Wellness and Cognition Among Community Dwelling Older Adults

A dissertation presented

by

Kelley Ann Strout

to

The Bouvé College of Health Sciences, School of Nursing

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Doctor of Philosophy
in the subject of
Nursing

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Boston, Massachusetts

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Dedication

Eleven years ago, James Strout and I were sitting at his Mother’s kitchen island completing our admission paperwork to University of Maine. I was trying to decide which undergraduate major I should pursue. With complete certainty, James said, “You should major in nursing. My Mother is a nurse, and you two are a lot alike. I think it’s a perfect fit for you.” I trusted his evaluation, and I circled “nursing” on my admission paperwork. At 18 years old, James knew the perfect career for me.

James has been my rock throughout four years of undergraduate nursing education, two years of full-time graduate school, and three years of doctoral studies. He never doubted my academic abilities, even when I become discouraged and overly doubtful. For the past five years, James has been the anchor to my personal wellness. He cooked me healthy well-balanced meals and maintained me as his running partner (even though he can run much faster!) He provided me daily encouragement, told me hilarious jokes, and motivated me to continue my journey. He embraced the full-time role as stay at home “Daddy” for our fifteen-month-old son, Cameron. He diligently peer-reviewed every draft of two published manuscripts and my entire dissertation.

Finally, James declined acceptance to the PhD program of engineering at Duke University so that I could earn my PhD in nursing at Northeastern University. James’ lifelong dream was to become a “Duke Blue Devil.” I will never forget this sacrifice.

This PhD degree would not be possible without James. He has been there for me every step of the way and supported me in every area of my life. Words cannot express the gratitude I owe to God for placing me in the arms of my husband, James.
Acknowledgements

Throughout my doctoral studies, I received three pieces of invaluable advice from my mentors: “Your goal is to graduate,” Dr. Elizabeth Howard; “Excellent data are available and waiting for researchers to use them to answer important questions,” Dr. James Alan Fox; and “Work on your scholarship every day.” Dr. Deborah D’Avolio. This advice came from the three members of my dissertation committee. I am truly thankful and appreciative to my entire committee for their dedication and support.

I formally want to acknowledge my chair, Dr. Elizabeth Howard. I will never forget my first day in the doctoral program. Dr. Howard looked at me directly and told me that I should have my dissertation topic selected by the end of the month. She told me that from that point forward; everything I did would be related to my dissertation topic. She was firm and direct with me, which is exactly what every doctoral student needs to achieve success in his or her program.

Dr. Howard has been the most important mentor in my life. She has always believed in my ability, and she supported me through anything I wanted to pursue. On top of her joint appointment at the Institute for Aging Research, her position as the PhD Program Director, her per diem role as an Acute Care Nurse Practitioner, and her role as a mother of three and a wife, she has always made me feel that I am a priority. Dr. Howard supported me through three manuscript submissions and three grant applications. She always returned feedback rapidly. She has provided me just enough guidance and direction to allow my own intellectual abilities to develop. She is an amazing woman who I deeply admire and respect. I am forever blessed to have the opportunity to work with Dr. Howard for the past three years.
Chapter One: Introduction

Dimensions of Wellness and Cognition Among Community Dwelling Older Adults

Kelley Strout

Northeastern University
Dimensions of Wellness and Cognition Among Community Dwelling Older Adults

The demographic group commonly referred to as “baby boomers,” (those born between 1946 and 1964) represent 20% of the population; they are largest cohort in American history and started turning 65 in 2011 (Hartman-Stein & Potkanowicz, 2003; Federal Interagency Forum on Aging-Related Statistics, 2010). Because the risk for cognitive decline increases significantly with age, the rapid expansion of adults entering old age will likely create a considerable increase in those living with cognitive impairment (Plassman et al., 2007). Age-related cognitive health decline is not inevitable (Harrison, Weintraub, Mesulam, Rogalski, 2012). Variables that represent the concept of wellness appear to protect cognition as adult’s age (Strout & Howard, 2012).

Wellness is a complex multidimensional state of being that includes five to seven dimensions (Adams, Bezner, Steinhardt, 1997; Becker, Dolbier, Durham, Glascoff, & Adams, 2008; Hattie, Myers, & Sweeney, 2004; Hettler, 1976; Nenn & Vaisberg, 2010; Witmer & Sweeney, 1992). Nurses’ ability to promote wellness and protect cognition as adult’s age is limited by the absence of valid and reliable methods to measure wellness among older adults (Adams, Bezner, Garner, & Woodruff, 1998; Adams, et al., 1997; Becker, Whetstone, Glascoff, & Moore, 2008; Becker, et al., 2008; TestWELL Online Assessment Tools, 2008; Hattie, et al., 2004). Without a method to measure the multidimensional concept of wellness, we are unable to determine which dimension(s) of wellness leads to the greatest cognitive health protection as adults age. The purpose of this research was to evaluate method to measure wellness among older adults and then determine how multiple dimensions of wellness contribute to cognitive health protection.
Research Aims and Manuscript Dissemination Plan

This research achieved two specific aims. The first aim was to create scores for five dimensions of wellness using variables from a wellness assessment tool designed for community dwelling older adults. The second aim was to examine the association between each of the five dimensions of wellness and cognitive health among a cohort of community dwelling older adults. The results of this research are presented in three separate manuscripts. The manuscript dissemination plan is presented below.

Manuscript One

This research study began with an extensive review of the literature. The theoretical framework from William Hettler’s (1976) Six Dimensions of Wellness guided the literature review. The theoretical definitions for each dimension of wellness are listed in Table 1. We examined the contribution of wellness in six dimensions (occupational, social, intellectual, physical, emotional, and spiritual) on cognition in aging adults. Literature was retrieved from Cumulative Index to Nursing and Allied Health Literature and MEDLINE. Research that examined the effect of wellness in each of the six dimensions on cognition in older adults was included. We found that one or more of the following may protect cognition in aging: mid-life occupation complexity, marriage, social networks, formal education, intellectually stimulating activities, physical activity, healthy nutrition, motivational ability, strong purpose in life, and spirituality.

Wellness in one or more of the six dimensions may protect cognition in aging. The cognitive protective benefits may increase when wellness in more than one dimension is demonstrated. High wellness in one dimension may protect cognition by compensating for low wellness in another dimension. The interconnectedness of each of the dimensions signifies the
importance of evaluating older adults holistically. Wellness achieved and maintained throughout the life span may result in improved cognition in aging. This literature review manuscript was published in the *Journal of Holistic Nursing*.


**Manuscript Two**

The purpose of the second manuscript was to present the results of an innovative method to measure and score wellness among older adults. This research is guided by William Hettler’s (1976) Dimensions of Wellness. The sample was drawn from members of the COLLAGE consortium. COLLAGE is a national member consortium of Continuing Care Retirement Communities (CCRC), moderate-income and federally subsidized housing programs, home care, and community-based agencies elder-housing sites. COLLAGE aims to support older adults’ independence and health maintenance as they age. Residents who are members of COLLAGE complete an annual innovative Wellness Assessment Tool (WEL) that provided the data for this research. The WEL contains 113 items and was designed to measure wellness among older adults. The author analyzed WEL data from 5,604 community-dwelling older adults of both genders who are members of the COLLAGE consortium. The theoretical definitions listed in Table 2, from five of Hettler’s dimensions of wellness (social, intellectual, physical, emotional, and spiritual), were used to select the 22 variables from the WEL listed in Table 3 that align with each dimension. Rasch analysis and Master’s Partial Credit method were used to create logit values for each item within the five dimensions of wellness. The manuscript presents the scoring method for each dimension and describes the application of Rasch model to measure wellness. The target journal for the second manuscript, *Rasch Analysis to Measure Five Dimensions of*
Wellness Among A Cohort of Community Dwelling Older Adults, is the *Journal of Nursing Measurement*.

**Manuscript Three**

The third manuscript reports the results of the relationship between the dimensions of wellness and cognitive ability. The overall objective of this research was to determine the dimensions of wellness that demonstrate the strongest cognitive health protection and the dimensions that demonstrate the least cognitive health protection. Five dimensions from William Hettler’s (1976) Dimensions of Wellness theoretical framework guided this research (social, intellectual, physical, emotional, and spiritual). Occupational wellness was omitted from the analysis because the target sample represented older adults without meaningful employment. The sample was drawn from members of the COLLAGE consortium. COLLAGE is a national member consortium of Continuing Care Retirement Communities (CCRC), moderate-income and federally subsidized housing programs, home care, and community-based agencies elder-housing sites. COLLAGE aims to support older adults’ independence and health maintenance as they age. Members of COLLAGE complete an annual innovative Wellness Assessment Tool (WEL) and Community Health Assessment (CHA) that provided the data for this research. The WEL contains 113 items and was designed to measure wellness among older adults. The CHA is a core COLLAGE tool that measures health and wellness including: cognition, communication, vision, mood, psychosocial well-being, functional status, continence, disease diagnosis, health conditions, oral and nutrition status, medications, treatments and procedures, social relationships, and environment assessment.

WEL and CHA data from 5,605 male and female community dwelling adults over age 60 with a range of cognitive abilities were analyzed. Applying Rasch analysis and Master’s Partial
Credit method to 22 variables from the WEL data created composite scores for five of Hettler’s Dimensions of Wellness. The logit values were combined to create composite scores for five dimensions of wellness. The list of the 22 variables and their associated dimensions of wellness are listed in Table 3. Cognition was measured using the Cognitive Performance Scale (CPS). The CPS is generated from select questions from the CHA and the WEL. These questions are listed in Table 4. The CPS correlates with the Mini Mental Status Examination (Morris, et al. 1994). The CPS ranges from 0-5 (0=cognitively intact and 5=severe impairment). It was hypothesized that at least one dimension of wellness will predict an older adult’s ability to remain cognitively healthy during aging. This manuscript reports the dimensions of wellness that provide the strongest cognitive health protection and discusses how other dimensions of wellness influence cognitive health among aging adults. The target journal for the third manuscript, Five Dimensions of Wellness and Predictors of Cognitive Health Protection in Community Dwelling Older Adults: A Historical COLALGE Cohort Study, is *Research in Nursing & Health*.

**Contribution to Nursing Science**

To understand the association between wellness and cognitive health protection among older adults, research that examines wellness in a multidimensional framework is essential. Composite scores for each dimension of wellness provide the ability to “profile” older adults to determine how wellness supports cognition in aging. Knowledge of the dimension of wellness that is most closely associated with cognitive health protection in aging will lead to the development of evidence-based interventions targeted to the most protective dimension(s). For example, if the intellectual dimension of wellness has the strongest association with cognitive health protection, researchers can focus on examining interventions within this dimension of wellness. The benefits and effectiveness of intellectually stimulating activities such as
education programs, computer programs, reading programs, or other intellectually challenging activities may be demonstrated in targeted projects. Public health prevention campaigns may focus to promote intellectual wellness in an effort to protect and maintain cognitive abilities.

In addition, knowledge of how multiple dimensions contribute to cognitive health will support nurses’ and other health care providers’ ability to provide patient-specific interventions that promote cognitive health in aging. Dimensions of wellness appear interconnected (Strout & Howard, 2012). Therefore, if a patient is not interested or able to participate in interventions targeted to the dimension most strongly associated with cognitive health, providers may suggest alternative cognitive health protection interventions from the next most associated dimension. Finally, the combined effect of targeting interventions to the dimension of wellness that benefits the majority while also assessing older adults individually may provide the best cognitive health protection for all aging adults.
<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Wellness</td>
<td>Ability to contribute unique skills to personally meaningful and rewarding paid or unpaid work</td>
</tr>
<tr>
<td>Social Wellness</td>
<td>Ability to form and maintain positive personal and community relationships</td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>Commitment to lifelong learning through continual acquisition of skills and knowledge</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>Commitment to self-care through regular participation in physical activity and healthy eating</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>Ability to acknowledge personal responsibility for life decisions and their outcomes with emotional stability and positivity</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>Acquiring purpose in life and a value system</td>
</tr>
</tbody>
</table>

Table 2

Theoretical Definitions for 5 Dimensions of Wellness

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Wellness</td>
<td>Ability to form and maintain positive personal and community relationships</td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>Commitment to life long learning through continuous acquisition of skills and knowledge</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>Commitment to self-care through regular participation in physical activity and healthy eating</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>Ability to acknowledge personal responsibility for life decisions and their outcomes with emotional stability and positively</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>Having purpose in life and a value system</td>
</tr>
</tbody>
</table>

Table 3

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>Items from WEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Wellness</td>
<td>Has close friends in community?</td>
</tr>
<tr>
<td></td>
<td>Feels can count on friends for companionship</td>
</tr>
<tr>
<td></td>
<td>Has opportunity to give and receive physical affection</td>
</tr>
<tr>
<td></td>
<td>Feels community environment is supportive, nurturing</td>
</tr>
<tr>
<td></td>
<td>Participate as volunteer on campus or in community</td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>Interested or involved in computerized games</td>
</tr>
<tr>
<td></td>
<td>Interested or involved in cross word puzzles</td>
</tr>
<tr>
<td></td>
<td>Interested of involved in educational courses</td>
</tr>
<tr>
<td></td>
<td>Interested of involved in genealogy</td>
</tr>
<tr>
<td></td>
<td>Interested or involved in reading</td>
</tr>
<tr>
<td></td>
<td>Interested or involved in writing</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>Participates in Fitness/Exercise Program</td>
</tr>
<tr>
<td></td>
<td>Weight: Do you consider yourself?</td>
</tr>
<tr>
<td></td>
<td>Number of glasses of fluid consumed daily</td>
</tr>
<tr>
<td></td>
<td>Do you feel you are eating a healthy diet?</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>How satisfied are you with your life as a whole in the last 3 days?</td>
</tr>
<tr>
<td></td>
<td>Do you feel valued?</td>
</tr>
<tr>
<td></td>
<td>Do you look forward to being challenged by new opportunities?</td>
</tr>
<tr>
<td></td>
<td>Does stress have a negative effect on your quality of life?</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>Finds meaning in day-to-day life</td>
</tr>
<tr>
<td></td>
<td>Do you feel your spiritual needs are being met?</td>
</tr>
<tr>
<td></td>
<td>How do you view your spirituality?</td>
</tr>
</tbody>
</table>

Note. *WEL = Wellness Assessment Tool*
### Table 4
*Items from CHA, WEL, FS that Generate CPS Score*

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA</td>
<td>Is short-term memory OK?</td>
</tr>
<tr>
<td></td>
<td>What is the level of cognitive skills for daily decision making?</td>
</tr>
<tr>
<td></td>
<td>What is the level of ability in making self understood?</td>
</tr>
<tr>
<td>WEL</td>
<td>How would you rate your memory?</td>
</tr>
<tr>
<td></td>
<td>Are you interested in a program to improve your memory?</td>
</tr>
<tr>
<td>FS</td>
<td>Is procedural memory OK?</td>
</tr>
<tr>
<td></td>
<td>What is the level of ability in eating?</td>
</tr>
</tbody>
</table>

*Note. CHA=Community Health Assessment; WEL=Wellness Assessment Tool; FS=Functional Supplement; CPS=Cognitive Performance Score.*
References


The Six Dimensions of Wellness and Cognition in Aging Adults
Kelley Ann Strout and Elizabeth P. Howard
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What is This?
The Six Dimensions of Wellness and Cognition in Aging Adults

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Elizabeth P. Howard, PhD, RN, ACNP-BC
Northeastern University

Objective: Examine how wellness in six dimensions (occupational, social, intellectual, physical, emotional, and spiritual) protects cognition in aging adults. Background: Cognitive impairment increases with age. Baby boomers represent a significant percent of the population at risk for cognitive impairment. Cognitive impairment has a negative impact on nursing resources, health care finances, patient mortality, and quality of life. Wellness and prevention is one focus of Institute of Medicine’s vision for the future of nursing. Method: Literature was retrieved from Cumulative Index to Nursing and Allied Health Literature and MEDLINE. Research that examined the affect of wellness in each of the six dimensions on cognition in older adults was included. Results: One or more of the following may protect cognition in aging: midlife occupation complexity, marriage, social networks, formal education, intellectual activities, physical activity, healthy nutrition, motivational ability, purpose in life, and spirituality. Conclusion: Wellness in one or more of the six dimensions may protect cognition in aging. The cognitive protective benefits may increase when wellness in more than one dimension is demonstrated. High wellness in one dimension may protect cognition by compensating for low wellness in another dimension. The interconnectedness of each of the dimensions signifies the importance of evaluating older adults holistically. Wellness throughout the life span may result in improved cognition in aging. Application: Future research is needed to examine the relationship between the six dimensions of wellness and cognition, and to determine if one dimension of wellness is a significant predictor of cognitive health in aging adults.

