

Journal of Holistic Nursing

<http://jhn.sagepub.com/>

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

Kelley A. Strout and Elizabeth P. Howard
J Holist Nurs published online 27 June 2014
DOI: 10.1177/0898010114540322

The online version of this article can be found at:
<http://jhn.sagepub.com/content/early/2014/06/25/0898010114540322>

Published by:



<http://www.sagepublications.com>

On behalf of:



[American Holistic Nurses Association](http://www.americanholisticnurses.org)

Additional services and information for *Journal of Holistic Nursing* can be found at:

Email Alerts: <http://jhn.sagepub.com/cgi/alerts>

Subscriptions: <http://jhn.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

>> [OnlineFirst Version of Record](#) - Jun 27, 2014

[What is This?](#)

Article

Five Dimensions of Wellness and Predictors of Cognitive Health Protection in Community-Dwelling Older Adults

A Historical COLLAGe Cohort Study

Kelley A. Strout, PhD, RN

University of New England

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

Northeastern University

jhn

Journal of Holistic Nursing
American Holistic Nurses Association
Volume XX Number X
XXXX 201X 1–13
© The Author(s) 2014
10.1177/0898010114540322
<http://jhn.sagepub.com>



Wellness is associated with cognitive health protection; however, findings are limited because they only examine variable(s) within one dimension of wellness. This research examined the association between multiple dimensions of wellness and cognition among aging adults. The sample included 5,605 male and female community-dwelling adults 60 years and older. Four dimensions of wellness demonstrated a statistically significant higher mean difference in cognitively healthy older adults compared to cognitively impaired older adults, $F(4, 5,595) = 47.57, p < .001$. Emotional wellness demonstrated the strongest association with cognitive health, followed by physical and spiritual wellness, $F(5, 5,372) = 50.35, p < .001$. Future research is needed to examine the cognitive protective benefits of wellness using longitudinal, prospective designs that control for the potential temporal relationship between wellness and cognition.

Keywords: *older adults; health promotion; cognitive impairment; spirituality; holistic; health and wellness coaching; holistic scholarship; holistic inquiry; holistic theories and practices*

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 the largest cohort in American history and started turning 65 in 2011 (Federal Interagency Forum on Aging-Related Statistics, 2010; Hartman-Stein & Potkanowicz, 2003). Because the risk for cognitive decline increases significantly as adults and baby boomers age, the number of older adults at risk for cognitive decline will rise significantly (Alzheimer’s Association, 2012; Loge & Sorrell, 2010). In 2002, the number of adults age 70 years and older living with some form of impairment was 13.7%, and for those older than age 90, this percentage increased to 37.4 % (Plassman et al., 2007) However, age-related

cognitive decline is not inevitable (Harrison, Weintraub, Mesulam, & Rogalski, 2012). Some adults older than age 80, referred as “super agers” demonstrate cognitive abilities similar to those 20 to 30 years younger (Harrison et al., 2012). What remains unknown is if these “super agers” are born

Authors’ Note: This research was funded by the General Grant Fund at the University of Phoenix. The authors would like to acknowledge Dr. James Fox for his assistance with the statistical analyses, as well as his time and efforts in editing and reviewing this article for publication. The authors would also like to acknowledge Dr. Deborah D’Avolio for her time editing and reviewing this article for publication. Please address correspondence to Kelley A. Strout, Assistant Professor of Nursing, Westbrook College of Health Professions, University of New England, 24 Blewett Hall, 716 Stevens Avenue, Portland, ME 04103, USA; e-mail: kelley.a.strout@gmail.com.

with a genetic predisposition for cognitive health or if they develop resistance to decline risk throughout the years. Cognitive reserve theory posits that the brain is capable of generating additional neural pathways, or circuitries that may protect adults from declining cognitive abilities, even in the face of cognitive pathologies such as Alzheimer's disease and other forms of dementia (Stern, 2002).

Examining factors that may expand an adult's cognitive reserve and mediate the onset of cognitive decline is important for aging adults and health care economics. Older adults want to maintain their cognitive ability and prevent 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). From an economic perspective, cognitive health protection for the aging population can lead to significant health care savings. In 2011, the cost to care for those with cognitive impairment 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).

Focusing on wellness may increase cognitive reserve and thus protect cognition as adults age (Strout & Howard, 2012). Research has unveiled multiple health-promoting factors that contribute to cognitive health in aging adults; however, the best method for protecting cognitive health decline 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 related to cognitive health-protective factors examines variables from one dimension of wellness, which limits the ability to determine if one dimension is more effective than another at maintaining cognitive health (Strout & Howard, 2012). Therefore, nurses and other health care providers work with minimal evidence to provide holistic cognitive health protection interventions in practice. Research that examines wellness variables holistically is needed to advance progress in holistic 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

Dimensions of Wellness by William Hettler (1976) guide this research. According to this framework, wellness is an ever-changing process that encompasses six dimensions: social, intellectual, physical, emotional, spiritual, and occupational (Hettler, 1976). The theoretical definitions that guided this research are listed in Table 1. Dimensions of Wellness present a holistic view of the person (Hettler, 1976). For the purposes of this research, occupational wellness was excluded due to measurement limitations associated with the secondary data analysis. Research that examines the cognitive protective influence of meaningful and unpaid work for older adults will be examined in future research.

