COMMUNITY, B01	0.223389	1.503202	0.149	133	0.882
For TIME slope, P1					
INTRCPT2, B10	-0.105918	0.110741	-0.956	384	0.340
COMMUNITY, B11	0.023501	0.068618	0.342	384	0.732

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	54.180652	1.751510	30.934	87	0.000
CONDITIONS, B01	-1.855678	0.476132	-3.897	87	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.079359	0.081215	-0.977	271	0.330

CONDITIONS, B11	0.005766	0.022003	0.262	271	0.793

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	49.169455	2.619919	18.768	87	0.000
FRUITVEG, B01	-0.150747	0.421794	-0.357	87	0.721
For TIME slope, P1					
INTRCPT2, B10	0.073228	0.111497	0.657	271	0.512
FRUITVEG, B11	-0.022941	0.017869	-1.284	271	0.201

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	46.574108	2.254795	20.656	133	0.000
GENDER, B01	1.577891	1.537817	1.026	133	0.307
For TIME slope, P1					
INTRCPT2, B10	-0.088102	0.103422	-0.852	384	0.395
GENDER, B11	0.013042	0.070207	0.186	384	0.853

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	36.080223	4.206429	8.577	129	0.000
GIVING SS, B01	4.576274	1.481815	3.088	129	0.003
For TIME slope, P1					
INTRCPT2, B10	-0.031395	0.241878	-0.130	129	0.897
GIVING SS, B11	-0.013951	0.084167	-0.166	129	0.869

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	48.732655	2.473224	19.704	70	0.000
GROUP ACTS, B01	-0.421435	1.403674	-0.300	70	0.765
For TIME slope, P1					
INTRCPT2, B10	0.050882	0.107364	0.474	207	0.636
GROUP ACTS, B11	-0.036751	0.060942	-0.603	207	0.547

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	64.258260	5.767954	11.141	87	0.000
HEALTH SE, B01	-7.503397	2.671980	-2.808	87	0.007
For TIME slope, P1					
INTRCPT2, B10	-0.152608	0.238297	-0.640	271	0.522
HEALTH SE, B11	0.043013	0.109554	0.393	271	0.695

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	41.471861	3.917297	10.587	128	0.000
LIGHT EX, B01	1.622258	0.825828	1.964	128	0.051
For TIME slope, P1					
INTRCPT2, B10	-0.010358	0.185221	-0.056	378	0.956
LIGHT EX, B11	-0.015482	0.038945	-0.398	378	0.691

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	44.201182	3.239877	13.643	131	0.000
MARITAL, B01	1.840766	1.253176	1.469	131	0.144
For TIME slope, P1					
INTRCPT2, B10	-0.269743	0.147122	-1.833	377	0.067
MARITAL, B11	0.079194	0.057867	1.369	377	0.172

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	52.206234	1.817787	28.720	87	0.000
MEDS, B01	-1.517619	0.605105	-2.508	87	0.014
For TIME slope, P1					
INTRCPT2, B10	-0.044629	0.075340	-0.592	271	0.554
MEDS, B11	-0.006870	0.025163	-0.273	271	0.785

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	31.855780	4.940841	6.447	121	0.000
MOBILITY, B01	0.647612	0.191395	3.384	121	0.001
For TIME slope, P1					
INTRCPT2, B10	-0.592315	0.269276	-2.200	358	0.028
MOBILITY, B11	0.019957	0.010245	1.948	358	0.052

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	48.057156	3.037433	15.822	107	0.000
PHYS PARTICIP, B01	0.251502	1.437532	0.175	107	0.862
For TIME slope, P1					
INTRCPT2, B10	-0.128260	0.134242	-0.955	362	0.340
PHYS PARTICIP, B11	0.030067	0.063854	0.471	362	0.638

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	43.678648	5.046102	8.656	129	0.000
RECEIVING, B01	1.835441	1.787368	1.027	129	0.307
For TIME slope, P1					
INTRCPT2, B10	-0.044835	0.245009	-0.183	378	0.855
RECEIVING, B11	-0.010333	0.086193	-0.120	378	0.905

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	48.802291	1.997212	24.435	64	0.000
STRENGTH, B01	-0.073527	0.645081	-0.114	64	0.910
For TIME slope, P1					
INTRCPT2, B10	0.031773	0.088164	0.360	193	0.719
STRENGTH, B11	-0.014529	0.027379	-0.531	193	0.596

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	45.049754	1.694267	26.590	124	0.000
VIGOR EX, B01	1.129433	0.445300	2.536	124	0.013
For TIME slope, P1					
INTRCPT2, B10	-0.075493	0.083822	-0.901	364	0.369
VIGOR EX, B11	-0.001550	0.021715	-0.071	364	0.944

SELF-RATED HEALTH: MENTAL HEALTH SUBSCALE

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	53.426074	7.119634	7.504	129	0.000
AGE, B01	-0.011756	0.088117	-0.133	129	0.895
For TIME slope, P1					
INTRCPT2, B10	0.813365	0.537251	1.514	375	0.131
AGE, B11	-0.010259	0.006646	-1.544	375	0.123

Final estimation of fixed effects:

		Standard		Approx.	

