THE ROLE OF NEGATIVE COGNITIONS IN DEPRESSION, FUNCTIONAL LIMITATIONS, AND ACTIVITY: A NATIONAL LONGITUDINAL STUDY OF OLDER ADULTS

by

Diane C. Wagner

A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Doctor of Philosophy
Psychology

Committee:

_____ Director

_____

_____

_____ Department Chairperson

_____ Program Director

_____ Dean, College of Humanities and Social Sciences

Date: _____ Fall Semester 2015
George Mason University
Fairfax, VA

The Role of Negative Cognitions in Depression, Functional Limitations, and Activity: A National Longitudinal Study of Older Adults

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at George Mason University

by

Diane C. Wagner
Master of Arts
George Mason University, 2012

Director: Jerome L. Short, Professor
Department of Psychology

Fall Semester 2015
George Mason University
Fairfax, VA

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF EQUATIONS

ABSTRACT

THE ROLE OF NEGATIVE COGNITIONS IN DEPRESSION, FUNCTIONAL LIMITATIONS, AND ACTIVITY: A NATIONAL LONGITUDINAL STUDY OF OLDER ADULTS

Diane C. Wagner, PhD

George Mason University, 2015

Dissertation Director: Dr. Jerome L. Short

This study examines the role of negative cognitions in late life depression, functional limitations, and activity. Participants were 673 adults (36% male) aged 50 to 88 who completed repeated measures in 2004, 2008, and 2012 as part of the Health and Retirement Study, a large nationally representative longitudinal sample. Novel contributions of this study include combining functional limitations and cognitions in a cognitive model of depression to include aspects of depression that are specific to older adults, examining the unique contribution of cognitions in depression, and testing both growth and temporal covariance to capture the interrelatedness of depression and related factors over time. Three bivariate Latent Difference Score models tested time-lagged associations in pairs of variables at three time points. Contrary to expectations, depression levels and negative cognitions were unrelated over time, suggesting that cognitive theories of depression, which place cognitions at the core of depression

etiology and maintenance, may not generalize to older adults. Negative cognitions were not related to functional limitations, suggesting that functional limitations do not influence negative cognitions in older adults. Higher levels of negative cognitions were related to increases in activity over time, suggesting that negative cognitions may motivate older adults to increase activity levels.

THE ROLE OF NEGATIVE COGNITIONS IN DEPRESSION, FUNCTIONAL LIMITATIONS, AND ACTIVITY: A NATIONAL LONGITUDINAL STUDY OF OLDER ADULTS

The number of older adults (age 65+) is projected to more than double over the next 45 years (US Census Bureau Public Information, 2012), stimulating interest in health promotion and longevity. Depression, functional limitations, and activity, all of which are strong predictors of health and longevity, are important targets of study to improve the lives of older adults (Ben-Ezra & Shmotkin, 2010; Cesari et al., 2008; Goodwin, 2003; Kennison & Cox, 2013; Wagner & Short, 2014).

Major depressive disorder (MDD) becomes less prevalent with age (Blazer, 2010a) but is the most prevalent affective disorder in older adults (Gum, King-Kallimanis, & Kohn, 2009) and exerts debilitating effects comparable to diabetes or arthritis (Hirschfeld et al., 1997). Late life depression is related to increased physical illness, chronic disease, self-neglect, and decreased physical, cognitive, and social functioning, which are all associated with increased mortality (Blazer, 2003; Chapman & Perry, 2008; Collard, Comijs, Naarding, & Oude Voshaar, 2014). Additionally, direct costs are nearly one third higher for depressed than non-depressed older adults (Melanie Luppa et al., 2013).

Depression is a strong risk factor for suicide in late life (Turvey et al., 2002). Psychological autopsies suggest that depression is more common for older adults who

complete suicide than for younger individuals (Conwell & Brent, 1995). Men aged 85+ have the highest suicide rates (48.5 deaths per 100,000, compared to 12.6 in the general population) ("National Center for Injury Prevention and Control," 2013) and suicide rates are increasing for older adults (from 1999 to 2010: age 50-54=Δ48.4%; 55-59=Δ49.1%; and 60-64=Δ37.0%) ("Federal Interagency Forum on Aging-Related Statistics. Older Americans 2012: Key Indicators of Well-Being," 2012; Sullivan, Annest, Luo, Simon, & Dahlberg, 2013).