Keywords: aging; gerontologic nursing; health; health promotion; holistic care; holistic health; holistic nursing, memory; nursing knowledge; nutrition
previously higher level of cognitive function in more than one of four cognitive domains: recent memory, language, visual–spatial ability, or executive function (Alzheimer’s Association, n.d.). AD is the most common type of dementia and is currently the fifth leading cause of death among adults 65 years and older (Alzheimer’s Association, n.d.).

The risk of cognitive decline increases substantially with age. In 2002, the approximate number of Americans 71 years and older living some form of cognitive decline was 13.7% and for those 90 years and older this percentage increased to 37.4 (Plassman et al., 2007). The aging American demographic commonly referred to as “the baby boomers,” (those born between 1946 and 1964) represent 20% of the U.S. population; they are the largest cohort in American history and started turning 65 in 2011 (Federal Interagency Forum on Aging-Related Statistics, 2010; Hartman-Stein & Potkanowicz, 2003).

The aging demographic will make a considerable impact on the percentage living with cognitive decline, which will present economic challenges to society and the American health care system (Alzheimer’s Association, n.d.; Loge & Sorrell, 2010). Older adults with cognitive decline are at greater risk for losing their ability to perform instrumental activities of daily living and relying on paid or unpaid caregivers (CDC, n.d.). Those diagnosed with AD and other dementias use more long-term care, skilled nursing, hospital care, and home health care compared with other older adults (Alzheimer’s Association, 2011). Informal caregivers provide care at an estimated cost of $18 billion per year and unpaid caregivers provide more than 17 billion hours of care estimated at $202 billion (Alzheimer’s Association, 2011; Langa et al., 2001). The total future cost of health care for AD and other forms of dementia is projected at $1.1 trillion as the baby boomers age (Alzheimer’s Association, 2011).

In response to the unprecedented societal, health, and economic implications associated with cognitive decline, the CDC and the Alzheimer’s Association rank prevention and cognitive health protection as one of their top priorities (CDC, n.d.). The Institute of Medicine (IOM) envisions a future health care system where nurses intentionally promote wellness and disease prevention across the life span (National Academy of Sciences (NAS), 2010).

Nurses care for cognitively impaired patients and their families in a variety of health care settings; community, long-term care, acute care, and primary care. The nursing profession is well recognized for the role of disease prevention and wellness (Donaldson & Crowley, 1978; (NAS, 2010). Preventing cognitive decline among older adults would serve to maintain their independence and reduce the economic burdens associated with cognitive impairment. To meet the mission of the IOM, nurses need to intentionally promote wellness to prevent cognitive impairment. An understanding of how wellness contributes to cognition in older age is necessary before nurses can achieve this goal.

The National Wellness Institute (NWI, n.d.) offers a definition and framework to examine wellness. Wellness, according to NWI (n.d.), is a multidimensional and holistic state of being that is conscious, self-directed, and constantly evolving to achieve one’s full potential. Wellness is an ever-changing process that encompasses six dimensions: occupational, social, intellectual, physical, emotional, and spiritual (Hettler, 1976). The “six dimensions of wellness” interconnect with one another to represent a person. Wellness aligns with holism philosophy; nurses cannot understand a patient’s wellness without assessing the whole patient in multiple dimensions (Godfrey-Smith, 2003). An overview of each of the six dimensions of wellness is listed in Table 1.

The six-dimensional model provides a framework to examine how wellness may contribute to cognition and prevent decline as people age. Applying current research to the six-dimensional model provides preliminary evidence that wellness may protect against cognitive decline as adults age.

Method

Literature was retrieved from Cumulative Index to Nursing and Allied Health Literature and MEDLINE. The review contains research from 2003 to 2011 including both noninstitutionalized males and females. Research with dependent variables of cognition and cognitive disease states were included. Research with independent variables aligned with William Hettler’s Six Dimensions of Wellness theoretical framework were included (Hettler, 1976). Key terms are spirituality; physical activity; healthy eating; emotional states; marital status; social engagement with friends, family, and the community; occupation; spirituality; purpose in life; and religiosity.
Occupational Wellness

Occupational wellness is reflected in the contribution of unique skills and talents to personally meaningful and rewarding work expressed through paid or non-paid activities that benefit the well-being of the community (Hettler, 1976). Karp et al. (2009) evaluated midlife occupation complexity, education level, and cognition in a population-based longitudinal study of 931 adults 75 years and older without cognitive impairment at baseline. Participants completed two yearly examinations by physicians, neuropsychologists, psychologists, and nurses over a 6-year period. The Diagnostic and Statistical Manual of Mental Disorders (3rd ed., DSM-III, American Psychiatric Association, 1980) defined dementia and AD was diagnosed using the National Institute of Neurological and Communicative Disorders and Stroke–Alzheimer’s Disease–Related Disorders Association (NINCDS-ADRDA) criteria. Nurses interviewed knowledgeable informants to obtain the participant’s longest job, or main occupation. Karp et al. (2009) found that adults working in complex occupations involving data and people had stronger cognitive performance in older age compared with adults working in occupations involving things. Work with things required setting up, operating-controlling, driving, or handling. The adults working in complex occupations had more years of formal education and had worked in occupations involving data and people more than adults with fewer years of formal education. However, among adults with fewer years of formal education, those who worked in a complex occupation involving self-direction had less risk for cognitive impairment compared with adults working in low-complexity occupations.

Social Wellness

Social wellness reflects positive personal and community relationships built on mutual respect, cooperation, and interdependence. Social wellness is reflected in effective communication and a healthy environment (Hettler, 1976). Positive personal relationships demonstrating cohabitation and sustained marriage may protect cognition in aging (Håkansson et al., 2009). Håkansson et al. (2009) examined the relationship between midlife marital status and cognition in older age in a population-based longitudinal study.
sample included adults aged 65 to 79 years from a previous population-based sample from 1972 to 1998. Marital status was measured at midlife and again in older age. Participants completed self-administered questionnaires on health behavior, health status, depression, medical history, and biometrics. Dementia was diagnosed using a three-step protocol beginning with the Mini-Mental Status Examination (MMSE). Neurologists, cardiologists, and neuropsychologists examined participants with low-MMSE scores. Dementia was diagnosed using magnetic resonance imaging results, Diagnostic and Statistical Manual of Mental Disorders (4th ed., DSM-IV, American Psychiatric Association, 1994), and NINCDS-ADRDA criteria. Outcomes from this work revealed that adults who lived without a partner at midlife had nearly twice the risk of cognitive impairment in older age compared with adults living with a partner. Adults who lived without a partner at midlife AND older age had 3 times the risk for cognitive impairment compared with those cohabiting in midlife and older age. Older adult widows presented with the highest percentage of cognitive impairment among participants living without a partner (Håkansson et al., 2009).

Adolescent involvement in school-related, community activities may protect cognition in older age (Fritsch et al., 2005). Thomas Fritsch et al. (2005) used archived student records to investigate adolescent extracurricular activity involvement and cognitive impairment in older age. The retrospective cohort study of 396 participants with a mean age of 75 years was generated from part of the Cleveland Longitudinal Aging Studies of Students. The participants graduated from the same high school. Participants with missing activity data and whose cognitive impairment was a consequence of depression or multiple sclerosis were excluded. Participants completed the Modified Telephone Interview for Cognitive Status. Proxy respondents completed the Informant Questionnaire and Cognitive Decline in the Elderly Questionnaire. When either assessment indicated impairment, the participants answered the Dementia Questionnaire. Physical and mental health was examined with the Short Form 36 Health Survey. Extracurricular activity involvement was obtained from the school’s yearbook. The results indicate that when compared with those who participated in less than two extracurricular activities, adolescents who participated in two or more extracurricular activities had one third less risk of cognitive impairment in older age (Fritsch et al., 2005).

Social networks may protect against cognitive impairment in older age (Bennett, Schneider, Tang, Arnold, & Wilson, 2006). Researchers from the Rush Memory and Aging Project examined the effect of social networks on cognitive impairment in older age (Bennett et al., 2006). The longitudinal, epidemiological–pathological study included 89 older adults without known dementia at baseline. Participants with brain biopsy results were included. Each participant completed baseline questions about social network size and uniform structured clinical assessments including the following: medical history, neurological examination, and neuropsychological performance. AD and conditions affecting cognition were classified according to the NINCDS-ADRDA. Covariates included cognitively stimulating activities, physical activities, social activities, and seven common chronic diseases. Participants completed 21 cognitive performance tests yearly and brain autopsy at death. The dependent outcome variable was global cognition. The results indicate that even when participants demonstrated severe levels of global disease pathology, cognitive performance remained higher for participants with larger network sizes even after controlling for covariates (Bennett et al., 2006).

Intellectual Wellness

Intellectual wellness reflects a commitment to lifelong learning through self-directed behavior that promotes continuous acquisition and creative application of new skills and abilities (Hettler, 1976). Intellectual wellness demonstrated by years of formal education may protect cognition in older age. Specifically, 12 or more years of formal education compared with fewer than 12 years of education correlates with stronger cognitive performance in older age (Koster et al., 2005; Lièvre, Alley, & Crimmins, 2008; Plassman et al., 2007).

Intellectually stimulating activities such as computer games, crossword puzzles, and reading may reduce the risk of cognitive impairment for people with fewer years of formal education (Gilhooly et al., 2007). Gilhooly et al. (2007) examined older adults’ cognition, educational level, and participation in mental, physical, and social activities. The correlational cohort study included 145 participants aged 70 to 91 years from various health status and social economic backgrounds. Participants completed a battery of neuropsychological tests and semi-
interviews to determine the frequency of engagement in physical, mental, and social activities. Participants were asked, “Is there anything you deliberately do to maintain your cognition?” The results revealed a significant correlation between intellectual activities and stronger cognitive function in older age. Sixty-five percent of older adults reported deliberate engagement in intellectual activities to maintain cognition or prevent cognitive impairment. Older adults who reported deliberate engagement demonstrated significantly lower levels of cognitive impairment compared with those who did not deliberately engage. Compared with social and physical activities, older adults perceived intellectual activities most beneficial to maintaining cognition (Gilhooly et al., 2007).

Lachman, Agrigoroaei, Murphy, and Tun (2010) investigated years of education and intellectually stimulating activities to determine if cognitive activities can moderate the effect of limited education on cognition in older age. The cross-sectional national analysis included a random sample of 3,343 adults aged 32 to 84 years. Participants who reported stroke, Parkinson’s disease, or other neurologic disorders affecting cognitive performance were excluded. Participants were asked the frequency of engagement in four cognitive stimulating activities (reading books, reading magazines or newspapers, playing word games, or writing). They reported completed years of formal education. Cognition was measured using the Brief Test of Adult Cognition by telephone. Covariates included demographics, self-rated health, and physical activity. The results indicate that those with more than 12 years of formal education participated in intellectually stimulating activities more often than those with fewer than 12 years of education and therefore demonstrated stronger cognitive performance. However, people with fewer years of formal education who engaged in intellectually stimulating activities at least one or more times per week demonstrated stronger cognitive performance compared with those with fewer years of formal education who did not engage in intellectually stimulating activities.

Newson and Kemps (2006) examined the benefit of intellectual and physical activity on the affect of simple and complex task performance in adults. This correlational analysis included a sample of 24 adults without cognitive impairment from each age group: 18 to 27 years, 65 to 74 years, 75 to 84 years, and 85 to 92 years. Baseline screening included the Clox task (an executive clock drawing task) and the National Adult Reading Test–Revised. Participants recorded the amount of time and effort they spent engaging in 10 different physically and cognitively stimulating tasks. Simple and complex cognitive tasks were measured using two versions of the Visual Imagery Task. Participants reported years of formal education and completed the General Well-Being Scale. The results indicate that as age increased, energy and time spent engaging in physical and intellectual activities decreased. Engagement in both physical and intellectual activities improved cognitive performance; however, increased time and energy in intellectual activities improved cognitive performance on complex tasks regardless of physical activity (Newson & Kemps, 2006).

Physical Wellness

Physical wellness reflects investing in self-care: regular participation in physical activity, and recognition of the relationship between healthy nutrition and physical body functioning (Hettler, 1976). Middleton, Barnes, Lui, and Yaffe (2010) examined physical activity throughout various stages of life and the onset of cognitive impairment. The prospective cross-sectional study included 9,704 women 65 years and older. Women unable to walk without help or who had a bilateral hip replacement were excluded. Participants completed reports about their physical activity throughout various stages in their lives: teenage years, 30 years, 50 years, and current age (older age). Cognition was measured with the MMSE. Covariates included smoking, years of education, living arrangement, diabetes, Parkinson’s disease, hypertension, body mass index, and depression. The results indicate that physical activity during teenage years demonstrated the lowest odds of cognitive impairment in older age. Women who reported physical inactivity as teenagers and became active at 30 and 50 demonstrated significantly lower odds of impaired cognition compared with those who remained physically inactive (Middleton et al., 2010).

Dik, Deeg, Visser, and Jonker (2003) evaluated the relationship between physical activity and delayed onset of cognitive impairment or maintained cognition in older age. The prospective population-based correlational study included 1,241 subjects aged 62 to 65 years. Participants with an MMSE score less than 24 were excluded. Participants reported time and energy spent participating in early-life physical
activity involving sweat, sports, or exhaustion between the ages of 15 and 25 years. Cognition was measured using the MMSE and information-processing speed was measured using the Alphabet Coding Task-15. Covariates included age, sex, socioeconomic status, lifestyle, current physical activity level, smoking status, alcohol consumption, diabetes, cardiovascular disease, depression, and verbal intelligence. The results indicate that 65% of the elderly were physically inactive early in life. Males reported more time and energy spent engaging in physical activity in early life compared with females and consequently males demonstrated stronger processing speed on cognitive performance scales compared with females.

Larson et al. (2006) investigated the relationship between regular exercise and the incidence of dementia in older adults. The prospective population-based 6.2-year longitudinal cohort study included 1,704 randomly selected adults 65 years and older without cognitive impairment at baseline. Participants were excluded for the following reasons: dementia, potential MCI, impending dementia, residing in a nursing home, or participating in another study. Participants completed the Cognitive Ability Screening Instrument every 2 years. Those demonstrating low-cognitive performance underwent clinical and neuropsychological examinations to determine diagnosis consensus. DSM-IV and (NINCDS-ADRDA) criteria were used for diagnosis. Participants reported number of days per week that they participated in physical activity for at least 15 minutes. Covariates included physical function, cognitive function, depression, health conditions, and lifestyle. The results indicate that among older adults who exercised 3 or more times per week the incidence rate of dementia was 13.1,000 person-years compared with 19.7 per 1,000 person-years for those who exercised less than 3 times per week (Larson et al., 2006).

Laitinen et al. (2006) investigated the association between dietary fat intake, dementia, and AD. The sample of 1,449 randomly selected adults aged 65 to 79 years was generated from a population-based 21-year longitudinal data set. Participants completed a 135-item questionnaire at baseline and follow-up that investigated their health behavior, dietary habits, alcohol consumption, smoking, exercise, medical history, blood pressure, body mass index, and serum cholesterol. Cognition was measured using the MMSE. Dementia and AD were diagnosed with DSM-IV and the NINCD/SADA criteria. The results indicate that people who consumed moderate amounts of polyunsaturated and monounsaturated fats in midlife demonstrated decreased risk for dementia and AD in older age. Little to no fat intake and moderate amounts of saturated fat intake increased the risk for dementia and AD (Laitinen et al., 2006).

Scarmeas et al. (2009) investigated the affect of healthy eating habits on MCI. The longitudinal, multiethnic, community-based study with an average follow-up ranging from 1.0 to 13.8 years included 1,393 adults. Baseline assessments included medical and neurological examination, computed tomography, magnetic resonance imaging, health assessment, neurological battery, and the clinical dementia rating assignment. Neurologists and neuropsychologists used DSM-IV and NINCD/SADA criteria to diagnose dementia. Participants completed a 61-item version of the Semi-Quantitative Food Frequency Questionnaire. Foods were measured as healthy and detrimental according to daily gram per food intake. Healthy foods included fruits, vegetables, legumes, cereals, and fish. Detrimental foods included meat, dairy, no alcohol, heavy alcohol, and saturated fat consumption. Results indicate that participants who consumed a higher number of healthy foods demonstrated less risk of cognitive decline in older age. Compared with those with low consumption of healthy foods, those with moderate consumption of healthy foods demonstrated 17% less risk for cognitive decline, and those with the highest consumption of healthy foods demonstrated 28% less risk for cognitive decline in older age.

