A comprehensive investigation of change in self-reported resources of older adults

G. Kevin Randall

Iowa State University

Follow this and additional works at: https://lib.dr.iastate.edu/rtd

Part of the Developmental Psychology Commons, Family, Life Course, and Society Commons, and the Gerontology Commons

Recommended Citation
https://lib.dr.iastate.edu/rtd/3059

This Dissertation is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Retrospective Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
A comprehensive investigation of change in self-reported resources of older adults

by

G. Kevin Randall

A dissertation submitted to the graduate faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Human Development and Family Studies
(Life Span Studies)

Program of Study Committee:
Peter Martin, Major Professor
Jacques Lempers
Dan Russell
Mack Shelley
K. A. S. Wickrama

Iowa State University
Ames, Iowa
2006
Table of Contents

List of Figures                                    v
List of Tables                                    vii
Acknowledgements                                 ix
Introduction                                      1
    Purpose                                       3
Literature Overview                              5
    Why Centenarians?                             5
    Why OARS?                                     6
Theoretical and Conceptual Bases                  9
Primary Questions                                 12
Economic Resources                                13
Mental Health                                     15
Health Related Resources: ADLs and Physical Health 20
Social Resources                                  27
Research Questions and Hypotheses                32
Method                                           35
    Participants and Procedure                   35
    Measures                                     38
    Missing Data                                 41
    Data Analysis                                42
Results                                          47
    Measurement Model for OARS                   47
Appendix E. Social Resources Rating Scale

Appendix F. IRB Approval

References
List of Figures

Figure 1. Time by Age Group Interaction 60

Figure 2. Cross-Lagged Latent Variable Model for Mental and Physical Health 66

Figure 3. Cross-Lagged Latent Variable Model for IADLs and Physical Health 67

Figure 4. Age Group Predicts Change in IADLs 71

Figure 5. Mediation of Age Group Predicting Growth Factors of IADLs by Social Resources 73

Figure 6. Mediation of Physical Health Predicting Growth Factors of Economic Resources by Social Resources 74

Figure 7. Mediation of Age Group Predicting Growth Factors of Mental Health by Social Resources 74

Figure 8. Moderation by Social Resources of Age Group Predicting Change in IADLs 77

Figure 9. Social Resources Predicts Intercept and Change in IADLs (60s) 78

Figure 10. Social Resources Predicts Intercept and Change in IADLs (80s) 78

Figure 11. Social Resources Predicts Intercept and Change in IADLs (100s) 79

Figure 12. Moderation by Social Resources of Age Group (60s) Predicting Change in IADLs 83
Figure 13. Moderation by Social Resources of Age Group (80s)
Predicting Change in IADLs 84

Figure 14. Moderation by Social Resources of Age Group (100s)
Predicting Change in IADLs 85
List of Tables

Table 1. Sample Demographic Characteristics 37
Table 2. Differences Between Participants at Time 1 and Participants at Time 1 and Time 2 38
Table 3. Latent Variable Construct Measurement Model Results 49
Table 4. Correlation Matrix of OARS Latent Variables 54
Table 5. Descriptives for OARS Resource Single Index Constructs at Time 1 and Time 2 57
Table 6. Mean Difference for OARS Constructs by Age Group at Time 1 58
Table 7. Mean Changes by Age Group in OARS Single Index Constructs 59
Table 8. Correlation Matrix of Indicators for OARS Measurement Model 62
Table 9. Correlation Matrix of OARS Single Index Constructs 64
Table 10. Completely Cross-Lagged Model of Time 1 OARS Single Index Constructs Predicting Time 2 Single Index Constructs 64
Table 11. Cross-Lagged Latent Variables Measurement Model Results: Mental Health and Physical Health 65
Table 12. Cross-Lagged Latent Variables Measurement Model Results: IADLs and Physical Health 67
Table 13. Univariate Growth Curve Results for OARS Single Index Constructs 69
Table 14. Predictors of Growth Factors in OARS Single Index Constructs

Table 15. Simple Intercepts and Slopes Equations for Change in IADLs By Time 1 Age Group and Time 1 Social Resources
Acknowledgements

First, I wish to express my deepest appreciation to my major professor, my mentor, and my friend, Dr. Peter Martin. His patience and encouragement have been unfailing across the years of my doctoral training and across multiple contexts: discussions in the classroom, debates over research methods in the “lab,” and decision-making & career counseling sessions in the coffee shop. Thanks, too, for modeling balance in teaching, research, and family.

Second, I am grateful for the privilege to analyze data from the Georgia Centenarian Study. Without the vision and hard work of the co-principal investigators, Dr. Leonard W. Poon, Dr. Peter Martin, and Dr. Mary Ann Johnson, my aspirations to investigate change in resources used by older adults, especially centenarians, would not have been possible. Thanks for your efforts that have informed so many in the scientific literature and in the applied settings about the unique adaptational characteristics of older adults. Your efforts have made it possible for me to build a strong foundation for my research career.

Third, I am reminded daily of the financial and collegial support provided by my employer Dr. Richard L. Spoth, F. Wendell Miller Senior Prevention Scientist, and fellow prevention research scientists at Iowa State University’s Partnerships in Prevention Science Institute. Without your encouragement to persistent I would not have finished.

Finally, I am overwhelmed as I consider the unfailing support of my wife Carolyn and each of our children. In moments of discouragement and in moments of excitement each of you, in your own way, provided the appropriate type of social support needed at that time. Thanks for your understanding when I was not there in the past and for believing in me to finish so I can be there in the future.
Introduction

Increasingly, a guiding theme in gerontology is the overarching investigation of successful aging or adaptation to the deleterious processes associated with advanced age (Baltes & Baltes, 1990; Steverink, Lindenberg, & Ormel, 1998). Because the aging process is often conceptualized as a developmental challenge to maintain a balance between gains and losses, with losses increasing over the lifespan (Baltes, 1997), Steverink and colleagues (1998, p. 441) asked a number of penetrating questions: “What mechanisms and processes make people age successfully? Under what circumstances will the process of ageing be more or less optimal? And, finally, by which criteria should successful ageing be evaluated?”

Across the developmental landscape of an individual’s lifespan, resources – material, social, or personal characteristics that a person possesses and that can be utilized to obtain valued ends or to adapt to life’s changing conditions – hold a prominent position among factors influencing individual well-being (Diener & Fujita, 1995; Hobfoll, 2002; Martin, 2002). Resources have been dimensionally assessed as internal and external, biological and cultural, and distal and proximal, to name a few examples (Hobfoll, 2002). These resources have been empirically demonstrated to significantly influence adaptation in older adult age groups (Martin, 2002) and draw the attention of those interested in the quality of life among the young-old, old-old, and oldest-old (Bishop, Martin, & Poon, in press).

In the past decade, theoretical and empirical research on multiple resources and adaptation or successful aging among the growing population of older adults has grown tremendously (Bosworth & Schaie, 1997; Martin, Grunendahl, & Martin, 2001; Pinquart & Sorensen, 2000) and spawned great interest in psychometric concerns regarding how and what to assess in this older population (Blazer, 2000). First, with the advent of increased
longevity for so many, researchers have demonstrated the need to expand investigations of multi-dimensional resources in elderly populations to pointed studies of particular age groups such as those in their 60s, 80s, and 100s, because, it has been proposed, those in their 100s, 80s, and 60s are uniquely different subgroups of older age individuals (McCamish-Svensson, Samuelsson, & Hagberg, 2001; Suzman, Willis, & Manton, 1992). Many terms have been utilized for these sub-groups of older age participants – young-old, old, very old, old-old, oldest-old, centenarians, and even super-centenarians (Jeune & Andersen-Ranberg, 2000; Krause, Shaw, & Cairney, 2004).

Second, this past work was motivated not only by the increased prevalence of those advanced in years, but by a growing concern among geriatricians assessing and caring for frail older adults. One particular assessment tool, the Duke Older Americans Resources and Services multidimensional functional assessment procedure (known as the Duke OARS or OARS hereafter), was developed by a multidisciplinary team (including experts from such fields as social work, clinical and social psychology, gerontology, geropsychiatry, public health, and biostatistics) who recognized that personal well-being among the old, very old, and oldest-old encompasses many aspects or multiple functions (Fillenbaum, 1988). Because older age groups (i.e., those well into their 80s and beyond) tend to present chronic disabilities or ailments (Blazer, 2000; Selim et al., 2005; Stek, Gussekloo, Beekman, van Tilburg, & Westendorp, 2004), the developers of the OARS designed an assessment tool that focuses primarily on adaptation and the maintenance of personal well-being in five resource areas: social resources, economic resources, mental health, physical health, and self-care capacity or functional health (including both instrumental activities of daily living – IADLs - and activities of daily living - ADLs). This assessment instrument continues to receive
widespread use by a diverse group of geriatric practitioners, researchers, service group
providers such as epidemiologists characterizing particular populations, clinicians assessing
patient status, resource allocaters providing appropriate services, and program evaluators
investigating the impacts of interventions (Bailey et al., 2002; Blazer, 2000; Krach,
DeVaney, DeTurk, & Zink, 1996; Martin, 2002; Tierney et al., 2004).

Purpose

Multiple, coexisting physical and psychiatric diseases are prevalent among “expert
survivors” or centenarians (Blazer & Hybels, 2005; Stek et al., 2004). Andersen-Ranberg,
Schroll, and Jeune (2001, p. 906) maintained that, “although healthy centenarians do not
exist, autonomous ones do.” The focus of this study was on the mechanisms or resources that
older individuals draw upon to adapt to the normative decrepitude of advanced age. To date,
no studies have been found that systematically investigate the structural inter-relationships of
the five self-reported resource areas or factors (i.e., social, economic, mental, physical, and
functional) assessed by the OARS, among older adults - especially centenarians. In
particular, because the centenarian group typically struggles with increased hearing, vision,
and functional health losses, these five resources are especially salient for positive adaptation
to age-related losses. This study’s aims focused on the following questions among
participants in the Georgia Centenarian Study (Poon, Clayton, Martin, Johnson, Courtenay, et
al., 1992). First, what type of factor structure underlies each of the five resource areas?
Because clinical work and empirical research may be tiring and confusing for older
participants, a reduced version of the five OARS resources as modeled by the indicators of
five latent variables might be helpful in reducing the time required to gain reliable and valid
assessments of the resources. Second, because these five resources are so critical to the
positive adaptation of adults advanced in years, how do the resources change over time for those in their 60s, 80s, and 100s? Third, how do the OARS resource measures (e.g., economic resources, mental health, physical health, activities of daily living, and social resources) uniquely relate or contribute to change in each other over time? Finally, As Mike Martin and colleagues (2001, p. P124) so aptly stated, “Especially in very old age, because of the loss of other individual resources, social resources may be of increased importance for the successful coping with critical life events.” Thus, this study investigated the nature of the mediating and moderating influence of the OARS social resources relative to the other resource measures.
Literature Overview

Because the purpose of this study was to focus on five resources essential to optimal or positive adaptation to age-related losses by older adults, this review begins with a brief section emphasizing the increasing prevalence of older adults – namely centenarians. Next, the literature addressing the theoretical and conceptual underpinnings guiding this study’s conceptual model is reviewed, culminating in a description of the conceptual model and the primary questions addressed by the study. Finally, the literature pertinent to each resource included in the OARS assessment, the significance of each resource for older adults, and the subsequent contribution of this literature to the present study’s hypotheses is addressed.

Why Centenarians?

The focus of this study and this review is on centenarians. The question of why a focus on centenarians is answered demographically and intrinsically. Demographically, individuals age 65 and over, and in particular those 85 and over, comprise a unique segment of the United States’ population. Those 85 and over are projected to be the most rapidly growing age group, doubling in size between the early 1990s and 2025 and increasing five-fold by 2050 (Day, 1996). Studies of centenarians in Asia, Europe, and North America were found that focused on mental, physical, and psychological health outcomes ranging from suicide and depression to blood pressure and hip fractures (e.g., Chou & Chi, 2005; Martin, Rott, Hagberg & Morgan, 2000; Oliver & Burke, 2004; Stek et al., 2004). Recently, Coles (2004) extended previous demographic work even further by investigating super-centenarians (individuals 110 years or older) and concluded that the existing record of longevity – 122 years – will be difficult to break apart from a currently “unknown” medical breakthrough. Unfortunately, most studies tend to aggregate participants into the “over-65”
category overlooking the potential differential relationships between older age groups and outcomes of interest. However, studies that do investigate those in the later years of life pique the interest of the public and research community alike. For example, Baltes and Mayer (1999, p. 10) concluded their discussion regarding Berliners ages 70 -100 with this cogent comment, “Old age is not foremost a negative and problem-ridden phase of life.” Also, researchers investigating twins (Ljungquist, Berg, Lanke, McClearn, & Pedersen, 1998; Rowe & Kahn, 1999) came to the conclusion that factors other than genetics influence longevity.

Intrinsically, most human beings, if not on a hunt similar to Juan Ponce de Leon, find themselves intrigued and interested by centenarians. In fact, a U.S. Bureau of the Census, Current Population Report on centenarians provided this observation: “Yet, this segment of the population surviving to extreme old age draws the attention of researchers and the general public alike, as we try to understand and learn from the experience of individuals who beat the odds of environmental and biological obstacles to which most humans fall prey” (Krach & Velkoss, 1999, p. 1). Theoretical and empirical scientific literature regarding the oldest-old provides direction for this study’s investigation of these “odds-beaters,” and it is to the work of multidimensional resources, lifespan psychology, and resources and adaptation theorizing that this review now turns.

Why OARS?

At least two primary reasons provide justification for this study’s investigation of a multidimensional functional assessment of older adults or, in particular, the Duke OARS. First, an advanced search in the subject area social sciences was conducted by the author using the major on-line database index, PsycINFO. Specifying the key word OARS
(anywhere) resulted in over 400 citations. Examination of the abstracts revealed that over 300 publications used all or portions of Fillenbaum’s (1988) assessment. In fact, between the years of 1995 and 2002, 100 citations included the OARS; between the years 2002 and 2003, 100 citations included the OARS; and finally, between 2003 and 2006, 100 citations included the OARS. Closer reading revealed that a majority of the citations used the Activities of Daily Living scale, whereas fewer studies employed the entire OARS assessment. However, recently Ostbye and colleagues (2006) examined ten dimensions of health and their relationships with overall self-reported health and survival in a population study, the Cache County Memory Study, utilizing multiple OARS measures (e.g., self-rated health, ADLs, IADLs, Social Resources). In addition to the volume of use in the past decade alone, international use of the global OARS assessment was found. For example, Perracini and Ramos (2002) investigated factors associated with recurrent fall episodes using the BOMFAQ, the Brazilian version of the OARS. McCusker, Bellavance, Cardin, and Belzile (1999) found the French version of the OARS ADLs to be valid when administered to older adults in the emergency department of hospitals. Finally, structured interviews using the OARS were conducted by Canadian researchers investigating global health indicators predicting mortality among the elderly (Lefrancois & Lapointe, 1999). Thus, the OARS continues to be frequently and widely used in various types of research among older populations.

Second, calls for renewed attention to multidimensional assessments of older adults have surfaced in the literature. Krach and colleagues (1996) examined six domains of functioning in 50 adults over the age of 85: physical, mental, social, spiritual, economic resources and activities of daily living, and concluded that “. . . multidimensional assessment
is necessary to identify nursing interventions that will regain, maintain or enhance
functioning among oldest-old people” (p. 456). In an American Journal of Psychiatry article
titled, “Psychiatry and the Oldest Old,” noted physician and geriatric psychiatrist Dan Blazer
(2000, p. 1915) wrote, “I propose that psychiatrists who treat the oldest old rejoin our
colleagues in geriatric medicine by emphasizing health-related quality of life (specifically
functional status) and a comprehensive, interdisciplinary approach to assessment and
management of psychiatric disorders.” He summarized work by Patrick and Erickson (1993)
and defined health-related quality of life by core concepts that included the five
multidimensional resources assessed by the Duke OARS (Fillenbaum, 1988) and
recommended the OARS as a standardized scale focusing on the self-reported, health-related
quality of life (p. 1920).

These calls for renewed attention to health-related quality of life and
multidimensional assessments - especially of those over 85 and into their 100s - is in keeping
with the summary thoughts of Jeune and Andersen-Ranberg (2000) in their chapter titled,
“What Can We Learn from Centenarians?” They wrote, “. . . it is possible to preserve
relative autonomy into a very high age in spite of different diseases and disabilities . . . It is
therefore important to know more about the engagement and mood of the centenarians . . .”
(p. 18). Also, this study agrees with Martin, Grunendahl, and Martin (2001, p. P214) who
stated that, “Especially in very old age, because of the loss of other individual resources,
social resources may be of increased importance for the successful coping with critical life
events.” The theoretical literature addressing the necessary resources for adaptation in the
face of age-related losses in order to achieve or maintain well-being is now addressed.
*Theoretical & Conceptual Bases*

Paul Baltes (1997) addressed the American Psychological Association and outlined a two-fold purpose for his talk: (a) to introduce developmentalists to a metatheoretical concept labeled selection, optimization, and compensation (SOC) and (b) to alert psychologists to the special forces that challenge life for individuals, especially those in the fourth age or the oldest-old (i.e., 80 years of age and beyond). In order to justify the need for SOC, Baltes offered three foundational and constraining principles for individual human development across the lifespan from birth to old age. These three principles provided the theoretical underpinnings for this study’s investigation of the inter-relationships of resources necessary for adaptation to age-related losses among centenarians. First, because reproductive fitness, the driving force behind natural selection, operates more strongly in the first half of an individual’s life, the associated benefits from evolutionary selection decrease with age. Substantiating this claim with examples of age-associated loss, Baltes summarizes his point: “Evolution and biology are not good friends of old age” (p. 368).

Conversely, as evolutionary benefits of natural selection decrease with age, Baltes’ second principle stated that an individual’s need or demand for culture increases with age. Baltes (1997, p. 368) defined culture as, “. . . the entirety of psychological social, material, and symbolic (knowledge-based) resources . . .” He explained that these resources were necessary for individual human development beyond adulthood and into old age. Juxtaposing these two principles, Baltes painted the picture of an aging individual who experienced losses associated with the depreciating benefits of inherited biological assets, and who then experienced an increasing need for culture-based compensations in the form of resources (e.g., material, technical, social, economic, and psychological) in order to maintain adequate
and stable levels of functioning. The third constraining principle of lifespan development that substantiates the need for SOC in older adults is somewhat of a composite of the first two: because evolutionary benefits decrease with age and because an individual’s need for culture increases with age, the combined result is that with increased age the efficacy of culture to compensate or the relative power of psychological, social, and material resources also decreases with advancing age. Thus, this study affirms with Baltes that “multicausality, multidimensionality, multidirectionality, and multifunctionality reign supreme in ontogenesis at all stages of the life course” (p. 368) and, in particular, in advanced age or among those experiencing the impact of all three constraining principles of the lifespan architecture – the oldest-old or centenarians.

Building upon this foundational concept of the incomplete architecture of lifespan human development – especially salient for centenarians - M. M. Baltes (1998) and Stevan Hobfoll (2002) extended the literature by examining the role of psychosocial resources and well-being. Margret M. Baltes (1998) summarized work regarding knowledge about age-associated decline and resources (internal and external) based upon studies done with those in their 60s and 70s and postulated about the role played by resources for those in the “fourth age.” She made the point that the ability to apply SOC in later life to maximize gains and minimize losses is dependent upon the availability of resources stating, “This is particularly so in the case of old age, because more and more resources will have to be enlisted to maintain the status quo.” (p. 412). Further, she clarified the point that whereas age-related declines exist (and, likely, accelerate in advanced old age), resource-rich elders experience less of it, and she cited empirical research demonstrating the influence of resources on functional health (i.e., activities of daily living) and mental health. However, she cautioned
that the positive aging experienced by those in their 60s and 70s may not be so easily achieved by those 85 years and older. Recently, social and psychological theorists have begun to address these questions concerning the use of resources by individuals to adapt to age-related declines as explicated by life-span psychologists.

Hobfoll, known for his Conservation of Resources Theory (1998), provided a review of social and psychological resources and adaptation models and theories (Hobfoll, 2002). First, he provided a working or general definition of resources: “. . . those entities that either are centrally valued in their own right (e.g., self-esteem, close attachments, health, and inner peace) or act as a means to obtain centrally valued ends (e.g., money, social support, and credit)” (Hobfoll, 2002, p. 307). Second, he examined the theoretical and empirical heritage shared by today’s resource models reviewing work relating human adaptation, coping, and well-being (Grinker & Spiegel, 1945) and social resources and the resilient self (Kelly, 1966; Sarason, 1974) among others. Hobfoll (2002) illustrated the critical role played by social resources on health-related outcomes, especially mortality, as demonstrated by Berkman and Symes’ (1979) Alameda County research. Third, he reviewed the contribution of different theories including individual or key resource theories (e.g., control, self-efficacy, and social support) and integrated resource models that view resources broadly and view resources as critical mechanisms influencing health and well-being. It is within this resource and adaptation perspective that many researchers (Holohan & Moos, 1991; Holahan, Moos, Holahan, & Cronkite, 1999; Martin, 2002; Martin & Westerhof, 2003) have investigated the influential role that resources and age-related losses have on such outcomes as well-being. In addition, the theoretical and empirical work reviewed regarding the multicausal and multidirectional thinking of Baltes and resource theorists has found an applied home – a
clinical or practical application - in the work of those who examine and treat older people
(Blazer, 2000; Krach et al., 1996).

Primary Questions

This study adapted the conceptual model of the Georgia Centenarian Study (GCS hereafter; Poon, et al., 1992). The goal of the GCS was to investigate how biological, social, and psychological factors enabled older adults - especially centenarians - to successfully adapt to age-related changes. As adults age, functional difficulty in one resource area likely affects functioning in the other resource areas (Fillenbaum, 1988). The Duke OARS provides functional information in five resource areas critical to the independent functioning of older adults: economic resources, mental health, activities of daily living, physical health, and social resources. The present study, utilizing the five multidimensional resources of the Duke OARS instrument assessed on two separate occasions, conducted a comprehensive investigation of change in the self-reported resources of older adults. This investigation addressed three primary questions: (a) What is the influence of age on change in the resources? (b) What is the directional influence of each resource on change in the other resources? and (c) What can be learned about mediation and moderation of change in the resources, particularly by social resources?