The definition of cognitive health from the National Institutes of Health provided 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 by using a wellness framework provides an opportunity to combine multiple variables into wellness dimensions and determine which dimensions are 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

Table 1. Hettler's Dimensions of Wellness and Items That Align With the WEL

| Dimension of Wellness | Definition | Items From WEL |
|-----------------------|--|--|
| Social wellness | Ability to form and maintain positive personal and community relationships | Feels that he or she can count on friends for companionship? Has opportunity to give and receive physical affection? Feels that the community environment is supportive, nurturing? Has close friends in the community? Participates as volunteer on campus or in community? |
| Intellectual wellness | Commitment to lifelong learning through continuous acquisition of skills and knowledge | Interested or involved in computerized games? Interested or involved in crossword puzzles? Interested or involved in educational courses? Interested or involved in genealogy Interested or involved in reading? Interested or involved in writing? |
| Physical wellness | Commitment to self-care through regular participation in physical activity and healthy eating | Participates in fitness/exercise program? Weight: Do you consider yourself? Number of glasses of fluid consumed daily? Do you feel you're eating a healthy diet? |
| Emotional wellness | Ability to acknowledge personal responsibility for life decisions and their outcomes with emotional stability and positively | How satisfied are you with your life as a whole in the past 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 | Having purpose in life and a value system | 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.

(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 a 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).

Hakansson et al. (2009) found that 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 midlife 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 3 times the risk for developing cognitive impairment compared to those who lived with a partner during this time (Hakansson et al., 2009).

Social history also affects cognition. High social wellness supported by extracurricular activities during high school may protect cognitive health in aging adults (Fritsch et al., 2005). Out of 398 individuals, those who participated in two or more extracurricular activities in high school demonstrated less risk for dementia and mild cognitive impairment in older age (Fritsch et al., 2005).

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 older than age 65, those who demonstrated high social integration and large social networks had a lower probability of developing cognitive decline after a 4-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 rigorous yearly physical and neuropsychological testing. Participants' brains were biopsied on death. Older adults with lower performance on neuropsychological tests revealed more severe levels of pathology on postmortem analysis. However, social network size moderated 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; 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 (Gilhooly et al., 2007; Lachman, Agrigoroaei, Murphy, & Tun, 2010). In a cross-sectional analysis of 145 participants ages 70 to 91 years, Gilhooly et al. (2007) found that 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 cognitively stimulating 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 adults age (Angevaren, Vanhees, Nooyens, Wendel-Vos, & Verschuren,

2010; Chang et al., 2010; Dik, Deeg, Visser, & Jonker, 2003; Laitinen et al. 2006; Larson et al., 2006; Middleton, Barnes, Lui, & Yaffe, 2010; Nurk et al., 2010; Polidori et al., 2009; Scarmeas 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 (Angevaren et al., 2010; Chang et al., 2010; Dik et al., 2003; Middleton et al., 2010). In a cohort of 4,761 participants, those who participated in 5 or more hours of physical activity per week at midlife 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 age 62 to 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 age 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 6-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. Additionally, 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 adults, frequency of physical activity was not significantly associated with stronger cognitive performance after a 6-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 (Laitinen et al., 2006; Nurk et al., 2010; Polidori et al., 2009). 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.

The Mediterranean diet includes daily consumption of fruits, vegetables, grains, fish, and 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 Mediterranean diet 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 midlife demonstrated less risk for dementia and Alzheimer's disease compared to those who consumed less. Additionally, little to no fat intake and moderate amounts of saturated fat intake increased the risk for dementia and Alzheimer's disease. M. C. Morris, Evans, Bienias, Tangney, and Wilson (2004) found similar results in their prospective longitudinal study of 2,560 older adults. After a 6-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 percentage of those who consumed moderate levels of monounsaturated and polyunsaturated fat maintained their cognition compared to those who consumed little or none of these types of fat (M. C. 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 abilities, that is, choosing between alternative goals and striving towards achieving the chosen goal, are associated with cognitive health in old age.

Neuroticism, a characteristic of low emotional wellness, is a personality trait that reflects emotional instability, negative emotions, depressive symptoms, and anxiety. Neuroticism may impair cognitive health in older adults (L. L. Boyle et al., 2010; Wang, 2009; Wilson et al., 2007). In a 12-year longitudinal analysis by Wilson et al., 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 (L. L. Boyle et al., 2010). In another longitudinal analysis of 506 older adults by Wang et al. (2009), those with low neuroticism and high extraversion demonstrated lowest risk for developing dementia after a 6-year follow-up.

Depressive symptoms may increase the risk of cognitive health decline as adults age (Kohler et al., 2010). In a cohort of 479 adults older than age 60, those who demonstrated high depressive symptoms at baseline were at a significantly greater risk of developing cognitive health decline after a 6-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 (P. A. Boyle, Buchman, Barnes, & Bennett, 2010; Coin et al., 2010). Older adults with high purpose in life were 2.4 times more likely to remain free of Alzheimer's disease and mild cognitive impairment compared to adults with a low score at a 7-year follow-up (P. A. Boyle et al., 2010). 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 (P. A. Boyle et al., 2010).