Fixed Effect	Coefficient	Error	T-ratio	d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	50.619332	2.873416	17.616	120	0.000
SF8 PHYSICAL, B01	0.036849	0.056340	0.654	120	0.514
For TIME slope, P1					
INTRCPT2, B10	-0.340432	0.218071	-1.561	362	0.119
SF8 PHYSICAL, B11	0.006472	0.004233	1.529	362	0.127

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	53.424915	3.531040	15.130	87	0.000
BMI, B01	-0.035385	0.135845	-0.260	87	0.795
For TIME slope, P1					
INTRCPT2, B10	0.208875	0.238547	0.876	271	0.382
BMI, B11	-0.010535	0.009155	-1.151	271	0.251

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	52.886206	0.748818	70.626	87	0.000
BPRISK, B01	-1.008654	1.247236	-0.809	87	0.421
For TIME slope, P1					
INTRCPT2, B10	-0.035419	0.050556	-0.701	271	0.484
BPRISK, B11	-0.079204	0.088260	-0.897	271	0.371

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	52.239370	1.599910	32.651	133	0.000
COMMUNITY, B01	0.187609	1.011295	0.186	133	0.853
For TIME slope, P1					
INTRCPT2, B10	0.178559	0.117870	1.515	384	0.130
COMMUNITY, B11	-0.126009	0.073104	-1.724	384	0.085

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	54.370798	1.191878	45.618	87	0.000
CONDITIONS, B01	-0.571806	0.322471	-1.773	87	0.079
For TIME slope, P1					
INTRCPT2, B10	-0.119128	0.086728	-1.374	271	0.171
CONDITIONS, B11	0.018041	0.023583	0.765	271	0.445

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	51.573028	1.667906	30.921	87	0.000
FRUITVEG, B01	0.165492	0.269031	0.615	87	0.540
For TIME slope, P1					
INTRCPT2, B10	-0.050858	0.119954	-0.424	271	0.671
FRUITVEG, B11	-0.001909	0.019243	-0.099	271	0.922

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	51.519705	1.527006	33.739	133	0.000

GENDER, B01	0.709895	1.040634	0.682	133	0.496
For TIME slope, P1					
INTRCPT2, B10	-0.122100	0.110424	-1.106	384	0.270
GENDER, B11	0.077200	0.074911	1.031	384	0.304

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	44.688400	2.887679	15.476	129	0.000
GIVING SS, B01	2.801029	1.016938	2.754	129	0.007
For TIME slope, P1					
INTRCPT2, B10	0.069086	0.253537	0.272	377	0.785
GIVING SS, B11	-0.028828	0.088297	-0.326	377	0.744

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	50.551258	1.639523	30.833	70	0.000
GROUP ACTIVITY, B01	1.218685	0.931626	1.308	70	0.195
For TIME slope, P1					
INTRCPT2, B10	-0.123625	0.102889	-1.202	207	0.231
GROUP ACTIVITY, B11	0.039942	0.058440	0.683	207	0.495

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	56.274676	3.768022	14.935	87	0.000
HEALTH SE, B01	-1.751554	1.741469	-1.006	87	0.318
For TIME slope, P1					

INTRCPT2, B10	0.052420	0.256457	0.204	271	0.838
HEALTH SE, B11	-0.052682	0.118012	-0.446	271	0.655

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	50.079412	2.669753	18.758	128	0.000
LIGHT EX, B01	0.542945	0.563372	0.964	128	0.337
For TIME slope, P1					
INTRCPT2, B10	-0.379723	0.196834	-1.929	378	0.054
LIGHT EX, B11	0.077608	0.041391	1.875	378	0.061

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	50.535903	2.248027	22.480	131	0.000
MARITAL, B01	0.794003	0.870104	0.913	131	0.364
For TIME slope, P1					
INTRCPT2, B10	-0.279628	0.155822	-1.795	377	0.073
MARITAL, B11	0.107664	0.061214	1.759	377	0.079

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	54.087257	1.175487	46.013	87	0.000
MEDICATIONS, B01	-0.593871	0.390381	-1.521	87	0.132
For TIME slope, P1					
INTRCPT2, B10	-0.143506	0.080705	-1.778	271	0.076
MEDICATIONS, B11	0.031651	0.026966	1.174	271	0.242

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	44.823217	3.459543	12.956	121	0.000
MOBILITY, B01	0.300661	0.133512	2.252	121	0.026
For TIME slope, P1					
INTRCPT2, B10	-0.019929	0.281516	-0.071	358	0.944
MOBILITY, B11	0.000506	0.010731	0.047	358	0.963

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	51.348886	2.012686	25.513	107	0.000
PHYS PARTICIP, B01	0.645571	0.953745	0.677	107	0.500
For TIME slope, P1					
INTRCPT2, B10	0.001634	0.144743	0.011	362	0.991
PHYS PARTICIP, B11	-0.012188	0.068825	-0.177	362	0.860

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	50.500978	3.414199	14.791	129	0.000
RECEIVING SS, B01	0.747894	1.208969	0.619	129	0.537
For TIME slope, P1					
INTRCPT2, B10	0.010256	0.268935	0.038	378	0.970
RECEIVING SS, B11	-0.009242	0.094643	-0.098	378	0.923

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	49.927568	2.430690	20.540	68	0.000
SOLITARY ACTS, B01	1.089047	1.095373	0.994	68	0.324
For TIME slope, P1					
INTRCPT2, B10	-0.029093	0.135888	-0.214	200	0.831
SOLITARY ACTS, B11	-0.013189	0.059991	-0.220	200	0.826

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	50.170693	1.383888	36.253	64	0.000
STRENGTH, B01	0.820537	0.446417	1.838	64	0.070
For TIME slope, P1					
INTRCPT2, B10	0.008210	0.085891	0.096	193	0.924
STRENGTH, B11	-0.023280	0.026692	-0.872	193	0.384