Less severe depression also has harmful effects. Subthreshold depression, defined as depressive symptoms that do not meet criteria for MDD, is 2-3 times more prevalent than MDD in older adults and is associated with increases in healthcare usage, disability, cognitive impairment, risk of dementia, suicidal ideation, and declining physical health (Meeks, Vahia, Lavretsky, Kulkarni, & Jeste, 2011; Vahia et al., 2010).

In view of the current and growing challenges of meeting the burgeoning older adult population's health care needs, the Institute of Medicine recently recommended training in evidence-based mental health treatment for all health care professionals and social service providers (Bartels & Naslund, 2013). Innovative delivery of interventions has also been recommended to extend their reach (Bartels & Naslund, 2013; Kazdin & Rabbitt, 2013). However, few depression studies test hypotheses based on theoretical models that consider the unique aspects of late life, such as functional limitations, bereavement, age-related neurobiological changes, lifestyle changes, and insomnia; thus, we believe research to clarify theoretical models of depression for older adults is also needed to inform these interventions. Targeting specific mechanisms indicated by models

of late life depression may result in more powerful and efficient treatments to help address the growing mental and physical health needs (Dimidjian, Barrera, Martell, Muñoz, & Lewinsohn, 2011) of older adults.

To help fill this gap, the present study tested the generalizability of a cognitive theory of depression in older adults by examining the role of cognitions in late life depression. Specifically, this study examined the relationship of negative cognitions (hopelessness and pessimism) with depression. Testing theory may provide a better understanding of the causes of depression and the factors that maintain depression in older adults. For instance, finding that negative cognitions are related to change in depressive symptoms in ways not indicated by current cognitive models of depression may suggest modifications to current models to better explain the role of cognitions in late life depression and recommend new ways to target cognitions in interventions for older adults. Because depression, functional limitations, and activity are strongly associated with health and longevity, this study also examined the relationships of negative cognitions with functional limitations and activity, which are important predictors of depression.

Novel Contributions of This Study

This study offers several novel contributions to the literature. First, it combines functional limitations and cognitions in the study of depression, which are typically studied in isolation. Second, by including functional limitations and activity, which change in late life and are believed to be related to depression, it tests a cognitive model of depression that includes aspects specific to older adults. Third, it separates negative

cognitions from depression to examine the unique contribution of cognitions in depression. Much of the depression research is cross sectional. Moreover, most longitudinal studies examine trajectories or covariance of variables without examining temporal ordering. Thus, a fourth novel contribution of this study is its use of specific longitudinal analyses that test both growth and temporal covariance to better capture the interrelatedness of depression and related factors over time.

Cognitive Models of Depression

Cognitions are strongly implicated in the etiology of emotional disorders (Alloy & Riskind, 2005) and are core components in cognitive models of depression. In cognitive theory, cognitions are the primary mechanisms through which depression develops and is maintained (Beck, 1976). Cognitive theories of depression assert that thoughts, attitudes, interpretations, as well as attention to and recall of selective information increase the risk of depression (Gotlib & Joormann, 2010). In cognitive models of depression, cognitions are also theoretically linked to behaviors, which suggests that cognitions may provide a mechanism of behavior change in activities. For example, when people believe that aversive negative conditions are unavoidable (a hopeless negative cognition), they cease efforts to escape the situation. In late life, cognitions related to aging may influence depression and functioning. Internalized ageist stereotypes (e.g., that elderly people are warm but incompetent) (Cuddy, Norton, & Fiske, 2005) may be activated when receiving care and may lead to increased depressive symptoms (Kwak, Ingersoll-Dayton, & Burgard, 2014). Conversely, a positive self-

perception of aging may be protective of functioning up to one year later (Sargent-Cox, Anstey, & Luszcz, 2012).

Several separate but intersecting cognitive models of depression have been developed to describe or explain the relationships of symptoms with depression and delineate proximal and distal risk factors (Beck, 2002). Beck's cognitive theory (Beck, 1976) – arguably the most influential of the cognitive theories – is based on Beck's research on depression and asserts that negative cognitive schemas are central to the development and maintenance of depression. Negative cognitive schemas are longstanding mental structures stemming from negative early life experiences that shape individuals' interpretations of their experiences. When activated by negative events later in life, these schemas lead to negative outcome expectancies, which then lead to depression. Beck identified three negative cognitive schemas related to depression: negative views of the self, the world, and the future. Beck labeled the tendency to attribute negative outcomes to internal, global, and stable factors the negative cognitive triad (Beck, 1976).