Among 283 older adults with Alzheimer's disease, high religiosity at baseline correlated with slower cognitive decline after 1 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., 2010).

Cognitive Health Research and Dimensions of Wellness

Each dimension of wellness consists of multiple elements. Therefore, examining how dimensions contribute to cognitive health provides an opportunity to

examine older adults holistically. Identifying the dimensions that have 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 suffice for everyone.

The Dimensions of Wellness framework provide an opportunity to examine the combined influence of multiple dimensions on cognitive health protection. Wellness is the combination of multiple dimensions of wellness. Since high wellness in one dimension may positively influence other dimensions, high wellness scores may provide more cognitive health protection than low wellness scores. Evidence of high wellness as a strong predictor of cognitive health creates an opportunity to develop patient-specific interventions. 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.

Previous wellness research using a multidimensional framework is limited. Characteristically, researchers have targeted the physical dimension of wellness with a focus on improving nutrition and physical fitness (Brubaker, Witta, & Angelopoulos, 2003; Hatch & Lusardi, 2010; Milani & Lavie, 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 (a short-form health survey with only 36 questions; Brubaker et al., 2003; Chafetz, White, Collins-Bride, Cooper, & Nickens, 2008; Hatch & Lusardi, 2010; Joslin, Lowe, & Peterson, 2006; Milani & Lavie, 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 is a self-report measure of an individual's health status and does not examine the multidimensional concept of wellness. This study used a multidimensional wellness measurement tool specifically designed for older adults.

Method

The overall objective of this research was to determine how multiple dimensions of wellness contribute

to cognitive health in community-dwelling adults age 60 years and older. This research study answered three questions.

Research Question 1: Which of the five dimensions of wellness (social, intellectual, physical, emotional, and spiritual) is most strongly associated with cognition among community-dwelling older adults?

Research Question 2: Which of the five dimensions of wellness (social, intellectual, physical, emotional, and spiritual) is most predictive of cognitive health among older adults?

Research Question 3: Do the dimensions of wellness demonstrate a statistically significant mean difference between cognitively impaired and cognitively healthy older adults?

Sample

Individuals 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 consortium of continuing care retirement communities (CCRC). COLLAGE aims to achieve two goals: (a) to improve the quality of life for older adults and (b) to establish COLLAGE as the leading model for keeping older adults across all socioeconomic levels active and independent (COLLAGE, *The Art & Science of Healthy Aging*, 2008). Participants who live in a CCRC associated with COLLAGE complete yearly assessments that provided the data for this research: The Community Health Assessment (CHA), the WEL, and the Functional Supplement (FS). These instruments demonstrate national and international internal, test-retest, and interrater reliabilities as well as face, content, criterion, and predictive validities (Hirdes et al., 1999; Hirdes et al., 2008).

A sample of 7,958 unique adults completed the WEL and CHA between the years 2007 and 2013. Adults younger than 60 who were living in the community at the time of the assessment were excluded from the study. The final sample included 5,604 community-dwelling older adults from 72 CCRCs located in 24 states in the United States.

Measurement

Wellness was measured using the WEL. The WEL is a patient-centered instrument that allows

patients to express interest in participating or intention to participate in wellness activities. The tool contains items that cover nine core areas: exercise and physical fitness, nutrition, social relationships, emotional, spiritual, practices affecting health and well-being, recreation, sleep, and goals for wellness service planning. The assessment data are collected through a one-on-one conversation with a qualified and trained staff member. The trained staff member is a registered nurse, social worker, activities director, or fitness staff member (COLLAGE, The Art & Science of Healthy Aging, 2008).

Scores for five dimensions of wellness were created from 22 items on the WEL that align with Hettler's (1976) theoretical definitions. Table 1 lists each wellness dimension and their corresponding items 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). A 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. Logit values for each item within each dimension were summed to create a total score for each of the five dimensions of wellness. 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. Additional details about the construction of the logit values that created the dimensions of wellness scores may be found elsewhere (Strout & Howard, 2014).

Cognition was measured using the Cognitive Performance Scale (CPS). The CPS is generated from items on the CHA, the WEL, and the FS. Items that create the CPS and their corresponding instrument are listed in Table 2. 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

Table 2. Items From CHA, WEL, and FS That Comprise the Cognitive Performance Scale Score

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

Note: CHA = Community Health Assessment; WEL = Wellness Assessment Tool; FS = Functional Supplement.

nutrition status, medications, treatments and procedures, social relationships, and environment assessment. The FS is designed to assess impaired older adults. The FS represents a set of questions triggered by 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 scores range from 0 to 5. CPS 0 equals "cognitive health" or no impairment. CPS 5 equals "severely impaired cognition." The CPS is a valid and reliable measure of cognition that correlates highly with the Mini Mental Status Examination (MMSE; J. N. Morris et al., 1994). The CPS internal consistency reliability for this sample was $\alpha = 1.00$.

Statistical Analysis

Hierarchical multiple regression was used to address the first research question: Which of the five dimensions of wellness (social, intellectual, physical, emotional, and spiritual) is most strongly associated with cognition among community-dwelling older adults?