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	50.183503	1.176166	42.667	124	0.000
VIGOR EX, B01	0.696880	0.308697	2.257	124	0.026
For TIME slope, P1					
INTRCPT2, B10	0.000241	0.090637	0.003	364	0.998
VIGOR EX, B11	-0.002273	0.023506	-0.097	364	0.923

MOBILITY

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.083999	0.430054	60.653	134	0.000
B/L SIGEVENT, B01	0.296213	0.320314	0.925	134	0.357
For TIME slope, P1					
INTRCPT2, B10	0.005173	0.043374	0.119	381	0.906
SIG EVENT, B11	0.008717	0.013685	0.637	381	0.524

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	39.720361	4.669737	8.506	129	0.000
AGE, B01	-0.163681	0.057612	-2.841	129	0.006
For TIME slope, P1					

INTRCPT2, B10	0.990994	0.317798	3.118	370	0.002
AGE, B11	-0.011947	0.003915	-3.051	370	0.003

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	29.446653	2.328561	12.646	87	0.000
BMI, B01	-0.113138	0.090196	-1.254	87	0.213
For TIME slope, P1					
INTRCPT2, B10	-0.045221	0.152617	-0.296	273	0.767
BMI, B11	0.001719	0.005924	0.290	273	0.772

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	28.055632	1.146070	24.480	133	0.000
COMMUNITY, G01	-1.112348	0.719538	-1.546	133	0.124
For TIME slope, B1					
INTRCPT2, G10	0.351455	0.068952	5.097	380	0.000
COMMUNITY, G11	-0.207526	0.042534	-4.879	380	0.000

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.674307	0.825389	32.317	87	0.000
CONDITIONS, B01	-0.033531	0.222639	-0.151	87	0.881
For TIME slope, P1					
INTRCPT2, B10	0.000257	0.055569	0.005	273	0.996

CONDITIONS, B11	-0.000625	0.015310	-0.041	273	0.968

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	24.049546	0.833476	28.855	127	0.000
DRIVING, B01	2.795074	0.915863	3.052	127	0.003
For TIME slope, P1					
INTRCPT2, B10	-0.076680	0.056911	-1.347	367	0.179
DRIVING, B11	0.124081	0.062021	2.001	367	0.046

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	25.981427	1.082125	24.010	133	0.000
GENDER, B01	0.257968	0.740158	0.349	133	0.728
For TIME slope, P1					
INTRCPT2, B10	-0.041296	0.066809	-0.618	380	0.537
GENDER, B11	0.052135	0.045332	1.150	380	0.251

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	19.769492	1.933692	10.224	129	0.000
GIVING SS, B01	2.394612	0.681926	3.512	129	0.001
For TIME slope, P1					
INTRCPT2, B10	0.075105	0.138458	0.542	373	0.587
GIVING SS, B11	-0.015214	0.048577	-0.313	373	0.754

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	28.215872	2.568797	10.984	87	0.000
HEALTH SE, B01	-0.776600	1.191645	-0.652	87	0.516
For TIME slope, P1					
INTRCPT2, B10	-0.099612	0.168507	-0.591	273	0.555
HEALTH SE, B11	0.046202	0.078290	0.590	273	0.555

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	25.218091	1.974926	12.769	128	0.000
LIGHT EX, B01	0.253504	0.415739	0.610	128	0.543
For TIME slope, P1					
INTRCPT2, B10	-0.012038	0.120285	-0.100	374	0.921
LIGHT EX, B11	0.008792	0.025249	0.348	374	0.728

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	24.290562	1.586500	15.311	131	0.000
MARITAL, B01	0.821613	0.615833	1.334	131	0.185
For TIME slope, P1					
INTRCPT2, B10	-0.142227	0.097701	-1.456	373	0.146
MARITAL, B11	0.069809	0.038244	1.825	373	0.068

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	27.635838	0.804212	34.364	87	0.000
MEDS, B01	-0.410767	0.268661	-1.529	87	0.130
For TIME slope, P1					
INTRCPT2, B10	0.024143	0.052749	0.458	273	0.647
MEDS, B11	-0.010277	0.017932	-0.573	273	0.567

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	26.369429	0.496130	53.150	127	0.000
NONHEALTH SE, B01	0.033317	0.102691	0.324	127	0.746
For TIME slope, P1					
INTRCPT2, B10	0.010951	0.031780	0.345	369	0.730
NONHEALTH SE, B11	0.006783	0.006484	1.046	369	0.297

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	28.473831	1.357725	20.972	107	0.000
PHYS PARTICIP, B0	-0.877849	0.642510	-1.366	107	0.175
For TIME slope, P1					
INTRCPT2, B10	0.032902	0.087933	0.374	359	0.708
PHYS PARTICIP, B11	-0.006148	0.041667	-0.148	359	0.883

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	21.517980	2.368658	9.084	129	0.000
RECEIVING SS, B01	1.731774	0.839290	2.063	129	0.041
For TIME slope, P1					
INTRCPT2, B10	0.054723	0.141391	0.387	374	0.699
RECEIVING SS, B11	-0.006438	0.050153	-0.128	374	0.898

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	22.938046	2.290759	10.013	120	0.000
SF8 MENTAL, B01	0.071911	0.043018	1.672	120	0.097
For TIME slope, P1					
INTRCPT2, B10	0.323352	0.157486	2.053	349	0.040
SF8 MENTAL, B11	-0.005228	0.002938	-1.779	349	0.076