**Emotional Wellness**

Emotional wellness reflects a positive approach to life. Emotional wellness is the ability to manage and accept feelings and behavior. Emotional wellness is reflected through taking responsibility to manage one’s life in personally fulfilling ways and recognizing limitations and seeking support when necessary. Emotionally well people form interdependent relationships built on mutual trust, respect, and commitment. They accept challenges, take risks, and acknowledge conflict as part of growth (Hettler, 1976).

Neuroticism is a personality type that reflects emotional instability, negative emotions, depressive symptoms, and anxiety. Wilson et al. (2007) investigated the relationship between higher levels of...
emotional distress and the risk of cognitive impairment in older age. The 12-year longitudinal cohort study included a sample of 1,256 older adults (mean age 76.8 years). Participants with dementia, or MCI at baseline were excluded. The participants completed an average of 6.3 evaluations that included 19 cognitive tests. Neuroticism was measured at baseline using 6 items from the 12-item neuroticism scale of the NEO Five-Factor Inventory. Covariates included age, sex, and education. The results indicate that adults with high neuroticism or emotional distress were 42% more likely to develop impaired cognition than adults with low neuroticism. The risk of MCI increased 6% for each depressive symptom.

Wang et al. (2009) examined extraversion and neurotic personalities. The longitudinal correlational study included data from 506 older adults from a larger cohort study. Participants were excluded if they met the criteria for probably dementia, or demonstrated physical or cognitive impairment at baseline. Cognition was measured using the MMSE. Personality traits, neuroticism, and extraversion were measured using the Eyseneck Personality Inventory. Trained nurses assessed social networks and leisure activities. Covariates included age, sex, depressive symptoms, cardiovascular disease, stroke, diabetes mellitus, genomic DNA, and APOE (apolipoprotein E) genotyping. Participants completed three follow-up assessments over a 6-year period. The results indicate that adults with low neuroticism and high extraversion had the lowest incidence of dementia. Social isolation and inactive lifestyles increased dementia incidence. Adults who possessed low neurotic personality traits and lived inactive and socially isolated lifestyles, however, demonstrated decreased risk for dementia (Wang et al., 2009).

An individual’s motivation is the ability to choose among alternative goals and work and strive toward achieving the chosen goal (Forstmeier & Maercker, 2008). This is a characteristic of strong emotional wellness. Forstmeier and Maercker (2008) determined the affect of lifetime motivational and cognitive abilities on predicting cognitive health in older age. The sample included 147 community-dwelling adults aged 60 to 94 years. Older adults with visual impairment were excluded. Participants’ cognitive and motivational abilities were estimated using the Occupational Information Network (ONET). Motivational abilities were measured with the Volitional Components Questionnaire and the General Self-Efficacy Scale. Psychological well-being was measured using the Satisfaction With Life Scale, Geriatric Depression Scale, Brief Symptom Inventory, and the Perceived Stress Scale. Cognition was measured using a battery of neuropsychological assessments. The results indicate that lifetime motivational reserve protects cognition in older age. After controlling for age, sex, education, and intelligence, people who demonstrated stronger cognitive performance in older age had high psychological well-being and high lifetime motivational abilities.

**Spiritual Wellness**

Spiritual wellness reflects the ability to rise above and go beyond oneself to find meaning and purpose in life (Hettler, 1976). People possessing spiritual wellness accept the unknown in life and find harmony with social and physical forces from outside (Hettler, 1976). They can formulate a personal value system that gives unity, purpose, and goals to their hopes, thoughts, and action (Hettler, 1976).

Boyle, Buchman, Barnes, and Bennett (2010) examined the relationship between purpose in life and AD and MCI. The longitudinal study included a sample of 900 community-dwelling older adults. Participants with dementia at baseline or lack of follow-up data were excluded. Participants underwent a battery of 21 cognitive assessments. Dementia, MCI, and AD were diagnosed using NINCDS-ADRDA criteria. Participants completed the Ryff’s Scale of the Psychological Well-Being Scale. Covariates included sex, education, depression symptoms, social network size, and self-reported medical conditions (stroke, cancer, diabetes, cardiovascular disease, hypertension, thyroid disease, and head injury). During the 7-year follow-up, adults who developed AD were older and had less purpose in life. An older adult with a high purpose in life was approximately 2.4 times more likely to remain free of AD compared with a person with a low score. An older adult with high purpose in life was 1.5 times more likely to remain free of MCI compared with a person with a low score. Older adults with greater purpose in life maintained cognition compared with those with low purpose in life, and they declined less rapidly (Boyle et al., 2010).

Coin et al. (2010) examined the relationship between religiosity and the development of cognitive impairment in adults with mild-to-moderate AD. The correlational, longitudinal study included 64...
older adults with a mean age of 77.8 years. Participants without probable diagnosis of AD according to the NINCDS-ADRDA criteria were excluded. Patients living alone were also excluded. Cognition was measured using the MMSE. Informants provided information on the participant’s usual cognitive, functional, and behavioral state. Religiosity was measured using the Behavioral Religiosity Scale and the Francis Short Scale. The results indicate that significant differences between low and high religiosity did not exist at baseline. One year later, however, the high-religiosity group maintained cognition; the low-religiosity group declined significantly in cognitive performance and behavioral disturbance. Additionally, the high-religiosity group did not deteriorate in any items on the neuropsychiatric inventory; the low-religiosity group demonstrated significant increase in aberrant motor behaviors, irritability, apathy, depression, aggression, hallucinations, and delusions (Coin et al., 2010).

Discussion

Research examining cognition through the six dimensions of wellness contains limitations. Some studies included in this literature review use correlational and cross-sectional design; therefore, cause and effect for each dimension of wellness and the contribution to cognition in older adults is not identified (Dik et al., 2003; Forstmeier & Maercker, 2008; Gilhooly et al., 2007; Lachman et al., 2010; Middleton et al., 2010; Newson & Kemps, 2006). Cross-sectional and correlational designs used to examine cognition in aging, limit research findings because it is impossible to know if impaired cognition influenced the independent variables, or if the independent variable influenced cognition. Longitudinal designs that include cognitively healthy participants at baseline and examine the affect of independent variables on cognition over time yield stronger research findings. Although randomized controlled trials yield the strongest evidence, ethical limitations make this design less feasible in research examining wellness and prevention. For example, withholding health-promoting behaviors and education from a control group may be unethical. Research in this review did not examine several variables related to each dimension of wellness. For example, the relationship between cognition and participants’ perception of their occupation, participation in unpaid volunteer activities, social networks early in life or quality of social relationships, and continuous acquisition and creative application of new skills and abilities were not examined. Many studies included in this review used large sample sizes, longitudinal designs, and rigorous criteria for diagnosing cognitive impairment.

One or more dimensions of wellness may protect cognition in aging even for those with familial or genetic risk factors (Andel et al., 2005). Twins have similar familial and genetic risk factors, and twins with higher scores for complexity of work with people and data demonstrated lower risk for dementia and AD compared with their twin who worked in occupations with less complexity (Andel et al., 2005). Wellness in one dimension may enhance wellness in other dimensions (Karp et al., 2006; Lachman et al., 2010). For example, intellectual wellness may improve occupational wellness. Adults with more years of formal education are more likely to secure complex occupations and participate in intellectually stimulating activities throughout their lives (Karp et al., 2006; Lachman et al., 2010). Wellness in two or more dimensions may protect cognition more than wellness in one dimension (Fratiglioni, Paillard-Borg, & Winblad, 2004; Hartman-Stein & Potkanowicz, 2003; Hendrie et al., 2006; Lee et al., 2010) Wellness in one dimension may compensate for wellness lacking in another dimension. For example, occupational wellness may compensate for intellectual wellness. Occupations requiring high self-direction protected cognition in adults with fewer years of education (Karp et al., 2006). Emotional wellness may compensate for social wellness. Adults with no social networks and low neurotic personalities had less risk for cognitive impairment compared with adults with no social networks and high neurotic personalities (Wang et al., 2009). Acknowledging the limitations, the literature highlights the apparent interconnectedness of each dimension of wellness and the importance of evaluating older adults holistically.

Protecting cognition for the current aging demographic as well as populations to follow is essential for the health and economic stability of American society. Examining cognition through the Six Dimensions of Wellness supports the IOM’s vision to intentionally promote wellness and prevent disease (NAS, 2010). The interconnectedness of each dimension of wellness illustrates the significance of evaluating older adults holistically; promoting wellness in one or more dimensions may be an effective strategy to prevent cognitive impairment and protect cognition in aging adults (Fratiglioni et al.,
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2004; Hartman-Stein & Potkanowicz, 2003; Hendrie et al., 2006; Lee et al., 2010). Wellness may contribute to healthy cognition and prevention of cognitive decline in aging. Future research is needed to further examine the relationship between wellness and cognition in aging and determine if one or more dimensions of wellness predict greater protection from cognitive impairment and decline in older age. If one or more dimensions are more predictive of maintained cognition, nurses will be able to develop targeted, evidence-based wellness interventions designed to protect cognition in older age.

References


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Application of the Rasch Model to Measure Five Dimensions of Wellness in Community Dwelling Older adults

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Abstract

The purpose of this research is to develop an innovative method to measure and score wellness among older adults. This research was guided by William Hettler’s (1976) Dimensions of Wellness theoretical framework. The sample of 5,604 community dwelling older adults was drawn from members of the COLLAGE consortium. The Wellness Assessment Tool (WEL) of the COLLAGE assessment system provided the data to create the scores. Rasch analysis and Master’s Partial Credit method were used to create logit values for each item within the five dimensions of wellness. The items fit the Rasch Model, and the composite scores for each dimension demonstrated high reliability (1.00). The person reliability was low: social (.19), intellectual (.33), physical (.29), emotional (.20), and spiritual (.29). The small number of items within each dimension and the homogenous sample appear to have contributed to this low reliability. Ongoing research using multidimensional tools to measure dimensions of wellness among older adults is needed to advance wellness science and wellness promotion in nursing practice.
Promoting wellness among aging adults is a priority for nurses today and in the future (Institute of Medicine (IOM), 2011). Research that examines interventions to promote wellness among aging adults is a priority because the number of adults entering old age is increasing significantly. Baby boomers, those born between 1946 and 1964, started turning 65 in 2011; they represent 20% of the United States population (Hartman-Stein & Potkanowicz, 2003; Federal Interagency Forum on Aging-Related Statistics, 2010). As adults’ age, their risk for chronic disease, functional decline, and cognitive decline increases (Federal Interagency Forum on Aging-Related Statistics, 2010). These increased risks affect quality of life, increase health care costs, and limit older adults’ ability to remain living independently in the community (Federal Interagency Forum on Aging-Related Statistics, 2010). The recent *Future of Nursing Report* for the Institute of Medicine (IOM, 2011) expects a transformed health care system where nurses intentionally promote wellness and disease prevention, reliably improve health outcomes, and provide compassionate care across the life span (IOM, 2011, para 1).

Promoting wellness among older adult populations creates a paradigm shift in health care delivery from disease-focused, or deficit based care to well-focused or asset based care. The goal for the future of nursing is to shift sick-focused care to wellness care through creative, innovative, holistic, and multidimensional wellness interventions in the community (IOM, 2011). Nurses play a critical role in wellness program development, evaluation, and education (IOM, 2011). Before nurses can design effective wellness interventions for America’s aging adults, they need valid and reliable methods to measure the multidimensional concept of wellness. The purpose of this paper is to present a multidimensional wellness measurement tool and scoring method specifically designed for older adults.
Background

The concept of wellness is not universally defined (Mackey, 2009). However, theorists agree that wellness is a complex and holistic state of being that innately strives to expand and achieve one’s full potential (Adams, Bezner, Steinhardt, 1997; Hattie, Myers, & Sweeney, 2004; Hettler, 1976; National Wellness Institute, 2010; Nenn & Vaisberg, 2010; Witmer & Sweeney, 1992). Wellness is a multidimensional structure encompassing five to seven dimensions: social, occupational, spiritual, physical, intellectual, environmental, and psychological (Adams et al., M, 1997; Becker, Dolbier, Durham, Glascoff, & Adams, 2008; Hattie et al., 2004; Hettler, 1976; Nenn & Vaisberg, 2010; Witmer & Sweeney, 1992). Each dimension interconnects and represents the whole person (Hettler, 1976). High-level wellness, or magnitude in one dimension, can positively influence other dimensions and balance within dimensions can positively influence total wellness (Adams, et al., 1997). Imbalance in one dimension may negatively influence other dimensions (Nenn & Vaisberg, 2010). Wellness aligns with holism philosophy: Nurses cannot understand a patients’ wellness without assessing the whole patient in multiple dimensions (Godfrey-Smith, 2003). To achieve the IOM’s vision to intentionally promote wellness and to meet the needs of the aging population, nurses must begin to examine patient populations using multidimensional, holistic wellness measurement tools in research.

Current research in wellness program development and wellness intervention is not designed in a holistic or multidimensional wellness framework (Brubaker, Witta, & Angelopoulos, 2003; Hatch & Lusardi, 2010; Milani, 2009; Palumbo, Wu, Shaner-McRae, Rambur, & McIntosh, 2012; Turner, Thomas, Wagner, & Moseley, 2008). Characteristically, research exclusively targets the physical dimension of wellness by improving nutrition or increasing physical activity (Brubaker, et al., 2003; Hatch & Lusardi, 2010; Milani, 2009;
Palumbo, et al., 2012; Turner, et al., 2008). Wellness is commonly operationalized in research using the SF-36 (Brubaker et al., 2003; Chafetz et al., 2008; Hatch & Lusardi, 2010; Joslin, Lowe, & Peterson, 2006; Milani, 2009; Palumbo et al. 2012; Turner et al., 2008). Although the SF-36 is a valid and reliable measurement tool across general and specific populations, the tool is designed to compare the burden of disease and differentiate health benefits of specific treatments or interventions (Ware, 2011). The SF-36 does not examine the multidimensional concept of wellness.

**Multidimensional Wellness Measurement Tools**

To identify tools that measure the concept of wellness in multiple dimensions, we conducted a search of the Health and Psychosocial Instrument (HaPI) database using the key words wellness, multidimensional, and holistic. We reviewed tools specifically designed to measure wellness and tools that measure at least five of the seven dimensions (social, occupational, spiritual, physical, intellectual, and psychological) identified by wellness theorists. Four multidimensional wellness measurement tools were revealed: Perceived Wellness Survey (PWS), Salutogenic Wellness Promotion Scale (SWPS), TestWELL Lifestyle Assessment Questionnaire (LAQ), and Five Factor Wellness (5-FWEL) (Adams, Bezner, Garner, & Woodruff, 1998; Adams, et al., 1997; Becker, Whetstone, Glascoff, & Moore, 2008; Becker, et al., 2008; TestWELL Online Assessment Tools, 2008; Hattie, et al., 2004). The psychometric testing of the PWS, SWPS, and 5-FWEL focuses on adolescent, young adults, and middle aged adults; published research that examines the reliability and validity of these measurement tools for older adult populations is absent (Adams et al., 1998; Adams, et al., 1997; Becker, et al., 2008; Becker, et al., 2008; TestWELL Online Assessment Tools, 2008; Hattie, et al., 2004). An older adult version of the LAQ is available; however, this measurement tool is designed for
wellness program development and personal wellness improvement. The tool is proprietary and published research that examines the validity and reliability of this measurement tool is absent. Measurement methods for older adults are at a critical juncture to advance wellness science in nursing. The Wellness Assessment (WEL) tool of the COLLAGE assessment system is a multidimensional measurement tool designed to measure wellness among aging adults.

**Wellness Assessment Tool**

WEL was developed by interRAI, a collaborative network of researchers representing more than 30 countries committed to improving health care for elderly, frail, or disabled persons. InterRAI instruments are developed through an extensive process of consultation with leading researchers collaborating with hundreds of health administrators, policy developers, and organizations. Critical assessments of instruments in the interRAI series are completed before release for public use (Hirdes, et al., 2008). The interRAI suite demonstrates national and international internal, test re-test, and inter-rater reliability as well as face, content, criterion and predictive validity (Hirdes et al., 1999; Hirdes, et al., 2008).

**Purpose of the WEL**

The WEL was developed in response to the needs of the COLLAGE consortium. COLLAGE is a national member consortium of continuing care retirement communities (CCRC) and was established to achieve two goals: (1) improve the quality of life for older adults; and (2) establish COLLAGE as the leading model for keeping older adults across all socio-economic levels active and independent (COLLAGE, The Art and Science of Healthy Aging, 2008).