Another cognitive model of depression, Seligman's learned helplessness theory of depression, (Peterson & Seligman, 1984; Seligman, 1975) stemmed from the finding that animals became helpless after experiencing unavoidable aversive conditions. Seligman extended this finding of learned helplessness to people with hopeless cognitions who overgeneralized their perceptions of helplessness in unavoidable aversive situations to new situations, despite the possibility of escape (Peterson & Seligman, 1984; Seligman, 1975). A subtype of depression, labeled hopeless depression, was proposed

by Abramson, Metalsky, and Alloy (1989). Based on Beck's and Seligman's theories, it identified hopelessness as the precipitating cause of hopeless depression (Abramson, Metalsky, & Alloy, 1989).

Pessimistic thinking, a main contributor to hopeless depression, can take different forms. A pessimistic explanatory style is the tendency to explain negative life events in a pessimistic way and attribute these events to global and stable factors. According to the theory of hopeless depression, individuals with a pessimistic explanatory style are at a greater risk of developing hopelessness and subsequent depression (Abramson et al., 1989). Explanatory styles tend to be stable (stability of over 52 years has been observed) (Burns & Seligman, 1989), which could exert increasing effects over time, as some evidence suggests that a pessimistic explanatory style may generate depressive symptoms and hopelessness that actually lead to negative events in the future (Kleiman, Liu, Riskind, & Hamilton, 2014).

Pessimistic expectancy is the expectation that one will experience negative events in the future. In a prospective study of 67 older adults, pessimistic explanatory style and pessimistic expectancy were uncorrelated and influenced mood differently (Isaacowitz & Seligman, 2001). A pessimistic explanatory style did not predict increased depression 1 month and 6 months later. Individuals who predicted that they would experience more negative life events over the next month (thus exhibiting a pessimistic expectancy) reported more depressive symptoms and experienced more negative life events at the end of the month. Effects remained when depression and number of life events at baseline were accounted for in analyses. Surprisingly, individuals with optimistic expectations

who experienced negative events reported the highest levels of depression after 6 months and 1 year (Isaacowitz & Seligman, 2001).

The theoretical centrality of cognitions in depression along with empirical findings of the association of cognitions and mood corresponds to treatment of depression with cognitive therapy, which has strong support as an empirically supported therapy for depression (APA Presidential Task Force on Evidence-Based Practice., 2006; "Cognitive Therapy for Depression," 2013). Cognitive Therapy (CT) is a product of Beck's depression research that targets negative cognitions (Beck, 1967, 1979). In CT, individuals learn to identify, refute, and restructure maladaptive negative cognitions, which leads to improved mood and behaviors. Cognitive Behavioral Therapy (CBT) combines CT with behavioral components. The basic tenet of CBT is that people derive meaning from their thoughts, feelings, and behaviors, which are interrelated (Beck, Rush, Shaw, & Emery, 1979). CBT has demonstrated effectiveness in a wide range of applications and change in cognitions appears to be a mechanism in depression treatment (Lorenzo-Luaces, German, & DeRubeis, 2014); however, a recent meta-analysis reported that effect sizes have declined over the past 3 to 4 decades (Johnsen & Friborg, 2015). Compared to behavioral or physiological mechanisms in mood disorders (Ayers & Riskind, 2014), cognitions are less vulnerable to aging-related changes, so it is not surprising that the effectiveness of CBT with older adults is comparable to that of younger adults. Adaptations of CBT for age-related concerns (e.g., grief, medical conditions, attitudes about aging) and limitations (e.g., cognitive impairment and sensory

limitations) are comparatively effective (DiNapoli, LaRocca, & Scogin, 2015; Johnsen & Friborg, 2015).

Explanations of the etiology of late life depression include cognitive and memory deficits due to age-related biological changes in the brain (Stuart-Hamilton, 2006), which may increase vulnerability to depression. Cognitive biases in memory and attentional processing of emotional information (key features in depression) are interrelated and may contribute to emotional dysregulation through multiple pathways, including rumination and reduced cognitive control in both processing and disengaging from negative information (Gotlib & Joormann, 2010). Despite aging-related biological changes, emotional regulation improves in late life, perhaps because we tend to prioritize the present moment over the future, invest in fewer intimate relationships, and focus on positive emotions as we age (Carstensen, Isaacowitz, & Charles, 1999; Laidlaw, 2013). This improved emotional regulation in late life despite aging-related changes that increase vulnerability to depression suggests that models could more accurately delineate late life differences in cognitive biases influencing emotion regulation.