The inexorable process of aging results in health status declines (i.e., mental and physical health and instrumental activities of daily living). However, limitations inherent with advanced age often force older adults to rely on others for assistance (i.e., environmental support) to offset these age-related declines. This is an essential aspect of older adults’ adaptation to the process of aging and often such environmental support may either mediate or moderate the relationship between age and health status. The following
sections of this review focus on the explication of each of the five OARS resource areas and the particular relationships among the five resources. Special emphasis is given to those studies assessing older adults, the oldest-old, and especially centenarians. The focus of this review now turns to each of the resources assessed by the OARS.

*Economic Resources*

Economic resources have been defined as the “adequacy of income and income resources” (Fillenbaum, 1988, p. 8). With increasing age, the role of economic resources as a valued commodity necessary for maintaining optimal levels of living and adapting to the vicissitudes of age is particularly salient for older adults, especially centenarians as demonstrated by Goetting, Martin, Poon, and Johnson (1996). In a comparative examination of the economic well-being of community-dwelling centenarians in the Georgia Centenarian Study, Goetting and colleagues (1996) found that (a) economic resources of the expert survivors were lower than those in their 80s and 60s; (b) fewer centenarians collected Social Security Benefits than those in their 80s; (c) approximately two-thirds of the centenarians (68%) had incomes below the poverty threshold; and (d) one in five centenarians indicated that their economic resources were not enough to meet emergency or future needs, and that they needed financial assistance.

Economic resources are most often considered as a capital resource and are addressed by a number of researchers (Coleman, 1988; Entwistle & Astone, 1994; Guo & Harris, 2000). Capital, inclusive of resources and assets, has become a preferred conceptualization for socioeconomic status (SES) because both human capital (nonmaterial supports – such as education) and social capital (nonmaterial and material resources accessed within and through social ties) are linked to outcomes like well-being. Bradley and Corwyn (2002)
reminded readers that although a general consensus exists among researchers that conceptualizations of SES should include income, education, and occupation together rather than alone, there is no consensus on (a) how best to create the set of indicators; (b) whether it works best to examine relations between SES and outcomes using composite measures or individual indicators; or (c) how to measure each component. This lack of agreement exists based upon the number of empirical studies with participants across the lifespan that demonstrate the indicators overlap (thus, tapping into the same dimension) and at other times the indicators appear to assess different underlying phenomena. However, that SES or associated measures of economic resources are important constructs in research regarding older adults remains true for a number of reasons.

First, what is known about economic resources and the influential role they play in the lives of older adults is limited. One association established as predominantly causal is the direction from SES to health (George, 2005; Link & Phelan, 1995; McDonough, Sacker, & Wiggins, 2005). Linda George (2005) summarized the relationship between economic resources and health across the life course as empirically well-founded in the literature. She also mentioned that “lifespan literature demonstrates that economic fortunes change multiple times during adulthood and that precious little is known about the effects of adults’ changing fortunes on health” (George, p. 135). Although studies have investigated the influence of economic resources from distinct points in the lifespan (Barrett & Turner, 2005; Mirowsky & Ross, 1992; Osler et al., 2003; Yang & Clum, 1996) and SES across the life course predicting health problems in later life (Pearlin, Schieman, Fazio, & Meersman, 2005), few have investigated economic resources among older adults, especially centenarians.
Goetting, Martin, and Johnson (2000) conducted a second, intriguing study of 521 respondents from the Study of Aging and Health Dynamics project. These participants were aged 70 years and older. They found six factors with direct influence on adults’ assessment as to whether or not they might leave a financial bequest upon their passing. Physical health problems and medical expenses were two constructs along with socioeconomic status that were associated with having enough financial reserves left at life’s end to leave a financial bequest. Thus, it appears from the literature that economic resources and health are intertwined for older adults, especially centenarians, and the need exists for further investigation of these resources over time.

One clue to the direction of the relationship between economic resources and health-related resources is provided by Link and Phelan (1995). The preponderance of research on the effects of economic resources across the developmental periods of the lifespan led Link and Phelan to posit certain social conditions (e.g., socioeconomic status and social support) as “fundamental causes” of disease because they provide access to important resources, and influence multiple physical and mental health outcomes through numerous and changing mechanisms. There is no question that measures of SES hold a significant place in models specifying the relationships among the resources. In sum, a number of studies reviewed included a measure of socioeconomic status (either economic resources or education or both) as an exogenous, substantive variable of interest or as a control.

**Mental Health**

The adaptive resource, mental health, has been conceptualized and operationalized in numerous ways. The following constructs representing mental health were found in the aging literature: (a) subjective well-being (Pinquart & Sorensen, 2000); (b) psychological well-
being (Kammann, Farry, & Herbison, 1984); (c) low depressive symptomatology (Fiori, Antonucci, & Cortina, 2006; Newman, 1989); (d) life satisfaction, happiness, and congruence (Bishop, Martin, & Poon, in-press; Kozma, Stones, & McNeil, 1991; Pinquart & Sorensen, 2000); and (e) low psychological distress, low loneliness and anxiety (Fry & Debats, 2002). Fillenbaum (1988) defined mental health as adequacy of cognitive functioning and presence or absence of psychiatric disorder, tapping into dimensions consistent with the literature: overall life satisfaction, anxiety, happiness, loneliness, and questions regarding global assessments of emotional health.

That measures of mental health assess a resource salient to older adults is demonstrated by numerous investigations. A parallel study of predictors of loneliness among centenarians in the United States and in Sweden reported that more than 30 to 40 % of all centenarians were lonely often or sometimes (Martin, Hagberg, & Poon, 1997). Another study examined old age and loneliness in the European Longitudinal Study on Aging (Jylha, 2003). Cross-sectional results indicated that older age groups were significantly lonelier than younger age groups – a consistent finding with other cross-sectional studies (Ernst & Cacioppo, 1999; Fees, Martin, & Poon, 1999). However, in her longitudinal analyses, Jylha (2003) found that negative life changes associated with aging explained loneliness. Participants with functional disability and lower levels of social resources reported higher levels of loneliness and were more likely to become lonely. This is also consistent with other longitudinal research (Heikkinen, 1999; Tijhuis, de Jong Gierveld, Feskens, & Kromhout, 1999).

Similarly, Stek et al. (2004) examined a representative sample of 500 community-based participants in the Leiden 85-plus study and found that the prevalence of depression
was 15.4 percent. This level was not dissimilar to the prevalence of depression in community-based studies of the oldest old cited by the authors; the 19 studies provided prevalence rates from as low as 5.0% to as high as 25.3%. The authors also found that, “In the oldest old, it is very likely that depressive symptoms and functional disability are intimately interrelated, negatively influencing each other as part of the frailty concept” (p. 198). Thus, assessments of mental health resources are particularly salient to older adults and are very likely related to other adaptive resources. What studies of mental health resources among older adults contribute to other resources necessary for successful adaptation to age related declines is now addressed.

First, a meta-analysis was conducted of 286 empirical studies examining the influences of socioeconomic status, social network, and competence with subjective well-being (Pinquart & Sorensen, 2000). Next to measures of competence, the authors concluded that quality of social relationships was most influential on the various outcomes of well-being (e.g., life satisfaction, happiness, and self-esteem). In fact, among samples of elderly individuals, social resources influenced measures of well-being for those older adults who experienced some loss and declines and for those who did not.

Second, studies using samples of oldest-old and centenarian participants typically use a measure of mental health resources as an outcome and very often use other resource measures as predictors. For example, the Leiden 85-plus study is a population-based study of those living in Leiden, the Netherlands. In this study of 705 participants, self-rated health and functional disability were highly associated with poor mental health or depression (Stek et al., 2004). The association between assessments of social supports and loneliness among elderly Jews in Russia and the Ukraine was studied by Iecovich and colleagues (2004). They
found that characteristics of social networks (e.g., number of children, contact with children, quality of ties with children and neighbors) were strongly associated with mental health. A recent review of the origins of depression in later life by Blazer and Hybels (2005) highlighted the unique influences of biological and social origins, including impaired social support. Perceived support was found to be the greatest predictor of depressive symptoms in late life relative to other social resource constructs (Bruce, 2002; Chi & Chou, 2002; Forsell & Winblad, 1999). Other studies of older adults demonstrate the mediating and moderating role of social support in relation to depressive outcomes (Geerlings et al., 2000; Taylor & Lynch, 2004).

Two studies of centenarians have focused on predictors of poor mental health resources. First, in a cross-sectional study investigating predictors of depressive symptoms among centenarian participants in the Georgia Centenarian Study, Martin, Rott, Poon, and Johnson (2000) found that the rate of depressive symptoms of centenarians is relatively high despite common perceptions to the contrary. Also, compared to those in their 60s and 80s, centenarians scored higher on depressive symptoms. However, not all centenarians – in fact the majority – were depressed. Important predictors included an interaction between an interviewer rating of social resources and a subjective rating by the participant of health appraisal (e.g., did health difficulties limit involvement in activities) – namely, under the condition where self-perceived health difficulties limited the centenarians’ involvement in activities they wished to participate in “a great deal,” poor social relations significantly predicted depressive symptoms, leading the authors to conclude that “. . . the evaluation of one’s health with respect to functional ability, rather than functional ability itself appears to predict depressive symptoms” (p. 103).
Second, a parallel study of predictors (e.g., measures of personality, cognition, social support and physical health) of loneliness in centenarians participating in the Georgia Centenarian Study and the Swedish Centenarian Study was conducted by Martin et al. (1997). Cognition and social support were found to predict loneliness for the Swedish centenarians, and personality, social support and physical health predicted loneliness for the Georgians. The Georgia data substantiated that higher social support was associated with lower levels of loneliness. However, intriguingly the Swedish data revealed a positive relationship between social support and loneliness. The authors discussed possible explanations for this finding and suggested that future studies should investigate the direction of the relationship between social support and loneliness – a measure of mental health resources - because it might be that low levels of mental health solicit attention from a centenarian’s support network and thus the centenarian improves on the measure of mental health. Cross-sectional studies cannot determine the direction of influence for these predictors, whereas prospective, longitudinal studies could investigate the direction of this association.

In sum, a number of studies revealed the association of physical health resources (i.e., functional health or self-care capacity and self-rated health), social resources and measures of mental health (i.e., depression, loneliness, and subjective well-being). However, in similar fashion to studies reviewed regarding physical health resources (see Lenze et al., 2001), no studies were found attempting to disentangle the relationship between mental health resources and other adaptive resources over time.
Health-Related Resources: Activities of Daily Living and Physical Health

First, it is important to note that a vast array of predictors essential for effective adaptation later in the lifespan have received recent empirical attention, including medical predictors such as serum cholesterol, blood pressure, and the body-mass index, to name just a few (Allard, Robine, & Henon, 2000). However, two variables used to assess health-related resources, self-rated physical health and functional health (i.e., self-care capacity or activities of daily living), also play an important role in the prediction of quantity of life (longevity) and quality of life (mental and physical health) for those advanced in age (Allard et al., 2000; Martin, Rott, Hagberg, & Morgan, 2000). In their assessment of the health status of a national cohort of centenarian veterans, Selim and colleagues (2005) argued that although most health studies of centenarians enumerate medical conditions, assessments of self-perceived health and functional status are equally important and central because older individuals tend to present multiple interrelated medical problems and their current mental and physical functioning is not always directly related to particular medical diagnoses. Andersen-Ranberg et al. (2001, p. 906) affirmed this assessment of the relative health of centenarians and stated, “Furthermore, when reaching the age of 100, people suffer from several chronic conditions, which strongly suggests that healthy centenarians do not exist, or at least are extremely rare.”

In keeping with Andersen-Ranberg and colleagues’ (2001) perspective, this study’s focus includes two resources utilized by community-dwelling and cognitively intact centenarians for adaptation to advanced age - the OARS measures of physical health resources: self-rated physical health and activities of daily living (ADLs; also known as self
care capacity or functional health). It is to these resources and the extant literature addressing them that we now turn our attention.

Activities of Daily Living (ADLs) are assessed by the OARS and conceptualized as the “extent of capacity to do those tasks needed for continued independent living in the community” (Fillenbaum, 1988, p. 10). This particular resource is often expressed as disability (when operationalized as low level of activities) and assesses the difficulties individuals face in the daily ebb and flow of physical living. Numerous studies have identified risk factors associated with lower levels of ADLs including depression (Bruce, Seeman, Merrill, & Blazer, 1994; Smits, Deeg, & Jonker, 1997), subjective health (Idler & Kasl, 1995), and social support (Camacho, Strawbridge, Cohen, & Kaplan, 1993).

The salience of these resources to older adults is demonstrated by a number of findings. Overall, the probability of an older adult experiencing difficulty performing activities of daily living increases with age (Peek, Coward, Henretta, Duncan, & Dougherty, 1997). Jang and colleagues (2004) found that centenarians had higher levels of disability relative to those in their 60s and 80s. One nationally representative study indicated that eight percent of respondents aged 65 – 74 years had difficulty with one or more ADLs compared to 21.4% of older adults aged 75 – 84 and 52.7% of adults aged 85 years and older (Manton, Corder, & Stallard, 1997). Declines in ADLs have been shown to result in significant changes or restrictions in life style, recreational activities, social resources, nutrition, and quality of life (Peek et al., 1997).

Verbrugge and Jette (1994) proposed a disablement model that linked external risk factors (sociodemographics) and psychosocial resources (e.g., depression and social support), pathological factors (e.g., disease and injury), and physiological limitations (e.g., blood
pressure, grip strength, and upper and lower body limitations) with disability. Femia, Zarit, and Johansson (2001) tested an adaptation of the conceptual model of Verbrugge and Jette (1994) in a sample of 203 older Swedish participants. Their purpose was to examine simultaneously the influence of physical impairments, functional limitations, mental health, and social resources on disability among the oldest-old. Analyzing results from a series of path analytic models, the authors found that disability is as much a function of an older individual’s psychosocial characteristics as the specified functional limitations and impairments. In other words, after controlling for the physiological influences, the psychosocial measures (i.e., subjective health, depression, and social integration) exhibited unique effects on disability. This finding affirmed that psychosocial measures form resources that older adults use to affect their level of functional health, independent of underlying physical ailments (Camacho et al., 1993; Seeman, Unger, McAvay, & Mendes de Leon, 1999; Smits et al., 1997). However, Femia and colleagues (2001) reminded readers that their findings were limited to cross-sectional data and causal explanations for the relationships between the variables are not offered.

A review of the literature regarding the reciprocal inter-relationships or associations of physical disability and late life poor mental health was conducted by Lenze and colleagues (2001). Summary findings from over 60 studies include (a) longitudinal studies demonstrate that depression is a risk factor for disability; (b) disability is a risk factor for depression; (c) most intervention studies showed significant improvements in participants’ self-rated physical disability when receiving antidepressant medication, relative to placebo.

However, the chicken and the egg question dilemma still exists, as is demonstrated in the authors’ summary model of depression and disability based upon their review of the
literature (Lenze et al., 2001). For example, the authors’ model of depression and disability included (a) an external underlying factor (third variable or possible suppressor) explaining or moderating the association between poor mental health and poor functional health; (b) poor mental health predicting the criterion poor functional health through the mechanism or mediator of poor self-rated physical health; and (c) poor mental health predicting the criterion physical disability through the mediator strained interpersonal relationships. The reciprocal relationship for this latter suggestion may also be posited – namely that individuals experiencing functional health might negatively influence their social resources resulting in a loss of support and an associated reduction in mental health.

In sum, the literature reviewed for ADLs, in similar fashion to the literature reviewed for self-rated physical health, leads to a few observations pertinent to this study. The models used in these studies again revealed the theoretical and empirical specifications for some of the resources examined. In particular, psychosocial resources uniquely influenced functional health. In addition, social resources were found to mediate the relationship between functional health and mental health. Finally, the studies reviewed were cross-sectional in nature, and revealed a need to examine the directional relationship between self-care capacity and mental health. This review now focuses upon what is known about self-rated physical health among older adults.

Self-rated physical health as a robust predictor of mortality, morbidity, and health care use in older age groups is well-supported in the past two decades (Benyamini & Idler, 1999; Deeg & Bath, 2003; Ferraro, 2006; Quinn, Johnson, Poon, & Martin, 1999). Self-rated health may be a better predictor of mortality than physician-rated health, because it likely contains much biographical and symptomatic-related information (Ferraro, 2006; Markides,
Lee, Ray, & Balck, 1993). Furthermore, results from a survival analysis of 800 French centenarians demonstrated the importance of both self-reported physical health and functional health (self-care capacity or ADLs) in predicting survivorship along with living in one’s own home, with relatively good health, and without cognitive impairment (Allard et al., 2000).

Also, according to Van Nostrand, Furner, and Suzman (1992), the number of older adults in the United States who rated their health as marginal (i.e., fair or poor) increased with age. For example, among adults aged 65-74 years 28.3 percent rated their health as marginal relative to 34.4 percent among adults aged 75-84 and 34.5 percent among those over age 85. Thus, self-rated health is not only an efficient and meaningful measure of longevity or quantity of life, but numerous studies have revealed its salience for quality of life relative to other resources necessary for adaptive living and utilization of resources in advanced age.

Quinn et al. (1999) explicated research studies explaining why subjective health is considered a meaningful measure of health and well-being in older adults - casting the measure as an efficient tool for researchers and clinicians. First, subjective health or self-rated physical health has been shown to be highly associated with objective measures such as number of diseases and doctor’s ratings. Second, functional health or the activities of daily living is also related to self-reported subjective health. An increase in health care or institutionalization has been related to ratings of subjective health. Finally, and most important for this study’s focus, a number of psychosocial factors have been demonstrated to associate with subjective ratings of physical health: social integration, depression, life satisfaction, perceived control, contentment, hardiness, and social support.
Because self-report of physical health is an efficient and highly manageable tool for geriatric researchers and clinicians to utilize in older groups of people, Quinn and colleagues (1999) tested and compared the unique contributions of three theoretical models, a demographic model, a physical health model, and a psychosocial model, relative to the amount of variance explained in subjective physical health among participants in their 60s, 80s, and 100s in the Georgia Centenarian Study. They found that indeed, for older adults, a model including psychosocial variables explained more variance in the outcome subjectively rated physical health than either the demographic or physical health model. One of their conclusions was that relative to current medical models of subjective health in older adults, a multidimensional model is more appropriate. Overall, they also found that predictors of subjective health differed across age groups, affirming that participants over age 65 comprise sub-groups of older adults (e.g., young-old, old-old, and oldest-old) with differing health or social care needs (Atchley, 1987).

A second hypothesis of Quinn and colleagues (1999) focused on centenarians in particular and stated that functional health, social support, mental health, and personality would explain the most variance in subjective health. They found that apprehension and perception of control over health, two measures of personality, predicted subjective health, whereas functional, mental, and social resources did not. This study provided an important contribution to the literature assessing predictors of subjective physical health among centenarians, demonstrating that centenarians in this sample had a unique set of predictors of subjective health relative to age groups of adults in their 60s and 80s.

A second study of centenarians in the Georgia Centenarian Study has specified self-rated or subjective health as a mediating variable. Investigating a sample of 252 cognitively
intact and community-dwelling older adults, Jang et al. (2004) specified subjective health as a mediator between disease and disability (functional health or ADLs) and depressive symptoms. In this sample, centenarians were more likely to have greater levels of disability, lower subjective health ratings, and higher depressive symptoms compared to those in their 60s and 80s. A series of hierarchical regression models were used to examine age moderation of disease and disability on depressive symptoms. Centenarians were found to be more resilient to the deleterious effects of lower functional health or disability compared to those in their 60s and 80s; in fact, subjective health and the depressive symptoms of the younger old (60s age group) was more likely to be influenced by disability. Thus, in this study, perceived or subjective health mediated between more objective measures of physical health (ADLs, an index of disease, and the multiplicative term of these two) and mental health.

The authors discussed the salubrious effect of an “optimistic view of one’s own health” as demonstrating the significance of “mind over matter” and delineated the possible reasons for the different perceptions of health made by the three age groups regarding the effects of poor functional health or disability. Despite limitations based on the cross-sectional nature of the data and the possible health bias of centenarians who were cognitively intact and community-dwelling, this study provides an example of research linking functional health and mental health through the intervening or mediating variable subjective health.

Although there is little disagreement regarding the influence of economic resources on health, the literature is mixed about when the effect is strongest. Studies have shown disparities in economic resources due to educational achievement differences increase over the lifespan and others demonstrate that the influence of education and income are greatest in middle age, with advanced age mitigating education’s influence (House et al., 1994; Ross &
Wu, 1995). A number of mechanisms for the link between economic resource differences and adult morbidity and mortality are found in the literature (Land & Yang, 2006). In particular, a large amount of research provides evidence for the direct, mediating, and moderating influence of social support on the relationship between economic resources (the exogenous predictor) and physical health (George, 1996). Thus, the literature demonstrates the interrelationships between physical health and a number of other resources (e.g., economic resources, social resources, and mental health) pertinent to successful adaptation by older adults coping with age-related declines.

In sum, a few observations based on this section of the review regarding self-rated health are helpful to the present study. First, the models used in these studies begin to reveal the theoretical and empirical specifications for some of the resources examined. Social resources, mental health, and functional health were associated with self-rated health directly and indirectly. Functional health influenced mental health through the mediator, self-rated health. Also, social resources mediated and moderated the influence of economic resources on self-rated health. Finally, the studies reviewed were cross-sectional in nature, leaving the direction of the effects open to question for future research.

Social Resources

A voluminous body of social structure research – summarized along the two dimensions of socioeconomic hierarchy and social networks that includes social integration and social support – reveals that social resources affect mental and physical health outcomes (Blazer, 2000; Lin & Peek, 1999; Lin, Ye, & Ensel, 1999; Moren-Cross & Lin, 2006; Sorkin, Rook, & Lu, 2002; Zunzunegui et al., 2004). In fact, Blazer (2000, p. 1920) wrote, “poor social support is a powerful predictor of poor health and mental health outcomes,” and
Krause (2006, p. 181) stated, “...older people with strong social ties tend to enjoy better physical and mental health than older adults who do not maintain close relationships with others.”

That these social resources are subject to change over time, especially for older adults, is evidenced by Johnson and Barer’s (1997) research on the oldest old; they found that, “These respondents [the oldest old] must deal with persistent pain, problems with mobility, loss of vision and hearing, the recurrent deaths of contemporaries, and even the onset of old age among their children” (p. 4). In fact, across cultures, social resources have been found to be fairly stable until very late in life (Antonucci, 2001; Baltes & Mayer, 1999). “There is no doubt, however, that as one reaches 80, 90, and 100 years, significantly fewer people who have been close supporters are still alive” (Antonucci, 2001, p. 432). Martin, Poon, Kim, and Johnson (1996) empirically confirmed that age differences in resources exist between young old, oldest old, and centenarians. In their assessment of the first wave of the Georgia Centenarian Study, they found that centenarians scored the lowest, relative to those in their 60s and 80s, on a number of resources including social resources. Just what these constructs (e.g., social support, social resources, or social networks) so critical to the adaptive well-being of older adults represent, is now addressed.