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 recoded. Those who scored a zero, which demonstrates cognitive health, remained coded as 0. Those demonstrating some level of cognitive impairment with a CPS score from 1 through 5 were recoded to a 1.

Multivariate analysis of variance (Hotelling T^2) was applied to answer the third research question (Does 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 recoded to 0 = *cognitively healthy* and 1 = *cognitively impaired* and entered as the independent variable; dimensions of wellness were entered as dependent variables.

Results

The age range of the 5,604 community-dwelling older adults in this sample was 60 to 102 years. The ages were normally distributed with a mean of 83 years and a standard deviation of 6.2 years. Seventy percent of the sample was female. Two percent completed 8th to 11th grade, 12% graduated high school, 5% attended 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 ethnicity. Seventy-eight percent of the population demonstrated cognitive health, 13% borderline intact cognition, 5% mild impairment, 3% moderate impairment, and 1% severe impairment.

Research Question 1

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 at Step 1 to determine how much of the variance the dimensions of wellness explained after controlling for age and education. Age and education explained 3% ($R^2 = .03$) of the variance in cognition. Age was statistically significant ($\beta = .125, p < .001$). After entering social, intellectual, physical, emotional, and spiritual wellness scores, the total variance explained by the model was 5% ($R^2 = .054$), $F(7, 5,372) = 44.22, p < .001$. In the final model, three dimensions of wellness were statistically significant. Emotional wellness demonstrated the strongest association with cognition ($\beta = -.080, p < .001$), followed by physical wellness ($\beta = -.065,$

Table 3. Hierarchical Multiple Regression Analysis Predicting Cognitive Health From Five Dimensions of Wellness: Social, Intellectual, Physical, Emotional, and Spiritual

| Predictor | Cognitive Performance Score | |
|-----------------------|-----------------------------|----------|
| | ΔR^2 | β |
| Step 1 | .030*** | |
| Age | | .137*** |
| Education | | -.094 |
| Step 2 | .054*** | |
| Social wellness | | -.034 |
| Spiritual wellness | | -.055*** |
| Intellectual wellness | | -.035 |
| Physical wellness | | -.065*** |
| Emotional wellness | | -.099*** |

*** $p < .001$.

$p < .001$), then spiritual wellness ($\beta = -.055, p < .001$). Intellectual wellness and social wellness were not significantly associated with cognition. Table 3 presents the hierarchical multiple regression results and displays how each dimension contributed to cognition.

Research Question 2

In the final sample, 22% were cognitively impaired and 78% were cognitively healthy. Emotional, physical, social, and spiritual wellness were statistically significant and predicted 78.1% correct classification to the cognitively healthy group ($\chi^2 = 187.16$, degrees of freedom = 4, $p < .0001$). Intellectual wellness was not statistically significant. The standardized discriminant function coefficients in order of predictive power were the following: emotional wellness (.696), physical wellness (.415), spiritual wellness (.311), and social wellness (.203). The five dimensions of wellness predicted membership in the cognitively impaired group for only 3 out 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 demonstrating cognitive health with a CPS score of 0 (78%). Adults demonstrating cognitive decline with a CPS code of 1 represented only 13% of this sample. The cognitive abilities between adults demonstrating cognitive health (0) and cognitive decline (1) may not be sensitive enough to demonstrate the association with the dimensions of wellness.

Table 4. Multivariate Analysis of Variance (Hotelling's T^2) Contribution of Dimensions of Wellness to Overall Multivariate F Results

| Dimension of Wellness | $F(1, 5,598)$ | p | Partial η^2 | Power |
|-----------------------|---------------|----------|------------------|-------|
| Emotional | 122.680 | .0001*** | 0.020 | 1.000 |
| Physical | 60.010 | .0001*** | 0.010 | 1.000 |
| Spiritual | 38.430 | .0001*** | 0.007 | 1.000 |
| Social | 16.490 | .0001*** | 0.003 | 0.980 |
| Intellectual | 1.238 | .266 | 0.000 | 0.199 |

*** $p < .001$.

Research Question 3

Cognitively healthy adults demonstrated statistically significant higher mean social, physical, emotional, and spiritual wellness than cognitively impaired older adults, $F(4, 5,595) = 47.57$, $p < .0001$. Intellectual wellness was not a statistically significant predictor of cognitive health. The amount of variance explained was low (partial $\eta^2 = .03$) with a power = 1.00 given the large sample size. Table 4 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 may increase cognitive reserve and protect cognition as adults age. Scientists have postulated that effective methods to reduce the risk of declining cognition may require multiple interventions or that more interventions may provide greater resilience, or stronger reserves, against cognitive deficits as adults age (Strout & Howard, 2012; Fratiglioni, Paillard-Borg, & Winblad, 2004; Karp et al., 2006). The results of this study support these beliefs; 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 wellness and spiritual wellness were also associated with cognitive health among older adults, but intellectual wellness was not. After accounting for the variance of age and

education, emotional wellness demonstrated the strongest association of cognitive ability, followed by physical wellness 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 (L. L. Boyle et al., 2010; Forstmeier & Maercker, 2008; Kohler et al., 2010; Wang et al., 2009; Wilson et al., 2007). 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 finding that time and energy spent both in engaging in physical activity and consuming a healthy diet protect cognition in aging adults (Angevaren et al., 2010; Chang et al., 2010; Dik et al., 2003; Fratiglioni, Paillard-Borg, & Winblad, 2004; Laitinen et al., 2006; Lee et al., 2010; Nurk et al., 2010; Polidori et al., 2009; Scarmeas et al., 2009). Finally, previous research suggests that purpose in life and high religiosity protect cognition as adults age (P. A. Boyle et al., 2010; Coin et al., 2010). This research suggests that spiritual wellness demonstrates cognitive protective factors among aging adults.