**Description of the WEL**

The WEL was designed for older adults living independently in the community to focus their attention on wellness and facilitate the process of developing healthy aging plans, and
individualized roadmap towards wellness. It also provides data to the community and affiliate organizations that develop and evaluate wellness-based programs and services. The WEL allows older adults to respond to specific items that address dimension of wellness and express interest, or intention to participate in wellness activities. Responses are summarized and discussed with the older adult. According to an in-depth and detailed concept analysis of wellness by McMahon and Fleury, (2012) wellness among older adults focuses on three qualities: adult’s values and strengths, adult’s individualism, and adult’s partnership with health care professionals. The WEL addresses each of these qualities.

The WEL contains 113 items that cover nine core areas: exercise and physical fitness, nutrition, social relationships, emotional, spiritual, practices affecting health and wellbeing, recreation, sleep, and goals for wellness service planning. The assessment data were collected through a one-on-one conversation with a qualified and trained staff member at least once annually. The trained staff member guides the older adult in a conversation and learns about his or her involvement, preference, and satisfaction with items covered on the WEL. The WEL provides a goal planning section that allows the older adult to identify wellness goals. Trained staff members enter the results of the WEL in an electronic database. Older adults have an option of completing a paper version of the WEL independently; however, staff members always review and discuss the results with the adult and enter the data into a computerized data-base (COLLAGE, The Art and Science of Healthy Aging, 2008).

The WEL is a comprehensive measurement tool for older adults. The 113 items are not currently scored to identify more wellness. The ability to score the WEL provides researchers and clinicians the opportunity to profile older adults’ wellness. Researchers then may identify specific wellness qualities that protect adults’ health and improve their quality of life as they age.
The purpose of this research is to create composite scores for five dimensions of wellness. The Internal Review Board at Northeastern University and University of Phoenix approved this research.

**Theoretical Framework**

Dimensions of Wellness by William Hettler (1976) guided the scoring for the WEL. According to this framework, wellness is an ever-changing process that encompasses six dimensions: social, intellectual, physical, emotional, spiritual, and occupational (Hettler, 1976). The Six Dimensions of Wellness interconnect to represent a person. For the purposes of this research, occupational wellness was excluded because of the limited variability of this dimension in an older adult population. The population for this research includes retired adults. The theoretical definitions that guided this research are listed in Table 1.

**Method**

**Sample Selection**

Participants from the COLLAGE consortium who completed a WEL between the years 2007 and 2012 were included in the analysis. The original sample contained 7,985 adults. Adults younger than age 60 who were not living in the community at the time of the assessment were excluded. The final sample includes 5,604 community-dwelling male and female adults representing 72 continuing care retirement communities located in 24 states.

**Approach**

To create scores for the five dimensions, 22 items from the WEL that align with the theoretical definitions from five dimensions of wellness were selected for the analysis. Table 2 lists the wellness dimension and the corresponding items from the WEL. The items included in the analysis represent nominal and ordinal levels of measurement. To achieve basic fundamental
measurement comparisons, interval level measurement is essential (Andrich, 1988). Rasch analysis was used to convert ordinal, dichotomous data into interval-level data.

**Measurement**

Rasch analysis offers the ability to compute the degree of wellness a person possesses using a logit score (Andrich, 1988). A logit is determined by comparing the subject’s ability with item difficulty (Andrich, 1988). In this research, the person’s ability was the level of wellness the person demonstrated, and the item difficulty is the level of wellness associated with item. The logit in the Rasch analysis asserts that the probability of wellness depends on the level of wellness a person demonstrates relative to the level of wellness associated with the item (Andrich, 1988).

The Rasch Rating Scale for dichotomous variables follows a “pass” or “fail” structure. The person answers “correctly” and scores a “1” or he or she answers “incorrectly” and scores a “0.” Individuals will earn credit for the “correct” answer and they will not earn credit of the “incorrect” answer. When a person’s ability increases, the probability of answering correctly moves closer to “1.” Rasch Model is

\[
\frac{P_{in_1}}{P_{in_0} + P_{in_1}} = \frac{e^{(\beta_n - \delta_i)}}{1 + e^{(\beta_n - \delta_i)}}
\]

\(P_{in_1}\) is the probability of person \(n\) scoring 1 on item \(i\). \(P_{in_0}\) is the probability of person \(n\) scoring “0” on item \(i\). \(\beta_n\) is the ability of person \(n\) and \(\delta_i\) is the difficulty of the item (Masters, 1982).

Traditional Rasch method does not award credit for responses closer to the “best” response (Masters, 1982).

The response options on the WEL reflect various degrees of wellness. For example, one of the items from the emotional dimension of wellness, asks the subject, “How satisfied are you with your life as a whole in the last 3 days?” The response options are “delighted,” “pleased,”
“mostly satisfied,” “mixed,” “mostly dissatisfied,” and “unhappy.” The response that represents the highest level of wellness is “delighted.” However, the response “pleased” is better than “mostly satisfied” and “mostly satisfied” is better than “mixed” and so on. The Master’s Partial Credit model extends traditional Rasch model by awarding partial credit for success on items closer to the best response, which is a more precise measure of a person’s ability, or level of wellness than the “pass/fail” method (Masters, 1982). In addition, the items selected from the WEL that correspond with the five dimensions of wellness contained different response choices; some items include dichotomous scales while other vary from 0 to 5. The Master’s Partial Credit model allows each item to contain different response patterns (Bond & Fox, 2001). Therefore, the Rasch Partial Credit Model was applied. The Rasch Partial Credit model is defined by:

$$\Pr\{X_{ni} = x\} = \frac{e^{\sum_{k=0}^{x} (\beta_n - \tau_{ki})}}{1 + \sum_{k=0}^{m} e^{\sum_{x=0}^{x} (\beta_n - \tau_{ki})}}$$

Where $X_{ni}$ is a random variable that can take on integer values between 0 and a maximum scale value of $m$; $\tau_{ki}$ represents the $k$th threshold location of question $i$ on the constructed variable; and $\beta_n$ is the location of person $n$ on the same constructed variable continuum. Partial credit model permits co-calibration of sets of items with different rating scale structures.

**Missing Data**

Logit values for items within five dimensions of wellness were created: social, intellectual, physical, emotional, and spiritual. The physical dimension had one subject who had missing values on all items. The emotional dimension had two subjects who had missing values on all items. A value of “0” was inserted for missing responses before conducting the analysis. A value of “0” does not influence the partial credit model given $m=0$ to maximum of 5 depending on the item scale. This method is preferred if missing items for persons are rare, or
limited to few items within the scales (Lincare, 2013). The social and intellectual dimensions of wellness did not contain any missing values.

**Reverse Coding**

Several items required reverse coding in the original data set. The items requiring reverse coding, original code, WEL variable name, and recode sequence are listed in Table 2. The five dimensions of wellness comprised different number of questions and response options (after recoding), which are listed below in Table 2.

**Results**

The average age of the final sample of 5,604 community-dwelling older adults was 83 years. Seventy percent of the sample was female and 30% male. Three percent of the sample completed grades eight to eleven; 12% completed high school; 5% trade school; 15% attended some college; 34% earned a Bachelor’s Degree; and 31.6% earned a Graduate degree or above. Eighty six percent of the sample was Caucasian, and 14% represented Hawaiian, Black, Asian, American Indian, Hispanic, or other. The results of the analysis for each of the items within the five dimensions of wellness and the fit statistics are reported in Table 4. Higher logit values for each item represent higher levels of wellness.

**Social wellness.** Figure 1 presents the Rasch analysis results for social dimension of wellness. The map illustrates the level of wellness the sample demonstrated next to the level of wellness associated with each item. The level of wellness the sample demonstrated is displayed on the left, and the level of wellness associated with each item is displayed on the right. Items at the top of the map are associated with higher-level wellness and items near the bottom of the map are associated with lower-level wellness. Item one, “Has close friends in the community?” is located at the top of the map, which indicates this item demonstrates the highest level of
wellness. However, as shown in Figure 2, more than 250 adults in the sample remain “above” this item, meaning the level of wellness demonstrated by the sample exceeds the level of wellness associated with the item. In order of higher-level wellness to lower-level wellness, the items that represent the social dimension of wellness are as follows: “feels can count on friends for companionship,” “feels community environment is supportive,” “participates as a volunteer on campus,” and “has opportunity to give and receive affection.” As listed in Table 4, data from four items within the social dimension fit the Rasch model. Fit statistics ranging from 0.5 to 1.5 are productive for measurement (Linacre, 2012). Items 1-4 fall within this reference range. Item five demonstrates a fit of 2.31. Fit statistics greater than one suggest unpredictable response patterns among subjects. Therefore, item five does not fit the social wellness dimension.

**Intellectual wellness.** Figure 3 displays the results for the intellectual dimension of wellness. Item four, “interested or involved in genealogy?” demonstrates the highest-level of wellness within the intellectual dimension; followed by item three, “interested or involved in educational courses;” item one, “interested or involved in computerized games;” item six, “interested or involved in writing;” and item two, “interested or involved in crossword puzzles.” Item five, “interested or involved in reading” represents the least amount of wellness. As displayed in figure two, although item five is associated with the least amount of wellness, this item remains below some adult’s level of wellness. Item four is associated with the highest-level of wellness, and more than 200 hundred older adults in this sample remain “below” this level of wellness. Data from items within the intellectual dimension of wellness appear to fit the Rasch model. As shown in Table 4, item four is slightly out of the 0.5-1.5 range, with a fit value of 1.58 suggesting that the sample does not respond to item five in a predictable way.
**Physical wellness.** Figure 4 presents the physical dimension of wellness results. The items in order from of highest-level of wellness to lowest-level wellness follow: Item four, “do you feel you’re eating a healthy diet;” item three, “number of glasses of fluid consumed per day;” item one, “participates in fitness/exercise program;” and item two, “weight: do you consider yourself?” As displayed in Figure 3, item four, “do you feel you’re eating a healthy diet?” remains above any adult’s level of wellness, where item two is above 100 adults’ level of wellness. As outlined in Table 4, the data from the items within the physical dimension of wellness fit the Rasch model. Items 1-3 fall within the acceptable fit range. Item four falls slightly out of range with a fit of .47 suggesting that responses to item four are too predictive among this sample.

**Emotional wellness.** Figure 5 presents the results for the emotional dimension of wellness. The items in order from highest-level of wellness to lowest-level of follow: item four, “does stress have a negative effect on your quality of life;” item two, “do you feel valued;” item three, “do you look forward to being challenged by new opportunities;” and item one, “how satisfied are you with your life as a whole in the last three days.” As displayed in Figure 4, item four is beyond any person’s level of wellness, in this sample. Item one is beyond the level of wellness of 100 older adults in this sample. As listed in Table 4, the data for the items within the emotional dimension of wellness do not fit the Rasch model well. Items one “how satisfied are you with your life as a whole in the last three days” and three, “do you look forward to being challenged by new opportunities?” fall within the recommended fit ranges; however, item two, “do you feel valued,” and four, “does stress have a negative effect on your quality of life?” are well outside the range at 3.43 and 9.90, respectively. Responses on items two and four are unpredictable among this sample.
Spiritual wellness. Figure 6 presents the results from the spiritual dimension of wellness. Item two, “Do you feel your spiritual needs are being met” is the associated with the highest-level of wellness, followed by item one, “find meaning in day-to-day life.” Item three, “how do you view your spirituality” is the associated with the least amount of wellness. Item three is beyond the ability of 200 older adults in this sample. As listed in Table 4, data from items one, “finds meaning in day-to-day life” and two, “how do you view your spirituality?” fit the Rasch model well; however, item three, “how do you view your spirituality?” exceeds the recommended range at 2.32. Responses to item three are too unpredictable among this sample of older adults.

Reliability

The item internal consistency reliability for each dimension of wellness is excellent. Each dimension of wellness, social, intellectual, physical, emotional, and spiritual has item reliability at 1.00. This verifies the item hierarchy. The items that construct the dimension scales have wide difficulty variance among this population, meaning the level of wellness associated with each item is wide (Linacre, 2012). These data support the Rasch assumption that the data should fit the Rasch model, which they do. This also supports the construct validation of the five dimensions: social, intellectual, physical, emotional, and spiritual (Linacre, 2012). The high item reliability is supported by the large sample size (n=5,604). High item reliability depends on large sample sizes (Lincare, 2012).

The person reliability for each dimension is poor. The Winsteps reliability outputs for each dimension follow: social (.19), intellectual (.33), physical (.29), emotional (.20), and spiritual (.29). The low person reliability means that the level of wellness demonstrated by the sample did not generate a wide variance of “high” and “low” wellness, which negatively
COGNITION AND WELLNESS

influences the person reliability (Lincare, 2012). The low person reliability may be related to the homogenous sample, or the number of items used to create each dimension of wellness. Each dimension of wellness included fewer than five items from the WEL; the length of rating scales can negatively influence person reliability in the Rasch model (Lincare, 2012). Scales with more items generate larger person reliabilities (Lincare, 2012).

Discussion

The results of this research provide preliminary findings to support Rasch analysis as a method to measure wellness among older adults. The data used to construct the five dimensions of wellness fit the Rasch model, as demonstrated by the high item reliability. Some items within each dimension demonstrate poor fit: item five within the social dimension of wellness, “feels community environment is supportive;” items two and four within the emotional dimension of wellness, “Do you feel valued?” and “Does stress have a negative effect on your quality of life?” and item three within the spiritual dimension, “How do you view your spirituality?” The probability of responding to a specific item among those with high and low levels of wellness was unpredictable on these items within this sample. The fit of these items may improve in a sample with a wider variance of wellness. These items may be too broad, which may cause older adults to interpret them differently. Some may interpret “do you feel valued” as valuing themselves, where others may interpret the question as feeling valued by their family members, peers, or health care providers. Broad interpretations of the item may contribute to unpredictable responses.

The sample that generated the data used to conduct the Rasch analysis was a homogenous group. Over 65% of the sample earned a Bachelor’s Degree or higher. Positive health correlates with more education (Robert Wood Johnson Foundation, Commission to Build
a Healthier America, 2009). Even with the large sample size, \( n=5,604 \), the variance of wellness demonstrated was small. The lack of variance among the responses may contribute to the low person reliability for each dimension of wellness (Linacre, 2012). To increase reliability in future analysis, Rasch analysis may be conducted on a sample that represents a wider range of wellness. In addition, each dimension is constructed with few items /\( \leq 5 \). Fewer items create lower reliability estimates (Linacre, 2012). Adding additional items to each dimension of wellness may improve person reliability (Linacre, 2012) although this was not feasible given the data collection tool used in this study.

Valid and reliable methods to measure wellness among older adults are a critical next step to caring for the aging population. Wellness is a multidimensional state of being (Adams, et al., 1997; Becker, et al., 2008; Hattie et al., 2004; Hettler, 1976; Nenn & Vaisberg, 2010; Witmer & Sweeney, 1992); therefore, researchers and clinicians need valid and reliable multidimensional measurement tools to examine wellness. Currently, four valid and reliable multidimensional wellness tools are available: PWS, SWPS, LAQ, and 5-FWEL (Adams et al., 1998; Adams, et al., 1997; Becker, et al., 2008; Becker, et al., 2008; TestWELL Online Assessment Tools, 2008; Hattie, et al., 2004).

The PWS measures six subscales, each of the six dimensions of perceived wellness. The PWS contains 36 questions (6 questions within each subscale) in statement format; “I believe there is a real purpose in my life.” The PWS is scored on a six point Likert scale one (very strong disagree) to six (very strongly agree). The tool measures each dimension of perceived wellness independently and total perceived wellness. The score for each dimension of perceived wellness is the mean of the subscales. The wellness composite scores is the sum of the means of
each subscale divided by the standard deviation among dimensions (Adams et al., 1998; Adams, et al. 1997).

The SWPS was developed using the concept of Salutogenesis, the study of positive health development. The SWPS measures health potential in seven dimensions of wellness: physical, emotional, intellectual, spiritual, and environmental. The SPWS contains 25 questions; each question asks participants to identify how often they engage in the identified item. The items are scored using a six point Likert scale zero (never engage) to six (always engage) (Becker et al., 2008). Higher scores represent higher levels of wellness within each dimension (Becker et al., 2008).

The LAQ measures ten total subscales: six dimensions of wellness (social, intellectual, emotional, physical, and spiritual), environmental wellness and wellness knowledge, attitudes, and behaviors (Frank-Stromber, 2004). The assessment is available in four demographic versions: adult, teen, college, and older adult. Each assessment contains between 50 and 100 questions in statement format focused on the specific dimension; “I am satisfied with the balance between my work and leisure time.” The questions are scored on a five point Likert scale one (almost never) to five (almost always). The items for each subscale are summed and all subscale sums are added to obtain a total composite wellness score. The scores range from 100-500 (Frank-Stromberg, 2004).