It has been noted by several scholars that “social network,” “social integration,” “social support,” and numerous other related concepts (e.g., social provisions, perceived and received social support) are often used interchangeably, metaphorically, and without careful consideration of theoretical and operational bases (Berkman & Glass, 2000; Krause, 1999; Moren-Cross & Lin, 2006). In their recent chapter on “Social Networks and Health” in The Handbook of Aging and the Social Sciences, Moren-Cross and Lin (2006) offered an
explication of the differences among conceptualizations of social networks and social support. Interrelationships among individuals and specific features of such intertwining relationships such as density, size, intimacy, and reciprocity (to name a few) describe the concept of social networks. Berkman and Glass (2000) emphasized the structural role of networks and stated, “The strength of social network theory rests on the testable assumption that the social structure of the network itself is largely responsible for determining individual behavior and attitudes by shaping the flow of resources which determine access to opportunities and constraints on behavior” (pp. 141-142). Krause (1999) addressed inherent difficulties with the literature on social resources; he provided 14 measures of this multidimensional construct and conducted a prospective, two-wave investigation of change at the aggregate and individual level in adults 65 years and older to address some of the difficulties.

Social integration is construed to be a concept that links the larger social structure to an individual. However, social support, in contrast to social integration and the larger social network, captures the concept of an individual relying upon others or extricating resources from the larger network (e.g., received social support) and often includes the mere perception that when necessary one will receive help from others (e.g., perceived social support). These latter constructs of support (received and perceived) are often further classified into emotional, informational, or instrumental support (Moren-Cross & Lin, 2006). Lin’s (2001, p. 29) definition of social capital is, “. . . resources embedded in a social structure that are accessed and/or mobilized in purposive actions” demonstrates the overlap or permeable boundaries between the definitions or domains of social capital, social support, social integration, and social network. Furthermore, Moren-Cross and Lin (2006) argue that social
capital consists of social resources (instrumental or expressive) that are explicitly embedded in social networks.

These recent, integrative conceptualizations of social capital, social networks, and social support are in keeping with Vaux’s (1988, p. 28) perspective: “The view taken here is that no single and simple definition of social support will prove adequate because social support is a metaconstruct: a higher-order theoretical construct comprised of several legitimate and distinguishable theoretical constructs . . .” In a similar vein, Fillenbaum (1988, p. 8) conceptualized social resources in the OARS as the, “extent and perceived adequacy of social contacts with friends and family; presence of a confidant; availability of help from friends in time of need.” How social resources are related to other resources essential for successful adaptation by older adults is now addressed.

Based upon the literature, measures of social resources are most often specified as predictors, mediators, or moderators unless the focus of interest is on the antecedents or determinants of social resources. For example, Sorkin et al. (2002) found an association between greater loneliness or social isolation and low levels of emotional support and companionship. Work by Antonucci (2001) demonstrated that the perceived quality of social relations had a greater impact on well-being than structural characteristics of social networks. Social resources have been linked to health resources by specifying that social support measures partially mediate or moderate the relationship between social networks and health-related outcomes (Haines, Beggs, & Hurlburt, 2002; Lin et al., 1999). Recently, Fiori, Antonucci, and Cortina (2006) examined data from 1,669 adults aged 60 and over in the first wave of the Americans’ Changing Lives panel study. They found that perceived social support partially mediated the relationship between network type and depressive...
symptomatology. Once again, social resources were specified as a mediator or a predictor in association with mental health outcomes. However, Krause (2006) emphasized the importance of first examining factors that promote and maintain social relationships before investigating the effects of constructs such as social resources on such outcomes as well-being.

Direction of effects is a nagging problem in aging studies (Vaillant & Mukamal, 2001), especially when social resources are investigated. Despite social resources being typically specified in a causal role (as predictor, moderator, or mediator) associated with positive outcomes, House and colleagues (1988) observed that little attention had been given to social resources as a dependent variable. Recently, one study investigated resources that influence or are associated with social resources. Strough, Patrick, Swenson, Cheng, and Barnes (2003) examined a number of close relationships that might serve as social resources for older adults engaging in collaborative every-day problem solving. Analyses conducted using their sample of 112 community-dwelling older adults revealed that the domains of difficulties necessitating collaborative problem solving included health, finances, family, transportation, meals, and home repair. They wrote that, “. . . consulting others for advice is a particularly salient means of solving everyday problems to older adults” (p. 61). Thus, low economic resources might motivate an older person’s social resources to engage in supportive behavior, either instrumentally or emotionally. In the same vein, functional disabilities might enlist the aid of an older individual’s social supports.

In sum, the literature reviewed regarding social resources leads to a few observations relevant to the present study. First, the construct of social resources, as already seen in this review concerning other resource measures, is typically cast as a mediator or moderator,
influencing the relationship between a predictor and an outcome. Second, because social
resources hold such an influential role in models assessing the relationships among these
resources so necessary for adaptation by older adults, studies examining predictors of social
resources are encouraged. And finally, Krause (2001), in his selective review of social
support among older adults, reminded readers that much is yet to be done, including a look at
changes in social resources over the life course.

Research Questions and Hypotheses

The previous survey of the literature related to resources older adults employ for
adaptation to age-related declines leads one to ask, “What have I learned about these
important resources so necessary for adaptation across the lifespan, especially those
advanced in years?” In a sense, we return to where we started – these are fundamental,
multidimensional resources critical to adaptation by adults at each level of the lifespan.
However, the findings are many and mixed as to the relationships between social resources
and the other resources assessed in the OARS instrument. A few summary points guide this
study’s hypotheses.

Measurement Model for the OARS Multidimensional Resources. First, few studies
have specified the OARS resources as latent variables (e.g., Fees et al., 1999; Martin,
Hagberg, and Poon, 1997). A recent study specified a latent variable for social support
consisting of three interviewer proxy ratings, also part of the OARS assessment (Bishop et
al., in press). However, to date, no study was found that developed a measurement model for
all five OARS resources based upon the self-report assessments. This study investigated the
factor structure of each resource area at Time 1 and at Time 2.
Age Differences and Changes in OARS Resources. Based upon the results from the confirmatory factor analyses specifying a measurement model for the five resource areas, this study created summary scores from the indicators for each resource at each measurement occasion in order to compare age differences and mean changes over time in the OARS resource areas. Although empirical studies have found that most resources are stable among older adults (Martin et al., 1996; Martire et al., 1999; van Tilburg, 1998), previous frequency analyses of Time 1 OARS resources differed significantly across the three age groups (60s, 80s, and 100s); centenarians reported the lowest levels of resources (Martin et al., 1996). Therefore, this study’s first and second hypotheses predicted: (a) a significant effect for age group on the single index constructs of OARS resources at Time 1, and (b) a significant effect for Time on change in the OARS resources. Also, this study posited that the centenarians would exhibit the most loss relative to the other two age groups.

Completely Cross-Lagged Analyses of Change. Numerous studies have used one or more measures of OARS resources to investigate relationships between predictors and outcomes (Fry & Debats, 2006; Lefrancois & Lapointe, 1999; Perracini & Ramos, 2002). Also, these studies have primarily conducted cross-sectional analyses based upon theoretically driven conceptual models. However, to date, no study has been found that specified each of the five OARS resource areas together in a completely cross-lagged analysis utilizing two time points in order to determine direction of association when controlling for the influence of each of the other resources. As a research question, this study specified such a model and included age group at Time 1.

Mediation by Social Resources. The literature is replete with examples of the mediating role of social resources (Lenze et al., 2001; Taylor and Lynch, 2004) in older
populations. Building upon the completely cross-lagged analyses of change results, this study predicted that Social Resources would mediate the relationship between Time 1 predictors and Time 2 outcomes. For example, as age increases reductions in functional health or IADLs is common. However, it may be that one mechanism through which the influence of age on IADLs is mediated is through social resources.

*Moderation by Social Resources.* The literature often specifies that social resources moderate the relationship between predictors and outcomes. Once again, based upon the direction of influence results from the completely cross-lagged analyses of change, this hypothesis predicted that social resources would act as a moderator. For example, as noted previously under mediation, as age increases reductions in IADLs is common. However, under certain conditions the influence of age might be attenuated – if an individual has high levels of social resources, then the influence of age on reduction in IADLs might be attenuated relative to individuals with lower levels of social resources.
Method

First, this study obtained approval from Iowa State University’s Institutional Review Board (Appendix F) for research involving human subjects. Second, the older adults who participated in the first Georgia Centenarian Study (GCS; Poon et al., 1992) were the focus of this study. Although the GCS participants provided information on a wide variety of measures, the focus of this study was a comprehensive assessment of the inter-relationships of the multidimensional resources included in the OARS (Fillenbaum, 1988). In particular, mean differences in the OARS resources between age groups, between age groups over time, and exploratory factor analyses were conducted using SPSS 14.0; confirmatory factor analyses, latent variable structural equation modeling, and latent growth curve analyses were conducted using Mplus (Muthén & Muthén, 2004) to examine this study’s research questions and to test hypotheses.

Participants and Procedure

The University of Georgia’s Survey Research Center, utilizing current voter registration rosters, obtained a representative sample of the younger age groups (i.e., those in their 60s and 80s). Potential subjects were selected by random digit dialing, providing a representative sample of older adults in Georgia in terms of gender and race. Small groups of participants completed their questionnaires at community testing locations (Martin et al., 2002). Centenarians were selected through the assistance of the University of Georgia’s Survey Research Center, the Office of the Governor of Georgia, the media, and local older adult service organizations (Holtsberg, Poon, Noble, & Martin, 1995; Martin et al., 2002). After the sampling frame was created, letters were sent to each potential participant describing the study. Next, arrangements to administer the MMSE were made by telephone.
Selection criteria for the final sample of community-dwelling individuals (at Time 1) included a score of 23 or higher on the Mini-Mental Status Examination (MMSE; Folstein, Folstein, & McHugh, 1975) or a score of 2 or lower on the Global Deterioration Scale (Reisberg, Ferris, de Leon, & Crook, 1982).

Thus, community-dwelling and cognitively intact older adults included in this study were participants in the Georgia Centenarian Study (Martin, Long, & Poon, 2002; Poon et al., 1992). Community-dwelling (i.e., self-sufficient or partially self-sufficient, living in the community and not in custodial institutions) participants might live in their own homes, those of relatives, or other residential community settings. Cognitively intact individuals were defined as not demented or disoriented based on scores on the Mini-Mental Status Examination at the time of recruitment. The first wave of data collection included 321 older adults (217 women, 104 men), classified as sexagenarians \((n = 91)\), octogenarians \((n = 93)\), and centenarians \((n = 137)\). At Time 2, there were 70 sexagenarians, 63 octogenarians, and 68 centenarians. Almost one third of the sample was Black (27.7% and 30.8% at Time 1 and Time 2, respectively). The majority of the sample was female (67.6%) at Time 1, well-educated (at least graduated from high school) and rated their health as excellent or good. A summary of demographic characteristics of the samples at Time 1 and Time 2 can be found in Table 1.

The younger two age groups were assessed again, five years later; the centenarians were assessed after approximately 20 months. The second wave involved 201 of the original participants (63% of the baseline sample). The differential time frame for assessment based on age group was part of the project’s design, intended to allow time for intended change and
Table 1

**Sample Demographic Characteristics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Time 1</th>
<th>Time 2</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Sex</td>
<td>1.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>104</td>
<td>32.4</td>
<td>60</td>
</tr>
<tr>
<td>Female</td>
<td>217</td>
<td>67.6</td>
<td>141</td>
</tr>
<tr>
<td>Race</td>
<td>2.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>89</td>
<td>27.7</td>
<td>62</td>
</tr>
<tr>
<td>White</td>
<td>232</td>
<td>72.3</td>
<td>139</td>
</tr>
<tr>
<td>Age Group</td>
<td>18.86***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60s</td>
<td>91</td>
<td>28.3</td>
<td>70</td>
</tr>
<tr>
<td>80s</td>
<td>93</td>
<td>29.0</td>
<td>63</td>
</tr>
<tr>
<td>100s</td>
<td>137</td>
<td>42.7</td>
<td>68</td>
</tr>
<tr>
<td>Education</td>
<td>6.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-8 years</td>
<td>90</td>
<td>28.2</td>
<td>55</td>
</tr>
<tr>
<td>High School</td>
<td>84</td>
<td>26.3</td>
<td>42</td>
</tr>
<tr>
<td>Business/trade school</td>
<td>23</td>
<td>7.2</td>
<td>14</td>
</tr>
<tr>
<td>College</td>
<td>75</td>
<td>23.6</td>
<td>44</td>
</tr>
<tr>
<td>Graduate School</td>
<td>47</td>
<td>14.7</td>
<td>36</td>
</tr>
<tr>
<td>Self-Rated Health</td>
<td>4.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>67</td>
<td>21.1</td>
<td>39</td>
</tr>
<tr>
<td>Good</td>
<td>159</td>
<td>50.2</td>
<td>93</td>
</tr>
<tr>
<td>Fair</td>
<td>79</td>
<td>24.9</td>
<td>52</td>
</tr>
<tr>
<td>Poor</td>
<td>12</td>
<td>3.8</td>
<td>9</td>
</tr>
</tbody>
</table>

Note. Because of rounding, percentages may not add to 100.
***$p < .001$. 

...to optimize sample size (remaining life expectancy for centenarians is much shorter relative to the younger age groups).
An analysis was conducted to assess differences between individuals who only participated at Time 1 and those who participated at both Time 1 and Time 2. Differences in demographic characteristics and mean scores on mental status and single index variables of this study’s constructs of interest were tested (chi-square and independent samples t tests). Tables 1 and 2 report the results of these tests. Participants who dropped out of the study after Time 1 were more likely to be centenarians, had lower cognitive functioning as measured by the MMSE and SPMSQ, and showed more impairment in IADLs and physical health at Time 1.

Table 2

<table>
<thead>
<tr>
<th>Variables</th>
<th>Time 1 Only</th>
<th>Time 1 and Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Mini-Mental (MMSE)</td>
<td>25.30</td>
<td>2.72</td>
</tr>
<tr>
<td>Short Portable (SPMSQ)</td>
<td>8.63</td>
<td>1.58</td>
</tr>
<tr>
<td>Economic Resources</td>
<td>4.73</td>
<td>1.48</td>
</tr>
<tr>
<td>Mental Health</td>
<td>5.12</td>
<td>1.33</td>
</tr>
<tr>
<td>IADLs</td>
<td>4.81</td>
<td>1.30</td>
</tr>
<tr>
<td>Physical Health</td>
<td>3.73</td>
<td>1.70</td>
</tr>
<tr>
<td>Social Resources</td>
<td>4.49</td>
<td>1.55</td>
</tr>
</tbody>
</table>

*p < .05. **p < .01.

Measures

Fillenbaum (1988, pp. 22-25) reported factor analytic results for the self-reported resources (i.e., social resources, economic resources, mental health, physical health, and ADLs). The factor-derived scales are provided by Fillenbaum and items used for the
indicators are listed in the Appendices. Fillenbaum reported the original reliability and validity assessments of the measures used in this study. First, criterion validity for each resource area, except social resources, was assessed; Spearman’s rank order correlations with criterion scales were very high ($p = .001$). For economic resources, the selected criterion was an objective six-point economic scale assessing total income and assets (Fillenbaum & Maddox, 1977). Geropsychiatric assessments were used as a criterion for mental health. The ten-point Karnofsky scale (Karnofsky & Burchenal, 1948) was the criterion used for physical health. Physical therapists rated participants on a 12-point scale; this was the criterion for ADL. An appropriate external standard was not identified when the social resources measure was created. Instead, Fillenbaum employed social workers to provide content and conceptual validity to the items used and commented, “. . .they would use exactly the same items as those in the OMFAQ (i.e., OARS Multidimensional Functional Assessment Questionnaire) in order to arrive at an assessment of the individual’s social resources” (p.14).

**Economic Resources.** Fillenbaum (1988) included six items in this unidimensional assessment; the index had an original reliability coefficient $\alpha = .86$. Examples of questions include, “How well does the amount of money you have take care of your needs – very well, fairly well, or poorly?” and, “Please tell me how well you think you are now doing financially as compared to other people your age – better, about the same, or worse?” These items were scaled $0 = $poorly or worse to $2 = $very well or better. Economic resources was scaled so that higher scores indicate higher levels of economic resources.

**Mental Health.** Satisfaction (six items), sleep disturbance (two items), lethargy (6 items), and paranoid (three items) comprised the four dimensions of mental health derived originally by Fillenbaum (1988) with original internal consistency, coefficient $\alpha = .70, .58,$
.71, and .52, respectively. Examples of questions for each dimension include: (a) satisfaction – “In general, do you find life exciting, pretty routine, or dull?” and scaled so that 0 = dull, 1 = pretty routine, and 2 = exciting; (b) sleep disturbance – “Do you wake up fresh and rested most mornings?” and scaled so that 0 = no, 1 = yes; (c) lethargy – “Have you had periods of days, weeks, or months when you couldn’t take care of things because you couldn’t “get going?” and scaled so that 0 = no, 1 = yes; (d) paranoid – “Does it seem that no one understands you?” and scaled so that 0 = no, 1 = yes. Mental health was scored so that higher scores indicate higher levels of mental health.

**ADLs.** Two commonly used dimensions, instrumental activities of daily living (IADLs; seven items) and physical activities of daily living (PADLs; six items) comprise the self-care capacity assessment (Fillenbaum, 1988) with original internal consistency coefficient $\alpha = .87$ and $\alpha = .84$, respectively. An example of an IADL question is, “Can you do your housework?” and is scaled so that 2 = without help (can clean floors, etc.); 1 = with some help (can prepare some things but unable to cook full meals yourself); or 0 = are you completely unable to prepare any meals? A PADL question is, “Can you dress and undress yourself” and is scaled so that 2 = without help (able to pick out clothes, dress and undress yourself); 1 = with some help or 0 = are you completely unable to dress and undress yourself? ADLs was scaled so that higher scores indicate higher levels of self-care capacity.

**Physical Health.** A subjective self-rated health assessment of current status is comprised of two questions (Fillenbaum, 1988) with original internal consistency coefficient $\alpha = .74$. An example of one question is, “How would you rate your overall health at the present time – excellent, good, fair, or poor?” and was scaled so that 0 = poor to 3 = excellent. A third item was used to assess current self-rated physical health relative to a five-
year previous assessment. Physical health was scored so that higher scores indicate higher levels of physical health.

**Social Resources.** Social Resources were measured using seven questions that comprise three dimensions in the original assessment by Fillenbaum (1988). The first dimension, an interaction aspect of social support, included three questions with an original reliability coefficient $\alpha = .56$. An example of a question asked is, “How many people do you know well enough to visit with in their homes?” Participants chose from a scale of 0 = none to 3 = five or more. The second dimension, an assessment of dependability of social support, included two questions with an original reliability coefficient $\alpha = .69$. These questions were answered 1 = yes and 0 = no; for example, one question was, “Do you have someone you can trust and confide in?” The third dimension, an assessment of the affective domain of social support, also included two questions, scaled 1 = yes and 0 = no; for example, one question was, “Do you see your relatives and friends as often as you want to or not? This dimension had an original reliability coefficient $\alpha = .71$. Social resources was scaled so that higher scores indicate higher levels of social resources.

**Age Group.** Age Group included three groups: participants in their 60s, participants in their 80s, and participants in their 100s. Age group was used as an exogenous predictor to detect associations of the resource variables with age.

**Missing Data**

An inevitable challenge for researchers in the behavioral sciences, regardless of research design (experimental, quasi-experimental, or non-experimental), is the fact that respondents will not answer all items asked or, in subsequent waves or assessments, not be present. In recent years, numerous statistical techniques for the handling of missing data and
articles explicating the rationale and implementation of these techniques have surfaced in the social and behavioral sciences literature (e.g., Abraham & Russell, 2004; Acock, 2005; Allison, 2003; Raykov, 2005; Schafer & Graham, 2002). The reason for this proliferation of modeling techniques and subsequent explanatory literature is based upon the empirically demonstrated poor results (biased estimates, distorted statistical power, and invalid conclusions) of traditional approaches to handling missing data: listwise deletion, pairwise deletion, and mean substitution (see illustrations in Acock, 2005; Schafer & Graham, 2002). One workable and fairly accessible solution for handling missing data in a structural equation modeling context is to use full-information maximum likelihood or FIML estimation of models (Acock, 2005; Allison, 2003; Schafer & Graham, 2002). In contrast to techniques that impute data values, FIML uses all the available information to obtain the data log-likelihood (Raykov, 2005). Based upon this, the current study used the statistical software Mplus (Muthén & Muthén, 2004) and employed FIML with the estimator MLR (maximum likelihood parameter estimates with standard errors and a mean-adjusted chi-square test statistic that are robust to non-normality, Muthén & Muthén, p. 368) for latent variable SEM and latent growth curve analyses.

Data Analysis

Measurement Model. Exploratory factor analyses were conducted using SPSS 14.0, whereas confirmatory factor analyses and structural equation modeling were conducted with Mplus Version 4.0 (Muthén & Muthén, 2004); overall model fit was assessed by employing the Satorra-Bentler chi-square test statistic. This type of chi-square test statistic provided maximum likelihood parameter estimates with standard errors and a mean-adjusted chi-square test statistic that is robust to non-normality of measures. Because the chi-square
goodness of fit test and its corresponding probability value are sensitive to sample size, often making it difficult to accurately assess model fit when limited to this single statistic (Byrne, 2001; Kelloway, 1998; Ullman & Bentler, 2003), other measures of model fit will be reported including the Comparative Fit Index—CFI (Bentler, 1990); the Tucker-Lewis coefficient (also called the NNFI)—TLI (Bentler & Bonett, 1980; Tucker & Lewis, 1973); Browne and Cudeck’s (1989) root mean squared error of approximation (RMSEA); and the standardized root mean squared residual (SRMR). It has been suggested that values close to .95 for TLI and CFI, .08 for SRMR, and .06 for RMSEA are necessary before concluding that a relatively good fit between the observed data and the hypothesized model exists (Hu and Bentler, 1999; MacCallum & Austin, 2000).