Intellectual wellness 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 from social networks at baseline protected cognition after a 7.5-year follow up and that larger social network size protects cognitive health after postmortem analysis (Bennett et al., 2006; Seeman et al., 2001), the findings in this study did not support social wellness as 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. Green, Robok, and Lyketsos (2008) found that belonging to larger social networks was associated with higher scores on the MMSE on cross-sectional analysis; however, after a 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 sample was skewed toward cognitively healthy adults (78%), which may have overshadowed the consequences of declining cognition and the negative influence on social networks. In addition, the social wellness measurement did not include a variable that examined the size of the 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. Gilhooly et al. (2007) and Lachman et al. (2010) found that cognitive stimulating activities protect cognition as adults age. However, our findings were not consistent with previous work. More than 65% of adults examined in this analysis possessed a bachelor's degree or higher. Additionally, 78% of the adults in this sample demonstrated cognitive health. Previous research suggests that 12 or more years of formal education is positively correlated with cognitive health as adults age (Koster et al., 2005; Livevre et al., 2008; Plassman et al., 2007). Educational achievement in our sample may have overshadowed 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 greater 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 some evidence that dimensions of wellness are

associated with cognitive health as adults age. The adults in this sample are cognitively healthy, 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 to 5 (0 = *cognitively healthy* and 5 = *severe impairment*), this narrow range may not be as sensitive as other cognitive measurement methods; however, the CPS does correlate strongly with the MMSE (J. N. Morris et al., 1994).

Implications

Nurses need to take leadership roles in interdisciplinary public health campaigns that educate older adults about the cognitive health benefits of emotional, physical, and spiritual wellness. Maintaining cognitive abilities is a priority for aging adults (Phelan et al., 2004). Older adults believe that cognitive ability is associated with living well (Laditka et al., 2009). However, older adults report that they do not read or hear about strategies to help them protect their cognition (Friedman et al., 2009). Creative public health 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. Emotional wellness demonstrated the strongest association with cognitive health; therefore, developing population-based interventions designed to improve emotional wellness may reduce the risk of cognitive decline for the majority. However, if an older adult is not willing or able to improve his or her emotional wellness, providers may suggest other interventions about which the older adult is motivated and confident to perform. In addition, older adults could be encouraged to participate in multiple wellness interventions to develop stronger cognitive reserves. Future work should focus on an effective nurse-led interdisciplinary cognitive health education tool that nurses and other care providers could provide patients.

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. The dimension of wellness

that demonstrates the strongest protective ability over time may 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., 2008).