The 5-FWEL measures wellness using five rims: creative self, coping self, social self, essential self, and physical self (Hattie et al., 2004). The 5-FWEL contains 74 items and five factors. The 5-FWEL is scored based on responses to statements, “I am an active person.” Statements are scored using a five point Likert scale one (strongly disagree) to five (strongly
agree). Raw scores for each subscale are obtained by generating the mean. The sum of the means for each subscale creates the overall WEL score (Hattie et al., 2004).

As described above, the available tools to measure the wellness in multiple dimensions currently apply traditional testing methods to create composite scores for each dimension of wellness and total wellness (Adams et al., 1998; Adams, et al., 1997; Becker et al., 2008; Frank-Stromberg, 2004; Hattie et al., 2004). For example, individuals earn five points if they “strongly agree” to being an “active person” and they earn zero points if they “strongly disagree.” This method of examining wellness is limited because it does not account for the person’s level of wellness, or the level of wellness associated with each item. Some items may represent more or less wellness than others. For example, being active may be a higher level of wellness than drinking the recommended number of ounces of water each day. In addition, some individuals may demonstrate more wellness than others. Using Rasch analysis to compute logit values for items within each dimension of wellness allows one to compute dimension scores by summing the logit values for each item representing each dimension. This method offers an innovative and objective measurement option to examine the degree or magnitude of wellness among adults.

Tools to specifically examine the multidimensional concept of wellness among older adults are unavailable (Adams et al., 1998; Adams, et al., 1997; Becker, et al., 2008; Becker, et al., 2008; TestWELL Online Assessment Tools, 2008; Hattie, et al., 2004). For nurses to intentionally promote wellness and support older adult’s ability to remain living well in the community, they need valid and reliable tools to measure wellness (IOM, 2010). Computing a score for each dimension using logit values from Master’s Partial Credit, Rasch Analysis provides and opportunity to profile older adults and determine how specific dimensions of wellness protect their health. Further psychometric examinations of the validity and reliability of scores
within dimensions of wellness should be conducted. In future analysis, researchers should include more items within each dimension and conduct the analysis on a population with more variance in the level of wellness.
### Table 1
Theoretical Definitions for 5 Dimensions of Wellness

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Wellness</td>
<td>Ability to form and maintain positive personal and community relationships</td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>Commitment to lifelong learning through continuous acquisition of skills and knowledge</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>Commitment to self-care through regular participation in physical activity and healthy eating</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>Ability to acknowledge personal responsibility for life decisions and their outcomes with emotional stability and positively</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>Having purpose in life and a value system</td>
</tr>
</tbody>
</table>

Table 2
*Items from WEL, Corresponding Dimension of Wellness, Number of Items, and Coding and Recode Sequence*

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th># of items from WEL</th>
<th>Item</th>
<th>Original Code</th>
<th>Recode Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual Wellness</td>
<td>6</td>
<td>Interested or involved in computerized games</td>
<td>(0, 1, 2)</td>
<td>(0, 2, 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interested or involved in cross word puzzles</td>
<td>(0, 1, 2)</td>
<td>(0, 2, 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interested or involve in educational courses</td>
<td>(0, 1, 2)</td>
<td>(0, 2, 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interested or involved in genealogy</td>
<td>(0, 1, 2)</td>
<td>(0, 2, 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interested or involved in writing</td>
<td>(0, 1, 2)</td>
<td>(0, 2, 1)</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>4</td>
<td>Participates in Fitness/Exercise Program</td>
<td>(0, 1, 2, 3, 4, 5)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weight: Do you consider yourself</td>
<td>(0, 1, 2, 3)</td>
<td>(1, 2, 3, 4, 0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of glasses of fluid consumed daily</td>
<td>(0, 1, 2, 3)</td>
<td>(3, 2, 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you feel you are eating a healthy diet?</td>
<td>(0, 1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>4</td>
<td>How satisfied are you with your life as a whole in the last 3 days?</td>
<td>(0, 1, 2, 3, 4, 5)</td>
<td>(5, 4, 3, 2, 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you feel valued?</td>
<td>(0, 1)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you look forward to being challenged by new opportunities?</td>
<td>(0, 1, 2)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Does stress have a negative effect on your quality of life?</td>
<td>(0, 1)</td>
<td>(1, 0)</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>3</td>
<td>Finds meaning in day-to-day life</td>
<td>(0, 1)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you feel your spiritual needs are being met?</td>
<td>(0, 1)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How do you view your spirituality?</td>
<td>(0, 1, 2, 3)</td>
<td>(3, 2, 1, 0)</td>
</tr>
</tbody>
</table>

*Note: WEL = Wellness Assessment Tool*
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Item #</th>
<th>Rasch Item Measure</th>
<th>Count</th>
<th>Outfit Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Wellness</td>
<td>1</td>
<td>0.78</td>
<td>5581</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.59</td>
<td>5581</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-1.30</td>
<td>5532</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.54</td>
<td>5556</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>-0.61</td>
<td>5548</td>
<td>2.42</td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>1</td>
<td>0.35</td>
<td>5537</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>-0.54</td>
<td>5510</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.43</td>
<td>5524</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1.33</td>
<td>5508</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>-1.23</td>
<td>5561</td>
<td>0.61</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>-0.34</td>
<td>5521</td>
<td>1.28</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>1</td>
<td>-0.74</td>
<td>5575</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>-1.53</td>
<td>5585</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.10</td>
<td>5581</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>2.17</td>
<td>5575</td>
<td>0.47</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>1</td>
<td>-7.47</td>
<td>5577</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2.38</td>
<td>5565</td>
<td>3.43</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-1.20</td>
<td>5517</td>
<td>1.17</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>6.29</td>
<td>5483</td>
<td>9.90</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>1</td>
<td>1.53</td>
<td>5604</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1.69</td>
<td>5604</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-3.22</td>
<td>5604</td>
<td>2.32</td>
</tr>
</tbody>
</table>

*Note. Higher positive Rasch item measures = easier items. Negative Rasch item measure = more difficult items. Mean-square fit statistics, 0.5-1.5 = productive for measurement.*
Figure 1: Distribution of Age at time of Wellness Assessment

Note. n=5,604, $\bar{x}$=83, s=6.2
Figure 2: Social Dimension of Wellness Item and Person Map

<table>
<thead>
<tr>
<th>Measure</th>
<th>Person Map</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td></td>
</tr>
</tbody>
</table>
| 1       | S          | Item 1= "Has close friends in community."
|         | M          | Item 2= "Feels can count on friends for companionship."
|         | S          | Item 3= "Has opportunity to give and receive affection."
| -1      | M          | Item 5= "Participates as a volunteer on campus."
| -2      |            |      |
| -3      | T          |      |
| -4      |            |      |
| -5      |            |      |

<more> <rare> <less> <frequent>
Note: Level of wellness associated with sample on left. Level of wellness associated with item on right. Items representing more wellness located near top of map, items representing less wellness located near bottom of map. 

T= two standard deviations from the person or item mean. S= one standard deviation from the person or item mean. 

EACH "■" IS 127. EACH "☉" IS 1 TO 126
<table>
<thead>
<tr>
<th>Measure</th>
<th>Person</th>
<th>Map</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>&lt;more&gt;</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>S</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>M</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Item 4 = "Interested or involved in Genealogy?"

Item 3 = "Interested or involved in educational courses?"
Item 1 = "Interested or involved in computerized games?"

Item 6 = "Interested or involved in writing?"
Item 2 = "Interested or involved in crossword puzzles?"
<table>
<thead>
<tr>
<th>&lt;less&gt;</th>
<th>&lt;frequent&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 5: &quot;Interested or involved in reading?&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Note: Level of wellness associated with sample on left. Level of wellness associated with item on right. Items representing more wellness located near top of map, items representing less wellness located near bottom of map.

T = two standard deviations from the person or item mean. S = one standard deviation from the person of item mean. M = mean of person or item distribution. EACH "■" IS 87. EACH "○" IS 1 to 86
Figure 4: Physical Dimension of Wellness Item and Person Map

<table>
<thead>
<tr>
<th>Measure</th>
<th>Person Map</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>--</td>
<td>T</td>
</tr>
</tbody>
</table>
|         |            | Item 4= "Do you feel you're eating a healthy diet?"
| 2       | --         | S    |
| 1       | --         | M    |
| 0       | --         | S    |
| -1      | --         | S    |
| -2      | --         | T    |
| -3      | --         | T    |
| -4      | --         | T    |
| -5      | --         | T    |
| -6      | --         | T    |

Note: Level of wellness associated with sample on left. Level of wellness associated with item on right. Items representing more wellness located near top of map, items representing less wellness located near bottom or map. T= two standard deviations from the person or item mean. S= one standard deviations from the person or item mean. M= mean of person or item distribution. EACH "■" IS 72. Each "○" IS 1 TO 71
**Figure 5: Emotional Dimension of Wellness Item and Person Map**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Person Map</th>
<th>Item</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>-- --</td>
<td>Item 4=&quot;Does stress have a negative effect on our quality of life?&quot;</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>-- --</td>
<td>Item 2=&quot;Do you feel valued?&quot;</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>-- -- S</td>
<td>Item 3=&quot;Do you look forward to being challenged by new opportunities?&quot;</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>-- --</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-- --</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-- --</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-- --</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>-- -- M</td>
<td></td>
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*Note: The table includes measures, person maps, and items related to emotional dimension of wellness.*
Note: Level of wellness associated with sample on left. Level of wellness associated with item on right. Items representing more wellness located near top of map, less wellness located near bottom of map. T=two standard deviations from the person or item mean. S= one standard deviation from the person or item mean. M=mean of person or item distribution. EACH "□" IS 171. EACH "●" IS 1 TO 170
Figure 6: Spiritual Dimension of Wellness Item and Person Map

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</table>
|         |            | Item 2 = "Do you feel your spiritual needs are being met?"
|         |            | Item 1 = "Finds meaning in day-to-day life."
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| 0       | M          | M    |
| -1      | --         | --   |
| -2      | S          | S    |
|         |            | Item 3 = "How do you view your spirituality?"
| -3      | --         | --   |
| -4      | T          | T    |
| -5      | --         | --   |
| -6      | --         | --   |
| -7 | ⋄ | -- | -- |
| -8 | | -- | |
| -9 | ⋄ | -- | -- |

| <less> | <frequent> |

*Note:* Level of wellness associated with sample on left. Level of wellness associated with item on right. Items representing more wellness located near top of map, less wellness located near bottom of map. T=two standard deviations from the person or item mean. S= one standard deviation from the person or item mean. M=mean of person or item distribution. EACH "n" IS 103. EACH "σ" IS 1 TO 102
References


Five Dimensions of Wellness and Predictors of Cognitive Health Protection in Community Dwelling Older Adults: A Historical COLLAGE Cohort Study

Kelley Strout, RN, MSN, PhD Nursing Student, Bouvé College of Health Sciences, Northeastern University

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Abstract

This research examined the association between wellness and cognition among aging adults. Guided by William Hettler’s Dimensions of Wellness, the sample of 5,605 male and female community dwelling adults 60 years and older was drawn from members of the COLLAGE consortium. These subjects complete an annual Wellness Assessment Tool (WEL) and Community Health Assessment (CHA). Hotelling’s $T^2$ revealed that the four dimensions of wellness demonstrated a statistically significant higher mean difference in cognitively healthy older adults compared to cognitively impaired older adults $F(4, 5595)=47.57, p <.001$. Multiple regression analysis revealed that emotional wellness demonstrated the strongest association with cognitive health, followed by physical and spiritual wellness $F(5, 5372)=50.35, p < .001$. Discriminant analysis revealed that dimensions of wellness did not predict cognitively unhealthy older adults. Public campaigns and health care providers should educate older adults about the cognitive health protection benefits of wellness.
The urgency to determine how to prevent cognitive decline is fueled by the growing aging population. The American demographic commonly referred to as “baby boomers,” (those born between 1946 and 1964) represent 20% of the population; they are largest cohort in American history and started turning 65 in 2011 (Hartman-Stein & Potkanowicz, 2003; Federal Interagency Forum on Aging-Related Statistics, 2010). As adults age, their risk for cognitive decline increases significantly (Plassman et al., 2007). As Baby Boomers age, the number of older adults at risk for cognitive decline will rise significantly (Alzheimer’s Association, 2012; Loge & Sorrell, 2010). However, age-related cognitive decline is not inevitable (Harrison, Weintraub, Mesulam, Rogalski, 2012). Some adults over age 80, referred as “super agers” by Northwestern scientists demonstrate cognitive abilities similar to those 20-30 years younger (Harrison, et al., 2012). The question that remains unknown is, if these “super agers” are born with a genetic predisposition for cognitive health, or if they develop resistance to decline throughout the years.

Examining factors that may contribute to cognitive decline resistance is important for aging adults and health care economics. Older adults want to maintain their cognitive ability; losing cognitive abilities is one of the most feared consequences of aging (Phelan, Anderson, LaCroix, & Larson, 2004). Older adults who preserve their cognitive health are less likely to experience premature death, become disabled or hospitalized, depend on paid and unpaid caregivers, and/or live in long-term care settings (McGuire, Ford, & Ajani, 2006). Cognitive health protection for the aging population can lead to significant healthcare savings. In 2011, the cost to care for those with cognitive health decline was $183 billion and that sum is expected to increase to $1.1 trillion by 2050 without interventions or treatments that protect cognitive health in older adults (Alzheimer’s Association, 2012; Langa et al., 2001).
Nurses care for cognitively impaired patients and their families in a variety of settings: community, long-term care, acute care, and primary care. Nurses are well positioned to take a leadership role in protecting cognitive health and preventing cognitive decline. For decades, nurses have been recognized as leaders in promoting health and wellness to prevent disease (Institute of Medicine, 2010; Donaldson & Crowley, 1978). Nurses represent the largest group of health care professionals, and they are being actively called upon to promote wellness in practice. According to the vision statement in the *Future of Nursing Report*, published by IOM (2010), nurses will *intentionally* promote wellness in practice.

Wellness may protect cognition and support resistance to cognitive health decline as adults’ age (Strout & Howard, 2012). Research has unveiled multiple health promoting variables that contribute to cognitive health maintenance in aging adults; however, the best method for protecting cognitive health remains unknown (Strout & Howard, 2012; Alzheimer’s Association, 2012). This gap in knowledge results in part from the methods currently used to conduct cognitive health research. Most research is univariate or bivariate, which limits the ability to determine if one variable is more effective than another at maintaining cognitive health (Strout & Howard, 2012). Therefore, health care providers work with minimal evidence to effectively promote cognitive health in practice. Research that examines variables in a multidimensional wellness structure is needed to advance progress in preventive and intervention strategies targeting cognitive health. The purpose of this research is to examine how multiple dimensions of wellness contribute to cognitive health in a cohort of community dwelling older adults.
Theoretical Framework

Wellness offers an innovative approach to cognitive health research. Although a universal definition of wellness is absent, the concept is described as a multidimensional structure encompassing up to seven dimensions: social, occupational, spiritual, physical, intellectual, environmental, and psychological. (Adams, Bezner, Steinhardt, 1997; Becker, Dolbier, Durham, Glascoff, & Adams, 2008; Hattie et al., 2004; Hettler, 1976; Nenn & Vaisberg, 2010; Witmer & Sweeney, 1992). Dimensions of wellness are interconnected (Hettler, 1976). The influence of positive wellness in one dimension can improve wellness in other dimensions (Adams, Bezner, Steinhardt, 1997). Balance within the dimensions of wellness can lead to higher wellness (Adams, et al., 1997). Imbalance in one dimension can negatively influence other dimensions (Nenn & Vaisberg, 2010). Wellness and holism philosophy align; without examining each dimension, health care providers cannot view patients holistically (Godfrey-Smith, 2003).

The Six Dimensions of Wellness by William Hettler (1976) will guide this research. According to this framework, wellness is an ever-changing process that encompasses six dimensions: social, intellectual, physical, emotional, and spiritual (Hettler, 1976). The Six Dimensions of Wellness interconnect to represent a person (Hettler, 1976). For the purposes of this research, occupational wellness will be excluded because the target population includes adults who are not employed. Research that examines the cognitive protective influence of early, mid, and late life occupation will be examined in future research. The theoretical definitions that will guide this research are listed in Table 1.

The definition of cognitive from the National Institute for Health (2006) provides the theoretical definition for this research. Cognitive health is “not just the absence of disease, but the development and preservation of the multidimensional cognitive structure that allows elderly
to maintain social connectedness, an ongoing sense of purpose, and ability to function independently to permit functional recovery from injury or to cope with residual functional deficits” (Hugh, et al., 2006; p. 3).