In order to assess the equivalence of factor structure over time, nested model testing was conducted following the prescribed procedure provided by Mplus (Muthén & Muthén, 2004). Because the difference test of the MLR chi-square test statistic is not normally distributed as a chi-square, algebraic manipulations of the fit statistics were performed so that the normal chi-square difference test was performed with the difference in the degrees of freedom between the base model and the nested model as the degrees of freedom for the chi-square test. In this test, residuals or error terms for the measured variables were correlated over time in both the base model and the nested model. The nested model was specified with the factor loadings for each latent variable constrained to equality over time in order to ensure that the nature of the construct did not change over time.

*Single Index Constructs: Descriptives, Mean Differences, and Mean Changes.* Once an adequate measurement model for each of the five OARS resources was found, the indicators of each latent variable were summed to form single index constructs at Time 1 and
Timed 2. Descriptive statistics for the constructs at Time 1 and Time 2 were computed. Second, in order to investigate the research questions and to test the hypotheses regarding age differences and mean differences over time for the single index constructs, this study specified two general linear model tests (factorial ANOVA and repeated measures, respectively) using SPSS 14.0.

*Cross-Lagged Analyses of Change in OARS Resources.* Directional influences were investigated by specifying a completely cross-lagged path analytic model employing the single index constructs and age group in *Mplus* (Muthén & Muthén, 2004). Based upon the results of the completely cross-lagged analyses, OARS constructs assessed at Time 1 that predicted another construct at Time 2 were specified as latent constructs in a two variable cross-lagged model. Because these tests were inconclusive and based upon recent discussions in the literature regarding the modeling of change, this study also employed latent growth curve models.

*Modeling Change Using a Latent Growth Curve Framework.* This study applied a latent growth curve framework to further investigate change and predictors of change in the OARS resources. In their chapter on “Modeling Continuity and Change,” Lorenz, Wickrama, and Conger (2004) demonstrated that autoregressive models of change were sensitive to the magnitude of the stability coefficients and, in general, models specified as growth curves were more likely than autoregressive models to evidence significant paths between predictor variables and change in the outcome variable. Stoolmiller and Bank (1995) also recommended that individual growth curve models are often a more useful alternative to studying change because they do not force the predictor variable to compete with the initial level of the outcome of interest. In fact, Stoolmiller and Bank asked this very challenging
question, “How could X change with the mere passage of time? In order to have X change from time 1 to time 2, we need a causal agent that is logically distinct from X itself; otherwise we are supposing that X can change for no reason” (p. 271). They also include Mulaik’s (1987) argument that philosophically, spontaneous change of an object is not plausible, “A reason for the change must be something other than that which it explains” (p. 271).

Stoolmiller and Bank (1995) also point out that change measured across two time points and analyzed in a growth curve analysis is, essentially, an analysis of simple difference scores. Over the years there have been a number of critics of difference scores, suggesting they are unreliable and sensitive to regression toward the mean (Allison, 1990; Kaplan & Uribe-Zarain, 2005; Miller & Kane, 2001). However, a number of authors have spoken out in defense of change scores, especially when researchers are limited to two repeated measures (Collins, 1996; Rogosa, 1995; Rogosa, Brandt, & Zimkowski, 1982). In fact, Stoolmiller and Bank (1995) go so far as to state, “This paper offers a complete account of the statistical and psychometric properties of differences or change scores and dispels the negative myths surrounding their use” (p. 263). Because there is considerable support for change scores and because of the recent advances in analyzing change in a growth curve environment, this study specified and tested models of level and slope using repeated measures on two occasions in the growth curve framework.

Also, recent methodological advances in growth curve modeling (Duncan et al., 1999; Raudenbush & Bryk, 2002) allow developmentalists to examine interindividual differences in intraindividual change over the life course. As Krause (1999) demonstrated, whereas mean differences may not exist over time, between individual differences in within
individual change do exist and they may be profound. Thus, based upon this review of the literature, I first specified univariate growth curve models for each single index construct to test for significant variation in intraindividual change between individuals. Finally, because of strong evidence for significant interindividual differences in intraindividual change, I tested for significant predictors of growth factors of each OARS resource by regressing the growth factors on the other OARS single index constructs at Time 1.

Mediation and Moderation by Social Resources. Based upon the results of the cross-lagged analyses, OARS constructs assessed at Time 1 that predicted other constructs at Time 2 were specified using path analysis in Mplus (Muthén & Muthén, 2004) to test for mediation and moderation by Social Resources.
Results

Analyses for this study included exploratory and confirmatory factor analyses to test a measurement model of latent variables for each OARS resource dimension at Time 1 and at Time 2. Second, the indicators for each resource dimension were summed to create a single index for the five constructs. Next, utilizing these single index resource measures, I computed descriptive statistics at Time 1 and Time 2, tested mean differences between Age Groups at Time 1, and conducted a repeated-measures Age Group by Time analysis. Also, a cross-lagged path analysis was performed including each OARS resource index measured at both Time 1 and Time 2 to explore predictors of change in each resource, including Age Group at Time 1. Based upon the cross-lagged results, multiple indicator latent variable analyses for two latent variables were conducted to assess significant relationships over time between the two latent variables. Next, I conducted univariate growth curve analyses for two time points assessing interindividual differences in intraindividual change for each OARS index variable. Also, because each index had significant interindividual differences in intraindividual change, latent growth curve analyses including Time 1 predictors of intercept (Time 1 level) and change (slope) were performed. Finally, results from the predictors of change in latent growth analyses informed tests of mediation and moderation by Social Resources at Time 1; the models for these tests were specified within the latent growth curve framework.

Measurement Model for OARS

The analyses conducted to confirm a measurement model for the five resource areas at Time 1 included the following steps for each area: (a) specifying and testing Fillenbaum’s subscales; (b) adapting Fillenbaum’s recommendations when either modeling difficulties
were encountered or when she provided unidimensional measures (economic resources and physical health); (c) employing exploratory factor analyses to assess relationships within the data and to posit possible indicators for latent constructs; and (d) testing the measurement model at Time 1 and at Time 2 using confirmatory factor analyses. Fillenbaum (1988) provided psychometric structural results based on factor analyses of a large sample (N=2036). I used these results as a starting point for testing a measurement model at Time 1, correlating each resource area specified as a latent factor and employing Fillenbaum’s factors as indicators when possible. Two major difficulties were encountered during the analyses. First, many of the dichotomous variables created difficulty, especially when over 90% of respondents scored the same on an item. In these instances the item was dropped from consideration. Second, latent variables with two indicators (activities of daily living and social resources) tended to create problems with convergence (non-positive definite covariance matrices) in the models with the smaller sample size (i.e., for those present at both Time 1 and Time 2; N = 201). Thus, I developed at least three indicators and then tested the constructs via confirmatory factor analysis. Table 3 provides assessment of measurement model fit, standardized loadings, and the uniqueness or $R^2$ for each indicator at both Time 1 and Time 2.

First, Economic Resources as specified by Fillenbaum included six items in a unidimensional construct. I assessed the possibility of three indicators by first conducting an exploratory factor analysis (principal axis factoring) with an oblique rotation and extracted three factors, accounting for 76 percent of the variance. Based upon these results, I constructed three indicators. First, I summed the three dichotomous items tapping the sufficiency of the respondent’s economic resources to meet emergencies and provide
Table 3  
Latent Variable Construct Measurement Model Results

<table>
<thead>
<tr>
<th>Construct/Indicators</th>
<th>Loadings ($\lambda$)</th>
<th>Uniqueness ($R^2$)</th>
<th>Loadings ($\lambda$)</th>
<th>Uniqueness ($R^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1*</td>
<td>T2**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient Income</td>
<td>.81&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.66</td>
<td>.96&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.93</td>
</tr>
<tr>
<td>Overall Income</td>
<td>.70</td>
<td>.49</td>
<td>.61</td>
<td>.37</td>
</tr>
<tr>
<td>Meet Payments</td>
<td>.63</td>
<td>.40</td>
<td>.30</td>
<td>.09</td>
</tr>
<tr>
<td>Mental Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exciting</td>
<td>.60&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.36</td>
<td>.53&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.28</td>
</tr>
<tr>
<td>Overall Mental Health</td>
<td>.53</td>
<td>.29</td>
<td>.49</td>
<td>.24</td>
</tr>
<tr>
<td>Life Satisfaction</td>
<td>.50</td>
<td>.25</td>
<td>.69</td>
<td>.47</td>
</tr>
<tr>
<td>IADLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting Out</td>
<td>.89&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.80</td>
<td>.94&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.88</td>
</tr>
<tr>
<td>Housework</td>
<td>.88</td>
<td>.78</td>
<td>.94</td>
<td>.88</td>
</tr>
<tr>
<td>Medicine</td>
<td>.65</td>
<td>.42</td>
<td>.77</td>
<td>.59</td>
</tr>
<tr>
<td>Physical Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Troubles</td>
<td>.70&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.49</td>
<td>.86&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.73</td>
</tr>
<tr>
<td>Overall Physical Health</td>
<td>.66</td>
<td>.44</td>
<td>.49</td>
<td>.24</td>
</tr>
<tr>
<td>Comparative Health</td>
<td>.46</td>
<td>.21</td>
<td>.48</td>
<td>.23</td>
</tr>
<tr>
<td>Social Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone Talk</td>
<td>.64&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.41</td>
<td>.94&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.89</td>
</tr>
<tr>
<td>Visit Network Number</td>
<td>.47</td>
<td>.22</td>
<td>.08</td>
<td>.01</td>
</tr>
<tr>
<td>Visits With Others</td>
<td>.42</td>
<td>.17</td>
<td>.29</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note:  
<sup>a</sup>Parameter estimates are from the standardized solution.  
<sup>b</sup>These indicator loadings were fixed to 1.0(unstandardized) for model identification; all estimated loadings’ $p < .01$; except Time 2 Social Resources.  
*T1 Fit Indices: MLR $\chi^2 (N=321; \text{df}=80) = 144$; CFI = .94; TLI = .92; RMSEA = .05; SRMR = .05  
**T2 Fit Indices: MLR $\chi^2 (N=201; \text{df}=80) = 136$; CFI = .93; TLI = .90; RMSEA = .06; SRMR = .07
extras currently and in the future (Cronbach’s alpha = .81). This indicator was recoded so that the scores ranged from 0 – 2; skewness and kurtosis were less than two. Second, two items loaded on a second factor, both asking the respondent how well they were doing financially. These two items were then averaged to create a second indicator assessing how well the respondents felt they were doing overall in terms of financial resources (Cronbach’s alpha = .59). Finally, the last item, assessing how heavy the participant’s expenses were, was recoded to 0 – 2 and used as a third indicator. This item tapped the respondent’s ability to meet payments. The three indicators, sufficient income, overall income, and meet payments loaded significantly and substantively on the latent variable, Economic Resources, at both Time 1 and Time 2. Results from the confirmatory factor analyses for the economic resources measurement model are found in Table 3.

*Mental Health* as specified by Fillenbaum (1988), included four factors. However, three of the four factors were comprised of dichotomous variables. Inspection of the frequencies the Georgia Centenarian Study sample revealed that of the 15 items five had 90% or more respondents scoring alike, five had 80% or more of respondents scoring alike, and three had 70% or more of respondents scoring alike. When I specified the Fillenbaum four factor model, the model failed to converge due to a non-positive definite covariance matrix, likely due to the lack of variance among respondents on these items. Thus, I did not use these items and specified a latent variable with three single-item indicators: (a) “In general, do you find life exciting, pretty routine, or dull?” (b) “How would you rate your mental or emotional health at the present time?” and (c) “Taking everything into consideration how would you describe your satisfaction with life in general at the present time?” Cronbach’s alpha for these three items at Time 1 was .54. Frequency statistics for these items were adequate with
skewness and kurtosis less than two for each. These three indicators loaded significantly and substantively on the latent variable Mental Health at both Time 1 and Time 2. Results from the confirmatory factor analyses for the mental health measurement model are found in Table 3.

Activities of Daily Living (IADLs) were specified by Fillenbaum as two factors consisting of instrumental activities of daily living (seven items) and physical activities of daily living (6 items –“Do you have trouble getting to the bathroom on time?” was not used). I specified a measurement model for ADLs consisting of these two factors as indicators. Models specified with these two sub-scales as indicators of a latent construct were stable when tested with the Time 1 only sample ($N = 321$). However, when the Time 2 sample was tested ($N = 201$) convergence difficulties were encountered with this construct. Examination of descriptive statistics demonstrated that for those in their 60s and 80s few difficulties with physical activities of daily living were encountered. Thus, the decision was made to not include this subscale and to create three sub-scales based upon an exploratory factor analysis of the seven items of the instrumental activities of daily living. One item tended to load by itself (Medicine) and was used as a single-item indicator in the confirmatory analyses. The latent variable for IADLs was comprised of three indicators (e.g., getting out, housework, and medicine). The first indicator, labeled getting out, included items assessing: (a) “Can you use the phone?” (b) “Can you get to places out of walking distance?” and (c) “Can you go shopping for groceries or clothes?” Cronbach’s alpha for these three items was .76. The second indicator labeled housework was comprised of three items (Cronbach’s alpha = .88) assessing: (a) “Can you prepare your own meals?” (b) “Can you do your own housework?” and (c) “Can you handle your own money?” The third indicator was the single item “Can you
take your own medicine?” The three indicators loaded significantly and substantively on the latent variable IADLs at both Time 1 and Time 2. Results from the confirmatory factor analyses for the IADLs measurement model are found in Table 3.

Physical Health as specified by Fillenbaum (1988) consisted of two items assessing subject health perceptions. First, respondents were asked, “How much do your health troubles stand in the way of your doing the things you want to do?” Second, overall health asked “How would you rate your overall health at the present time?” Often, a third question from this assessment is asked in addition to the previous two and was included in this study, “Is your health now better, about the same, or worse than it was five years ago?” Frequencies for these three items were normal; skewness and kurtosis for the three items were less than two. Cronbach’s alpha for these three items at Time 1 was .63. These three indicators loaded significantly and substantively on the latent variable Physical Health at both Time 1 and Time 2. Results from the confirmatory factor analyses for the physical health measurement model are found in Table 3.

Finally, for Social Resources, Fillenbaum (1988) extracted three factors from seven items (three items were dichotomous). On one of the dichotomous items, 94% of the respondents said “Yes” they had someone they can trust and confide in. On another item, 96% replied “Yes” there was someone who would give help if the respondent were sick or disabled. I therefore did not use these items in further analyses. I conducted an exploratory factor analysis (principal axis factoring) and extracted three factors using an oblique rotation. The pattern matrix suggested that three items: (a) “How many people do you know well enough to visit in their homes?” (b) “How many times in the past week did you spend some time with someone who does not live with you?” and (c) “How many times did you talk to
friends, relatives, or others on the phone in the past week?” loaded on the first factor (.468, .553, .538, respectively); the single item, “Do you find yourself feeling lonely?” (recoded so that high scores reflect low loneliness) loaded on a second factor (.376), and the final item, “Do you see your relatives and friends as often as you want to?” did not load strongly on any factor (.115, .263, and .079, respectively). Thus, a latent variable was specified with “talking on the phone” as the first indicator, with “the number of individuals known well enough to visit” as a second indicator, “visits with others” as a third indicator and “loneliness” as a fourth. However, in the first test of the measurement model loneliness did not significantly load on the latent variable for Social Resources at Time 1 ($t = 1.62$); this item was dropped and not used as an indicator in further analyses. Frequency statistics for these items were adequate with skewness and kurtosis less than two for each. Cronbach’s alpha for these three items at Time 1 was .51. These indicators, phone talk, visit network number, and visits with others, loaded on the latent factor, Social Resources, significantly and substantively at Time 1. However, at Time 2 the second and third indicator did not load significantly or substantively, although the overall measurement model had adequate fit to the data. This indicates that the construct might have changed over time, and the following results for Time 2 Social Resources need to be stated with caution. Other than change over time in Social Resources, the rest of the hypotheses tested do not call for the use of Social Resources at Time 2. Results from the confirmatory factor analyses for the social resources latent variable are found in Table 3.

The latent variables were significantly correlated with one another at each measurement occasion with a few exceptions at Time 2. For example, at Time 2 Social Resources was only significantly associated with IADLs; also, Physical Health was not
significantly associated with either Mental Health or Social Resources at Time 2. The latent variable correlation matrix results are found in Table 4.

Table 4

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Economic Resources</td>
<td>—</td>
<td>.26**</td>
<td>.43**</td>
<td>.27**</td>
<td>.08</td>
</tr>
<tr>
<td>2. Physical Health</td>
<td>.46**</td>
<td>—</td>
<td>.15</td>
<td>.58**</td>
<td>.14</td>
</tr>
<tr>
<td>3. Mental Health</td>
<td>.60**</td>
<td>.83**</td>
<td>—</td>
<td>.38**</td>
<td>.25</td>
</tr>
<tr>
<td>4. IADLS</td>
<td>.21**</td>
<td>.56**</td>
<td>.42**</td>
<td>—</td>
<td>.45**</td>
</tr>
<tr>
<td>5. Social Resources</td>
<td>.27**</td>
<td>.34**</td>
<td>.35**</td>
<td>.50**</td>
<td>—</td>
</tr>
</tbody>
</table>

**p < .01.

In sum, the five latent variable resource constructs with their corresponding indicators were first tested as a measurement model using confirmatory factor analyses at Time 1 and at Time 2. The measurement model fit the data adequately at both Times. Two estimated indicators of the latent variable for Time 2 Social Resources did not have significant loadings. Finally, I attempted a nested model test for factorial invariance over time by constraining the loadings of each indicator at Time 1 equal to the same indicator at Time 2. Also, the residual for each indicator at Time 1 was correlated with its counterpart at Time 2. This constrained or nested model did not fit the data well: MLR $\chi^2 (354, N = 201) = 527.03$, $p = .001$, CFI = .91; TLI = .89; RMSEA = .05 and SRMR = .07. However, despite increasing the number of iterations and specifying starting values, I was not able to get the unconstrained or base model to converge. This measurement model included the Social
Resources latent construct at Time 2 that does not have significant loadings for its estimated indicators and Cronbach’s alpha at Time 2 was .39. Thus, the overall poor model fit may be due to a poor measurement model for Social Resources. Jackson (2003) investigated a number of issues in structural equation modeling with smaller sample sizes and stressed the importance of (a) carefully choosing theoretically and empirically reliable indicators; and (b) ensuring an adequate number of indicators per latent variable.

Thus, as a follow-up, I decided to fit a measurement model without the Social Resources Latent Variable. The unconstrained or base model including the four latent variable resource constructs (without Social Resources at Time 1 and Time 2), specified with correlated residuals across time, fit the data well: MLR $\chi^2 (211, N = 201) = 289.09, p = .001, CFI = .95; TLI = .94; RMSEA = .04$ and $SRMR = .06$. Next, I added across time constraints to the factor loadings for each corresponding indicator and ran the model. This constrained or nested model with eight more degrees of freedom fit the data well also: MLR $\chi^2 (219, N = 201) = 300.18, p = .001, CFI = .95; TLI = .94; RMSEA = .04$ and $SRMR = .07$. Finally, I performed a nested model test following the specifications provided by Mplus for the MLR chi-square. After appropriate transformations, the final test is that of a normal chi-square distribution with degrees of freedom based upon the difference in degrees of freedom between the nested model and the base model. In this case, the chi-square difference was 11.06 for eight degrees of freedom. The .05 cut off for a chi-square statistic with eight degrees of freedom is 15.51. Thus, there is no significant difference between these two models and it is reasonable to assume factorial invariance over time.

Overall, the results of the confirmatory factor analyses were encouraging. The specified measurement model for the OARS resource dimensions fit the data well at Time 1;
it was somewhat less stable at Time 2. The model fit well and all indicators loaded substantively and significantly, as specified. In this study, the loadings tended to reduce over time and Social Resources, in particular, had only one indicator load significantly and substantively at Time 2. Because a nested model test for measurement invariance over time could not be conducted due to lack of convergence (a common problem with small sample sizes and complex models with many degrees of freedom) it is recommended that the confirmatory factor results for Time 2 be taken with caution. Supplemental analyses demonstrated that a measurement model without the latent variable Social Resources adequately fit the data and it is not unreasonable to assume factorial invariance over time for the remaining four latent variables.

*Single Index Constructs: Descriptives, Mean Differences, and Mean Changes*

Next, the indicators for each latent variable were summed to create summary scores for each resource area. Descriptive statistics (range, means, standard deviations, skew, and kurtosis) for each resource index are provided in Table 5. The constructs appear to be univariate normal at both Time 1 and Time 2. Also, mean differences between age groups were tested for each resource dimension at Time 1 (see Table 6).

With the exception of Economic Resources, significant mean differences were found between age groups for each resource. Post-hoc Scheffé analyses indicate that the centenarians had the lowest mean levels of IADLs, Physical Health, and Social Resources compared to the other age groups. Also, centenarians had lower levels of Mental Health relative to those in their 60s but not those in their 80s. Finally, age group explains a significant amount of the variance in IADLs ($\eta^2 = .521$); centenarians had a significantly
Table 5
Descriptives for OARS Resource Single Index Constructs at Time 1 and Time 2

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>Range</th>
<th>Mean</th>
<th>(SD)</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Economic Resources Time 1</td>
<td>176</td>
<td>0-6</td>
<td>4.82</td>
<td>1.47</td>
<td>-1.44</td>
<td>1.07</td>
</tr>
<tr>
<td>2. Economic Resources Time 2</td>
<td>178</td>
<td>0-6</td>
<td>4.69</td>
<td>1.46</td>
<td>-1.12</td>
<td>.10</td>
</tr>
<tr>
<td>3. Mental Health Time 1</td>
<td>195</td>
<td>0-7</td>
<td>5.27</td>
<td>1.24</td>
<td>-0.84</td>
<td>1.41</td>
</tr>
<tr>
<td>4. Mental Health Time 2</td>
<td>189</td>
<td>0-7</td>
<td>5.18</td>
<td>1.32</td>
<td>-0.64</td>
<td>-0.08</td>
</tr>
<tr>
<td>5. IADLs Time 1</td>
<td>195</td>
<td>0-6</td>
<td>5.25</td>
<td>1.19</td>
<td>-1.67</td>
<td>1.92</td>
</tr>
<tr>
<td>6. IADLs Time 2</td>
<td>195</td>
<td>0-6</td>
<td>4.79</td>
<td>1.60</td>
<td>-1.37</td>
<td>.94</td>
</tr>
<tr>
<td>7. Physical Health Time 1</td>
<td>197</td>
<td>0-7</td>
<td>4.24</td>
<td>1.58</td>
<td>-0.61</td>
<td>0.04</td>
</tr>
<tr>
<td>8. Physical Health Time 2</td>
<td>192</td>
<td>0-7</td>
<td>3.81</td>
<td>1.68</td>
<td>-0.32</td>
<td>-0.66</td>
</tr>
<tr>
<td>9. Social Resources Time 1</td>
<td>197</td>
<td>0-9</td>
<td>7.57</td>
<td>1.45</td>
<td>-1.87</td>
<td>5.64</td>
</tr>
<tr>
<td>10. Social Resources Time 2</td>
<td>190</td>
<td>0-9</td>
<td>7.40</td>
<td>1.55</td>
<td>-1.16</td>
<td>1.58</td>
</tr>
</tbody>
</table>

lower score on IADLs than both those in their 80s and those in their 60s.