References

- Alzheimer's Association. (2012). Alzheimer's disease: Facts and figures. *Alzheimer's & Dementia*, 8(2). Retrieved from http://www.alz.org/downloads/facts_figures_2012.pdf
- Andrich, D. (1988). *Rasch models for measurement (quantitative application in the social sciences)*. Newbury Park, CA: Sage.
- Angevaeren, M., Vanhees, L., Nooyens, A. C., Wendel-Vos, C. G., & Verschuren, W. M. (2010). Physical activity and 5-year cognitive decline in the Doetinchem cohort study. *Annals of Epidemiology*, 20, 473-479. doi:10.1016/j.annepidem.2010.03.007
- Bennett, D. A., Schneider, J. A., Tang, Y., Arnold, S. E., & Wilson, R. S. (2006). The effect of social networks on the relation between alzheimer's disease pathology and level of cognitive function in old people: A longitudinal cohort study. *Lancet Neurology*, 5, 406-412. doi:10.1016/S1474-4422
- Bond, T. G., & Fox, C. M. (2001). *Applying the Rasch model: Fundamental measurement in the human sciences*. Mahwah, NJ: Erlbaum.
- Boyle, L. L., Lyness, J. M., Duberstein, P. R., Karuza, J., King, D. A., Messing, S., & Tu, X. (2010). Trait neuroticism, depression, and cognitive function in older primary care patients. *American Journal of Geriatric Psychiatry*, 18, 305-312. doi:10.1097/JGP.0b013e3181c2941b
- Boyle, P. A., Buchman, A. S., Barnes, L. L., & Bennett, D. A. (2010). Effect of a purpose in life on risk of incident alzheimer disease and mild cognitive impairment in community-dwelling older persons. *Archives of General Psychiatry*, 67, 304-310. doi:10.1001/archgenpsychiatry.2009.208
- Brubaker, C., Witta, L., & Angelopoulos, T. J. (2003). Maintaining exercise tolerance and quality of life by long-term participation in a hospital-based wellness program for individuals with congestive heart failure. *Journal of Cardiopulmonary Rehabilitation*, 23, 352-356.
- Chafetz, L., White, M., Collins-Bride, G., Cooper, B. A., & Nickens, J. (2008). Clinical trial of wellness training: Health promotion for severely mentally ill adults. *Journal of Nervous and Mental Disease*, 196, 475-483. doi:10.1097/NMD.0b013e31817738de.
- Chang, M., Jonsson, P. V., Snaedal, J., Bjornsson, S., Saczynski, J. S., Aspelund, T., & Launer, L. J. (2010). The effect of midlife physical activity on cognitive function among older adults: AGES-Reykjavik Study. *Journals of Gerontology, Series A: Biological Sciences & Medical Sciences*, 65A, 1369-1374. doi:10.1093/gerona/g1q152
- Coin, A., Perissinotto, E., Najjar, M., Girardi, A., Inelmen, E. M., Enzi, G., & Sergi, G. (2010). Does religiosity protect against cognitive and behavioral decline in Alzheimer's dementia? *Current Alzheimer Research*, 7, 445-452. doi:10.2174/156720510791383886
- COLLAGE, The Art & Science of Healthy Aging. (2008). *About COLLAGE*. Retrieved from <http://collageaging.org/Site/Home/Home.aspx>
- Dik, M., Deeg, D. J. H., Visser, M., & Jonker, C. (2003). Early life physical activity and cognition at old age. *Journal of Clinical and Experimental Neuropsychology*, 25, 643-653.
- Federal Interagency Forum on Aging-Related Statistics. (2010). *Older Americans 2010: Key indicators of well-being*. Retrieved from http://www.agingstats.gov/agingstatsdotnet/Main_Site/Data/Data_2010.aspx
- Forstmeier, S., & Maercker, A. (2008). Motivational reserve: Lifetime motivational abilities contribute to cognitive and emotional health in old age. *Psychology and Aging*, 23, 886-899. doi:10.1037/a0013602
- Fratiglioni, L., Paillard-Borg, S., & Winblad, B. (2004). An active and socially integrated lifestyle in late life might protect against dementia. *Lancet Neurology*, 3, 343-353.
- Friedman, D. B., Laditka, J. N., Hunter, R., Ivey, S. L., Bei, W., Laditka, S. B., . . . Mathews, A. E. (2009). Getting the message out about cognitive health: A cross-cultural comparison of older adults' media awareness and communication needs on how to maintain a healthy brain. *The Gerontologist*, 49(Suppl. 1), S50-S60. doi:10.1093/geront/gnp080
- Fritsch, T., Smyth, K. A., McClendon, M. J., Ogrocki, P. K., Santillan, C., Larsen, J. D., & Strauss, M. E. (2005). Associations between dementia/mild cognitive impairment and cognitive performance and activity levels in youth. *Journal of the American Geriatrics Society*, 53, 1191-1196. doi:10.1111/J.1532-5415.2005.53361.X
- Gilhooly, K. J., Gilhooly, M. L., Phillips, L. H., Harvey, D., Murray, A., & Hanlon, P. (2007). Cognitive aging: Activity patterns and maintenance intentions. *International Journal of Aging & Human Development*, 65, 259-280. doi:10.2190/AG.65.3.d
- Green, A. F., Rebok, G., & Lyketsos, C. G. (2008). Influence of social network characteristics on cognition and functional status with aging. *International Journal of Geriatric Psychiatry*, 23, 972-978. doi:10.1002/gps.2023
- Hakansson, K., Rovio, S., Helkala, E. L., Vilska, A. R., Winblad, B., Soininen, H., & Kivipelto, M. (2009). Association between mid-life marital status and cognitive function in later life: Population based cohort study. *British Medical Journal*, 339. doi:10.1136/bmj.b2462
- Harrison, T. M., Weintraub, S., Mesulam, M. M., & Rogalski, E. (2012). Superior memory and higher cortical volumes in unusually successful cognitive aging. *Journal of the International Neuropsychological Society*, 18, 1081-1085. doi:10.1017/S1355617712000847.