A model that includes functional limitations (that tend to increase in late life), physical activity (that typically decreases in late life), and negative cognitions (that may have a different role in late life depression than earlier) may be useful to understand how late life depression develops and is maintained. Figure 1 depicts such a model, indicating relationships between negative cognitions, functional limitations, activity, and depression. The blue lines connecting constructs indicate temporal relationships that will be empirically tested in this study. Arrows indicate hypothesized temporal effects (e.g.,

change in functional limitations will precede change in negative cognitions); arrows on both ends of a line indicate bidirectional temporal relationships (e.g., change in depression and negative cognitions precede change in the other paired construct).

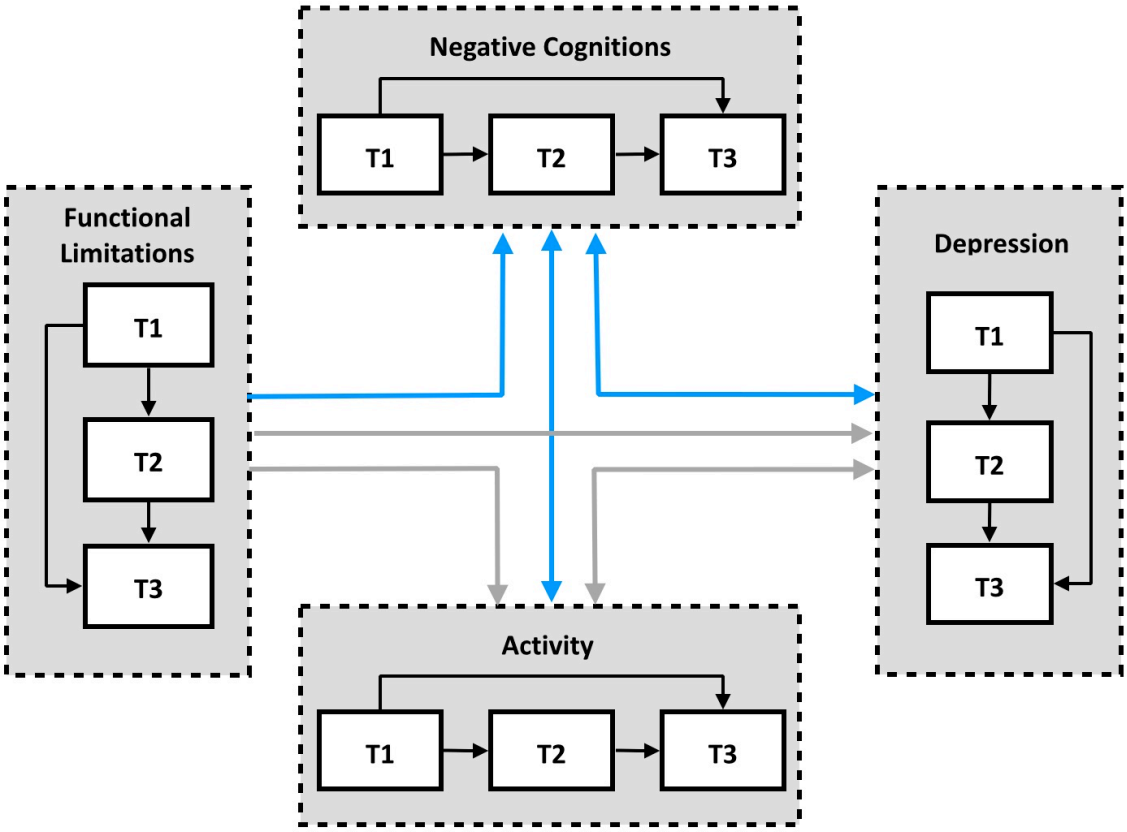

Figure 1 Conceptual model of changes in negative cognitions, functional limitations, activity, and depression