A final investigation of the single index variables compared mean changes over time by age groups (see Table 7). First, no effects were found for Time or the interaction of Time and Age Group on Economic Resources, Mental Health, and Social Resources. Second, a main effect of Time on Physical Health was found \((p < .001)\); Physical Health declined approximately 11% on average, across the three age groups. Finally, a significant interaction of Time and Age Group on IADLs was found \((p < .001)\). Over time, the centenarians declined in IADLs approximately 23% on average compared to the relative stability of the sexagenarians and the octogenarians (Figure 1). This is especially noteworthy when considering the time between measurement occasions for the centenarians (i.e.,
<table>
<thead>
<tr>
<th>Resource Construct</th>
<th>M (SD)</th>
<th>F</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60s</td>
<td>4.79a</td>
<td></td>
<td>.375</td>
</tr>
<tr>
<td>80s</td>
<td>4.89a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100s</td>
<td>4.70a</td>
<td></td>
<td>.003</td>
</tr>
<tr>
<td>(1.47)</td>
<td>(1.44)</td>
<td></td>
<td>(1.47)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IADLs</td>
<td></td>
<td></td>
<td>167.46***</td>
</tr>
<tr>
<td>60s</td>
<td>5.91a</td>
<td></td>
<td>.521</td>
</tr>
<tr>
<td>80s</td>
<td>5.76a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100s</td>
<td>4.01b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(.302)</td>
<td>(.503)</td>
<td></td>
<td>(1.25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Health</td>
<td></td>
<td></td>
<td>15.79***</td>
</tr>
<tr>
<td>60s</td>
<td>4.62a</td>
<td></td>
<td>.092</td>
</tr>
<tr>
<td>80s</td>
<td>4.30a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100s</td>
<td>3.48b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1.60)</td>
<td>(1.40)</td>
<td></td>
<td>(1.65)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Health</td>
<td></td>
<td></td>
<td>6.24**</td>
</tr>
<tr>
<td>60s</td>
<td>5.50a</td>
<td></td>
<td>.039</td>
</tr>
<tr>
<td>80s</td>
<td>5.34a,b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100s</td>
<td>4.92b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1.42)</td>
<td>(1.19)</td>
<td></td>
<td>(1.18)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Resources</td>
<td></td>
<td></td>
<td>13.53***</td>
</tr>
<tr>
<td>60s</td>
<td>7.65a</td>
<td></td>
<td>.080</td>
</tr>
<tr>
<td>80s</td>
<td>7.94a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100s</td>
<td>6.94b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1.23)</td>
<td>(.91)</td>
<td></td>
<td>(1.91)</td>
</tr>
</tbody>
</table>

Note. Means in the same row that do not share subscripts differ at $p < .05$ in the Scheffé post hoc test.

*p < .05. **p < .01. ***p < .001.
<table>
<thead>
<tr>
<th>Variable</th>
<th>60s</th>
<th>80s</th>
<th>100s</th>
<th>( F_T )</th>
<th>( F_{TA} )</th>
<th>( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Resources</td>
<td>5.00 (1.27)</td>
<td>4.74 (1.43)</td>
<td>4.93 (1.40)</td>
<td>.38</td>
<td>1.89</td>
<td>.002</td>
</tr>
<tr>
<td>Mental Health</td>
<td>5.46 (1.40)</td>
<td>5.57 (1.34)</td>
<td>5.43 (1.03)</td>
<td>.66</td>
<td>1.02</td>
<td>.004</td>
</tr>
<tr>
<td>IADLs</td>
<td>5.96 (.15)</td>
<td>5.84 (.35)</td>
<td>5.79 (.46)</td>
<td>56.61***</td>
<td>12.81***</td>
<td>.232</td>
</tr>
<tr>
<td>Physical Health</td>
<td>4.78 (1.46)</td>
<td>4.12 (1.62)</td>
<td>4.45 (1.31)</td>
<td>13.35***</td>
<td>1.08</td>
<td>.067</td>
</tr>
<tr>
<td>Social Resources</td>
<td>7.77 (1.19)</td>
<td>7.75 (1.17)</td>
<td>7.93 (.87)</td>
<td>2.40</td>
<td>.62</td>
<td>.013</td>
</tr>
</tbody>
</table>

Note. Standard deviations in parentheses.

*** \( p < .001 \).
approximately 20 months) compared to the younger age groups (five years). Results from post hoc Scheffé tests revealed that those in their 60s scored significantly higher in IADLs compared to those in their 100s ($p < .001$) and moderately higher in IADLs relative to those in their 80s ($p = .088$). Finally, those in their 80s scored significantly higher in IADLs compared to those in their 100s ($p < .001$).

These initial analyses of the single index constructs, summed from the indicators of the latent variables, clearly demonstrated differences between the age groups at Time 1 and differences in change over time between the age groups. Not surprisingly, the centenarians experienced the lowest levels of resources relative to those in their 80s and 60s. However, relative to the other age groups they did not experience significantly lower levels of resources over time (except for IADLs). It must be noted once again, that the assessment periods
differed for those in their 100s (approximately 20 months apart) than those in their 60s and 80s (60 months apart). In light of the IADLs finding, the deleterious effect of time and age on functional health for centenarians is significant and substantive.

**Bivariate Analyses**

A correlation matrix of indicators for each latent variable (both Time 1 and Time 2) is found in Table 8. Overall, indicators of the latent constructs at each time were significantly and positively correlated. However, only the correlation between the Social Resources’ indicators “phone talk” and “visits with others” was significant at Time 2. This lack of association at Time 2 for the indicators of Social Resources was also observed in the measurement model tests. Overall, Age Group (coded so that 0 = 60s; 1 = 80s; and 2 = 100s) tended to be negatively associated with each indicator. However, for the economic resources indicators Age Group was only significantly and negatively associated with sufficient income at Time 2.
## Table 8

**Correlation Matrix of Indicators for OARS Measurement Model (Time 1 below the diagonal; Time 2 above the diagonal)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age Group</td>
<td>—</td>
<td>- .18***</td>
<td>.02</td>
<td>-.08</td>
<td>-.22**</td>
<td>-.23**</td>
<td>-.13</td>
<td>-.72**</td>
<td>-.71**</td>
<td>-.47**</td>
<td>-.27**</td>
<td>-.10</td>
<td>-.09</td>
<td>-.40**</td>
<td>-.18**</td>
<td>-.03</td>
</tr>
<tr>
<td>2. Sufficient Income</td>
<td>-.05</td>
<td>—</td>
<td>.58**</td>
<td>.28**</td>
<td>.17**</td>
<td>.18**</td>
<td>.32**</td>
<td>.27**</td>
<td>.25**</td>
<td>.12</td>
<td>.19**</td>
<td>.30**</td>
<td>.04</td>
<td>.14</td>
<td>-.02</td>
<td>.16</td>
</tr>
<tr>
<td>3. Overall Income</td>
<td>.07</td>
<td>.56**</td>
<td>—</td>
<td>.22**</td>
<td>.07</td>
<td>.14</td>
<td>.21*</td>
<td>.02</td>
<td>.04</td>
<td>-.01</td>
<td>.02</td>
<td>.16*</td>
<td>.04</td>
<td>.08</td>
<td>.10</td>
<td>.09</td>
</tr>
<tr>
<td>4. Meet Payments</td>
<td>-.04</td>
<td>.55**</td>
<td>.41**</td>
<td>—</td>
<td>.09</td>
<td>.06</td>
<td>.14</td>
<td>.12</td>
<td>.10</td>
<td>.06</td>
<td>.21**</td>
<td>.10</td>
<td>.13</td>
<td>-.02</td>
<td>-.06</td>
<td>-.01</td>
</tr>
<tr>
<td>5. Exciting</td>
<td>-.24**</td>
<td>.22**</td>
<td>.27**</td>
<td>.20**</td>
<td>—</td>
<td>.29**</td>
<td>.35**</td>
<td>.23**</td>
<td>.17</td>
<td>.22**</td>
<td>.05</td>
<td>.13</td>
<td>-.09</td>
<td>.14*</td>
<td>.06</td>
<td>.20**</td>
</tr>
<tr>
<td>6. Overall Mental Health</td>
<td>-.08</td>
<td>.28**</td>
<td>.31**</td>
<td>.16**</td>
<td>.27**</td>
<td>—</td>
<td>.33**</td>
<td>.16**</td>
<td>.21**</td>
<td>.07</td>
<td>.00</td>
<td>.33**</td>
<td>.01</td>
<td>.07</td>
<td>.13*</td>
<td>.03</td>
</tr>
<tr>
<td>7. Life Satisfaction</td>
<td>-.10</td>
<td>.22**</td>
<td>.24**</td>
<td>.24**</td>
<td>.38**</td>
<td>.23**</td>
<td>—</td>
<td>.19*</td>
<td>.26**</td>
<td>.20*</td>
<td>.09</td>
<td>.18**</td>
<td>-.02</td>
<td>.16**</td>
<td>.04</td>
<td>.17**</td>
</tr>
<tr>
<td>8. Getting Out</td>
<td>-.69**</td>
<td>.17**</td>
<td>.11</td>
<td>.18**</td>
<td>.33**</td>
<td>.13**</td>
<td>.20**</td>
<td>—</td>
<td>.88**</td>
<td>.73**</td>
<td>.46**</td>
<td>.32**</td>
<td>.17*</td>
<td>.40**</td>
<td>.13</td>
<td>.02</td>
</tr>
<tr>
<td>9. Housework</td>
<td>-.63**</td>
<td>.04</td>
<td>.07</td>
<td>.16**</td>
<td>.29**</td>
<td>.11</td>
<td>.14**</td>
<td>.79**</td>
<td>—</td>
<td>.72**</td>
<td>.48**</td>
<td>.27**</td>
<td>.16*</td>
<td>.40**</td>
<td>.07</td>
<td>.07</td>
</tr>
<tr>
<td>10. Medicine</td>
<td>-.38**</td>
<td>.19**</td>
<td>.00</td>
<td>.02</td>
<td>.21**</td>
<td>.03</td>
<td>.07</td>
<td>.55**</td>
<td>.61**</td>
<td>—</td>
<td>.38**</td>
<td>.27**</td>
<td>.14</td>
<td>.31**</td>
<td>.07</td>
<td>.05</td>
</tr>
<tr>
<td>11. Low Troubles</td>
<td>-.26**</td>
<td>.19**</td>
<td>.25**</td>
<td>.21**</td>
<td>.32**</td>
<td>.26**</td>
<td>.41**</td>
<td>.35**</td>
<td>.30**</td>
<td>—</td>
<td>.40**</td>
<td>.41**</td>
<td>.09</td>
<td>-.14*</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>12. Overall Physical Health</td>
<td>-.16**</td>
<td>.30**</td>
<td>.29**</td>
<td>.22**</td>
<td>.33**</td>
<td>.48**</td>
<td>.20**</td>
<td>.28**</td>
<td>.24**</td>
<td>.17**</td>
<td>.45**</td>
<td>—</td>
<td>.33**</td>
<td>.16*</td>
<td>.03</td>
<td>.08</td>
</tr>
<tr>
<td>13. Comparative Health</td>
<td>-.28**</td>
<td>.08</td>
<td>.12</td>
<td>.11</td>
<td>.25**</td>
<td>.17**</td>
<td>.13**</td>
<td>.29**</td>
<td>.27**</td>
<td>.19**</td>
<td>.35**</td>
<td>.28**</td>
<td>—</td>
<td>.10</td>
<td>-.13</td>
<td>-.03</td>
</tr>
<tr>
<td>14. Phone Talk</td>
<td>.23**</td>
<td>.04</td>
<td>.18**</td>
<td>.03</td>
<td>.16**</td>
<td>.08</td>
<td>.11</td>
<td>.35**</td>
<td>.30**</td>
<td>.20**</td>
<td>.15*</td>
<td>.20**</td>
<td>.01</td>
<td>—</td>
<td>.07</td>
<td>.27**</td>
</tr>
<tr>
<td>15. Visit Network Number</td>
<td>-.21**</td>
<td>.03</td>
<td>.07</td>
<td>.09</td>
<td>.11**</td>
<td>.05</td>
<td>.04</td>
<td>.32**</td>
<td>.21**</td>
<td>.19</td>
<td>.10</td>
<td>.13</td>
<td>.09</td>
<td>.24**</td>
<td>—</td>
<td>.19</td>
</tr>
<tr>
<td>16. Visits With Others</td>
<td>-.03</td>
<td>.14**</td>
<td>.05</td>
<td>-.01</td>
<td>.10</td>
<td>.09</td>
<td>.11</td>
<td>.10</td>
<td>.00</td>
<td>.08</td>
<td>.11</td>
<td>.09</td>
<td>-.01</td>
<td>.31**</td>
<td>.25**</td>
<td></td>
</tr>
</tbody>
</table>

Means:
- Time 1: 
  - N = 321
  - 1.14 1.52 1.44 1.78 1.41 2.06 1.75 1.63 1.58 1.83 1.29 1.89 .86 2.41 2.86 2.16
- Time 2: 
  - N = 201
  - .99 1.52 1.42 1.72 1.42 1.97 1.77 1.55 1.47 1.77 1.17 1.83 .78 2.41 2.87 2.08

SD:
- Time 1: 
  - N = 321
  - .78 .78 .52 .50 .57 .70 .47 .46 .59 .40 .76 .77 .62 .85 .49 .77
- Time 2: 
  - N = 201
  - .83 .78 .77 .58 .57 .72 .49 .55 .67 .51 .78 .80 .61 .89 .48 .88

*p < .05. **p < .01.
Cross-Lagged Analyses

First, basic descriptive statistics and correlations (employing Full Information Maximum Likelihood to account for the missing data) are found for Time 1 and Time 2 in Table 9. Age group was negatively and significantly associated with each construct at Time 1 and Time 2 except Economic Resources ($\gamma = -.05$ and $\gamma = -.10$, respectively). Second, in order to assess direction of influence and the possible inter-relationships between the OARS constructs, I specified a just-identified model including age group and both Time 1 and Time 2 single constructs of each resource. Results from this test are found in Table 10. In this model (with no degrees of freedom) all stability paths were significant. The regression coefficient for Time 2 Economic Resources regressed on Time 1 Economic Resources was significant ($\gamma = .59; t = 7.61$). The regression coefficient for Time 2 Mental Health regressed on Time 1 Mental Health was significant ($\gamma = .41; t = 4.75$). The regression coefficient for Time 2 IADLs regressed on Time 1 IADLs was significant ($\gamma = .62; t = 7.69$). The regression coefficient for Time 2 Physical Health regressed on Time 1 Physical Health was significant ($\gamma = .27; t = 3.19$). Finally, the regression coefficient for Time 2 Social Resources regressed on Time 1 Social Resources was significant ($\gamma = .23; t = 2.23$). However, the stability coefficients for Physical Health and Social Resources were lower in magnitude relative to the resource stabilities. Age group was negatively associated with Mental Health, IADLs, and Social Resources. Mental Health at Time 1 was associated with Physical Health at Time 2 ($\gamma = .13; t = 1.68$). IADLs at Time 1 was associated with Physical Health at Time 2 ($\gamma = .20; t = 1.75$).
Table 9

**Correlation Matrix of OARS Single Index Constructs**
*(Time 1 below the diagonal; Time 2 above the diagonal)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age Group</td>
<td>—</td>
<td>-.10</td>
<td>-.27**</td>
<td>-.70**</td>
<td>-.20**</td>
<td>-.29**</td>
</tr>
<tr>
<td>2. Economic Resources</td>
<td>-.05</td>
<td>—</td>
<td>.27**</td>
<td>.14</td>
<td>.22**</td>
<td>.07</td>
</tr>
<tr>
<td>3. Mental Health</td>
<td>-.20**</td>
<td>.44**</td>
<td>—</td>
<td>.28**</td>
<td>.15</td>
<td>.22**</td>
</tr>
<tr>
<td>4. IADLs</td>
<td>-.66**</td>
<td>.17**</td>
<td>.26**</td>
<td>—</td>
<td>.43**</td>
<td>.26**</td>
</tr>
<tr>
<td>5. Physical Health</td>
<td>-.30**</td>
<td>.35**</td>
<td>.52**</td>
<td>.42**</td>
<td>—</td>
<td>.06</td>
</tr>
<tr>
<td>6. Social Resources</td>
<td>-.21**</td>
<td>.17**</td>
<td>.21**</td>
<td>.29**</td>
<td>.18**</td>
<td>—</td>
</tr>
</tbody>
</table>

*p < .01

**Means:**

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>321</td>
<td>201</td>
</tr>
<tr>
<td>Age Group</td>
<td>1.14</td>
<td>0.99</td>
</tr>
<tr>
<td>Economic Resources</td>
<td>4.74</td>
<td>4.66</td>
</tr>
<tr>
<td>Mental Health</td>
<td>5.20</td>
<td>5.16</td>
</tr>
<tr>
<td>IADLs</td>
<td>5.06</td>
<td>4.78</td>
</tr>
<tr>
<td>Physical Health</td>
<td>4.04</td>
<td>3.79</td>
</tr>
<tr>
<td>Social Resources</td>
<td>7.43</td>
<td>7.37</td>
</tr>
</tbody>
</table>

**SD:**

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>321</td>
<td>201</td>
</tr>
<tr>
<td>Age Group</td>
<td>0.83</td>
<td>0.83</td>
</tr>
<tr>
<td>Economic Resources</td>
<td>1.47</td>
<td>1.45</td>
</tr>
<tr>
<td>Mental Health</td>
<td>1.28</td>
<td>1.32</td>
</tr>
<tr>
<td>IADLs</td>
<td>1.25</td>
<td>1.60</td>
</tr>
<tr>
<td>Physical Health</td>
<td>1.64</td>
<td>1.68</td>
</tr>
<tr>
<td>Social Resources</td>
<td>1.54</td>
<td>1.55</td>
</tr>
</tbody>
</table>

**Note.** Age Group scored so that 0 = 60s; 1 = 80s; 2 = 100s.

---

Table 10

**Completely Cross-Lagged Model of Time 1 OARS Index Constructs Predicting Time 2 Constructs**

<table>
<thead>
<tr>
<th>Time 1 Predictors</th>
<th>Economic Resources</th>
<th>Mental Health</th>
<th>IADLs</th>
<th>Physical Health</th>
<th>Social Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>γ t</td>
<td>γ t</td>
<td>γ t</td>
<td>γ t</td>
<td>γ t</td>
<td>γ t</td>
</tr>
<tr>
<td>1. Age Group</td>
<td>.05 .62 -1.82* -1.82* -2.6 ** -2.6 ** -4.29** .04 .37 -2.6 ** -2.55**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Economic Resources</td>
<td>.59 7.61** .00 .00 -2.6 ** -2.6 ** -2.6 ** -2.6 ** -2.6 ** -2.6 ** -2.6 **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Mental Health</td>
<td>.08 1.00 .41 4.75** .01 .19 .13 1.68* -2.4 .49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. IADLs</td>
<td>.07 .77 -2.3 .62 1.45** .20 1.75* -2.4 .49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Physical Health</td>
<td>-.09 -1.18 .05 .62 .08 1.45 .27 3.19** .11 1.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Social Resources</td>
<td>.10 1.55 .07 .93 -2.4 -2.4 -2.4 -2.4 -2.4 -2.4 -2.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** *p < .05. **p < .01. (one-tailed tests)
Based upon the completely cross-lagged results above, I specified and tested two
cross-lagged models of latent variables (specified according to the measurement model
results) including only Mental Health and Physical Health (Figure 2) and IADLs and
Physical Health (Figure 3). These models were specified with indicator residuals correlated
across time (e.g., life satisfaction at Time 1 residual correlated with life satisfaction at Time 2
residual) and with factor loadings constrained to be equal across time. The first model
(Mental Health and Physical Health) required two extra residual correlations (overall mental
health both with overall physical health and Time 2 overall physical health) for model fit.
Measurement model results are found in Table 11. This final model fit the data adequately,

Table 11

<table>
<thead>
<tr>
<th>Construct/Indicators</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loadings ($\lambda^a$)</td>
<td>Uniqueness ($R^2$)</td>
</tr>
<tr>
<td></td>
<td>T1</td>
<td></td>
</tr>
<tr>
<td><strong>Mental Health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exciting</td>
<td>.57b</td>
<td>.33</td>
</tr>
<tr>
<td>Overall Mental Health</td>
<td>.49</td>
<td>.24</td>
</tr>
<tr>
<td>Life Satisfaction</td>
<td>.60</td>
<td>.36</td>
</tr>
<tr>
<td><strong>Physical Health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Troubles</td>
<td>.69b</td>
<td>.48</td>
</tr>
<tr>
<td>Overall Physical Health</td>
<td>.55</td>
<td>.30</td>
</tr>
<tr>
<td>Comparative Health</td>
<td>.54</td>
<td>.29</td>
</tr>
</tbody>
</table>

Note. 

$^a$Parameter estimates are from the standardized solution.
$^b$These indicator loadings were fixed to 1.0 (unstandardized) for model identification;
all estimated loadings’ $p < .01$.
$^c$Fit Indices: MLR $\chi^2$ ($N=201; \text{df} = 44$) = 66.97; CFI = .95; TLI = .92; RMSEA = .05; SRMR = .06.
MLR $\chi^2 (44, N = 201) = 66.97, p = .01$, CFI = .95; TLI = .92; RMSEA = .05 and SRMR = .06 (Figure 2). Both stability coefficients were positively and significantly associated; the cross-lagged paths were not significant.