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	18.789483	1.701355	11.044	120	0.000
SF8 PHYSICAL, B01	0.158017	0.033385	4.733	120	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.255717	0.118604	-2.156	349	0.032
SF8 PHYSICAL, B11	0.005961	0.002312	2.578	349	0.011

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

Univariate Models all in one file

For INTRCPT1, P0					
INTRCPT2, B00	26.001520	0.837825	31.035	64	0.000
STRENGTH, B01	0.190641	0.271072	0.703	64	0.484
For TIME slope, P1					
INTRCPT2, B10	-0.000535	0.059438	-0.009	192	0.993
STRENGTH, B11	0.002088	0.018957	0.110	192	0.913

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	23.993104	0.797596	30.082	124	0.000
VIGOR EX, B01	0.688463	0.210122	3.276	124	0.002
For TIME slope, P1					
INTRCPT2, B10	-0.074615	0.052905	-1.410	359	0.159
VIGOR EX, B11	0.031164	0.014024	2.222	359	0.027

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.421694	0.488040	2.913	129	0.005
AGE, B01	-0.009952	0.006037	-1.648	129	0.101
For TIME slope, P1					
INTRCPT2, B10	0.072115	0.027972	2.578	382	0.011
AGE, B11	-0.000892	0.000345	-2.588	382	0.010

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.638576	0.043010	14.847	134	0.000
B/L SIGEVENTS, B01	-0.012139	0.033317	-0.364	134	0.716
For TIME slope, P1					
INTRCPT2, B10	0.008486	0.003790	2.239	391	0.026
SIG EVENTS, B11	-0.003191	0.001175	-2.716	391	0.007

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.591855	0.114096	5.187	133	0.000
COMMUNITY, B01	0.025073	0.071713	0.350	133	0.727
For TIME slope, P1					
INTRCPT2, B10	0.009971	0.006216	1.604	391	0.109
COMMUNITY, B11	-0.006548	0.003803	-1.722	391	0.085

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.402279	0.088257	4.558	127	0.000
DRIVING, B01	0.266323	0.096458	2.761	127	0.007
For TIME slope, P1					
INTRCPT2, B10	-0.009094	0.005196	-1.750	378	0.080
DRIVING, B11	0.010046	0.005590	1.797	378	0.073

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.550013	0.108172	5.085	133	0.000
GENDER, B01	0.056655	0.073517	0.771	133	0.442
For TIME slope, P1					
INTRCPT2, B10	0.001928	0.005732	0.336	391	0.737
GENDER, B11	-0.001529	0.003887	-0.393	391	0.694

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.021073	0.202624	-0.104	129	0.918
GIVING SS, B01	0.232750	0.071350	3.262	129	0.002
For TIME slope, P1					
INTRCPT2, B10	-0.025910	0.012348	-2.098	385	0.036
GIVING SS, B11	0.009071	0.004318	2.101	385	0.036

Final estimation of fixed effects:

		Standard		Approx.	

Fixed Effect	Coefficient	Error	T-ratio	d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.199717	0.327507	-0.610	69	0.544
LIFE HAPPY, B01	0.175617	0.077310	2.272	69	0.026
For TIME slope, P1					
INTRCPT2, B10	-0.016519	0.016092	-1.027	204	0.306
LIFE HAPPY, B11	0.005106	0.003861	1.322	204	0.188

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.147997	0.191293	0.774	129	0.441
LIFE SATISF, B01	0.113266	0.044256	2.559	129	0.012
For TIME slope, P1					
INTRCPT2, B10	-0.006126	0.010181	-0.602	387	0.547
LIFE SATISF, B11	0.001358	0.002344	0.580	387	0.562

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.931789	0.157369	5.921	131	0.000
MARITAL, B01	-0.119887	0.060865	-1.970	131	0.051
For TIME slope, P1					
INTRCPT2, B10	-0.004678	0.008181	-0.572	385	0.567
MARITAL, B11	0.001780	0.003223	0.552	385	0.581

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	-0.020914	0.238745	-0.088	121	0.931
MOBILITY, B01	0.025375	0.009231	2.749	121	0.007
For TIME slope, P1					
INTRCPT2, B10	-0.009663	0.014587	-0.662	361	0.508
MOBILITY, B11	0.000367	0.000556	0.661	361	0.509

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.195002	0.233871	0.834	129	0.406
RECEIVING SS, B01	0.157703	0.082946	1.901	129	0.059
For TIME slope, P1					
INTRCPT2, B10	-0.009025	0.011944	-0.756	387	0.450
RECEIVING SS, B11	0.003056	0.004244	0.720	387	0.472

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.551236	0.266335	2.070	120	0.040
SF8 MENTAL, B01	0.001293	0.004990	0.259	120	0.796
For TIME slope, P1					
INTRCPT2, B10	-0.002354	0.014734	-0.160	357	0.874
SF8 MENTAL, B11	0.000067	0.000275	0.242	357	0.809

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.117708	0.206871	0.569	120	0.570

SF8 PHYSICAL, B01	0.009975	0.004048	2.464	120	0.015
For TIME slope, P1					
INTRCPT2, B10	-0.013216	0.011384	-1.161	357	0.247
SF8 PHYSICAL, B11	0.000283	0.000221	1.281	357	0.201