Behavioral Model of Depression

Behavioral models of depression place overt and covert behaviors at the core. A behavioral explanation of depression assumes that insufficient engagement in rewarding

events leads to decreased engagement in activities, which limits opportunities for future rewarding interactions and leads to depressed mood (Lewinsohn & Graf, 1973). From a behavioral standpoint, depressive symptoms present as depressed behaviors. Within a behavioral conceptualization of depression, antecedent and consequent events maintain depressed behavior, affective experiences, and responses (Polenick & Flora, 2013). For instance, a change in activity level due to injury (antecedent) may lead to feeling disappointed and worthless (covert depressed behavior) about being unable to help build a grandchild's playhouse, and result in behavior such as self-critical remarks (overt depressed behavior). Restricted daily activity has been proposed as a common pathway leading to depression in older adults, regardless of risk factors (Fiske, Wetherell, & Gatz, 2009).

Declining functioning and perception might also contribute to a decrease in activity in late life. For example, because functional limitations, sensory decline, and cognitive impairment may reduce enjoyment of activities, these aging-related changes might limit sources of reinforcement or lead to reduced frequency of rewarding activities, thereby increasing vulnerability to depression. Thus, behavioral models are applicable in old age (Polenick & Flora, 2013).

Apart from aging-related changes in sensory perception, recent research suggests that major depression may be accompanied by altered sensory perception such as visual processing of emotional expression and dulled perception of sexual attraction cues. These abnormalities in perception may contribute to an inability to experience pleasure and loss of interest in activities by impairing reward circuits in the brain (Fitzgerald, 2013). The

motivation to approach positive outcomes and avoid negative outcomes is important for understanding behavior in depression. Both approach deficits and avoidance motivation may contribute to the onset and maintenance of depression by limiting positive reinforcing experiences and increasing negative experiences. Avoidance processes may also increase vulnerability to depression by influencing information processing biases (Fitzgerald, 2013).

As with cognitive treatments for depression, a behavioral intervention was developed based on the theoretical factors that initiate and maintain depression. Behavioral activation for depression has strong research support as an empirically-supported treatment (APA Presidential Task Force on Evidence-Based Practice., 2006; "Research-Supported Psychological Treatments," 2013). Behavioral activation aims to increase engagement in both rewarding activities and adaptive behaviors and reduce engagement in behaviors that maintain or increase the risk of depression. Behavioral activation may work independently of cognitive elements in CBT, as a component analysis indicated that a behavioral component of CBT was comparable in effectiveness to the complete CBT protocol (that also targeted negative cognitions) for treatment of depression and relapse prevention (Jacobson et al., 1996).

Risk Factors for Depression

Risk factors for depression among community dwelling older adults include bereavement, disability, history of depression, sleep disturbance, being female (Cole & Dendukuri, 2003), adverse experiences in childhood, social strain, financial strain, smoking, alcohol use, physical inactivity, obesity, diabetes, hypertension, and comorbid

medical conditions (Almeida et al., 2011). The onset and maintenance of late life depression is likely due to an interaction of vulnerabilities, cognitive diathesis, aging-related neurobiological changes, and stressful life events that become more frequent with age (Fiske et al., 2009). Thus, the most accurate models explaining the etiology of late-life depression incorporate multiple risk factors that represent interdependent and dynamic processes (Blazer, 2002; Zarit & Zarit, 2007). Moreover, these factors may influence depression differently at different ages. For example, although the prevalence of depression among older adults was higher among those aged 75 and older (compared to 55-74), age was a risk factor only up to 89 years old (Zhao et al., 2012). In addition, depressed older adults whose first onset of depression occurred at age 60+ were less likely to report a family history of depression or previous hospitalization for depression and had greater cognitive impairment compared to those whose first depressive episode occurred earlier (Gallagher et al., 2009).

Functional Limitations and Depression

Physical functioning decline in late life is associated with depression. In 2010, more than 38% of US adults aged 65+ had a disability, defined as difficulty in one or more of 6 categories: hearing and vision, cognition, ambulation (walking or climbing stairs), self-care, and independent living (doing errands alone) (Office of American Community Survey, 2010). The most common difficulties were walking, doing errands alone, and climbing stairs (West, Cole, Goodkind, & He, 2014). Functional limitation predicts functional decline and loss of independence, but there is considerable fluctuation in short-term levels of functioning (Guralnik, Patel, & Ferrucci, 2012).