**Review of Literature**

Previous research reveals a strong association between cognitive health protection and variables within each of the Six Dimensions of Wellness (Strout & Howard, 2012). Examining cognitive health using a wellness framework provides an opportunity to combine multiple variables into dimensions and determine if one dimension is most closely associated with cognitive health as adults’ age.

**Social wellness.** Social wellness is the ability to form and maintain positive personal and community relationships (Hettler, 1976). High social wellness, demonstrated through positive personal relationships, may protect cognitive health during the aging process (Seeman, Lusignolo, Albert, Berkman, 2001). In a 7.5 year longitudinal study on cohort of 1,189 older adults, strong emotional support from social networks at baseline resulted in better cognitive health compared with those who had lower emotional support from social networks (Seeman, et al., 2001).

In a study by Hakannason et al., (2009) high social wellness resulting from sustained marriage contributed to stronger cognitive performance in older adults. In a cohort of 1,449 individuals, those who lived without a partner at mid-life had nearly twice the risk of developing cognitive impairment in later life compared to those living with a partner. Adults who lived without a partner at mid- and later life had three times the risk for developing cognitive impairment compared to those who lived with a partner during this time (Hakannason, et al. 2009).
High social wellness supported by extra-curricular activities during high school may protect cognitive health in aging adults (Fritsch et al., 2009). Out of 398 individuals, those who participated in two or more extra-curricular activities in high school demonstrated less risk for dementia and mild cognitive impairment in older age (Fritsch et al., 2009).

Large social networks and high social engagement appear to protect adults from age-related cognitive health decline (Zunzunegui, Alvarado, Del Ser, & Otero, 2003). In a sample of 1,540 adults over age 65, those who demonstrated high social integration and large social networks had a lower probability of developing cognitive decline after a four-year follow-up.

High social wellness may protect cognitive function even among older adults with cognitive pathologies (Bennett, Schneider, Tang, Arnold, & Wilson, 2006). Bennett et al. (2006) examined 89 participants who underwent yearly rigorous physical and neuropsychological testing. Participants’ brains were biopsied upon death. Older adults with lower cognitive function on neuropsychological tests revealed more severe levels of pathology on post-mortem analysis. However, social network size modified the association between pathology and cognitive function. Even at more severe levels of global disease pathology, cognitive function remained higher for participants with larger social network sizes (Bennett et al., 2006).

**Intellectual wellness.** Intellectual wellness reflects a commitment to lifelong learning through self-directed behavior that promotes continuous acquisition and creative application of new skills and abilities (Hettler, 1976). Intellectual wellness demonstrated through years of formal education may protect cognitive health in older age. Specifically, 12 or more years of formal education compared to fewer than 12 years of formal education correlated with stronger cognitive health in older age (Koster et al., 2005; Livevre, Alley, & Crimmins, 2008; Plassman,
et al., 2007)

Intellectual wellness demonstrated through participation in cognitively stimulating activities appears to have a remedial effect on cognitive health among those with fewer years of formal education (Gillholly et al., 2007; Lachman, Agrigoroaei, Murphy, & Tun, 2010). In a cross-sectional analysis of 145 participants ages 70-91 Gilholly et al., (2007) found stimulating activities such as computer games, crossword puzzles, and reading reduced the risk of cognitive health decline among those with limited formal education. Lachman, et al., (2010) found similar results. In a cross sectional analysis of 3,343 older adults, those with fewer years of formal education who frequently engaged in cognitive activities had comparable cognitive performance to those with more years of formal education (Lachman, et al., 2010).

**Physical wellness.** Physical wellness is a commitment to self-care through regular participation in physical activity and healthy eating (Hettler, 1976). Physical wellness may protect cognitive health as adult’s age (Chang, et al., 2010; Dik, Deeg, Visser, & Jonker, 2003; Larson et al., 2006; Middleton, Barnes, Lui, & Yaffe, 2010; Angevaren, Vanhees, Nooyens, Wendel-Vos, & Verschuren, 2010; Polidori, et al., 2004; Nurk et al., 2010; Laitinen, et al. 2006; Searmeas et al., 2009).

**Physical activity.** The amount of time and energy spent engaging in physical activity throughout the life span may protect cognitive health in older adults (Chang et al., 2010; Dik et al, 2003; Middleton, et al., 2010; Angevaren et al, 2010). In a cohort of 4,761 participants, those who participated in five or more hours of physical activity per week in the middle of their life were significantly less likely to develop dementia after a 26-year follow-up (Chang et al., 2010). In another population-based cohort of 985 participants aged 62-85, males who reported regular participation in physical activity during adolescence demonstrated stronger cognitive
performance compared to those who reported little or no physical activity during adolescence (Dik et al., 2003). In a prospective study of 1,740 adults ages 65 and older, those who exercised fewer than three times per week were 15 times more likely to develop dementia compared to those who exercised three or more times per week at a six year follow-up (Larson et al., 2006). Middleton, et al. (2010) found that women who engaged in physical activity during adolescence demonstrated the lowest odds for cognitive impairment in older age compared to those who did not engage in physical activity during that time. However, women who reported physical inactivity as adolescents and became active at 30 years of age and 50 years of age demonstrated significantly lower odds of cognitive impairment compared to those who remained physically inactive (Middleton, et al., 2010).

In a longitudinal study of 1,904 healthy adult males and females, frequency of physical activity was not significantly associated with stronger cognitive performance after a six-year follow-up (Angevaren et al., 2010). However, those who increased or maintained intensity of physical activity demonstrated significantly stronger cognitive performance compared to those who declined in intensity (Angevaren, et al., 2010).

**Healthy eating.** Diets rich in fruits, vegetables, and unsaturated fats, and low in saturated fats may protect cognition in aging adults (Nurk et al., 2010; Polidori et al., 2009; Laitinen et al., 2006). In a cross-sectional analysis by Nurk et al. (2010) and Polidori et al. (2009), older adults who consumed higher amounts of fruits and vegetables demonstrated stronger cognitive performance compared to those who consumed lower amounts of fruits and vegetables.

The Mediterranean diet (MeDi) includes daily consumption of fruits, vegetables, cereal, fish, monounsaturated fat, and moderate alcohol intake. Scarmeas et al., (2009) investigated the effect of Mediterranean eating habits on the development of mild cognitive impairment in a
population of 1,393 cognitively intact individuals. Compared to participants with lower consumptions of MeDi foods, those who consumed higher amounts demonstrated less risk of mild cognitive impairment after 4.5-years.

In a prospective 21 year longitudinal analysis of 1,449 adults by Laitinen et al., (2006), individuals who consumed moderate amounts of polyunsaturated and monounsaturated fats in mid-life demonstrated less risk for dementia and Alzheimer’s disease compared to those who consumed less than moderate amounts. Additionally, little to no fat intake and moderate amounts of saturated fat intake increased the risk for dementia and Alzheimer’s disease. Morris, Evans, Bienias, Tangney, & Wilson (2004) found similar results in their prospective longitudinal study of 2,560 older adults. After a six-year follow-up, those who consumed high amounts of saturated fat demonstrated greater cognitive decline compared to those who consumed lower amounts of saturated fat. A larger percent of those who consumed moderate levels of monounsaturated and polyunsaturated fat maintained their cognition compared to those who consumed little or no monounsaturated and polyunsaturated fat (Morris et al, 2004).

**Emotional wellness.** Emotional wellness is the ability to acknowledge personal responsibility for life decisions with emotional stability and positivity (Hettler, 1976). Forstmeier and Maercker (2008) found that adults’ lifetime motivational ability, choosing between alternative goals and working to strive toward achieving the chosen goal, are associated with cognitive health in old age (Forstmeier & Maercker, 2008).

Neuroticism, a characteristic of low emotional wellness, is a personality type that reflects emotional instability, negative emotions, depressive symptoms, and anxiety. Neuroticism may impair cognitive health in older adults (Wilson et al., 2007; Boyle et al., 2010; Wang, 2009). In a 12-year longitudinal analysis by Wilson et al., (2007), individuals with high neuroticism scores
at baseline were 42% more likely to develop cognitive impairment than individuals with low neuroticism. Additionally, the risk of mild cognitive impairment increased 6% for each depressive symptom. In a cross-sectional analysis of 1,415 older adults, those with higher neurotic personalities demonstrated poorer cognitive performance compared to those with lower neurotic personalities (Boyle, et al., 2010). In another longitudinal analysis on 506 older adults by Wang et al. (2009), those with low neuroticism and high extraversion demonstrated lowest risk for developing dementia after a six-year follow-up.

Depressive symptoms may increase the risk of cognitive health decline as adult’s age (Kohler, et al., 2010). In a cohort of 479 adults over age 60, those who demonstrated high depressive symptoms at baseline were at a significantly greater risk of developing cognitive health decline after a six-year follow-up compared to those with no or fewer depressive symptoms.

**Spiritual wellness.** Spiritual wellness is having purpose in life and a value system (Hettler, 1976). Purpose in life and religiosity may protect cognition in older age (Boyle, Buchman, Barnes, & Bennett, 2010; Coin et al, 2010). In longitudinal analysis of 900 older adults by Boyle et al. (2010), older adults with high purpose in life were 2.4 times more likely to remain free of Alzheimer’s disease compared to adults with a low score at a seven year follow-up. Older adults with high purpose in life were one and a half times more likely to remain free of mild cognitive impairment compared to those with a low score. Additionally, older adults with greater purpose in life had higher levels of cognitive performance and declined less rapidly compared to those with low purpose in life (Boyle, et al., 2010).

Among 283 older adults with Alzheimer’s disease, high religiosity at baseline correlated with slower cognitive decline after one year (Coin et al., 2010). Additionally, the low religiosity
group demonstrated a significant increase in behavioral disturbance compared to the high religiosity group (Coin, et al., 201).

**Cognitive health research and dimensions of wellness.** One dimension of wellness contains multiple variables. According to Hetter’s (1976) six dimensional model, each dimension interconnects to represent the whole person. Therefore, examining how dimensions contribute to cognitive health provides an opportunity to examine older adults holistically. Identifying the dimension that reveals the strongest association with cognitive health protection can lead to targeted research and interventions. However, given heterogeneity in the natural history of cognitive decline among affected adults, one cognitive protective intervention may not work for all.

The six dimensions of wellness framework provide an opportunity to examine the combined influence of multiple dimensions on cognitive health protection. Overall wellness is the combination of all five dimensions of wellness. Higher overall wellness may provide stronger cognitive health protection than lower overall wellness. If high overall wellness, or balance within each dimension, is a strong predictor of cognitive health, researchers can develop patient-specific interventions targeted to dimensions revealing low wellness to increase overall wellness. The combined effect of targeting interventions to the dimension of wellness that benefits the majority while also assessing older adults individually will provide the best cognitive health protection for all aging adults.

Much of the previous wellness research has not been conducted using a multidimensional framework. Characteristically, research exclusively targets the physical dimension of wellness with a focus on improving nutrition and physical fitness (Brubaker, Witta, & Angelopoulos, 2003; Hatch & Lusardi, 2010; Milani, 2009; Palumbo, Wu, Shaner-McRae, Rambur, &
McIntosh, 2012; Turner, Thomas, Wagner, & Moseley, 2008). Wellness is commonly, and perhaps mistakenly operationalized in research using the SF-36 (Brubaker et al., 2003; Chafetz et al., 2008; Hatch & Lusardi, 2010; Joslin, Lowe, & Peterson, 2006; Milani, 2009; Palumbo et al. 2012; Turner et al., 2008). Although the SF-36 is a proven valid and reliable measurement tool across general and specific populations, the tool is designed to compare the burden of disease and differentiate health benefits of specific treatments or interventions (Ware, 2011). The SF-36 is a self-report measure of an individual’s health status. The SF-36 does not examine the multidimensional concept of wellness. This research will use a multidimensional wellness measurement tool specifically designed for older adults.

Method

The overall objective of this research is to determine how multiple dimensions of wellness contribute to cognitive health in community dwelling adults age 60 and older. This research study answered two research questions: 1) Which of the five dimensions of wellness (social, intellectual, physical, emotional, and spiritual) is most strongly associated with cognitive health among community dwelling older adults? And, 2) Do the dimensions of wellness demonstrate a statistically significant mean difference between cognitively impaired and cognitively healthy older adults? The Institutional Review Boards at Northeastern University and University of Phoenix approved this research.

Sample. Participants from the COLLAGE consortium who completed a Wellness Assessment Tool (WEL) between the years 2007 and 2012 were included in the analysis. COLLAGE is a national member consortium of continuing care retirement communities (CCRC). COLLAGE has two goals: (1) improve the quality of life for older adults; and (2) establish COLLAGE as the leading model for keeping older adults across all socio-economic levels active.
and independent (COLLAGE, The Art and Science of Healthy Aging, 2008). Members of COLLAGE complete three yearly interRAI assessment tools that provided the data for this research: The Community Health Assessment (CHA), the Wellness Assessment Tool (WEL), and the Functional Supplement (FS). Rigorous research and testing, nationally and internationally, have established the reliability and validity of interRAI assessment tools (Hirdes, et al., 2008). The interRAI suite demonstrates national and international internal, test re-test, and inter-rater reliability as well as face, content, criterion and predictive validity (Hirdes et al., 1999; Hirdes, et al., 2008).

The original sample contained 7,985 adults. Adults younger than age 60 who were not living in the community at the time of the assessment were excluded. The final sample includes 5,604 community-dwelling male and female adults from 72 continuing care retirement communities located in 24 states.

**Measurement.** Wellness was measured using the WEL. The WEL motivates older adults living independently in the community to develop healthy aging plans and provides data to the community and organizations to develop and evaluate programs and services. The WEL provides older adults an individualized assessment that allows them to express interest, or intention to participate in wellness activities. The complete tool contains 113 items that cover nine core areas: exercise and physical fitness, nutrition, social relationships, emotional, spiritual, practices affecting health and wellbeing, recreation, sleep, and goals for wellness service planning. The assessment data are collected annually through a one-on-one conversation with a qualified and trained staff member. The trained staff member guides the older adult in a conversation and learns about his or her involvement, preference, and satisfaction with items covered on the WEL. Older adults have an option of completing a paper version of the WEL independently; however,
staff members always review and discuss the results with the adult and enter the data into a computerized database (COLLAGE, The Art and Science of Healthy Aging, 2008).

Scores for five dimensions of wellness were created from 22 items on the WEL that align with the Hettler’s (1976) theoretical definitions. Table 2 lists the wellness dimension and the corresponding item from the WEL. Items on the WEL represent nominal and ordinal level measurement with many dichotomous variables. To convert ordinal, nominal, and dichotomous data into meaningful and mathematically comparable interval data, Rasch analysis using Master’s Partial Credit model was conducted (Bond & Fox, 2001; Masters, 1988). Rasch analysis offers the ability to compute the degree or magnitude of wellness a person possesses using a logit score (Andrich, 1988). A logit is determined by examining the subject’s ability with item difficulty (Andrich, 1988). The person’s ability was the level of wellness the person demonstrated, and the item threshold was the level of wellness associated with item. The logit in the Rasch analysis is the probability of wellness based on the level of wellness a person demonstrates. Person logit values given their response across items within each dimension on the WEL were computed. These logit values for each item within each dimension were summed to create a total score for each of the five dimensions of wellness. Additional details about the construction of the logit values that created the dimensions of wellness scores can be found elsewhere (Strout, 2013).

Cognition was measured using the Cognitive Performance Score (CPS). The Cognitive Performance Scale (CPS) is generated from items on the CHA the WEL and the Functional Supplement (FS). Items that create the CPS and their corresponding instrument are listed in Table 3. CHA is a core COLLAGE tool that measures health and wellness including: cognition, communication, vision, mood, psychosocial well-being, functional status, continence, disease
diagnosis, health conditions, oral and nutrition status, medications, treatments and procedures, social relationships, and environment assessment. The FS is designed to assess impaired residents and will trigger based on select CHA responses to collect additional information in the areas of cognition, mood and behavior, functional status, continence, disease diagnoses, health conditions, oral and nutritional status, skin condition, medications, treatments and procedures, responsibility, social supports, environmental assessment, and discharge potential and overall status. CPS range from 0-5. CPS “0” equals “cognitive health” or no impairment. CPS “5” equal “severely impaired cognition.” The CPS is a valid and reliable measure of cognition that correlates highly with the Mini Mental Status Examination (Morris, et al., 1994).

Results

Figure one displays the age distribution for this sample; the average age of 5,604 community-dwelling older adults in this sample was 83 years. Seventy percent of the sample was female and 30% male. Two percent completed eight to eleventh grade, 12% graduated high school; 5% trade school; 15% attended some college; 34% earned a Bachelor’s Degree; and 32% earned a Graduate degree or above. Eighty-six percent of the sample was Caucasian, and 14% represented Hawaiian, Black, Asian, American Indian, Hispanic, or other. Seventy-eight percent of the population had intact cognition, 13% borderline intact cognition, 5% mild impairment, 3% moderate impairment, 1% severe impairment.