![Figure 2. Cross-Lagged Latent Variable Model for Mental and Physical Health](image)

The second model specified stabilities and cross-lagged paths between IADLs and Physical Health (Figure 3; measurement model results are in Table 12) and fit the data well as specified (e.g., no extra residual correlations were required), MLR $\chi^2 (46, N = 201) = 37.37, p = .81$, CFI = 1.00; TLI = 1.00; RMSEA = .00 and SRMR = .05). Again, both stability coefficients were positively and significantly associated; the cross-lagged paths were not significant.
### Table 12

**Cross-Lagged Latent Variable Measurement Model Results**

<table>
<thead>
<tr>
<th>Construct/Indicators</th>
<th>Loadings ($\lambda^a$)</th>
<th>Uniqueness ($R^2$)</th>
<th>Loadings ($\lambda^a$)</th>
<th>Uniqueness ($R^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>T1</strong></td>
<td></td>
<td><strong>T2</strong></td>
<td></td>
</tr>
<tr>
<td><strong>IADLs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting Out</td>
<td>.88$^b$</td>
<td>.77</td>
<td>.93$^b$</td>
<td>.87</td>
</tr>
<tr>
<td>Housework</td>
<td>.91</td>
<td>.83</td>
<td>.95</td>
<td>.90</td>
</tr>
<tr>
<td>Medicine</td>
<td>.72</td>
<td>.52</td>
<td>.76</td>
<td>.58</td>
</tr>
<tr>
<td><strong>Physical Health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Troubles</td>
<td>.77$^b$</td>
<td>.59</td>
<td>.79$^b$</td>
<td>.62</td>
</tr>
<tr>
<td>Overall Physical Health</td>
<td>.51</td>
<td>.26</td>
<td>.52</td>
<td>.27</td>
</tr>
<tr>
<td>Comparative Health</td>
<td>.50</td>
<td>.25</td>
<td>.53</td>
<td>.28</td>
</tr>
</tbody>
</table>

**Note.**
- $^a$Parameter estimates are from the standardized solution.
- $^b$These indicator loadings were fixed to 1.0 (unstandardized) for model identification; all estimated loadings' $p < .01$.
- $^c$Fit Indices: MLR $\chi^2$ ($N=201; df = 44$) = 37.37; CFI = 1.00; TLI = 1.00; RMSEA = .00; SRMR = .05.

---

**Figure 3.** Cross-Lagged Latent Variable Model for IADLs and Physical Health
The completely cross-lagged analyses provided empirical evidence for the relative stability of each resource construct over time; the stability coefficients were substantive and significant. However, Social Resources, as noted in the latent variable models discussed previously, had the lowest stability coefficient relative to the other resource constructs and the lowest significance test ($t = 2.23$). Also, the results of the completely cross-lagged analyses informed tests of cross-lagged latent constructs; however, no significant cross-lagged paths were found. Thus, the results from the cross-lagged analyses were inconclusive regarding directions of influence among the OARS resource constructs. Alternative options for modeling change are now addressed.

*Modeling Change Within a Latent Growth Curve Framework*

A number of authors have pointed out the limitations of modeling change over time in a cross-lagged framework (see Allison, 1990; Lorenz, Wickrama, & Conger, 2004; Stoolmiller & Bank, 1995). Thus, this study’s analyses proceeded to examine change in each of the OARS resources employing a latent growth curve framework. First, univariate or unconditional growth curve models for each construct were examined for significant individual variance in level and change (slope). Note that in order to estimate these models with two time points, the errors for the repeated measures are fixed to zero (see Duncan, Duncan, Strycker, Li, & Alpert, 1999). Thus, for this study, the intercept loadings were fixed at one, the loadings for the change factor were fixed to zero (Time 1) and to one (Time 2), and the errors were fixed to zero. Each construct evidenced significant interindividual differences in intraindividual change as noted by the significant variance for both level and slope. Results for these analyses are found in Table 13.
Table 13

Univariate Growth Curve Results for OARS Resource Constructs

<table>
<thead>
<tr>
<th>Outcome Construct</th>
<th>Mean</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>Slope</td>
</tr>
<tr>
<td>1. Economic Resources</td>
<td>4.76**</td>
<td>-.09</td>
</tr>
<tr>
<td>2. IADLs</td>
<td>5.25**</td>
<td>-.47**</td>
</tr>
<tr>
<td>3. Physical Health</td>
<td>4.25**</td>
<td>-.46**</td>
</tr>
<tr>
<td>4. Mental Health</td>
<td>5.26**</td>
<td>-.08</td>
</tr>
<tr>
<td>5. Social Resources</td>
<td>7.57**</td>
<td>-.18</td>
</tr>
</tbody>
</table>

**p < .01.

The association between level and slope was negative and significant for Economic Resources, Physical Health, Mental Health, and Social Resources. This means that on the average, initial levels of each resource was associated with a decline in that resource over time; in fact the higher the initial level, the steeper the decline. However, such was not the case for IADLs; no association was found for initial level of IADLs and change in IADLs over time. Thus, regardless of initial level of IADLs, the average change was decline over time.

After establishing significant individual change in each construct, the next phase of the analyses specified models to predict the growth factors of change (intercept and slope) by Time 1 resource constructs and age group. These just-identified models correspond to Rogosa’s “improved-difference-score model” (Rogosa, Brandt, & Zimowski, 1982; Stoolmiller, 1995). As noted before, the intercept loadings were fixed at one, the loadings for the change factor were fixed to zero (Time 1) and to one (Time 2), and the errors were fixed to zero. The results for predictors of the growth factors (intercept and slope) in each resource measure are found in Table 14.
### Table 14

**Predictors of Growth Factors in OARS Resource Constructs**

<table>
<thead>
<tr>
<th>Time 1 Predictors</th>
<th>Economic Resources</th>
<th>ADLs</th>
<th>Physical Health</th>
<th>Mental Health</th>
<th>Social Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>Slope</td>
<td>Level</td>
<td>Slope</td>
<td>Level</td>
</tr>
<tr>
<td>1. Age Group</td>
<td>.03</td>
<td>.05</td>
<td>-.60**</td>
<td>-.32**</td>
<td>-.06</td>
</tr>
<tr>
<td>2. Economic Resources</td>
<td>—</td>
<td>—</td>
<td>-.02</td>
<td>.00</td>
<td>.19**</td>
</tr>
<tr>
<td>3. IADLs</td>
<td>-.05</td>
<td>.12</td>
<td>—</td>
<td>—</td>
<td>.29**</td>
</tr>
<tr>
<td>4. Physical Health</td>
<td>.24**</td>
<td>-.19*</td>
<td>.21**</td>
<td>.09</td>
<td>—</td>
</tr>
<tr>
<td>5. Mental Health</td>
<td>.32**</td>
<td>-.05</td>
<td>.02</td>
<td>.01</td>
<td>.32**</td>
</tr>
<tr>
<td>6. Social Resources</td>
<td>.03</td>
<td>.08</td>
<td>.10</td>
<td>-.11</td>
<td>-.02</td>
</tr>
</tbody>
</table>

* \( p < .05 \). ** \( p < .01 \) (one-tailed tests).  

Significant predictors of change (slope) were found for Economic Resources, Activities of Daily Living, Mental Health, and Social Resources. Age group at Time 1 was negatively associated with slope for ADLs (\( \gamma = -.32; t = -4.26 \)), Mental Health (\( \gamma = -.18; t = -1.67 \)), and Social Resources (\( \gamma = -.20; t = -1.81 \)). Physical Health at Time 1 was negatively associated with slope for Economic Resources (\( \gamma = -.19; t = -2.13 \)). Mental Health at Time 1 was negatively associated with slope for Social Resources (\( \gamma = -.16; t = -1.70 \)). Because of the significant and substantive effect for the interaction of Time and Age Group in the mean change analyses of IADLs (Table 7), I plotted the growth curves for Age Group predicting change in IADLs by Age Group (Figure 4). In this analysis, the influence of the other resources is controlled for and the significant decline over time for centenarians is revealed.
Figure 4. Age Group Predicts Change in IADLs

In sum, because significant variation in both level and slope existed for each resource construct, I was able to investigate direction of influence and the interrelationships of the OARS resource constructs. The latent growth curve framework provided the opportunity to test, simultaneously, predictors of both level at Time 1 and change in each OARS resource construct. Age Group was a main predictor of slope or change in IADLs, Mental Health, and Social Resources. The steepest declines in these outcomes over time were experienced by the oldest participants. These findings appear fairly robust, replicating the findings of the completely cross-lagged model results in which Age Group predicted negatively and significantly Mental Health, IADLs, and Social Resources at Time 2, controlling for the
influence of all Time 1 OARS resource index constructs. Thus, these results informed the next step of the analyses: mediation and moderation by Social Resources.

**Mediation by Social Resources**

Based upon the predictors of growth factors results, I conducted the following tests of mediation by Social Resources. First, three path analytic models specifying Social Resources at Time 1 as a mediator between predictors of change in outcomes (latent growth framework models specified as before) were tested: (a) Age influenced change in ADLs; (b) Age influenced change in Mental Health; and (c) Physical Health influenced change in Economic Resources.

Mediation by Social Resources of growth factors of IADLs regressed on Age Group was not found (see Figure 5). The direct effects of Age Group both on intercept ($\gamma = -.66; t = -12.32$) and change ($\gamma = -.35; t = -4.61$) remained significant and substantive when Social Resources was specified as a mediator. In other words, the older the participant the lower their score on IADLs at Time 1, and the greater their decline in IADLs over time. Social Resources did not predict level or change in IADLs in this model ($\beta = .13; t = 1.79$ and $\beta = -.10; t = -1.25$, respectively).
Intercept of IADLs ($R^2 = .49$)

Change in IADLs ($R^2 = .12$)

Age Group

Social Resources

In the second model tested (see Figure 6), mediation of growth factors of Economic Resources on Physical Health by Social Resources was not found. The direct effects of Physical Health both on intercept ($\gamma = .34; t = 4.23$) and change ($\gamma = -.18; t = -2.47$) remained significant and substantive when Social Resources was specified as a mediator. In other words, the higher a participant’s score was on Physical Health at Time 1, the higher their level of Economic Resources at Time 1, and the greater their decline in Economic Resources over time. Also, in this model, Social Resources did not predict either intercept ($\beta = .09; t = 1.16$) or change ($\beta = .08; t = 1.12$) of Economic Resources.

Mediation of change by Social Resources was not found in the final model tested (Figure 7). No direct effect was found for Age Group on the change factor of Mental Health ($\gamma = -.10; t = -1.24$) nor was Social Resources predictive of change in Mental Health ($\beta = -.10; t = -1.25$). It is possible to argue for partial mediation of the effect of Age Group on intercept or level of Mental Health at Time 1 because the magnitude of the direct effect in the
Figure 6. Mediation of Physical Health Predicting Growth Factors of Economic Resources by Social Resources

Figure 7. Mediation of Age Group Predicting Growth Factors of Mental Health by Social Resources
model specified without Social Resources ($\gamma = -.19; t = -2.53$) was reduced in magnitude when Social Resources was included as a mediator ($\gamma = -.14; t = -1.87$). Also, the indirect effect from Age Group to the intercept of Mental Health mediated by Social Resources was significant ($-.049; t = -1.95$).

Again, as in the previous analyses of predictors of change, results from the mediation models tested were similar to those of the completely cross-lagged model of Time 1 OARS index constructs predicting Time 2 constructs establishing the robustness of the findings. Social Resources at Time 1 was not predictive of any other construct except itself at Time 2. Thus, despite strong theoretical and empirical support for Social Resources to serve as a mediator between other resources, in the models examined mediation by Social Resources was not found.

**Moderation by Social Resources**

Moderation by Social Resources of the relationship between the predictors and change in the outcomes for the three mediation models previously tested was also examined. In each of these models, the predictor variables were mean-centered and the interaction term was computed by multiplying the two mean-centered predictors (Cohen, Cohen, West, & Aiken, 2003). For Age Group (coded 0 = 60s, 1 = 80s, and 2 = 100s), the mean was almost 1.0 (i.e., .99). Thus, analyses including Age Group as a predictor and as a part of an interaction term refer to low, medium, and high levels of this variable and correspond to those in their 60s, 80s, and 100s.

The growth factors of the outcome of interest, level and slope, were regressed on these three predictors (i.e., the two predictor variables and their cross-product or multiplicative, interaction term) in each of the three models previously examined for
mediation. Moderation was not found for the models specifying (a) the interaction term Age Group X Social Resources and its influence on change in Mental Health ($\gamma = -.12; t = -1.23$) and (b) the interaction term Physical Health X Social Resources and its influence on change in Economic Resources ($\gamma = .01; t = .07$). However, moderation by Social Resources of Age Group (Age Group X Social Resources) predicting change in IADLs was found. In this model (Figure 8), the multiplicative term, Age Group X Social Resources significantly predicted the slope factor ($\gamma = -.15; t = -2.41$) but not the intercept ($\gamma = .07; t = 1.21$). Also, Age Group significantly predicted both intercept and change in IADLs ($\gamma = -.66; t = -12.22$ and $\gamma = -.35; t = -4.65$, respectively).

In order to examine the influence of the interaction between Age Group and Social Resources on change in IADLs, I employed two methods. First, I split the sample into three groups (i.e., 60s, 80s, and 100s) and computed three separate models specifying Social Resources at Time 1 predicting change in IADLs (Figures 9-11). Social Resources negatively and significantly predicted change in IADLs only for the centenarians (Figure 11). Social Resources was not associated with change in IADLs for those in their 60s and 80s (Figures 9 and 10). Second, the procedure outlined by Preacher, Curran and Bauer (2004) was followed for plotting the three-way interaction in latent curve analyses (time by the interaction of Age Group and Social Resources). Because the outcome change in IADLs was a repeated measure over time, the basic equation for the conditioned IADLs level at a point in Time (where Time 1 or baseline = 0 and where Time 2 = 1) was used (e.g., IADL = Intercept + Slope*Time) to plot the interaction at different levels (+1 Standard Deviation, 0, and -1 Standard deviation) of Social Resources - holding Age Group constant. This also was done
Figure 8. Moderation by Social Resources of Age Group Predicting Change in IADLs
Intercept of IADLs
($R^2 = .04$)

Social Resources Time 1

.19 ($t = 1.09$)

-.11 ($t = -.49$)

Change In IADLs
($R^2 = .001$)

Social Resources Time 1

.04 ($t = .31$)

.27 ($t = 1.21$)

Figure 9. Social Resources Predicts Intercept and Change in IADLs (60s)

Intercept of IADLs
($R^2 = .003$)

Social Resources Time 1

-.06 ($t = -.51$)

-.08 ($t = -.84$)

Change In IADLs
($R^2 = .07$)

Figure 10. Social Resources Predicts Intercept and Change in IADLs (80s)
for three levels of Age Group (those in their 60s, those in their 80s, and those in their 100s).

Two equations, one for the intercept factor and one for the slope or change factor were derived based upon the Cohen, Cohen, Aiken and West (2003) technique for probing interactions. These equations were based upon the classic Aiken and West (1991) derivation for plotting significant interactions (where $X =$ Age Group and $Z =$ Social Resources at Time 1, holding Age Group constant). Initially, the regression equation with the interaction term was

$$Y = b_0 + b_1X + b_2Z + b_3XZ.$$  

The term $b_0$ referred to the intercept; $b_1$ refers to the unstandardized regression coefficient for $X$; $b_2$ refers to the unstandardized regression coefficient for $Z$; and $b_3$ refers to the
unstandardized regression coefficient for the interaction term, $XZ$. Both predictors were first mean-centered to avoid multicollinearity and to ease interpretation of results (Cohen et al., 2003). The interaction term was the product of these centered predictors. Factoring out the $X$ term resulted in the basic equation for the simple regression of the outcome on $X$ conditioned upon $Z$. This basic equation took the form

$$Y = (b_1 + b_3 Z)X + (b_0 + b_2 Z).$$

In this equation, the $(b_1 + b_3 Z)$ term is referred to as the simple slope for the regression of the outcome on $X$ at different levels of the moderator or $Z$. The last term, $(b_0 + b_2 Z)$, was the simple intercept. Thus, the outcome $Y$ was conditioned upon the interaction variable. This basic algebraic expression was followed and extended to interactions in a latent growth curve analysis for both the intercept factor and the slope or change factor (Preacher, et al., 2004).

Based upon the results from the full model (Figure 8) the intercept, slope, and combined equation were derived. In the following equations $X =$ mean-centered Age Group where 60s = -1, 80s = 0, and 100s = +1, and $Z =$ mean-centered Social Resources at Time 1. The intercept factor equation was

$$Y_{\text{intercept}} = (-.947 + .065*Z)*X + .083*Z + 5.251.$$  

The intercept equation demonstrated that for the higher Age Group, centenarians (+1), the intercept was the lowest and for the lower Age Group, the sexagenarians (-1) the intercept was the highest. The slope or change in IADLs factor equation was

$$Y_{\text{slope}} = (-.392 + -.107*Z)*X + -.025*Z + -.489.$$  

Note that in this equation, the coefficient for the interaction term (.107) was multiplied by the score for the levels of the moderator, $Z$, or Social Resources in this case. Also, this equation demonstrated that when Social Resources were high ($Z = +1$ SD = 1.45) and
centenarians were the Age Group of interest then the rate of change in IADLs had the steepest decline. Conversely, when Social Resources were high and those in their 60s were the Age Group of interest, then the rate of change in IADLs had the lowest decline.

The combined equation for the estimated average individual level of IADLs at each time point (e.g., Time 1 = 0 and Time 2 = 1) conditioned upon the predictors in the model was

\[ Y_{it} = \text{Intercept} + \text{Slope} \times \text{Time}. \]

Note that for the first measurement occasion (where the loading for Time = 0), the slope portion was zero or the level of IADLs was simply equal to the result of the intercept equation. This basic equation was computed for IADLS at Time 1 and at Time 2 and plotted to probe the interaction effect. The basic equations for each Age Group by levels of Social Resources are shown in Table 15. Age Group was held constant across the three levels of Social Resources at Time 1; equations were produced for each level of Age Group.

The table of equations shows the contrast between the sexagenarians and the centenarians for both intercept at Time 1 and slope. The sexagenarians had higher average levels at Time 1 than the centenarians. Also, centenarians tended to have steeper slopes. However, for the sexagenarians the steeper slopes were associated with lower levels of Social Resources at Time 1; in this case higher levels of Social Resources acted as a buffer, mitigating the reduction in IADLs over time. In contrast, for centenarians, higher levels of Social Resources at Time 1 resulted in greater declines in IADLs over time.
Table 15

*Simple Intercepts and Slopes Equations for Change in IADLs by Time 1 Age Group and Time 1 Social Resources (mean-centered predictors)*

<table>
<thead>
<tr>
<th></th>
<th>Low Age Group 60s</th>
<th>Mean Age Group 80s</th>
<th>High Age Group 100s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Social Resources T1 (-1 SD = -1.45)</td>
<td>5.99 - .26*(Time)</td>
<td>5.13 - .45*(Time)</td>
<td>4.27 - .65*(Time)</td>
</tr>
<tr>
<td>Average Social Resources T1 (0)</td>
<td>6.04 - .16*(Time)</td>
<td>5.25 - .49*(Time)</td>
<td>4.47 - .81*(Time)</td>
</tr>
<tr>
<td>High Social Resources T1 (+1 SD = 1.45)</td>
<td>6.08 - .07*(Time)</td>
<td>5.37 - .45*(Time)</td>
<td>4.66 - .98*(Time)</td>
</tr>
</tbody>
</table>

Participants in their 60s also experienced a decline in IADLs over time (Figure 12). For this particular Age Group, those who had the lowest level of Social Resources at Time 1 tended to experience the greatest loss in IADLs at Time 2.

Participants in their 80s experienced a reduction in IADLs over time (Figure 13). Also, the range in slope coefficients was limited (-.45 for High Social Resources, -.49 for Average levels of Social Resources, and -.45 for low levels of Social Resources).

Finally, centenarians had the lowest intercept levels and also experienced the steepest declines in IADLs over time relative to the other Age Groups (see Figure 14). Again, these findings were consistent with the completely cross-lagged model results: the higher the level of Age Group, the greater the decline in IADLs at Time 2. Also, it is interesting that the level of IADLs appears to converge at Time 2 for all levels of Social Resources.
In sum, moderation by level of Social Resources at Time 1 of the regression of the growth factors of IADLs on Age Group at Time 1 was found. First, participants in their 60s reported the highest levels of IADLs at baseline, relative to those in their 80s and 100s. Also, the sexagenarians had the lowest rates of decline across the different levels of Social Resources. In this case, for those in their 60s, higher levels of Social Resources at Time 1 appeared to mitigate the decline in self-reported IADLs. However, for the centenarians, the results were different. These participants scored the lowest on baseline levels of IADLs across the levels of Social Resources relative to participants in their 80s and 60s. Also, the centenarians experienced the steepest rates of decline across the levels of Social Resources. However, centenarians who reported the highest level of Social Resources at Time 1
experienced the steepest rate of decline in self-reported IADLs; whereas sexagenarians who reported the highest level of Social Resources at Time 1 experienced the lowest rate of decline in IADLs.

**Figure 13.** Moderation by Social Resources of Age Group (80s) Predicting Change in IADLs
Figure 14. Moderation by Social Resources of Age Group (100s) Predicting Change in IADLs.
Discussion

The purpose of this study was to systematically investigate five main resources older individuals rely upon for healthy adaptation to the normal declines experienced with age (i.e., social resources, economic resources, mental health, physical health, and activities of daily living). In particular, this study set out to examine whether or not social resources might play an increasingly important role in older Age Groups, especially centenarians, for successful coping with age-related loss. Also, the empirical focus of this study was on a widely used procedure for multidimensional functional assessment of older adults - an integral part of the Duke Older Americans Resources and Services Program (Fillenbaum, 1988). Numerous studies have employed one or more dimensions from the OARS (e.g., Bailey et al., 2002; Fry & Debats, 2006; Martin, Bishop, Poon, & Johnson, 2006; Ostbye et al., 2006). However, to date, no studies were found that specifically examined change in the structural inter-relationships of the five self-reported resources assessed by the OARS among older adults – especially centenarians.

Thus, this study conducted a confirmatory factor analysis with the goal of creating latent variables for each resource area of the OARS. Second, index variables comprised of the summed indicators for each resource latent variable were employed in a completely cross-lagged analysis to assess directional influences between the resources across two measurement occasions. Based upon the completely cross-lagged results (i.e., all five OARS resources specified at both Time 1 and Time 2), three different models with two associated and cross-lagged latent variables were tested. However, these cross-lagged, latent variable models did not provide any substantive results regarding the cross-lagged paths. A second method for modeling change was then employed; univariate and conditional growth curve
models were specified to assess change and predictors of change among the OARS resource dimensions. Finally, based upon the findings from the latent growth curve analyses, this study investigated mediation and moderation by Social Resources.