Some studies suggest that, except for prior levels of depression, disability and changes in disability are the greatest risk factors for increased depression (Kennison & Cox, 2013; Yang, 2006) but evidence for a longitudinal relationship is inconsistent (Chao, 2014; Pearlin & Skaff, 1996; Yang, 2006). Older adults with disabilities are nearly three times more likely to have depressive symptoms (Meltzer et al., 2012), with each additional ADL or IADL limitation and disability type increasing the likelihood of depression. In a Netherlands population based study, 37% of older men and 36% of older women with disabilities were classified as depressed, which was approximately twice the prevalence found in the community population (Ormel, Rijsdijk, Sullivan, van Sonderen, & Kempen, 2002). High levels of functional abilities, visual acuity, and stability of functioning predict stable low depressive symptoms (Schilling, Wahl, & Reidick, 2013).

Although disability has long been recognized as a major risk factor for depression, only recently have researchers examined the role of psychosocial factors in this relationship (Jang, Haley, Small, & Mortimer, 2002) and results are inconsistent. In a cross-sectional study, after adjusting for disability severity, dependence on others was not related to depression, suggesting that increased functional limitation was the key risk factor for depression (Meltzer et al., 2012); however, another cross-sectional study found that self-efficacy in managing one's environment, autonomy, and purpose in life better predicted depression than did medical illness and disability (Davison, McCabe, Knight, & Mellor, 2012). Some potential mediators of disability on subsequent depression may include cognitive elements such as discrimination, sense of control, and self-esteem (Gayman, Turner, & Cui, 2008; Yang, 2006). Over time, functional loss accompanied by

chronic strain may deplete psychosocial coping resources and lead to negative self-perceptions, increasing depressive risk (Yang, 2006).

There is some evidence of a bidirectional relationship between disability and depression and trajectories of disability and depressive symptoms are interrelated both concurrently and longitudinally (Kennison & Cox, 2013; Ormel et al., 2002; Taylor & Lynch, 2004). Depression predicts future disability (Hybels, Pieper, & Blazer, 2009) and may be among the most important risk factors of functional decline (Bruce, 2001). Improvement in depressive symptoms is also associated with improvement in ADL and IADL over 12 months (Nyunt, Lim, Yap, & Ng, 2012). However, compared to the effects of disability on depression, the effects of depression on subsequent disability may be more complex, nonlinear, weaker or non-significant, and may vary by time frame, functional domain, and chronic disease status (Chen et al., 2012; Gayman et al., 2008; Geerlings, Beekman, Deeg, Twisk, & Van Tilburg, 2001; Guralnik et al., 2012; Hybels, Pieper, & Blazer, 2009; Yang, 2006). For example, no relationship of disability and depression was found over 3 months in older men and women (Conradsson et al., 2013).

Physical Activity and Depression

Physical activity, which declines in late life, is associated with mental and physical health, functioning, longevity, and quality of life in older adults, and therefore, is important for healthy aging (Gill, Allore, Gahbauer, & Murphy, 2010; Griffiths et al., 2014; Pahor et al., 2014; Wagner & Short, 2014; Wassink-Vossen et al., 2014). Physical inactivity and disability predict persistently high and increasing depressive symptoms over 20 years in women aged 65 and older (Byers et al., 2012). Notably, sedentary

women aged 50-55 had nearly twice the risk of depressive symptoms up to 9 years later compared to women who either sat 4 or fewer hours per day or engaged in 2½ hours of moderate physical activity per week. Compared to women who sat 4 or fewer hours per day and engaged in 2½ hours of moderate physical activity per week, the sedentary group had 3 times the risk of depression (van Uffelen et al., 2013). In treatment studies, physical activity demonstrates beneficial effects on depressive symptoms in older adults (Mura & Carta, 2013) but surprisingly, no studies have been published on the effects of depression treatment on physical activities (Cuijpers, de Wit, & Taylor, 2014).

Bidirectional longitudinal associations between physical activity and mental health of up to 10 years have also been identified (Griffiths et al., 2014; Steinmo, Hagger-Johnson, & Shahab, 2014). Emerging depression is associated with a decrease in minutes of physical activity and is a risk factor for adopting a sedentary lifestyle in older adults, regardless of disease status (van Gool et al., 2003).