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.633350	0.164154	3.858	107	0.000
SOC PARTICIP, B01	0.004368	0.075819	0.058	107	0.955
For TIME slope, P1					
INTRCPT2, B10	-0.006389	0.009111	-0.701	370	0.483
SOC PARTICIP, B11	0.002788	0.004260	0.655	370	0.513

VOLUNTEERING OUTSIDE THE CCRC:

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.311958	0.678462	1.934	129	0.055
AGE, B01	-0.010293	0.008400	-1.225	129	0.223

For TIME slope, P1					
INTRCPT2, B10	-0.002722	0.037635	-0.072	313	0.943
AGE, B11	0.000014	0.000464	0.029	313	0.977

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.470752	0.060780	7.745	134	0.000
B/L SIGEVENTS, B01	0.020618	0.046810	0.440	134	0.660
For TIME slope, P1					
INTRCPT2, B10	-0.006571	0.004899	-1.341	318	0.181
SIG EVENTS, B11	0.001583	0.001560	1.015	318	0.311

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.233343	0.161386	1.446	133	0.151
COMMUNIT, B01	0.165379	0.101003	1.637	133	0.104
For TIME slope, P1					
INTRCPT2, B10	-0.001822	0.008010	-0.227	318	0.820
COMMUNIT, B11	0.000225	0.004954	0.045	318	0.964

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.233343	0.161386	1.446	133	0.151
COMMUNIT, B01	0.165379	0.101003	1.637	133	0.104
For TIME slope, P1					

INTRCPT2, B10	-0.001822	0.008010	-0.227	318	0.820
COMMUNIT, B11	0.000225	0.004954	0.045	318	0.964

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.483736	0.154556	3.130	133	0.003
GENDER, B01	0.000340	0.103690	0.003	133	0.997
For TIME slope, P1					
INTRCPT2, B10	-0.002854	0.007562	-0.377	318	0.706
GENDER, B11	0.000926	0.004996	0.185	318	0.853

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.174058	0.271913	-0.640	129	0.523
GIVINGSS, B01	0.240724	0.096582	2.492	129	0.014
For TIME slope, P1					
INTRCPT2, B10	-0.002341	0.013772	-0.170	314	0.865
GIVINGSS, B11	0.000320	0.004878	0.066	314	0.948

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.418019	0.406520	-1.028	69	0.308
LIFEHAPP, B01	0.199419	0.096861	2.059	69	0.043
For TIME slope, P1					
INTRCPT2, B10	-0.015273	0.017953	-0.851	173	0.396
LIFEHAPP, B11	0.002817	0.004417	0.638	173	0.524

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.178249	0.259329	-0.687	129	0.493
LIFESATI, B01	0.159327	0.060584	2.630	129	0.010
For TIME slope, P1					
INTRCPT2, B10	-0.009732	0.011983	-0.812	316	0.417
LIFESATI, B11	0.001986	0.002810	0.707	316	0.480

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.698697	0.221675	3.152	131	0.002
MARITALS, B01	-0.084222	0.085847	-0.981	131	0.329
For TIME slope, P1					
INTRCPT2, B10	0.008843	0.010658	0.830	314	0.408
MARITALS, B11	-0.004231	0.004208	-1.005	314	0.316

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.159907	0.341497	-0.468	121	0.640
MOBILITY, B01	0.024507	0.013111	1.869	121	0.064
For TIME slope, P1					
INTRCPT2, B10	-0.016473	0.019798	-0.832	298	0.406
MOBILITY, B11	0.000553	0.000750	0.737	298	0.461

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.488852	0.316499	-1.545	129	0.125
RECEIVIN, B01	0.352521	0.112670	3.129	129	0.003
For TIME slope, P1					
INTRCPT2, B10	-0.023165	0.016143	-1.435	312	0.152
RECEIVIN, B11	0.007722	0.005767	1.339	312	0.182

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.230116	0.376660	0.611	120	0.542
SF8MENTA, B01	0.005217	0.007070	0.738	120	0.462
For TIME slope, P1					
INTRCPT2, B10	-0.003633	0.018366	-0.198	288	0.844
SF8MENTA, B11	0.000048	0.000347	0.137	288	0.891

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.028030	0.288579	0.097	120	0.923
SF8PHYSI, B01	0.009570	0.005688	1.683	120	0.095
For TIME slope, P1					
INTRCPT2, B10	0.006605	0.014574	0.453	288	0.650
SF8PHYSI, B11	-0.000152	0.000286	-0.532	288	0.595

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.590570	0.239233	2.469	107	0.015
SOC PARTICIP, B01	-0.025774	0.110945	-0.232	107	0.817
For TIME slope, P1					
INTRCPT2, B10	-0.005668	0.012147	-0.467	298	0.641
SOC PARTICIP, B11	0.001449	0.005811	0.249	298	0.803

HELPING INSIDE THE CCRC

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.267652	0.859666	0.311	129	0.756
AGE, B01	0.006390	0.010661	0.599	129	0.550
For TIME slope, P1					
INTRCPT2, B10	0.027161	0.060732	0.447	300	0.655
AGE, B11	-0.000326	0.000756	-0.432	300	0.666

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.724972	0.070990	10.212	134	0.000
B/L SIGEVENT, B01	0.084183	0.054760	1.537	134	0.126
For TIME slope, P1					
INTRCPT2, B10	-0.002788	0.007774	-0.359	307	0.720
SIG EVENTS, B11	0.000886	0.002433	0.364	307	0.716