**Measurement Model for OARS**

The OARS became commonly used by clinicians and gerontological researchers in the late 1980s, concurrent with the advent of structural equation modeling with latent variables (Bollen, 1989). Thus, it is not surprising that empirical research specifying OARS items in a latent variable framework are limited. A few studies have specified one or more of the OARS resource areas as latent variables. For example, employing soft modeling and latent variable partial least square estimation, Martin et al. (1997) developed a measurement model for latent variables with three indicators for social support and physical health. Fees et al. (1999) specified a latent variable for physical health with two indicators. A recent study specified a latent variable for social support consisting of three interviewer proxy ratings, also part of the OARS assessment (Bishop et al., in press).

However, my review of the literature found no study that developed a measurement model for each OARS resource area based upon the self-report items. Recent calls for renewed attention to multidimensional assessments of older adults and the continued popularity of the OARS instrument as a standardized scale focusing on the self-reported and health-related quality of life motivated this study’s attempt to develop a measurement model for each resource area using a sample of older adults.

Five latent variables with three indicators each were specified; the combined measurement model fit the data adequately. Three results from the measurement analyses are noteworthy. First, advances in user-friendliness of SEM software technology and applied
researcher’s training in structural equation modeling analytic procedures increasingly call for specification of measurement error and the modeling of simultaneous outcomes, including direct and indirect effects. With the exception of Social Resources at Time 2, researchers employing the OARS multidimensional functional assessment of older adult’s resources may confidently specify the measurement models tested in this study. Despite a 38% reduction in sample size over time the measurement model tested in this study fit the data well at both measurement occasions. All factor loadings (except those of Social Resources at Time 2) were significant and substantive, providing evidence of a psychometrically sound factor structure for the OARS resources.

Second, supplementary analyses of factorial invariance over time, conducted without the Social Resources latent variable, revealed that in this sample, the four constructs (i.e., Economic Resources, IADLs, Physical Health, and Mental Health) were not changing significantly over time. It is noted that for the younger Age Groups, five years elapsed between measurement occasions whereas for the centenarians, approximately 20 months had passed. Researchers interested in developmental questions of change over time are encouraged to employ the measurement model verified by this study’s results and to extend this work by carefully considering the time intervals necessary for proximal and distal influences to unfold among older adults.

Third, Social Resources tended to have the lowest loadings per indicator. This could mean that the OARS items for this construct are not good assessments of the latent variable or in this sample, relative to the other indicators, talking on the phone is the main indicator tapping the respondent’s Social Resources. Other valid and reliable assessments of social support might be examined to augment or supplant the items included in the OARS
assessment. Also, larger sample sizes would allow examination of the possible change over
time in the factor structure of the latent variable Social Resources, ruling out lack of power as
an explanation for the lack of significant loadings for the latent variable at Time 2. Finally,
empirical work investigating the relationship between measures of social support and
loneliness has demonstrated discriminant validity. Despite the strong association these
measures tap different constructs (Russell, 1996; Russell, Kao, & Cutrona, 1987). This is
consistent with the finding of this study; the loneliness item did not load significantly on the
Social Resources latent variable and was not included in the final measurement model.

Finally, it must be noted that this investigation was not a psychometric assessment of
the entire OARS questionnaire and services supplement. Rather, the intent of this study’s
evaluation was to develop a measurement model for each of the five resource areas,
effectively reducing the number of questions and time needed to adequately assess the
resources of older adult participants. Thus, this study’s measurement model for the OARS
tends to fit the data well and should be replicated in other samples for cross-validation.
However, researchers who wish to use the single constructs are advised to consider including
more of the OARS items or to investigate using the computer-based ratings provided by
Fillenbaum (1988).

*Single Index Constructs: Descriptives, Mean Differences, and Mean Changes*

Understandably, when working with samples of older adults, centenarians in
particular, sample sizes may not be adequate for complex structural equation models.
However, researchers may still wish to employ path analytic techniques allowing for the
simultaneous solving of multiple regression equations including mediators and multiple
outcome variables. Thus, this study’s measurement model indicators were summed to create
single index variables for each resource area. Before employing these index variables in analyses designed to assess directional influence and change (cross-lagged and growth curve analyses), mediation, and moderation, aggregate level differences between Age Groups and between Age Groups over time were conducted.

Four specific results, based on the tests of mean differences in the OARS constructs between Age Groups at the first measurement occasion and over time, are noteworthy. First, no mean differences between the Age Groups were found for economic resources. This finding is consistent with a focused investigation of the economic well-being of the three Age Groups in this sample (Goetting et al., 1996). In their investigation of the OARS economic resource self-assessed items at Time 1 in the Georgia Centenarian Study, Goetting and colleagues included the items used in this study’s measurement model. Overall, they only found Age Group differences on two out of 10 items assessed and one of those Age Group differences was based on only one response category. Finally, Goetting et al. provided rationale for the lack of significant differences in economic resources among the three Age Groups. It could be that centenarians (who reported the lowest economic resources) employed a downward comparison to others who are worse off than themselves. Perhaps the centenarians made relative comparisons to other previous economically difficult periods in their lifespan (e.g., two World Wars and a Great Depression), mitigating concerns over their current economic situation.

Second, in keeping with other studies of older age groups, including centenarians, and their levels of resources relative to younger age groups (Martin et al., 1996; Ostbye et al., 2006), in this study’s sample the mean levels of IADLs, Physical Health, Mental Health, and Social Resources were significantly lower for centenarians. In particular, centenarians in this
study were extremely low in IADLs relative to those in their 60s and 80s. These results may further support the “compression of morbidity” (Fries, 1980) hypothesis. Rather than experience gradual declinations in overall health and gradual increases in disease-related mortality, individuals appear to experience a longer lifespan of good health truncating in small period of poor health prior to death (Fries, 1980). Third, this “compression of morbidity” likely explains the significant difference in IADLs between centenarians and both those in their 60s and 80s. Whereas there is not a significant difference between sexagenarians and octogenarians in IADLs, centenarians report, on average, 32% lower functional ability at Time 1 relative to the younger age groups.

Third, the repeated measures analyses affirmed the results previously discussed regarding mean differences in IADLs at Time 1. First, the significance test and the corresponding effect size for the interaction of age group and time represented, according to Cohen’s (1988) criteria, a large effect size. Age group differences explain most of the differences in IADLs over time. Post-hoc examinations revealed that once again, centenarians were significantly and substantively lower on IADLs than those in either their 60s or 80s. Further support for the compression of morbidity explanation previously discussed was found in the less than significant difference in IADLs between those in their 60s and 80s.

Recently, Fry and DeBats (2006) investigated sources of life strengths as predictors of late-life mortality and, among other measures, employed the OARS scale to assess self-rated disability (i.e., the IADL scale). In their sample of 380 randomly selected volunteers between the ages of 65 and 87 years, Fry and DeBats found a number of independent predictors of survival including disability (i.e., low levels of IADLs); low levels of these
predictors created the greatest risk for male mortality. Finally, a longitudinal investigation predicting change in ADLs (in this particular study, IADLs and PADLs were combined) among the oldest old in Sweden also affirms the current study’s findings that mean levels of IADLs change for the older participants relative to the younger age groups. Femia et al. (2001) did find a decline over time, but were also encouraged by Swedish participants who either remained stable or improved in functional health over time. A significant predictor of stability in ADL functioning over a four year time period was residential status, in particular community dwelling. In the current study’s sample, relative stability is observed for the younger age groups (60s and 80s); all participants were community dwelling at the baseline assessment. However, a large effect was found for age; the centenarians experienced significant losses in IADLs compared to those in their 60s and 80s. Again, it must be noted that the difference in timing between measurements was five years for the sexagenarians and the octogenarians whereas approximately 20 months separated measurement occasions for the centenarians. Thus, change in IADLs happened and radically so for the centenarians in this study.

Finally, consistent with previous investigations (Martin et al., 1996; Steverink, Westerhof, Bode, & Dittmann-Kohli, 2001) and the previously discussed “compression of morbidity” or accelerated decline of resources necessary for adapting to age-related changes at the very end of the lifespan, the centenarians reported the lowest levels of each of the other OARS resources at Time 1 (i.e., Physical Health, Mental Health, and Social Resources) relative to the younger age groups. However, only two resources significantly declined over time in this study’s sample: Physical Health and IADLs. Although loss over time in Physical Health was experienced across the age groups, the centenarians reported the lowest levels of
Physical Health at both Time 1 and Time 2. Second, as noted previously, centenarians reported significant losses in IADLs over time relative to the younger age groups. These results are similar to the findings of Steverink et al. (2001) who assessed multiple resources relevant to the aging process and concluded, “The higher the age, the more inclined the people were to frame the aging process in terms of physical decline and social loss and less in terms of continuous growth, regardless of most of their resources” (p. P371).

In this study, declines over time were found for both IADLs and Physical Health, with the centenarians experiencing a more rapid loss of IADLs relative to the other age groups. The lack of significant findings for aggregate changes over time by age group for all the resources except IADLs may be indicative of the GCS sample: cognitively intact and community-dwelling at the first measurement occasion. These older individuals are relatively healthy, mentally and socially. However, the threat of diminishing resources, especially in those resource areas so essential for independent living or personal autonomy (i.e., IADLs and Physical Health), is real for aging individuals in this study and presents both opportunities and challenges for healthy adaptation to these inexorable age-related declines (Steverink et al., 1998).

Cross-Lagged Analyses

This study employed the single index constructs for each of the OARS resources assessed at two time points in a completely cross-lagged path analysis to assess predictors of change in the resources holding the influence of the other dimensional resources constant. The effect of age significantly predicted declines in mental health, IADLs, and social resources. Of interest is the fact that when any one particular resource predicts another,
holding the influence of all the others constant, only age remains a significant and negative influence. However, age did not predict change in physical health or economic resources. A moderate association or statistical trend was found for mental health predicting change in physical health. On one hand, it appears that the interrelatedness of these resources cancel one another out; researchers need to investigate these relationships within the strata of the age groups. For example, Quinn and colleagues (1999) examined correlates of subjective health in the three age groups of the Georgia Centenarian Study utilizing the first time point assessments. These researchers not only examined predictors of subjective health in the whole sample but also examined predictors of subjective health among the sub-groups: sexagenarians, octogenarians, and centenarians. In addition to disparate findings for different predictive models of subjective health (e.g., demographic, physical health, and psychosocial models), Quinn et al. (1999) found that “certain correlates of subjective health were unique to some cohorts, whereas other correlates overlapped between cohorts” (p. 165). Thus, future research employing the single index constructs from this study might examine the differences between the age groups in Time 1 resource predictors of change in Time 2 resource outcomes.

However, based upon statistical trends in the completely cross-lagged analyses, this study did investigate directional influence using two latent variable cross-lagged analyses. These models included latent variable constructs of mental health and physical health and IADLs and physical health. Because of the presence of the fairly stable and strong stabilities among the latent variables over time, no cross-lagged effects were found. As a result, change in the OARS resource constructs was investigated using a latent growth curve framework with two time points as specified by Duncan et al. (1999).
Modeling Change Within a Latent Growth Curve Framework

This study applied a latent growth curve framework to further investigate change and predictors of change in the OARS resources. Heterogeneity within the sample for both level and change in each of the OARS resources, consistent with Krause (1999), was demonstrated by the finding of significant interindividual differences in intraindividual change. Change in resources is complex among the age groups: some individuals are increasing in their levels of each resource, some are remaining relatively stable, and some are decreasing. Thus, this study proceeded to examine Time 1 predictors of change in each resource. Three findings from these analyses are discussed: (a) Mental Health predicted change in Social Resources; (b) Physical Health predicted change in Economic Resources; and (c) age group was a primary predictor of change in IADLs, Mental Health, and Social Resources.

First, and intriguingly, Mental Health predicted decline in Social Resources. Previous research has connected mental health (e.g., loneliness) with social resources (e.g., Martin et al., 1997) and found support for both negative and positive associations between mental health and social resources. For example, in the Georgia sample, Martin and colleagues found that higher levels of social support were associated with lower levels of loneliness, whereas in the Swedish data a positive relationship was found. The authors discussed the possibility that centenarians with higher levels of loneliness might solicit increased attention from their social resources. The reverse effect might have occurred with this study’s centenarians over time. In other words, centenarians with high levels of Mental Health likely sought to maintain their autonomy and therefore, resisted increased attention from their support network or caused their social resources to go dormant until needed. However, because this study did not have a psychometrically sound scale for Social Resources at the
second measurement occasion, this result is taken with caution and provides opportunity for future research directions.

Second, in regards to the influence of Physical Health on decreases in Economic Resources over time, Steverink et al. (2001) felt that the most important physical and material resources for older adults included health and financial security and that “Adapting to the process of aging is generally easier when a person is healthy and without financial worries” (p. P365). However, at first glance, for this study’s participants that maxim did not appear to hold. The higher the levels of Physical Health at Time 1, the greater the decrease in Economic Resources. This counterintuitive finding is likely explained by the fact that for each age group, physical health significantly declines over time. Thus, for each age group, Physical Health declined over time and subsequently Economic Resources declined also.

Third, a statistical trend was found for the negative influence of age group on change in Mental Health and Social Resources. In light of the measurement concerns regarding Social Resources over time, these findings are to be taken with caution. However, Age Group was a significant and substantive predictor of change in IADLs, consistent with the previously discussed results for mean differences by age group in IADLs. Independence and autonomy, as assessed by IADLs, are decreasing, especially for the centenarians. Again, this finding appears to be consistent with the previous discussion regarding the apparent “accelerated decline” in resources for the centenarians in particular.

In sum, it appears that a “pile up” of age-related losses converge for older adults, especially the centenarians. This decline is substantive in light of the limited amount of time between measurement occasions for those in their 100s: approximately 20 months.
Mediation by Social Resources

This study did not find support for the role of Social Resources as a mediator in the models tested. Although research guided by conceptual models of stress paradigms (Ensel & Lin, 1991; Pearlin, Menaghan, Lieverman, & Mullan, 1981) often demonstrate the role of social resources as a mechanism through which the impacts of stressful situations on outcomes of well-being are mitigated (Lempers & Lempers, 1997; Kostelecky & Lempers, 1998), it has also been demonstrated that received support, in particular, had no ameliorative effects regarding disability (Jang, Haley, Small, & Mortimer, 2002). Taylor and Lynch (2004) summarize, in their review of the literature on the mediatorial role of social support between disability and depression, that the role is unclear.

Based upon the literature, three explanations are offered for the lack of evidence for the mediatorial role of Social Resources in the current study. First, it is possible that Social Resources does not act as a mediator, especially when it comes to models of change as specified in this study. Much of the previous work has been cross-sectional in nature and may have missed the dynamic of change. Also, as Taylor and Lynch (2004) posit, it may well be that change in Social Resources is occurring; however, such change is occurring not at the aggregate level but within and between individuals over time. Thus, an appropriate methodological tool for capturing the mediating role of Social Resources would be to specify interlocking trajectories of a stressor and an outcome with Social Resources. Taylor and Lynch (2004) did just this and stated,

Our finding shows that the relationship between growth in disability and growth in depressive symptoms is mediated by growth in perceived social support, whereas baseline disability’s effect on baseline depressive symptoms is not mediated by
baseline perceived support. Using a cross-sectional design or analysis therefore would not fully reveal the importance of social support across the life course. (p. S245)

A second explanation for this study’s failure to find a mediating role for Social Resources may be due to two aspects of measurement: (a) an inappropriate or poor measure of Social Resources or (b) an inappropriate or poor timing of measurement. Previously, the suggested deterioration of reliability and validity of this study’s measure of Social Resources was noted. The construct itself may or may not be psychometrically sound or it may be confounded with changes in the age groups over time. Either way, the measurement model revealed deterioration over time and the single index constructs built upon the indicators from the measurement model likely reflect the same difficulties. However, this study only posited Social Resources at Time 1 as a mediator, thus weakening the strength of this argument. The second aspect of timing of measurement may provide a more satisfying explanation for this study’s lack of findings. Some researchers argue that a mediator cannot be measured concurrently with the exogenous predictor of interest (Cole & Maxwell, 2003), arguing that time must elapse for one variable to have an effect on another. Also, in a similar vein, it is incumbent upon the researcher to consider whether or not mediators and outcomes represent proximal or distal effects and how much time must elapse before such influences are able to be detected. Finally, the reduction in sample size from Time 1 to Time 2 may very well have reduced this study’s ability to detect mediation.

In sum, design, measurement, and methodological issues may account for this study’s lack of evidence for mediation by Social Resources. Future research, in addition to carefully attending to sample size and power concerns, could employ more sensitive measures of Social Resources (e.g., perceived or received social support), could collect more waves of
data allowing for interlocking trajectories of growth curves for constructs of interest, and could carefully consider appropriate intervals of time lapse between measurement occasions allowing processes of influence and mediation to unfold.

*Moderation by Social Resources*

This study examined Social Resources as a potential moderator of the relationship between other OARS resources. Although other resource areas might be specified as moderators, this investigation of the OARS resources chose first to focus on the resource most often specified as a moderator in the literature: social resources. Future research will want to investigate the possible buffering effects of other resources (e.g., economic resources, George, 2005). An interesting finding from this study is that centenarians with higher levels of social resources at Time 1 experienced steeper declines in instrumental activities of daily living (e.g., using the telephone, accessing places out of walking distance, preparing their own meals, or handling their own money) relative to other centenarians with lower levels of social resources. A number of explanations for this finding are possible. First, findings from the literature have presented a theoretical and empirical conundrum. For example, the stress-buffering literature includes reports that (a) the deleterious outcomes related to stress are often mitigated in the presence of social support (Jang et al., 2002; Krause, 1986); (b) social support does not have an influence on the impact of stress and its association with health-related outcomes (Lin, Simeone, Ensel, & Kuo, 1979); and (c) receiving help from others might strengthen the effects of stress (Barrera, 1986; Krause, 1997; Mendes de Leon, Gold, Glass, Kaplan, & George, 2001).

One example of this last point – the counterintuitive negative impact of social support on outcomes of well-being – is found in the work of Newsom and Schulz (1998) regarding
caregiving from the recipient’s perspective. These investigators found that in a long-term caregiving scenario, too much support or help was perceived by the receiver as negative and reduced the recipient’s self-esteem and perceived control. Current theoretical frameworks suggest social resources affect health and well-being through social cognitive processes such as sense of control, mastery, or self-efficacy (Bisconti & Bergeman, 1999; Hess & Blanchard-Fields, 1999). Other researchers, examining the types of relationships that give support, suggest that the cumulative effect of life-long associations influence health and well-being outcomes differentially, dependent upon the valence of the supportive exchanges (i.e., positive or negative interactions; Antonucci, 2001; Krause, 2001, 2006). Krause (1997a; 1997b) found that type of social support matters. In a prospective longitudinal study, he discussed the downside of received support in contrast to the benefits of anticipated support, suggesting that received support may actually serve as a marker of failed or ineffective individual coping efforts and/or may initiate negative interactions with those called upon for support. Finally, in his recent chapter on “Social Relationships in Late Life,” Krause (2006) reviewed literature suggesting that in the presence of chronic stress (i.e., continuous and ongoing stressors are often associated with the caregiving process and are typically encountered more frequently in later life) social relationships in late life tended to have a pernicious effect. Furthermore, he postulated that because of the continuous nature of chronic stressors, resources necessary to ameliorate such strain are themselves eroded over time.

In this study, whether Social Resources produced a deleterious effect on level of IADLs is difficult to determine. In other words, could it be that deterioration of IADLs had begun prior to baseline for some and was just beginning for others? Or, does social learning theory and the concept of learned helplessness (e.g., because a respondent received support at
one point in time, that recipient perceives the need for continues help) account for the finding (for possible interpretations of such a finding, see Seeman, Bruce, & McAvay, 1996). In fact, how Social Resources produced such an effect is also difficult to determine. However, the literature on the deleterious effects of social resources and chronic difficulties with IADLs (Talyor & Lynch, 2004, found a similar pattern among those aged 70 -79) or accelerating decline in IADLs of those nearing life’s end, centenarians, likely combine to produce the effect found in this study.

In the present study, centenarians who already scored the lowest on IADLs relative to the younger age groups also experienced the steepest decline in IADLs over time. However, the group of centenarians who experienced the most precipitous decline in IADLs was the group that scored the highest on Social Resources at Time 1. Because centenarians with different levels of Social Resources at Time 1 tended to decline to relatively similar levels of IADLs at Time 2 regardless of level of Social Resources, it appears that normative declines or perhaps, accelerated declines associated with advanced age produced the steep declines regardless of the amount of support experienced by the centenarians. In fact, it may be that those centenarians who received the higher levels of social resources at Time 1 only recently experienced the need for such greater levels of help and thus, their social resources rallied to the cause (this study does not have data for the levels of social resources and IADLs for the centenarians when they were in their 90s). Whereas, those centenarians with lower levels of Social Resources and lower levels of IADLs at Time 1, had already experienced such a need for increased Social Resources prior to this study’s assessment at Time 1.

Thus, for those centenarians who scored average or lower levels of Social Resources at Time 1 and also experienced less precipitous declines in change in IADLs over time
(relative to the centenarians with the highest levels of Social Resources at Time 1) it may well be that they had begun such a decline prior to the first measurement occasion and this study’s assessment of Time 1 Social Resources reflects the “leveling out” of a prior increase in social support rallying to the cause. Regardless, it is clear that the centenarians are experiencing increasing reductions in IADLs and are requiring increasing levels of help to accomplish these tasks of daily living relative to the younger age groups.

Limitations and Direction for Future Research

Findings from this study produced several results advancing the knowledge base regarding (a) a measurement model for the Duke OARS resources; (b) change and predictors of change in and by each of the five resource areas over time, and (c) both the mediating and moderating roles of Social Resources relative to change in each of the other four OARS resource areas. Several limitations, however, exist that affect the generalization of this study’s results. First, the participants were Southeastern older adults in reasonably good health, mentally competent, and community-dwelling. Second, the younger age groups (those in their 60s and those in their 80s) were randomly selected by race and gender to approximate older adults in Georgia. However, in contrast, centenarians were selected using convenience sampling through state and local agencies. Also, the sexagenarians and octogenarians were assessed in testing locations; centenarians completed their assessments at home. In addition, for the two younger age groups, measurement occasions were five years apart but for the centenarians the measurement occasions were approximately 20 months apart. With only two waves of data, longitudinal results and age group comparisons are to be interpreted with caution. The functional form of change might not be linear, limiting the study’s ability to test non-linear or curvilinear models possible with multiple time points. Finally, this study was
not able to differentiate distinctly between age effects and the possible influence of cohort
effects for any of the associations examined. For example, George (2005) cited the
conundrum of the fundamental influence of SES on illness vis-à-vis research that suggests
differences in the association between SES and health across birth cohorts and summarizes
her discussion by stating, “Nonetheless, more effort is needed to understand cohort
differences in the links between SES and health” (p. 136). In order to disentangle the age and
cohort confound, future research might consider a cohort sequential design that follows
different cohorts across equal time intervals (e.g., follow a sample of adults who transitioned
to young adulthood during the Great Depression and a second sample who transitioned to
young adulthood ten and twenty years later).