The Proposed Study

Few depression studies test hypotheses based on theoretical models that consider the unique aspects of late life, such as functional limitations and decreasing activity levels. In addition, few models of late-life depression incorporate interdependent and dynamic processes that may influence depression differently in late life. Improved emotional regulation in late life, despite aging-related changes that increase vulnerability to depression, suggests that cognitive influences may operate differently to regulate emotion at older ages. A model that includes functional limitations (that tend to worsen in late life), physical activity (that typically decreases in late life), and negative cognitions

(that may have a different role in late life depression than earlier) may be useful to understand how late life depression develops and is maintained.

This study will attempt to help fill this gap by examining the level of Negative Cognitions, Depression, Functional Limitations, and Activities in older adults across 3 time points, spanning 8 years. It will also examine how Negative Cognitions relate to Depression, Functional Limitations, and Activities. Specifically, it will test the time-lagged associations in pairs of variables (Negative Cognitions with Depression, Negative Cognitions with Functional Limitations, and Negative Cognitions with Activities) using 3 bivariate latent difference score (LDS) models. Of primary interest in this study is whether Negative Cognitions are leading indicators of Depression, Functional Limitations, and Activities in older adults.

Negative implicit cognitions (those outside of conscious awareness) are related to past, present, and future depression (Phillips, Hine, & Thorsteinsson, 2010) and a negative cognitive style is implicated in the hopelessness model of depression (Beck, 1979; Beck, Brown, Steer, Eidelson, & Riskind, 1987; Gotlib & Joormann, 2010). However, despite a large body of research on cognitions and depression, little research has examined how negative cognitions may operate differently in late life depression. In addition, few studies have examined the role of negative cognitions in functioning or activities in older adult samples. A specific cognition that appears to be predictive of functioning is a positive perception of aging, which was related to better functional health over 18 years and was partially mediated by perceived control (Levy, Slade, & Kasl, 2002).

This study will examine the trajectories of negative cognitions with depression, functioning, or activities in older adults. Evidence of negative cognitions as a leading indicator of functioning and activities would suggest that theoretical models of depression might need to be expanded to include aging-related factors for older adults. It would also provide support for targeting cognitions to improve functional limitations and activity levels in older adults, whose life experiences and perspective taking abilities are strengths contributing to effective cognitive restructuring in treatment (Satre, Knight, & David, 2006). As functional limitations and activity are both predictors of depression, health, and longevity (Ben-Ezra & Shmotkin, 2010; Cesari et al., 2008; Goodwin, 2003; Kennison & Cox, 2013; Wagner & Short, 2014), knowing whether negative cognitions are worthwhile targets for improvement in these areas might lead to more powerful and efficient interventions.

Research Question and Hypotheses

Depression, functional limitations, and activity are important research emphases for improving the quality of life and well-being of older adults. The purpose of this study is to examine the relationships of Negative Cognitions with Depression, Negative Cognitions with Functional Limitations, and Negative Cognitions with Activities by asking the following research question: In what ways do Negative Cognitions change and relate with Depression, Functional Limitations, and Activities?

The literature on older adults suggests that mental health improves during most of late adulthood, while physical activity and abilities decline (Cotter & Lachman, 2010).

Hypothesis 1. Depression, Negative Cognitions, Functional Limitations, and Activities will decline over time.

Negative implicit cognitions are related to past, present, and future depression (Phillips et al., 2010). *Hypothesis 2.* Negative Cognitions will lead to Depression and Depression will lead to Negative Cognitions.

To our knowledge, no published research exists on how negative cognitions relate to functioning in older adults; however, a positive view of aging was shown to be associated with better future functioning and was mediated by perceived control. In addition, functional limitations are associated with higher rates of depression. *Hypothesis 3.* Functional Limitations will lead to Negative Cognitions.

According to cognitive and behavioral theory, thoughts, feelings, and behaviors are interrelated (Beck & Haigh, 2014; Dimidjian et al., 2011) and evidence-based cognitive-behavioral therapies target thoughts and behaviors to effect change (Barlow, 2008). To our knowledge, the relationship of negative cognitions and activity has not been tested. However, a cognitive behavioral model to promote physical activity in older adults recommended that several beliefs related to physical activity – self-efficacy beliefs, outcome expectations, and attributions about difficulties – should be addressed in CBT interventions (Lachman et al., 1997). Given the consistent theoretical relationship between cognitions and depression and the efficacy of cognitive and behavioral techniques that address cognitions or behaviors to improve mental and physical health outcomes (e.g., behavioral activation to alleviate depression in older adults) (Dimidjian et al., 2011), we expect that negative cognitions and behaviors will be interrelated over

time. *Hypothesis 4.* Higher levels of Negative Cognitions will lead to fewer Activities and lower levels of Activities will lead to increased Negative Cognitions.