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.485287	0.186878	2.597	133	0.011
COMMUNITY, B01	0.202539	0.118671	1.707	133	0.090
For TIME slope, P1					
INTRCPT2, B10	0.012364	0.012168	1.016	307	0.311
COMMUNITY, B11	-0.007554	0.007604	-0.993	307	0.322

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.534517	0.144868	3.690	127	0.001
DRIVING, B01	0.325437	0.159213	2.044	127	0.043
For TIME slope, P1					
INTRCPT2, B10	-0.007819	0.011439	-0.684	295	0.495
DRIVING, B11	0.009616	0.012182	0.789	295	0.431

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.874276	0.182252	4.797	133	0.000
GENDER, B01	-0.061803	0.121519	-0.509	133	0.611
For TIME slope, P1					
INTRCPT2, B10	-0.007059	0.011552	-0.611	307	0.541
GENDER, B11	0.005700	0.007757	0.735	307	0.463

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	-0.330502	0.311007	-1.063	129	0.290
GIVING SS, G01	0.407774	0.110318	3.696	129	0.001
For TIME slope, B1					
INTRCPT2, G10	0.001601	0.024503	0.065	303	0.948
GIVING SS, G11	-0.000062	0.008580	-0.007	303	0.994

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.295330	0.453329	-0.651	69	0.517
LIFE HAPPY, B01	0.232508	0.107298	2.167	69	0.034
For TIME slope, P1					
INTRCPT2, B10	-0.011798	0.031765	-0.371	171	0.710
LIFE HAPPY, B11	0.004036	0.007637	0.529	171	0.597

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	0.069042	0.313819	0.220	129	0.826
LIFE SATISF, B01	0.172124	0.072735	2.366	129	0.020
For TIME slope, P1					
INTRCPT2, B10	-0.013031	0.021329	-0.611	304	0.541
LIFE SATISF, B11	0.003354	0.004948	0.678	304	0.498

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.367131	0.257164	5.316	131	0.000
MARITAL, B01	-0.225252	0.099183	-2.271	131	0.025
For TIME slope, P1					
INTRCPT2, B10	-0.022453	0.015666	-1.433	304	0.153
MARITAL, B11	0.009362	0.006201	1.510	304	0.132

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.071266	0.407486	0.175	121	0.862
MOBILITY, B01	0.028131	0.015741	1.787	121	0.076
For TIME slope, P1					
INTRCPT2, B10	-0.045084	0.029174	-1.545	286	0.123
MOBILITY, B11	0.001686	0.001100	1.532	286	0.126

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					

INTRCPT2, B00	-0.133687	0.380011	-0.352	129	0.725
RECEIVING SS, B01	0.334429	0.135095	2.476	129	0.015
For TIME slope, P1					
INTRCPT2, B10	0.006449	0.024098	0.268	303	0.789
RECEIVING SS, B11	-0.001703	0.008593	-0.198	303	0.843

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.390024	0.433280	0.900	120	0.370
SF8 MENTAL, B01	0.007600	0.008140	0.934	120	0.353
For TIME slope, P1					
INTRCPT2, B10	-0.007642	0.027693	-0.276	281	0.783
SF8 MENTAL, B11	0.000190	0.000523	0.364	281	0.716

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.559734	0.345690	1.619	120	0.108
SF8 PHYSICAL, B01	0.004604	0.006800	0.677	120	0.499
For TIME slope, P1					
INTRCPT2, B10	-0.047772	0.022270	-2.145	281	0.033
SF8 PHYSICAL, B11	0.000988	0.000433	2.280	281	0.023

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.806375	0.064051	12.589	107	0.000
SOC PARTICIP, B01	0.016077	0.127492	0.126	107	0.900

For TIME slope, P1					
INTRCPT2, B10	-0.000331	0.003916	-0.085	289	0.933
SOC PARTICIP, B11	-0.011003	0.008757	-1.256	289	0.210

HELPING OUTSIDE THE CCRC

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.423612	0.831136	2.916	129	0.005
AGE, B01	-0.019963	0.010298	-1.939	129	0.054
For TIME slope, P1					
INTRCPT2, B10	-0.025821	0.062592	-0.413	312	0.680
AGE, B11	0.000316	0.000775	0.408	312	0.683

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.726766	0.069113	10.516	134	0.000
B/L SIGEVENT, B01	0.100004	0.053040	1.885	134	0.061
For TIME slope, P1					
INTRCPT2, B10	-0.009423	0.008452	-1.115	134	0.267
SIG EVENTS, B11	0.002905	0.002688	1.081	134	0.282

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.810266	0.187578	4.320	133	0.000
COMMUNITY, B01	-0.006792	0.118211	-0.057	133	0.955
For TIME slope, P1					
INTRCPT2, B10	-0.004331	0.013394	-0.323	319	0.746
COMMUNITY, B11	0.002557	0.008204	0.312	319	0.755

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.477854	0.143206	3.337	127	0.001
DRIVING, B01	0.413620	0.156842	2.637	127	0.010
For TIME slope, P1					
INTRCPT2, B10	-0.001481	0.010477	-0.141	308	0.888
DRIVING, B11	0.001039	0.011403	0.091	308	0.928

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.821619	0.179318	4.582	133	0.000
GENDER, B01	-0.014999	0.120114	-0.125	133	0.901
For TIME slope, P1					
INTRCPT2, B10	0.008543	0.012360	0.691	319	0.490
GENDER, B11	-0.006319	0.008286	-0.763	319	0.446