- Hartman-Stein, P. E., & Potkanowicz, E. S. (2003). Behavioral determinants of healthy aging: Good news for the baby boomer generation. *Online Journal of Issues in Nursing*, 8(2). Retrieved from <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume82003/No2May2003/BehaviorandHealthyAging.aspx>
- Hatch, J., & Lusardi, M. (2010). Impact of participation in a wellness program on functional status and falls among aging adults in an assisted living setting. *Journal of Geriatric Physical Therapy*, 33, 71-77. doi:10.1097/JPT.0b013e3181defe81
- Hettler, B. (1976). *The six dimensions of wellness*. Retrieved from <http://www.hettler.com/sixdimen.htm>
- Hirdes, J. P., Fries, B. E., Morris, J. N., Steel, K., Mor, V., Frijters, D., & Teare, G. (1999). Integrated health information systems based on the RAI/MDS series of instruments. *Healthcare Management Forum*, 12, 30-40.
- Hirdes, J. P., Ljunggren, G., Morris, J. N., Frijters, D. H., Finne Soveri, H., Gray, L., & Gilgen, R. (2008). Reliability of the interRAI suite of assessment instruments: A 12-country study of an integrated health information system. *BMC Health Services Research*, 8, 277. doi:10.1186/1472-6963-8-277
- Hugh, C. H., Marilyn, S. A., Meryl, A. B., Sujuan, G., David, S. K., Lenore, J. L., & Molly, V. W. (2006). The NIH cognitive and emotional health project: Report of the Critical Evaluation Study Committee. *Alzheimer's & Dementia*, 2, 12-32. doi:10.1016/j.jalz.2006.01.001
- Joslin, B., Lowe, J. B., & Peterson, N. A. (2006). Employee characteristics and participation in a worksite wellness programme. *Health Education Journal*, 65, 308-319. doi:10.1177/0017896906069367
- Karp, A., Paillard-Borg, S., Wang, H.-X., Silverstein, M., Winblad, B., & Fratiglioni, L. (2006). Mental, physical and social components in leisure activities equally contribute to decrease dementia risk. *Dementia and Geriatric Cognitive Disorders*, 21, 65-73. doi:10.1159/000089919
- Kohler, S., van Boxtel, M. P. J., van Os, J., Thomas, A. J., O'Brien, J. T., Jolles, J., & Allardyce, J. (2010). Depressive symptoms and cognitive decline in community-dwelling older adults. *Journal of the American Geriatrics Society*, 58, 873-879. doi:10.1111/j.1532-5415.2010.02807
- Koster, A., Penninx, B. W. J.H., Bosma, H., Kempen, G. I. J.M., Newman, A. B., Rubin, S. M., & Kritchevsky, S. B. (2005). Socioeconomic differences in cognitive decline and the role of biomedical factors. *Annals of Epidemiology*, 15, 564-571. doi:10.1016/j.annepidem.2005.02.008
- Lachman, M., Agrigoroaei, S., Murphy, C., & Tun, P (2010). Frequent cognitive activity compensates for education differences in episodic memory. *American Journal of Geriatric Psychiatry*, 18, 4-10. doi:10.1097/JGP.0b013e3181ab8b62
- Laditka, S. B., Corwin, S. J., Laditka, J. N., Lui, R., Tseng, W., Wu, B., . . .Ivey, S. L. (2009). Attitudes about aging well among a diverse group of older Americans: Implications for promoting cognitive health. *The Gerontologist*, 49(Suppl. 1), S30-S39. doi:10.1093/geront/gnp084
- Laitinen, M. H., Ngandu, T., Rovio, S., Helkala, E. L., Uusitalo, U., Viitanen, M., & Kivipelto, M. (2006). Fat intake at midlife and risk of dementia and alzheimer's disease: A population-based study. *Dementia and Geriatric Cognitive Disorders*, 22, 99-107. doi:10.1159/000093478
- Langa, K. M., Chernew, M. E., Kabeto, M. U., Herzog, A. R., Ofstedal, M. B., Willis, R. J., & Fendrick, A. M. (2001). National estimates of the quantity and cost of informal caregiving for the elderly with dementia. *Journal of General Internal Medicine*, 16, 770-778. doi:10.1111/j.1525-1497
- Larson, E. B., Wang, L., Bowen, J. D., McCormick, W. C., Teri, L., Crane, P., & Kukull, W. (2006). Exercise is associated with reduced risk for incident dementia among persons 65 years of age and older. *Annals of Internal Medicine*, 144, 73-81. doi:10.7326/0003-4819-144-2-200601170-00004
- Lee, Y., Back, J. H., Kim, J., Kim, S. H., Na, D. L., Cheong, H. K., . . .Kim, Y. G. (2010). Systematic review of health behavioral risks and cognitive health in older adults. *International Psychogeriatrics*, 22, 174-187. doi:10.1016/j.annepidem.2005.02.008
- Livevre, A., Alley, D., & Crimmins, E. M. (2008). Educational differentials in life expectancy with cognitive impairment among the elderly in the United States. *Journal of Aging and Health*, 20, 456-477. doi:10.1177/0898264308315857
- Loge, J., & Sorrell, J. M. (2010). Implications of an aging population for mental health nurses. *Journal of Psychosocial Nursing and Mental Health Services*, 48, 15-18. doi:10.3928/02793695-20100730-02
- Masters, G. N. (1988). The analysis of partial credit scoring. *Applied Measurement in Education*, 1, 279-297.
- McGuire, L. C., Ford, E. S., & Ajani, U. A. (2006). Cognitive functioning as a predictor of functional disability in later life. *American Journal of Geriatric Psychiatry*, 14, 36-42.
- Middleton, L. E., Barnes, D. E., Lui, L., & Yaffe, K. (2010). Physical activity over the life course and its association with cognitive performance and impairment in old age. *Journal of the American Geriatrics Society*, 58, 1322-1326. doi:10.1111/j.1532-5415.2010.02903.x
- Milani, R. V., & Lavie, C. J. (2009). Impact of worksite wellness intervention on cardiac risk factors and one-year health care costs. *American Journal of Cardiology*, 104, 1389-1392. doi:10.1016/j.amjcard.2009.07.007
- Morris, J. N., Fries, B. E., Mehr, D. R., Hawes, C., Phillips, C., Mor, V., & Lipsitz, L. A. (1994). Minimum Data Set Cognitive Performance Scale. *Journals of Gerontology, Medical Sciences*, 49, M174-M182.
- Morris, M. C., Evans, D. A., Bienias, J. L., Tangney, C. C., & Wilson, R. S. (2004). Dietary fat intake and 6-year cognitive change in an older biracial community population.