Multiple regression was used to address the first research question 1) Which of the five dimensions of wellness (social, intellectual, physical, emotional, and spiritual) is the most strongly associated with cognitive ability among community dwelling older adults? After entering social, intellectual, physical, emotional, and spiritual wellness scores, the total variance explained by the model was 4% ($R^2 .043$), $F (5, 5372)=50.35, p < .001$. Emotional wellness
demonstrated the strongest association with cognitive ability (beta = -.158, p < .0001), then physical wellness (beta, -.070, p < .000), then spiritual wellness (beta, -.044, p < .0001). Intellectual and social wellness were not significantly associated with cognitive ability. Because age and education are strongly associated with cognitive ability (Koster et al., 2005; Livevre, et al., 2008; Plassman, et al., 2007), age and education were entered in model two to determine how much of the unique variance the dimensions of wellness explained after including age and education. The total variance explained by model two was 6% (R^2 = .063), F (7, 5378) = 52.020, p < .0001. In model two, emotional, physical, and spiritual dimensions of wellness remained statistically significant contributors to cognition. Table 4 presents the multiple regression results and displays how each dimension contributed to cognition.

To determine the relationship between the five dimensions of wellness (social, intellectual, physical, emotional, and spiritual) and cognitive health, discriminant analysis was conducted. To establish cognitive groups and determine membership, CPS scores were re-coded to 0=cognitively healthy and 1=cognitively impaired. In the final sample, 22% were cognitively impaired and 78% were cognitively healthy. Emotional, physical, social, and spiritual wellness was statistically significant and predicted 78.1% correct classification (Chi-square = 187.16, df = 4, P < .0001). Intellectual wellness was not statistically significant. The standardized discriminant function coefficients in order of predictive power were: Emotional wellness (.696), physical wellness (.415), spiritual wellness (.311), and social wellness (.203). The five dimensions of wellness predicted membership to the cognitively impaired group for 3 of 1,222 adults compared to 4,373 out of 4,378 cognitively healthy adults. These findings may be related to the high percentage of older adults receiving a CPS score of “0” (78%), or “1” (13%), the distinction
between “0” and “1” may not be sensitive enough to establish group membership using the dimensions of wellness.

Multivariate analysis of variance (Hotelling $T^2$) was applied to answer the second research question, 2) Do the combined influence of the five dimensions of wellness demonstrate a significant mean difference between cognitively impaired and cognitively healthy older adults? CPS scores were re-coded to 0=cognitively healthy and 1=cognitively impaired and entered as the independent variable, dimensions of wellness were entered as dependent variables. Cognitively healthy adults demonstrated statistically significant higher mean social, physical, emotional, and spiritual wellness than cognitively impaired older adults $F (4, 5595)=47.57$, $p<.0001$. Intellectual wellness was not a statistically significant predictor of cognitive health. The amount of variance explained was low (partial eta squared=.03) with a power=1.00 given the large sample size. Table 5 presents how each dimension of wellness contributes to the overall multivariate F results. The cognitively impaired group had statistically lower mean wellness scores than the cognitively healthy group.

Discussion

Dimensions of wellness appear to protect cognition in older adults. The results support the interconnectedness of each dimension of wellness, and the theory that the combined influence of multiple dimensions may provide the strongest cognitive health protection as adults’ age (Strout & Howard, 2012; Fratiglioni, Paillard-Bord, Winblad, 2004; Karp, Paillard-Borg, Wang, Silverstein, Winblad, & Fratiglioni, 2006). Cognitively healthy older adults in this research study demonstrated statistically significant higher mean scores in emotional, physical, spiritual, and social dimensions of wellness compared to cognitively impaired older adults. After examining the influence of each dimension, emotional wellness demonstrated the strongest
association with cognitive health among older adults. Physical, and spiritual wellness was also associated with cognitive health among older adults. Intellectual wellness did not demonstrate a statistically significant predictor to cognitive health among older adults. Dimensions of wellness did not demonstrate a significant prediction for cognitively impaired older adults. After accounting for the variance of age and education, emotional wellness demonstrated the strongest association of cognitive ability among this sample, followed by physical and spiritual wellness.

The results of this research align with previous studies that support emotional wellness as a cognitive health protective factor. Positive emotional qualities, strong motivational abilities, and fewer depressive symptoms are related to stronger cognitive health among aging adults (Forstmeier & Maercker, 2008; Wilson, et al., 2007; Boyle et al., 2010; Wang et al., 2009; Kohler, et al., 2010). Physical activity and healthy eating comprise the physical dimension of wellness in this research. Physical wellness was associated with higher cognitive abilities in this study. These results are supported by previous research that found time and energy spent engaging in physical activity; and consuming a healthy diet both protect cognition in aging adults (Chang et al, 2010; Dik et al., 2003; Angevaen et al., 2010; Nurk et al., 2010; Polidori et al., 2009; Laitinen, et al., 2006; Scarmeas, et al., 2009; Fratiglioni, Paillard-Borg, & Winblad, 2004; Lee, Back, Kim, Na, Cheong, Hong, Kim, 2010). Finally, previous research suggests that purpose in life and high religiosity protects cognition as adults’ age (Boyle et al., 2010; Coin et al., 2010). This research suggests spiritual wellness demonstrates cognitive protective factors among aging adults.

Intellectual and social wellness did not demonstrate statistically significant contributions to cognitive ability among older adults in our sample. Although previous studies suggest that strong emotional support at baseline protected cognition after a 7.5 year follow up and larger
social network size protects cognitive health after post-mortem analysis (Seeman, et al., 2001; Bennett, et al., 2006), the findings in this study did not support social wellness a significant contributor to cognitive health protection. However, this study did not examine adults longitudinally; therefore, the cognitive health protective ability of social wellness may not manifest in cross-sectional designs. Research by Green, Robok, and Lyketos (2008) found that larger social networks was associated with higher scores on the Mini Mental Status Examination (MMSE) on cross-sectional analysis; however, after an 11 year follow-up, there was no significant association between baseline social networks and MMSE scores. Results from Green et al., (2008) suggest that smaller social network sizes may be the consequence of cognitive health decline, rather than the cause of the cognitive health decline. This research did not include a variable that examined the size of adult’s social network, which may be considered for future analysis.

The intellectual wellness score in this research was a product of summing logit values from responses to items representing six intellectually stimulating activities. These activities demonstrated cognitive protective factors in previous research. Gilholly et al., (2007) and Lachman, et al. (2010) found that cognitive stimulating activities protect cognition as adults ‘age. However, our findings did not support the findings of previous research. Over 65% of adults examined in this analysis earned a Bachelor’s degree or higher. Additionally, 78% of the adults in this sample demonstrated cognitive health. Previous research suggests that twelve or more years of formal education is positively correlated with cognitive health as adult’s age (Koster et al., 2005; Livevre, et al., 2008; Plassman, et al., 2007). The influence of the educational attainment of our sample may override the benefit of cognitively stimulating activities.
Limitations

The sample that provided the data for this study was homogenous; 78% of the population was cognitively healthy; 80% advanced their education beyond high school; 70% of the sample was female. Examining a population with stronger heterogeneity would strengthen the ability to profile older adults’ dimensions of wellness. However, despite the limitations associated with deriving statistically significant outcomes from a homogenous sample, this sample provides evidence that dimensions of wellness are associated with cognitive health as adult’s age. The adults in this sample are cognitively intact, living independently in the community, and demonstrate high wellness in each dimension compared to those who are cognitively impaired. The final limitation in our study is the method used to measure cognition. The CPS ranges from 0-5 (0=cognitively intact and 6=severe impairment), this narrow range may not be as sensitive as other cognitive measurement methods; however, the CPS does correlate strongly with the MMSE (Morris, et al., 1998).

Implications

Nurses should consider taking leadership roles in interdisciplinary public health campaigns that educate older adults about the cognitive health benefits of emotional, physical, and spiritual wellness. Older adult’s desire to maintain their cognition as they age; losing cognitive abilities is one of the most feared consequences of aging (Phelan, et al., 2004). Older adults’ believe that cognitive ability is associated with living well (Laditka, et al., 2009). Yet, older adult’s report that they do not read or hear about strategies to help them protect their cognition (Friedman, et al., 2009). Creative campaigns to promote cognitive health protection by improving emotional, physical, and spiritual wellness may lead to greater cognitive protection for the majority. Nurses and health care providers should assess patients’ holistically. If an
older adult is not willing or able to improve their emotional wellness, providers can suggest interventions or strategies from the physical or spiritual wellness dimensions.

**Future Research**

Future research that examines the protective influence of all six dimensions of wellness on cognitive health as adults’ age using a longitudinal-prospective design is needed. Researchers should include subjects who are cognitive healthy at baseline and follow them over time. Those who are able to remain cognitively healthy should be compared to those who decline. The dimension of wellness that demonstrates the strongest protective ability over time should be examined. Low-level wellness in one or more dimension may be a prodromal symptom of impaired cognition rather than a protective factor (Green et al., 2004).
Table 1

*Theoretical Definitions for 5 Dimensions of Wellness*

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Wellness</td>
<td>Ability to form and maintain positive personal and community relationships</td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>Commitment to lifelong learning through continuous acquisition of skills and knowledge</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>Commitment to self-care through regular participation in physical activity and healthy eating</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>Ability to acknowledge personal responsibility for life decisions and their outcomes with emotional stability and positively</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>Having purpose in life and a value system</td>
</tr>
</tbody>
</table>

Table 2  
*Questions from WEL that Align with Hettler’s Social, Intellectual, Physical, Emotional, and Spiritual Wellness Theoretical Definitions*

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>Items from WEL</th>
</tr>
</thead>
</table>
| Social Wellness       | Has close friends in community?  
                        | Feels can count on friends for companionship  
                        | Has opportunity to give and receive physical affection  
                        | Feels community environment is supportive, nurturing  
                        | Participate as volunteer on campus or in community |
| Intellectual Wellness | Interested or involved in computerized games  
                        | Interested or involved in cross word puzzles  
                        | Interested of involved in educational courses  
                        | Interested of involved in genealogy  
                        | Interested or involved in reading  
                        | Interested or involved in writing |
| Physical Wellness     | Participates in Fitness/Exercise Program  
                        | Weight: Do you consider yourself?  
                        | Number of glasses of fluid consumed daily  
                        | Do you feel you are eating a healthy diet? |
| Emotional Wellness    | How satisfied are you with your life as a whole in the last 3 days?  
                        | Do you feel valued?  
                        | Do you look forward to being challenged by new opportunities?  
                        | Does stress have a negative effect on your quality of life? |
| Spiritual Wellness    | Finds meaning in day-to-day life  
                        | Do you feel your spiritual needs are being met?  
                        | How do you view your spirituality? |

*Note. WEL = Wellness Assessment Tool*
Table 3
*Items from CHA, WEL, FS that Generate CPS Score*

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA</td>
<td>Is short-term memory OK?</td>
</tr>
<tr>
<td></td>
<td>What is the level of cognitive skills for daily decision-making?</td>
</tr>
<tr>
<td></td>
<td>What is the level of ability in making self-understood?</td>
</tr>
<tr>
<td>WEL</td>
<td>How would you rate your memory?</td>
</tr>
<tr>
<td></td>
<td>Are you interested in a program to improve your memory?</td>
</tr>
<tr>
<td>FS</td>
<td>Is procedural memory OK?</td>
</tr>
<tr>
<td></td>
<td>What is the level of ability in eating?</td>
</tr>
</tbody>
</table>

*Note. CHA=Community Health Assessment; WEL=Wellness Assessment Tool; FS=Functional Supplement; CPS=Cognitive Performance Score.*
Table 4

*Regression Analysis Predicting Cognitive Health from Dimensions of Wellness, Age, and Education*

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Model 1</th>
<th></th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>SEM</td>
<td>b</td>
<td>SEM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>-0.158</td>
<td>.007 ***</td>
<td>-0.137</td>
<td>.007 ***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>-0.032</td>
<td>.012</td>
<td>-0.035</td>
<td>.012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>-0.070</td>
<td>.012 ***</td>
<td>-0.059</td>
<td>.012 ***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Wellness</td>
<td>-0.033</td>
<td>.011</td>
<td>-0.025</td>
<td>.011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>-0.044</td>
<td>.004 ***</td>
<td>-0.052</td>
<td>.005 ***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>0.115</td>
<td>.002 ***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td>-0.078</td>
<td>.008 ***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.043</td>
<td>0.063</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>50.355 ***</td>
<td>52.020 ***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note:* *** p < .001, SEM=Standard Error of Mean
Table 5
Multivariate Analysis of Variance (Hotelling T2) Contribution of Dimensions of Wellness to Overall Multivariate F-Results

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>$F_{(1, 5598)}$</th>
<th>p value</th>
<th>Partial Eta Squared</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional</td>
<td>122.680</td>
<td>0.0001***</td>
<td>0.020</td>
<td>1.000</td>
</tr>
<tr>
<td>Physical</td>
<td>60.010</td>
<td>0.0001***</td>
<td>0.010</td>
<td>1.000</td>
</tr>
<tr>
<td>Spiritual</td>
<td>38.430</td>
<td>0.0001***</td>
<td>0.007</td>
<td>1.000</td>
</tr>
<tr>
<td>Social</td>
<td>16.490</td>
<td>0.0001***</td>
<td>0.003</td>
<td>0.980</td>
</tr>
<tr>
<td>Intellectual</td>
<td>1.238</td>
<td>0.266</td>
<td>0.000</td>
<td>0.199</td>
</tr>
</tbody>
</table>

Note. ***p<0.001
Figure 1: Distribution of Age at time of Wellness Assessment

Note. n=5,604, $\bar{x}$=83, s=6.2
References


older adult’s media awareness and communication needs on how to maintain a healthy brain. *Gerontologist, 49,* S50-S60.


Chapter 5: Cognition and Wellness Among Community Dwelling Older Adults, Conclusions and Implications

Kelley Strout

Northeastern University
Cognition and Wellness Among Community Dwelling Older Adults, Conclusions and Implications for Nursing Research and Practice

Protecting cognitive health decline is a top priority as the largest cohort in American history begins entering old age (Hartman-Stein & Potkanowicz, 2003; Federal Interagency Forum on Aging-Related Statistics, 2010). As adult’s age, their risk for cognitive health decline increases (Plassman, et al., 2007). Adults whose cognition declines are at greater risk for developing more severe cognitive disorders such as dementia and Alzheimer’s’ Disease (Alzheimer’s Association, 2012). Cognitive health differs from cognitive disorders because it does not focus on a disease. According to the National Institute for Health (2006), cognitive health is “not just the absence of disease, but the development and preservation of the multidimensional cognitive structure that allows elderly to maintain social connectedness, an ongoing sense of purpose, and ability to function independently to permit functional recovery from injury or to cope with residual functional deficits” (Hugh, et al., 2006; p. 3). Although the risk for cognitive decline increases with age, some adults referred to as “Super Agers” demonstrate cognitive abilities similar to those 20-30 years younger (Harrison, Weintraub, Mesulam, Rogalski, 2012), which highlights that age-related cognitive health decline is not inevitable.

Theoretical Framework

This research hypothesized that those who demonstrate high wellness may develop resistance from age-related cognitive decline. According to William Hettler’s (1976) Six Dimensions of Wellness theoretical framework, wellness is a complex and ever changing structure where individuals’ strive to achieve their full potential. Wellness represents the whole person and includes six dimensions: occupational, social, intellectual, physical, emotional, and
spiritual (Hettler, 1976). Each dimension includes multiple variables, which are listed in Table 1. The six dimensions of wellness interact; high wellness in one dimension may compensate for low wellness in another dimension. Balance within the dimension may serve the individual better than imbalance within the dimensions (Hettler, 1976).