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.111185	0.312531	-0.356	129	0.722
GIVING SS, B01	0.330652	0.110855	2.983	129	0.004
For TIME slope, P1					
INTRCPT2, B10	-0.006878	0.023419	-0.294	316	0.769
GIVING SS, B11	0.002385	0.008291	0.288	316	0.774

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.715514	0.459214	-1.558	69	0.124
LIFE HAPPY, B01	0.366640	0.109795	3.339	69	0.002
For TIME slope, P1					
INTRCPT2, B10	0.031827	0.036961	0.861	69	0.392
LIFE HAPPY, B11	-0.007114	0.009090	-0.783	69	0.437

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.293042	0.309674	0.946	129	0.346
LIFE SATISF, B01	0.121790	0.071947	1.693	129	0.092
For TIME slope, P1					
INTRCPT2, B10	-0.001277	0.021749	-0.059	129	0.954
LIFE SATISF, B11	0.000106	0.005088	0.021	129	0.984

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

For INTRCPT1, P0					
INTRCPT2, B00	1.138490	0.253916	4.484	131	0.000
MARITAL, B01	-0.129540	0.098149	-1.320	131	0.189
For TIME slope, P1					
INTRCPT2, B10	-0.008518	0.018883	-0.451	131	0.652
MARITAL, B11	0.002965	0.007447	0.398	131	0.691

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.091450	0.404278	-0.226	121	0.822
MOBILITY, B01	0.034604	0.015596	2.219	121	0.028
For TIME slope, P1					
INTRCPT2, B10	-0.031800	0.032570	-0.976	121	0.331
MOBILITY, B11	0.001193	0.001240	0.962	121	0.338

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	-0.156777	0.372032	-0.421	129	0.674
RECEIVING SS, B01	0.345208	0.132502	2.605	129	0.011
For TIME slope, P1					
INTRCPT2, B10	0.024019	0.027647	0.869	129	0.387
RECEIVING SS, B11	-0.008651	0.009854	-0.878	129	0.382

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					

INTRCPT2, B00	0.758443	0.420295	1.805	120	0.073
SF8 MENTAL, B01	0.001497	0.007890	0.190	120	0.850
For TIME slope, P1					
INTRCPT2, B10	-0.006719	0.032671	-0.206	120	0.838
SF8 MENTAL, B11	0.000138	0.000616	0.224	120	0.823

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.730740	0.338652	2.158	120	0.033
SF8 PHYSICAL, B0	0.002171	0.006649	0.327	120	0.744
For TIME slope, P1					
INTRCPT2, B10	-0.036662	0.025508	-1.437	120	0.153
SF8 PHYSICAL, B11	0.000743	0.000499	1.488	120	0.139

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	0.660785	0.265591	2.488	107	0.015
SOC PARTICIP, B01	0.060071	0.122750	0.489	107	0.625
For TIME slope, P1					
INTRCPT2, B10	0.009037	0.021129	0.428	107	0.669
SOC PARTICIP, B11	-0.004606	0.010070	-0.457	107	0.648

GIVING SOCIAL SUPPORT

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	4.065188	0.546297	7.441	129	0.000
AGE, B01	-0.016278	0.006752	-2.411	129	0.017
For TIME slope, P1					
INTRCPT2, B10	0.018582	0.028377	0.655	129	0.513
AGE, B11	-0.000252	0.000349	-0.723	129	0.471

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.749437	0.047739	57.593	134	0.000
B/L SIGEVENT, B01	0.005762	0.037016	0.156	134	0.877
For TIME slope, P1					
INTRCPT2, B10	-0.000217	0.003851	-0.056	134	0.955
SIG EVENT, B11	-0.000517	0.001197	-0.432	134	0.666

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.856797	0.127461	22.413	133	0.000

COMMUNITY, B01	-0.068183	0.080288	-0.849	133	0.398
For TIME slope, P1					
INTRCPT2, B10	0.003801	0.006296	0.604	133	0.547
COMMUNITY, B1	-0.003551	0.003837	-0.926	133	0.357

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.391190	0.092173	25.942	127	0.000
DRIVING, B01	0.443470	0.101318	4.377	127	0.000
For TIME slope, P1					
INTRCPT2, B10	0.002284	0.005213	0.438	127	0.662
DRIVING, B11	-0.004740	0.005616	-0.844	127	0.400

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.719401	0.121054	22.464	133	0.000
GENDER, B01	0.024390	0.082485	0.296	133	0.768
For TIME slope, P1					
INTRCPT2, B10	-0.008545	0.005753	-1.485	133	0.140
GENDER, B11	0.004864	0.003888	1.251	133	0.213

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.595811	0.179612	14.452	131	0.000
MARITAL, B01	0.062588	0.069455	0.901	131	0.369
For TIME slope, P1					

INTRCPT2, B10	-0.023307	0.008145	-2.861	131	0.005
MARITAL, B11	0.008618	0.003196	2.696	131	0.008

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.651948	0.259355	6.369	121	0.000
MOBILITY, B01	0.042908	0.010039	4.274	121	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.012978	0.015334	-0.846	121	0.399
MOBILITY, B11	0.000403	0.000583	0.691	121	0.491

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.671912	0.055899	47.799	127	0.000
NONHEALTH SE, B01	0.024712	0.010882	2.271	127	0.025
For TIME slope, P1					
INTRCPT2, B10	-0.002066	0.002677	-0.772	127	0.442
NONHEALTH SE, B11	0.000160	0.000552	0.289	127	0.773