Sample selectivity or nonrandom sample attrition threatens the representativeness of a
study’s results, mitigating generalizability or the study’s external validity. When all
participants of the Georgia Centenarian Study did not participate in both waves of data
collection, this resulted in sample attrition. If participants who completed the protocol at both
measurement occasions differ from those who did not (dropouts) on measures of importance
to the study, then sample selectivity or bias limits the study’s generalizability. In essence, the
analyzed sample is no longer equivalent to the parent sample and inferences made on the
reduced sample are not valid for the larger or parent sample (Lindenberger et al., 1999).

Lindenberger, Singer, and Baltes (2002) provide two major examples of threats to
generalizability when working with older samples. First, overestimation of an average level
of a variable (e.g., functional health) is likely if participants with lower levels of the variable
are less likely to be present at subsequent data collections. This is especially relevant when
the variable of interest is associated with mortality. Conversely, the amount of longitudinal
change may be underestimated if participants with greater declines in the variable of interest are less likely to participate at subsequent measurements than participants with less decline, stability, or gain.

Also, Lindenberger and colleagues (2002) specify that in longitudinal studies where mortality rates are greater than zero, selectivity results from two different sources: mortality-associated selectivity and experimental selectivity. Participants who have higher mortality risks may differ on variables of interest than participants with lower mortality risks, thus introducing a potential measurement confound; this type of selectivity is labeled mortality-associated. Experimental selectivity arises when subjects who participate in data collection differ on relevant variables of interest from subjects who are still living but are unable or unwilling to participate at later waves of data collection. In the case of the present study, it is highly probable that mortality-associated selectivity has influenced the findings. The result is that average levels of the multidimensional resources assessed are likely overestimated relative to the general population and that longitudinal change may be underestimated relative to the general population.

Sample size might explain the difficulty with assessing Social Resources in the measurement model at Time 2. The reduction in sample size from the first measurement occasion to the second (a 38% reduction from 321 to 201) also resulted in a similar reduction in observations per parameter estimated for the measurement model (from approximately eight observations per parameter estimated at Time 1 to five observations per parameter estimated at Time 2) and might lead to the poorer fit at Time 2 and the subsequent loss of two indicators for Social Resources. The literature on CFA or SEM with small sample sizes cautions researchers regarding the reliability of their results when sample sizes are below 200
and when the parameters estimated to cases ratio is small (Bollen, 1989; Kline, 2005). Kline, acknowledged a lack of a clear standard in the literature regarding sample size in SEM and suggests “a desirable goal is to have the ratio of the number of cases to the number of free parameters be 20:1; a 10:1 ratio, however, may be a more realistic target (p. 111).” In our model tested at Time 1 \( (N = 321) \) with 80 degrees of freedom, eight cases existed for each parameter estimated. For the model assessed at Time 2, five cases existed for each parameter estimated. The measurement model results for Time 2 are stated with caution based upon the sample size issue. Thus, future research could recruit larger samples from each age group and attempt to replicate this study’s findings or differentiate the factor structure across age groups. However, sample size may not be the reason for the problems encountered with the measurement model at Time 2.

Finally, the measure used for Social Resources in this study could be improved in future research. All the latent constructs except Social Resources were fairly consistent across measurement occasions. In fact, for the models tested without the Social Resources latent variable, the overall measurement model fit the data well and factorial invariance of the latent variables over time was substantiated. Also, the sample data includes three distinct age groups of older adults: sexagenarians, octogenarians, and centenarians, further substantiating the robustness of these latent variables in research on older samples. Lastly, in this study the aggregate scores for social resources at each measurement occasion were over the 80% level for the nine point scale; in other words, this measure exhibited a possible “ceiling effect” likely precluding its effectiveness as a predictor and a criterion variable. In light of this, future research is encouraged to consider the inclusion of other measures of Social Resources. This study’s use of three single-item indicators and the strength of the
assessment of talking on the phone relative to the other items (especially at Time 2) could be improved upon by utilizing a number of the existing valid and reliable scales for assessing social resources (see Krause, 1999, for 12 different measures assessing social support). For example, received support has been viewed as a marker of failed or ineffective self-coping; rather than buffering stress, such support may actually increase the deleterious impact of stress (Wethington & Kessler, 1986). However, anticipated support has been shown to promote individual coping efforts, to enhance network functioning, and to maintain hope (Krause, 1997a). Also, in keeping with the recommendation by Krause (2006) to investigate the valence of social relationships (e.g., positive or negative affect quality) - in addition to quantitative assessments of network support as in the OARS - it would be helpful to include items measuring the respondent’s affective response to social support.

However, it is noted that the purpose of this study was to investigate the inter-relationships of the five main resource areas of the OARS (Fillenbaum, 1988). Thus, those who use the OARS are limited to its social resources items and should consider this limitation when selecting their measurement instruments, especially if a measure of social resources is central to their hypotheses.

Summary

Despite these limitations, the findings from this study contribute to both the applied and theoretical/empirical knowledge base of change in multidimensional resources utilized by older adults as they adapt to the normative declines of aging. First, using the popular Duke OARS (Fillenbaum, 1988) assessment tool, a measurement model including latent variables for Economic Resources, Instrumental Activities of Daily Living, Physical Health, Mental Health, and Social Resources on two measurement occasions was specified and affirmed in a
sample of sexagenarians, octogenarians, and centenarians. In effect, the measurement model confirmed in this study reduces numerous items for assessing these five key multidimensional resources in the OARS to three items per construct. This has valuable, practical implications because increased difficulties with hearing, vision, and fatigue in older adults tend to require extended time or multiple interviewer sessions to complete the extensive battery of questions in the OARS. Thus, researchers conducting etiological investigations, health professionals conducting intake and out-patient assessments, and other gerontological practitioners wishing to employ the OARS measures with older populations will benefit from using this reduced version of the OARS (i.e., asking the fifteen questions employed in the measurement model and single index constructs).

Second, the interrelationships between these five resource areas were examined over time, including investigation of mediation and moderation by Social Resources. It was demonstrated that aging is not necessarily a continual decline in resources ending in death. In particular, for those in their 60s and 80s relative stability in resources over time was maintained. However, for centenarians in this study, accelerated decline was particularly found for Instrumental Activities of Daily Living and regardless of the level of Social Resources brought to bear on this difficulty, decline over time occurred. Thus, future research may want to examine the unique interrelationships among these multidimensional resources for centenarians in particular and pay special attention to the role and influence of social resources provided by caregivers.
Appendix A

ECONOMIC RESOURCES: SELF-REPORT BASED ON THE OLDER AMERICANS RESOURCES SURVEY

1. (FINEMER) Are your assets and financial resources sufficient to meet emergencies?
   1  Yes
   0  No

2. (FINPAY) Are your expenses so heavy that you cannot meet the payments, or can you barely meet the payments, or are your payments no problem to you?
   1  Subject cannot meet payments
   2  Subject can barely meet payments
   3  Payments are no problem

3. (COMPFIN) Please tell me how well you think you are now doing financially as compared to other people your age – better, about the same, or worse?
   3  Better
   2  About the same
   1  Worse

4. (COMPNEED) How well does the amount of money you have take care of your needs – very well, fairly, well, or poorly?
   3  Very well
   2  Fairly well
   1  Poorly
5. (EXTRAS) Do you usually have enough to buy those little “extras,” that is, those small luxuries?

   1   Yes
   0   No

6. (NEEDFUT) At the present time do you feel that you will have enough for your needs in the future?

   1   Yes
   0   No
Appendix B

MENTAL HEALTH RATING SCALE: SELF-REPORT BASED ON THE OLDER
AMERICANS RESOURCES SURVEY

Now I’d like to ask you some questions about how you feel about life.

1. (EXCITING) In general, do you find life exciting, pretty routine, or dull?

2  Exciting
1  Pretty routine
0  Dull

2. (LIFESAT) Taking everything into consideration how would you describe your satisfaction with life in general at the present time – good, fair, or poor?

2  Good
1  Fair
0  Poor

Please answer the following questions “yes” or “No” as they apply to you now. There are no right or wrong answers, only what best applies to you. Occasionally a question may not seem to apply to you but please answer either “Yes” or “No,” whichever is more nearly correct for you.

3. (LIST1) Do you wake up fresh and rested most mornings?
4. (LIST2) Is your daily life full of things that keep you interested?
5. (LIST3) Have you, at times, very much wanted to leave home?
6. (LIST4) Does it seem that no one understands you?
7. (LIST5) Have you had periods of days, weeks, or months when you couldn’t take care of things because you couldn’t get going?
8. (LIST6) Is your sleep fitful and disturbed?

9. (LIST7) Are you happy most of the time?

10. (LIST8) Are you being plotted against?

11. (LIST9) Do you feel useless at times?

12. (LIST10) During the past few years, have you been well most of the time?

13. (LIST11) Do you feel weak all over much of the time?

14. (LIST13) Have you had difficulty in keeping your balance in walking?

15. (LIST14) Are you troubled by your heart pounding and by a shortness of breath?

16. (LIST15) Even when you are with people, do feel lonely much of the time?

   1   Yes
   0   No

17. (EMOH) How would you rate your mental or emotional health at the present time – excellent, good, fair, or poor?

   3   Excellent
   2   Good
   1   Fair
   0   Poor
Appendix C

IADLs (SELF-CARE CAPACITY): SELF-REPORT BASED ON THE OLDER AMERICANS RESOURCES SURVEY

Instrumental ADL

1. (USEPHONE) Can you use the telephone . . .
   2  without help, including looking up numbers and dialing;
   1  with some help (can answer phone or dial operator in an emergency, but need
      a special phone or help in getting the number or dialing); or
   0  are you completely unable to use the telephone?

2. (TRAVEL)  Can you get to places out of walking distance . . .
   2  without help (drive your own car, or travel alone on buses, or taxis);
   1  with some help (need someone to help you or go with you when traveling); or
   0  are you unable to travel unless emergency arrangements are made for a
      specialized vehicle like an ambulance?

3. (SHOPPING) Can you go shopping for groceries or clothes [assuming subject has trans.]. .
   2  without help (taking care of all shopping needs yourself, assuming you had
      transportation);
   1  with some help (need someone to go with you on all shopping trips); or
   0  are you completely unable to do any shopping?

4. (PREMEALS) Can you prepare your own meals . . .
   2  without help (plan and cook full meals yourself);
   1  with some help (can prepare some things but unable to cook full meals
      yourself); or
0 are you completely unable to prepare any meals?

5. (HOUSWORK) Can you do housework . . .
   2 without help (can clean floors, etc.);
   1 with some help (can do light housework but need help with heavy work); or
   0 are you completely unable to do any housework?

6. (MEDICINE) Can you take your won medicine . . .
   2 without help (in the right dose at the right time);
   1 with some help (able to take medicine if someone prepares it for you and/or reminds you to take it); or
   0 are you completely unable to take your medicines?

7. (MONEY) Can you handle your own money . . .
   2 without help (write checks, pay bills, etc.);
   1 with some help (manage day-to-day buying but need help with managing your checkbook and paying your bills); or
   0 are you completely unable to handle money?

Physical ADL

8. (EAT) Can you eat . . .
   2 without help (able to feed yourself completely);
   1 with some help (need help with cutting, etc.); or
   0 are you completely unable to feed yourself?

9. (DRESS) Can you dress and undress yourself . . .
   2 without help (able to pick out clothes, dress and undress yourself);
   1 with some help or
0  are you completely unable to dress and undress yourself:

10. (APPEAR) Can you take care of your own appearance, for example combing your hair and (for men) shaving . . .
   2  without help
   1  with some help; or
   0  are you completely unable to maintain your appearance yourself?

11. (WALK) Can you walk . . .
   2  without help (except from a cane);
   1  with some help from a person or with the use of a walker or crutches, etc.;
   or
   0  are you completely unable to walk?

12. (BED) Can you get in and out of bed . . .
   2  without any help or aids;
   1  with some help (either from a person or with the aid of some device); or
   0  are you totally dependent on someone else to life you?

13. (BATH) Can you take a bath or shower . . .
   2  without help;
   1  with some help (need help getting in and out of the tub, or need special attachments on the tub); or
   0  are you completely unable to bathe yourself?
Appendix D

PHYSICAL HEALTH RATING SCALE: SELF-REPORT BASED ON THE OLDER AMERICANS RESOURCES SURVEY

1. (OVERHLH) How would you rate your overall health at the present time – excellent, good, fair, or poor?
   
   3   Excellent
   2   Good
   1   Fair
   0   Poor

2. (OVERHP) Is your health now better, about the same, or worse than it was five years ago?

   2   Better
   1   About the same
   0   Worse

3. (HEALTRO) How much do your health troubles stand in the way of your doing the things you want to do – not at all, a little (some), or a great deal?

   2   Not at all
   1   A little (some)
   0   A great deal
Appendix E

SOCIAL RESOURCES RATING SCALE: SELF-REPORT BASED ON THE OLDER AMERICANS RESOURCES SURVEY

Now I’d like to ask you some questions about your family and friends.

1. (VISITK) How many people do you know well enough to visit with in their homes?
   3   Five or more
   2   Three to four
   1   One or two
   0   None

2. (TALKP) About how many times did you talk to someone – friends, relatives, or others on the telephone in the past week (either you called them or they called you?) [IF SUBJECT HAS NO PHONE, QUESTION STILL APPLIES.]
   3   Once a day or more
   2   2 – 6 times
   1   Once
   0   Not at all

3. (VISITA) How many times during the past week did you spend some time with someone who does not live with you; that is you went to see them or they came to visit you, or you went out to do things together?
   3   Once a day or more
   2   2 – 6 times
   1   Once
   0   Not at all
4. (CONFIDE) Do you have someone you can trust and confide in?
   1. Yes
   0. No

5. (LONELY) Do you find yourself feeling lonely quite often, sometimes, or almost never?
   0. Quite often
   1. Sometimes
   2. Almost never

6. (SEERF) Do you see your relatives and friends as often as you want to, or not?
   1. As often as wants to
   0. Not as often as wants to

7. (HELP) Is there someone who would give you any help at all if you were sick or disabled, for example your husband/wife, a member of your family, or a friend?
   1. Yes
   0. No one willing and able to help
Appendix F

IRB APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

DATE: May 4, 2006
TO: Professor Peter Martin
FROM: Institutional Review Board,
Office of Research Assurances
RE: IRB ID Number: 04-577

Study Review Date: May 2, 2006

Following reassessment of the project, “Adaptation and Mental Health of the Oldest Old,” the Institutional Review Board (IRB) has declared the study exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b)(4). The applicable exemption category is provided below for your information. Please note that you must submit all research involving human participants for review by the IRB. Only the IRB may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

The IRB determination of exemption means that this project does not need to meet the requirements from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects, unless required by the IRB. We do, however, urge you to protect the rights of your participants in the same ways that you would if the project was required to follow the regulations. This includes providing relevant information about the research to the participants.

Because your project is exempt, you do not need to submit an application for continuing review. However, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or if required by the IRB.

Any modification of this research should be submitted to the IRB on a Continuation and/or Modification form, prior to making any changes, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Exempt Category:

(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

ORA 03/06 – Exempt Assessment
ISU HUMAN SUBJECTS CONTINUING REVIEW AND/OR MODIFICATION FORM

TYPE OF SUBMISSION: [ ] Continuing Review [ ] Modification [ ] Continuing Review and Modification

Principal Investigator: Peter Martin  Phone: (515) 294-5186
Degree: Ph.D.  Correspondence Address: 1086 LeBarron Hall, Ames, Iowa 50011-1120.
Department: Gerontology Program  E-mail Address: pmartins@iastate.edu
Project Title: "Adaptation and Mental Health of the Oldest Old"  IRB ID: 04-577
IRB ID: 04-577  Date of Last Continuing Review: IF STUDENT PROJECT
Name of Major Professor:  Phone:  
Department:  Campus Address:  E-mail Address:

FUNDING INFORMATION:

[ ] External Grant/Contract  [ ] Internal Support (no specific funding source) or Internal Grant (indicate name below)
Name of Funding Source: OSFA Record ID on Gold Sheet:  Part of Training, Center, Program Project Grant - Director: Overall IRB ID No:

CONFLICT OF INTEREST

The proposed project or relationship with the sponsor require the disclosure of significant financial interests that present an actual or potential conflict of interest for investigators involved with this project. By signing this form, all investigators certify that they have read and understand ISU's Conflict of Interest policy as addressed by the ISU Faculty Handbook and made all disclosures required by it. (http://www.provost.iastate.edu/faculty)

Do you or any member of your research team have a conflict of interest?  [ ] Yes  [ ] No
If yes, has the appropriate disclosure form been completed?  [ ] Yes  [ ] No

ASSURANCE

I certify that the information provided in this application is complete and accurate and consistent with proposal(s) submitted to external funding agencies. I agree to provide proper surveillance of this project to insure that the rights and welfare of the human subjects are protected. I will report any adverse reactions to the IRB for review. I agree that modifications to the originally approved project will not take place without prior review and approval by the Institutional Review Board, and that all activities will be performed in accordance with state and federal regulations and the Iowa State University Federal Wide Assurance.

Signature of Principal Investigator  Date

Student Projects: Faculty signature indicates that this application has been reviewed and is recommended for IRB review.

Signature of Supervising Faculty  Date  IRB Approval Signature  Date

File:

- EXPEDITED per 45 CFR 46.110(b)  
- STUDY REMAINS EXEMPT per 45 CFR 46.101(b)  
- WAIVER of SHARED CONSENT per 45 CFR 46.110(b)  
- WAIVER of ELEMENTS of Consent per 45 CFR 46.116  
- VULNERABLE POPULATION per 45 CFR 46.116

IR10MC 06/07/06
Please answer each question. If the question does not pertain to this study, please type not applicable (N/A).

SECTION I: KEY PERSONNEL

☐ Yes ☐ No Have there been any personnel/staff changes since the last IRB approval was granted?
If yes, complete the following sections (Additions/Deletions) as appropriate.

<table>
<thead>
<tr>
<th>Add</th>
<th>Delete</th>
<th>Last Name</th>
<th>First Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td></td>
<td>Randall</td>
<td>George</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Baenziger</td>
<td>Kevin</td>
</tr>
<tr>
<td>Add</td>
<td></td>
<td>Aneja</td>
<td>Aradhana</td>
</tr>
</tbody>
</table>

Add New Row

List all members and relevant experiences of the project personnel. This information is intended to inform the committee of the training and background of the investigators and key personnel.

<table>
<thead>
<tr>
<th>NAME &amp; DEGREE(S)</th>
<th>POSITION AT ISU &amp; ROLE ON PROJECT</th>
<th>TRAINING &amp; DATE OF TRAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td>George K. Randall - M.S.</td>
<td>Research Assistant</td>
<td>07/20/2000</td>
</tr>
<tr>
<td>Joan Baenziger - B.S.</td>
<td>Research Assistant</td>
<td>10/01/2003</td>
</tr>
<tr>
<td>Aradhana Aneja - B.S.</td>
<td>Research Assistant</td>
<td>2005</td>
</tr>
</tbody>
</table>

Add New Row

SECTION II: CONTINUING REVIEW

In addition to completing Section I: Key Personnel, please complete Section II if this is an application for Continuing Review. If this is an application for continuing review and you will be modifying your project in the future, please complete all sections of the form. If this application is only to request approval for a modification or change to your study, please complete Section I: Key Personnel and Section III: Proposed Modifications or Changes.

1. ☐ Yes ☐ No Is the research permanently closed to the enrollment of new subjects?
2. ☐ Yes ☐ No Have all subjects completed all research-related interventions?
3. ☐ Yes ☐ No Does research remain active only for long-term follow-up of subjects?
4. ☐ Yes ☐ No Are the remaining research activities limited to data analysis?
5. ☐ Yes ☐ No Subject enrollment has not begun and no additional risks have been identified.

(Note: If the answer in questions 1 – 5 is “yes” the study qualifies for Expedited Review.)

Part A: Enrollment Status

<table>
<thead>
<tr>
<th>Number of Subjects Approved by IRB:</th>
<th>Number of Subjects Consented to Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Subjects Consented Since Last Continuing Review: Total:</td>
<td>Males:</td>
</tr>
<tr>
<td>Number of Subjects Screened:</td>
<td>Number of Subjects Lost to Follow-up:</td>
</tr>
<tr>
<td>Check if any enrolled subjects are:</td>
<td>Check below if this project involves either:</td>
</tr>
<tr>
<td>☐ Minors (under 18)</td>
<td>☐ Existing Data/Records</td>
</tr>
<tr>
<td>☐ Pregnant Women/Fetuses</td>
<td>☐ Secondary Analysis</td>
</tr>
<tr>
<td>☐ Cognitively Impaired</td>
<td>☐ Pathology/Diagnostic Specimens</td>
</tr>
<tr>
<td>☐ Prisoners</td>
<td></td>
</tr>
</tbody>
</table>

List Estimated Percent of the Total Enrolled That Are Minorities Below

American Indians: | Alaskan Native:
Asian or Pacific Islander: | African American:
Black (Not of Hispanic Origin): | Hispanic:
References


392-401.


Holahan, C. J., & Moos, R. H. (1991). Life stressors, personal and social resources and


Martin, M., & Westerhof, G. J. (2003). Do you need to have them or should you believe you have them? Resources, their appraisal, and well-being in adulthood. *Journal of Adult Development, 10*, 99-112.


McCusker, J., Bellavance, F., Cardin, S., & Belzile, R. (1999). Validity of an activities of
daily living questionnaire among older patients in the emergency department. *Journal of Clinical Epidemiology, 52*, 1023-1030.


Pinquart, M., & Sorensen, S. (2000). Influences of socioeconomic status, social network,


supplemental questions. In J. Gottman (Ed.), *The analysis of change* (pp. 3-66).
Mahwah, NJ: Lawrence Erlbaum Associates.


everyday problem solving: Interpersonal relationships and problem dimensions.