**Review of Literature Findings**

A review of literature supported the hypothesis that one or more dimension of wellness may protect adults from age-related cognitive decline (Strout and Howard, 2012). The literature review supported Hettler (1976) theory that high wellness in one dimension may compensate for low wellness in another dimension (Karp et al., 2006; Lachman, Agrigoroaei, Murphy, & Tun, 2010). Adults with high intellectual wellness demonstrated through more years of formal education were more likely to secure occupations that require high cognitive ability (Karp et al., 2006; Lachman et al., 2010). High wellness in two or more dimensions may serve as a greater cognitive protection than high wellness in one dimension (Fratiglioni, Paillard-Borg, and Winblad, 2004; Hartman-Stein and Potkanowicz, 2003; Hugh, et al., 2006; Lee et al., 2010). High wellness in one dimension may compensate for low wellness in another dimension. Adults with fewer years of formal education demonstrated comparable cognitive abilities as those with more years of formal education if they worked in occupations that required self-direction (Karp et al., 2006). High emotional wellness may compensate for low social wellness. Older adults with small social networks demonstrated similar cognitive abilities as those with large social networks if they had low-neurotic personalities (Wang et al., 2009).
Application of the Rasch Model to Measure Five Dimensions of Wellness in Community Dwelling Older Adults

Research that examines how variables within each dimension of wellness protect cognition as adult’s age is limited because methods to measure wellness in multiple dimensions among aging adults are unavailable (Adams, Bezner, Garner, & Woodruff., 1998; Adams, Bezner, Steinhardt, M, 1997; Becker, Whetstone, Glascoff, & Moore, 2008; Becker, Dolbier, Durham, Glascoff, & Adams, 2008; TestWELL Online Assessment Tools, 2008; Hattie, Myers, & Sweeney, 2004). Current research is univariate or bivariate which limits the ability to determine if one specific dimension offers greater cognitive health protection than another (Strout and Howard, 2012). For example, one variable within the social wellness dimension appears to protect cognition as adults’ age: Those who remain married throughout life are less likely to experience cognitive health decline than those who divorce (Hakansson et al, 2009). Intellectually stimulating activities represent one variable within the intellectual dimension of wellness that appears to protect cognition as adult’s age (Gilholley et al., 2007). However, since these studies only examine one specific variable, researchers are unable to determine if social or intellectual wellness offer greater cognitive health protection. The ability to combine multiple variables that represent each dimension of wellness using a valid and reliable measurement tool, specifically designed for older adults, provides an opportunity to “profile” older adults and determine if one specific dimension of wellness provides greater cognitive health protection than another.

The first aim of this research was to develop a method to measure multiple dimensions of wellness among older adults. Twenty-two wellness variables that correspond with five dimensions of Hetter’s (1976) wellness framework were selected from the Wellness Assessment
Tool (WEL) of the InterRAI assessment system. The variables that correspond to each dimension of wellness are listed in Table 2. The sample included 5,604 male and female community-dwelling older adults who are members of the COLLAGE consortium. Adults not living in the community and those younger than age 60 were excluded. Rasch analysis with Master’s Partial Credit Method was applied to each variable within five dimensions of wellness to compute logit scores for each item. A logit is a measure of a person’s ability with the level of item difficulty (Andrich, 1988). In this research, the person’s ability was the level of wellness he or she demonstrated, and the item difficulty was the level of wellness associated with the item.

The partial credit method is an extension of traditional Rasch analysis. In traditional Rasch analysis, only one “correct” and one “incorrect” response is permitted (Masters 1982; Andrich, 1988). Master’s Partial Credit Method awards partial credit for success on items closer to the “best” response (Master’s 1988). This method provides a more precise measure of a person’s wellness ability compared to the “pass/fail” method (Masters, 1982). For example, one of the items within the WEL that was used in this analysis is related to physical activity. Participants were asked, “Participates in Fitness/Exercise Program?” The response options were: “None,” “Less than 2 hours,” “Less than 3 hours,” “Less than 4 hours,” and “4 hours or more.” The option, “four hours or more” represents the “best” response. However, option, “less than 4 hours” is better than “less than 2 hours.” Without applying Master’s Partial Credit method, only those who participated in four or more hours of physical activity would receive credit, and those participating in any other amount of activity would not receive credit.

The results of the Rasch analysis with Master’s Partial Credit Method produced logit values for each variable within each dimension of wellness. This method to measure wellness proved successful. The item reliability for each of the variables within each dimension of
wellness demonstrated perfect scores of “1.” These outcomes support the construct validation for the items that constructed the dimensions of wellness. Three items did not fit the model as well as others. These items include, item five within the social dimension, “feels community environment is supportive;” item two and four within the emotional dimensions, “Do you feel valued? And “Does stress have a negative effect on your quality of life?” and item three from the spiritual dimension, “How do you view your spirituality?” The fit of these items may be related to the homogenous sample used in the analysis. The sample represented a highly educated cohort with strong cognitive ability. Future analysis should include adults with greater variability.

The Rasch analysis was limited by the homogenous sample. Rasch analysis reveals stronger person reliabilities when the sample demonstrates greater variance (Linacre, 2012). However, the goal of this research was to examine community dwelling older adults and measure how this independent group of individuals demonstrates wellness. Despite the limitations, only a few items demonstrate poor fit in the analysis. The item reliability was high, which support the construct validation for each dimension. This is the first study to measure wellness in multiple dimensions using a tool specifically designed for older adults. Finally, Rasch analysis with Master’s Partial Credit offers a more precise measure of wellness compared to current tools used to measure wellness.

Four tools currently used to measure wellness, Perceived Wellness Survey (PWS), Salugentic Wellness Promotion Survey (SWPS), Lifestyle Assessment Questionnaire (LAQ), and 5-Factor Wellness, follow traditional scoring methods. Each tool measures a person’s wellness by awarding a “1” if a subject provides a positive response to an item related to wellness, and they receive a “0” if they provide a negative response (Adams, et al., 1998; Adams,
et al., 1997; Becker, et al., 2008; Becker, et al., 2008; TestWELL Online Assessment Tools, 2008; Hattie, et al., 2004). This method contains limitations because it does not account for the person’s level of wellness ability, or the level of wellness associated with the item. Rasch analysis using Master’s Partial Credit Method overcomes these limitations.

**Five Dimensions of Wellness and Predictors of Cognitive Health Protection in Community Dwelling Older Adults: A Historical COLLAGE Cohort Study**

Rasch analysis provided a method to measure wellness and examine the association between wellness and cognition to determine which dimension of wellness is most strongly associated with cognitive health among aging adults. The sample included 5,605 community dwelling male and female adults over age 60 who are members of the COLLAGE consortium. The research was guided by William Hettler’s Six Dimensions of Wellness theoretical framework (1976). Five dimensions of wellness were examined: social, intellectual, physical, emotional, and spiritual (Hettler, 1976). Occupational wellness was excluded because of sample included retired adults. Wellness was measured using 22 items from the WEL. The logit values for each item associated with five dimensions of wellness were imported from Winsteps 3.75 to SPSS version 20. Scores for each of the five dimensions of wellness were computing by summing the logit values for each item within the corresponding dimension. The items and their corresponding dimension of wellness are listed in Table 2. Cognition was measured using the Cognitive Performance Scale (CPS). The CPS is generated from responses to items from a Community Health Assessment (CHA), WEL, and Functional Supplement (FS). Each measurement tool is part of the interRAI assessment suite and demonstrates strong validity and reliability (Hirdes, et al, 2008) The items that generate the CPS score are listed in Table 3. CPS scores range from 0-5, 0=cognitively healthy and 5=severe impairment.
Data were analyzed using multiple regression, discriminant analysis, and multivariate analysis of variance (Hotelling $T^2$). After entering age and education, results from the multiple regression revealed emotional wellness was most strongly associated with cognitive ability (beta=-0.158, $p<.001$), followed by physical wellness (beta, -0.070, $p<.001$), followed by spiritual wellness (beta, -0.044, $p<.001$). Discriminant analysis identified emotional, physical, social, and spiritual wellness statistically significant and predictors of 78.1% correct classification for cognitively healthy adults: Chi-square=187.16, df=4, $p<.001$. The predictive power of the statistically significant dimensions revealed: Emotional wellness (.696), physical wellness (.415), social wellness (.203), and spiritual wellness (.331). The analysis did not correctly classify cognitively impaired older adults. The results from the Multivariate analysis of variance (Hotelling $T^2$) highlighted the influence of the combined dimensions of wellness. Those demonstrating cognitive health demonstrated statistically significant higher mean scores when the combined influence of all dimensions was examined, $F (4, 5595)=47.57$, $p<.001$. Intellectual wellness was not statistically significant in any of the analysis.

The results of this analysis support the hypothesis that dimensions of wellness appear to protect cognition as adults’ age. Those demonstrating cognitive health had statistically significant higher mean wellness scores when the combined influence of dimensions was examined. These findings support the dimensions of wellness theory and the hypothesis that the influence of multiple dimensions may provide the strongest cognitive health protection (Hettler, 1976; Howard and Strout, 2012).

Emotional wellness demonstrated the strongest predictor of cognitive health even after examining the influence of age and education. These findings align with research that suggest variables within the emotional dimension of wellness, such as positive personalities and strong
motivational abilities, protect cognitive health as adult’s age (Forstmeier & Maercker, 2008; Wilson, et al., 2007; Boyle, et al., 2010; Wang et al., 2009). Physical wellness was associated with cognitive health protection, which is also supported by previous research that found time and energy participating in physical activity, and consuming a health diet protects cognition as adult’s age (Chang et al., 2010; Dik., Deeg, Visser, & Jonker, 2003; Angevaen, Vanhees, Nooyens, Wendel-Vos, & Verschuren., 2010; Nurk et al., 2010; Polidori et al., 2009; Laitinen, et al., 2006; Scarmeas, et al., 2009). High spiritual wellness was associated with cognitive health in this research. Findings from Boyle, Buchman, Barnes, & Bennett (2010) and Coin et al. (2010) support these findings, they found that high purpose in life and high religiosity protect cognition as adult’s age.

Intellectual wellness did not demonstrate statistically significant contributions to cognitive health in this research. These findings do not align with previous research that suggest intellectually stimulating activities such as reading, crossword puzzles, or education courses protect cognition (Gilholly et al, 2007 and Lachman, 2010). The sample in this research study included highly educated adults with strong cognitive abilities. Over 65% of the adults earned a minimum of a Bachelor’s Degree and 78% scored a “0” on the CPS indicating that they are cognitively healthy. Since previous research suggests that higher levels of formal education demonstrate strong positive correlations with cognitive abilities (Koster et al., 2005; Livevre, Alley, & Crimmins, 2008; Plassman, et al., 2007), the level of education among this sample may have limited the ability to examine the influence of intellectually stimulating activities. In previous research, those with higher levels of education were more likely to participate in cognitively stimulating activities compared to those with fewer years of formal education (Giholly et al, 2007). Examining a population with a wider variance of education and
participation in cognitively stimulating activities may reveal stronger findings.

In previous research, high social wellness protected cognitive health as adults’ age (Seeman, Lusignolo, Albert, & Berkman, 2001 and Bennett, Schneider, Tang, Arnold, & Wilson, 2006). Findings from this research did support social wellness as a statically significant predictor of cognitive health in the discriminant analysis. However, in the multiple regression analysis, social wellness was not a statistically significant predictor of cognitive health. Green, Robok, and Lyketsos (2008) examined of the influence of social networks on cognitive health protection. In their cross-sectional analysis, large social networks were positively correlated with higher scores on Mini Mental Status (MMSE) examinations. However, after a 10-year follow-up, large social networks at baseline did not protect cognitive ability as adult’s age. These findings suggest that social wellness may be a consequence of decline, rather than a cause of the decline (Green, et al., 2008).

Limitations

This research was limited by the homogenous sample. However, the purpose of the research was to examine older adults who live independently in the community. These adults have not experienced enough functional and cognitive declines to require full-time care, or transfer to a long-term care facility. This population offers researchers the ability to explore the variables of wellness in multiple dimensions and determine how wellness supports older adults’ ability to remain cognitively healthy and live independently in the community. The CPS generates limitations in this research because this tool provides a narrow range to measure cognition. The scale ranges from 0-5, which may not be as sensitive in determining decline. However, the CPS correlates positively with the Mini Mental Status Examination (MMSE) a commonly used method to measure cognition among aging adults (Morris et al., 1994).
Implications and Future Research

The outcomes of this research provide a foundation to measure wellness among aging adults. Wellness measurement tools are limited (Adams et al., 1998; Adams, et al., 1997; Becker, et al., 2008; Becker, et al., 2008; TestWELL Online Assessment Tools, 2008; Hattie, et al., 2004). Without valid and reliable methods to measure wellness among aging adults, nurses and other health care providers cannot intentionally promote wellness and address the Center for Disease Control and Prevention’s (CDC) mission to protect cognition as adults’ age and the IOM (2011) mission to intentionally promote wellness (CDC, 2007; IOM, 2011). Rasch analysis with Master’s Partial credit method offers a precise method to quantify wellness among aging adults by producing mathematically comparable logit values (Andrich, 1988; Master’s 1982). Future analysis should be conducted using the WEL and applying Rasch analysis with Master’s Partial Credit Method to select items that align with all six of Hettler’s (1976) dimensions of wellness. Research should examine more items within each dimension and the sample should include adults with a greater range of wellness and cognitive ability.

Future research should examine how dimensions of wellness predict cognitive health using prospective longitudinal design. Researchers should include cognitively healthy adults at baseline and follow them over several years. Than they can examine those who were able to remain cognitively healthy over time and determine how wellness influenced their outcome. This method would allow researchers to determine if wellness is a cause of cognitive health, or a consequence of cognitive health.

Nurses should work with other members of health care teams to create public health campaigns to educate the upcoming aging population about the influence of wellness on cognition. Older adult’s want to protect their cognition, losing cognitive abilities is one of the
The most feared consequences of aging (Phelan, Anderson, LaCroix, & Larson, 2004). The findings suggest that emotional wellness provides the strongest cognitive health protection, followed by physical, and spiritual wellness. Future research should examine interventions to improve emotional, physical, and spiritual wellness for aging adults.
Table 1

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<thead>
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<tbody>
<tr>
<td>Social Wellness</td>
<td>Ability to form and maintain positive personal and community relationships</td>
</tr>
<tr>
<td>Intellectual Wellness</td>
<td>Commitment to lifelong learning through continuous acquisition of skills and knowledge</td>
</tr>
<tr>
<td>Physical Wellness</td>
<td>Commitment to self-care through regular participation in physical activity and healthy eating</td>
</tr>
<tr>
<td>Emotional Wellness</td>
<td>Ability to acknowledge personal responsibility for life decisions and their outcomes with emotional stability and positively</td>
</tr>
<tr>
<td>Spiritual Wellness</td>
<td>Having purpose in life and a value system</td>
</tr>
</tbody>
</table>

Table 2  
*Questions from WEL that Align with Hettler’s Social, Intellectual, Physical, Emotional, and Spiritual Wellness Theoretical Definitions*

<table>
<thead>
<tr>
<th>Dimension of Wellness</th>
<th>Items from WEL</th>
</tr>
</thead>
</table>
| Social Wellness        | Has close friends in community?  
|                        | Feels can count on friends for companionship  
|                        | Has opportunity to give and receive physical affection  
|                        | Feels community environment is supportive, nurturing  
|                        | Participate as volunteer on campus or in community  |
| Intellectual Wellness  | Interested or involved in computerized games  
|                        | Interested or involved in cross word puzzles  
|                        | Interested of involved in educational courses  
|                        | Interested of involved in genealogy  
|                        | Interested or involved in reading  
|                        | Interested or involved in writing  |
| Physical Wellness      | Participates in Fitness/Exercise Program  
|                        | Weight: Do you consider yourself?  
|                        | Number of glasses of fluid consumed daily  
|                        | Do you feel you are eating a healthy diet?  |
| Emotional Wellness     | How satisfied are you with your life as a whole in the last 3 days?  
|                        | Do you feel valued?  
|                        | Do you look forward to being challenged by new opportunities?  
|                        | Does stress have a negative effect on your quality of life?  |
| Spiritual Wellness     | Finds meaning in day-to-day life  
|                        | Do you feel your spiritual needs are being met?  
|                        | How do you view your spirituality?  |

*Note. WEL = Wellness Assessment Tool*
### Table 3
**Items from CHA, WEL, FS that Generate CPS Score**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA</td>
<td>Is short-term memory OK?</td>
</tr>
<tr>
<td></td>
<td>What is the level of cognitive skills for daily decision making?</td>
</tr>
<tr>
<td></td>
<td>What is the level of ability in making self understood?</td>
</tr>
<tr>
<td>WEL</td>
<td>How would you rate your memory?</td>
</tr>
<tr>
<td></td>
<td>Are you interested in a program to improve your memory?</td>
</tr>
<tr>
<td>FS</td>
<td>Is procedural memory OK?</td>
</tr>
<tr>
<td></td>
<td>What is the level of ability in eating?</td>
</tr>
</tbody>
</table>

*Note. CHA=Community Health Assessment; WEL=Wellness Assessment Tool; FS=Functional Supplement; CPS=Cognitive Performance Score.*
References


Joslin, B., Lowe, J. B., & Peterson, N.