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.426486	0.269544	9.002	120	0.000
SF8 MENTAL, B01	0.006588	0.005057	1.303	120	0.195
For TIME slope, P1					
INTRCPT2, B10	0.001506	0.015422	0.098	120	0.923
SF8 MENTAL, B11	-0.000069	0.000287	-0.242	120	0.810

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	1.766958	0.190956	9.253	120	0.000
SF8 PHYSICAL, B01	0.020071	0.003749	5.354	120	0.000
For TIME slope, P1					
INTRCPT2, B10	-0.017837	0.011652	-1.531	120	0.128
SF8 PHYSICAL, B11	0.000309	0.000227	1.361	120	0.176

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.312278	0.191245	12.091	107	0.000
SOC PARTICIP, B01	0.200139	0.088194	2.269	107	0.025
For TIME slope, P1					
INTRCPT2, B10	-0.014787	0.009140	-1.618	107	0.108
SOC PARTICIP, B11	0.006324	0.004266	1.482	107	0.141

RECEIVING SOCIAL SUPPORT

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.762583	0.399634	6.913	129	0.000
AGE, B01	0.000795	0.004938	0.161	129	0.873
For TIME slope, P1					
INTRCPT2, B10	-0.008915	0.025459	-0.350	129	0.727
AGE, B11	0.000153	0.000314	0.489	129	0.625

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.854625	0.028104	101.573	134	0.000
B/L SIGEVENT, B01	0.000869	0.021346	0.041	134	0.968
For TIME slope, P1					
INTRCPT2, B10	0.000962	0.003479	0.276	134	0.783
SIG EVENT, B11	0.000901	0.001101	0.818	134	0.415

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	2.663891	0.072082	36.957	133	0.000
COMMUNITY, G01	0.126106	0.045256	2.786	133	0.007
For TIME slope, B1					
INTRCPT2, G10	-0.002182	0.005784	-0.377	133	0.706
COMMUNITY, G11	0.003661	0.003550	1.031	133	0.305

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.822814	0.057783	48.852	127	0.000
DRIVING, B01	0.040504	0.063201	0.641	127	0.522
For TIME slope, P1					
INTRCPT2, B10	0.000755	0.004698	0.161	127	0.873
DRIVING, B11	0.003348	0.005092	0.658	127	0.512

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.915705	0.070629	41.282	133	0.000
GENDER, B01	-0.043817	0.048278	-0.908	133	0.366
For TIME slope, P1					
INTRCPT2, B10	0.000267	0.005329	0.050	133	0.960
GENDER, B11	0.002475	0.003631	0.682	133	0.496

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.964735	0.102690	28.871	131	0.000
MARITAL, B01	-0.042231	0.039762	-1.062	131	0.291
For TIME slope, P1					
INTRCPT2, B10	-0.002411	0.007713	-0.313	131	0.755
MARITAL, B11	0.002431	0.003024	0.804	131	0.423

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.467728	0.164709	14.982	121	0.000
MOBILITY, B01	0.015091	0.006360	2.373	121	0.019
For TIME slope, P1					
INTRCPT2, B10	0.011862	0.013519	0.877	121	0.382
MOBILITY, B11	-0.000346	0.000516	-0.671	121	0.503

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.582067	0.103578	24.929	127	0.000
NONHEALTH SE, B01	0.113998	0.040912	2.786	127	0.007
For TIME slope, P1					
INTRCPT2, B10	0.014343	0.008173	1.755	127	0.081
NONHEALTH SE, B11	-0.004525	0.003220	-1.405	127	0.162

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.783661	0.166389	16.730	120	0.000
SF8 MENTAL, B01	0.001482	0.003119	0.475	120	0.635
For TIME slope, P1					
INTRCPT2, B10	0.009687	0.013301	0.728	120	0.468
SF8 MENTAL, B11	-0.000135	0.000248	-0.545	120	0.586

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value

Univariate Models all in one file

Fixed Effect	Coefficient	Error	T-ratio	d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.686685	0.131847	20.377	120	0.000
SF8 PHYSICAL, B01	0.003490	0.002583	1.351	120	0.179
For TIME slope, P1					
INTRCPT2, B10	0.006515	0.010379	0.628	120	0.531
SF8 PHYSICAL, B11	-0.000080	0.000202	-0.395	120	0.693

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, P0					
INTRCPT2, B00	2.786616	0.109129	25.535	107	0.000
SOC PARTICIP, B01	0.033043	0.050288	0.657	107	0.512
For TIME slope, P1					
INTRCPT2, B10	-0.001698	0.008711	-0.195	107	0.846
SOC PARTICIP, B11	0.002610	0.004058	0.643	107	0.521

Univariate Models all in one file

ABOUT THE AUTHOR

Kathryn H. Petrossi received a Bachelor's Degree with a double major in Sociology and the Honors Program in Psychology from Vanderbilt University in 2000. She entered the Ph.D. in Aging Studies program at the University of South Florida in 2000.

While in the Ph.D. program at the University of South Florida, Kathryn was active in the Student Association for Aging Studies, and served as academic advisor for the Alpha Omicron Pi women's fraternity. Kathryn was a teaching assistant and instructor for the Physical Change and Aging undergraduate course. She has coauthored a book chapter on health care policy, and an online article on the importance of lifelong learning. She has made several presentations on successful aging programs at national conferences such as the Gerontological Society of America, The Association for Gerontology in Higher Education, The American Society on Aging, and the American Association of Homes and Services for the Aging.