- Neurology*, 62, 1573-1579. doi:10.1212/01.WNL.0000123250.82849.B6
- Nurk, E., Refsum, H., Drevon, C. A., Tell, G. S., Nygaard, H. A., Engedal, K., & Smith, A. D. (2010). Cognitive performance among the elderly in relation to the intake of plant foods: The Hordaland Health Study. *British Journal of Nutrition*, 104, 1190-1201. doi:10.1017/S0007114510001807
- Palumbo, M. V., Wu, G., Shaner-McRae, H., Rambur, B., & McIntosh, B. (2012). Tai chi for older nurses: A workplace wellness pilot study. *Applied Nursing Research*, 25, 54-59. doi:10.1016/j.apnr.2010.01.002
- Phelan, E. A., Anderson, L. A., LaCroix, A. Z., & Larson, E. B. (2004). Older adults' views of "successful aging"—how do they compare with researchers' definitions? *Journal of the American Geriatrics Society*, 52, 211-216.
- Plassman, B. L., Langa, K. M., Fisher, G. G., Heeringa, S. G., Weir, D. R., Ofstedal, M. B., & Wallace, R. B. (2007). Prevalence of dementia in the United States: The aging, demographics, and memory study. *Neuroepidemiology*, 29, 125-132. doi:10.1159/000109998
- Polidori, M. C., Pratio, D., Mangialasche, F., Mariani, E., Aust, O., Anlasik, T., & Nelles, G. (2009). High fruit and vegetable intake is positively correlated with antioxidant status and cognitive performance in healthy subjects. *Journal of Alzheimer's Disease*, 17, 921-927. doi:10.3233/jad-2009-1114
- Scarmeas, N., Stern, Y., Mayeux, R., Manly, J. J., Schupf, N., & Luchsinger, J. A. (2009). Mediterranean diet and mild cognitive impairment. *Archives of Neurology*, 66, 216-225. doi:10.1001/archneurol.2008.536
- Seeman, T. E., Lusignolo, T. M., Albert, M., & Berkman, L. (2001). Social relationships, social support, and patterns of cognitive aging in healthy, high-functioning older adults: MacArthur Studies of Successful Aging. *Health Psychology*, 20, 243-255. doi:10.1037/0278-6133.20.4.243.
- Stern, Y. (2002). What is cognitive reserve? Theory and research application of the reserve concept. *Journal of the International Neuropsychological Society*, 8, 448-460. doi:10.1017/S1355617702813248
- Strout, K., & Howard, E. P. (2012). The six dimensions of wellness and cognition in aging adults. *Journal of Holistic Nursing*, 30, 195-204. doi:10.1177/0898010112440883
- Strout, K., & Howard, E. P. (2014). Application of the Rasch model to measure five dimensions of wellness in community dwelling older adults. *Journal of Nursing Measurement*, 22(2). doi: <http://dx.doi.org/10.1891/1061-3749.22.2.1>.
- Turner, S. L., Thomas, A. M., Wagner, P. J., & Moseley, G. C. (2008). A collaborative approach to wellness: Diet, exercise, and education to impact behavior change. *Journal of the American Academy of Nurse Practitioners*, 20, 339-344. doi:10.1111/j.1745-7599.2008.00325.x
- Wang, H. X., Karp, A., Herlitz, A., Crowe, M., Kareholt, I., Winblad, B., & Fratiglioni, L. (2009). Personality and lifestyle in relation to dementia incidence. *Neurology*, 72, 253-259. doi:10.1212/01.wnl.0000339485.39246.87
- Ware, J. (2011). *SF-36 health survey update*. Retrieved from <http://www.sf-36.org/tools/sf36.shtml>
- Wilson, R. S., Schneider, J. A., Boyle, P. A., Arnold, S. E., Tang, Y., & Bennett, D. A. (2007). Chronic distress and incidence of mild cognitive impairment. *Neurology*, 68, 2085-2092. doi:10.1212/01.wnl.0000264930.97061.82
- Zunzunegui, M.-V., Alvarado, B. E., Del Ser, T., & Otero, A. (2003). Social networks, social integration, and social engagement determine cognitive decline in community-dwelling Spanish older adults. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 58B, S93-S100. doi:10.1093/geronb/58.2.S93

Kelley A. Strout, PhD, RN, is an assistant professor in the Westbrook College of Health Professions, Department of Nursing at University of New England in Portland, Maine. She is a certified health and wellness coach.

Elizabeth P. Howard, PhD, RN, ACNP-BC, is an associate professor in the Bouve College of Health Sciences School of Nursing at Northeastern University, Boston, Massachusetts. She holds a joint appointment as a Visiting Nurse Scientist at the Institute for Aging Research, Hebrew Senior Life, Roslindale, Massachusetts.