METHOD

Participants

Data for this study were collected as part of the HRS (Health and Retirement Study) (HRS, 2012), which is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is conducted by the University of Michigan. David R. Weir is the Principal Investigator of the Health and Retirement Study. The HRS is a nationally representative sample of more than 26,000 US adults, age 50+ who were surveyed about work, income, assets, disability, health, cognitive functioning, and psychosocial functioning.

Beginning in 2004, a randomly selected group of 7,611 community-dwelling participants who completed a core interview received a self-administered questionnaire with either disability or psychosocial items and were asked to complete and return it by mail. The psychosocial leave-behind questionnaire contained negative cognitions used in this study, which was comprised of hopelessness and pessimism items. In 2004, 78.2% of those who were asked to complete the psychosocial questionnaire returned it (n=3,182). Accounting for the 88.9% response rate for the 2004 core interview, the overall response rate was 68.3% (HRS, 2012). Beginning in 2006, participants scheduled for face-to-face interviews occurring every 4 years were asked to complete an updated psychosocial questionnaire. Some participants who completed the pilot questionnaire in 2004 were selected to receive the expanded questionnaire in 2008 (n = 1,377) and 2012 (n = 1,196).

The response rate among these participants was 94% in 2008 and 86% in 2012. Of the participants who completed the psychosocial questionnaire in 2004, 21% (n = 689) had died by 2012 and were excluded from the analyses. Participants younger than 50 in 2004 (n = 151) were removed from the data set. In 2004, 2008, and 2012, 673 adults (36% male), completed either the pilot questionnaire or an updated psychosocial questionnaire. In 2004, participants were 50 to 88 (M = 63.9, SD = 8.4) years of age.

Measures

Functional Limitations was measured with the total number of difficulties in mobility endorsed out of 5, (walking 1 block, walking several blocks, climbing 1 flight of stairs, climbing several flights of stairs, and jogging 1 mile). Reliability was good (α=.74 for 2004, α=.77 for 2008, α=.80 for 2012).

Activity was the frequency of vigorous, moderate, and mild activities. *Frequency of vigorous physical activities* was one item: "How often do you take part in sports or activities that are vigorous, such as running or jogging, swimming, cycling, aerobics for gym workout, tennis, or digging with the state or shovel?" *Frequency of moderate physical activities* was one item: "How often do you take part in sports or activities that are moderately energetic such as gardening, cleaning the car, walking out of moderate pace, dancing, floor or stretching exercises?" *Frequency of mild physical activities* was one item: "How often do you take part in sports or activities that are mildly energetic, such as vacuuming, laundry, or home repairs?" Responses for frequency of vigorous, moderate, or mild activities were 1 = *hardly ever or never*, 2 = *1 to 3 times a month*, 3 = *once a week*, *4 = more than once a week*, and 5 = *every day*.

Negative Cognitions were measured with scales of pessimism and hopelessness. *Pessimism* was measured with 3 items from the life orientation test (LOT) (Scheier, Carver, & Bridges, 1994). Reliability of the LOT pessimism was good (α=.84 for 2004, α=.76 for 2008, and α=.77 for 2012). *Hopelessness* was measured with 2 items from Beck Hopelessness scale (Beck, Weissman, Lester, & Trexler, 1974) and 2 items from the Everson et al. Hopelessness scale (Everson, Kaplan, Goldberg, Salonen, & Salonen, 1997). In the present study, hopelessness reliability was good (α=.87 for 2004, α=.84 for 2008, and α=.88 for 2012).

Depression was measured with an 8-item version of the Centers for Epidemiological Study, Depression Scale (CES-D). The sum of items ranged from 0 to 8, with higher numbers indicating more depressive symptoms (Radloff, 1977). Reliability was good (α=.80 for 2004, α=.81 for 2008, and α=.82 for 2012).

Analysis

To examine how trajectories of pairs of variables (Negative Cognitions with Depression, Negative Cognitions with Functional Limitations, and Negative Cognitions with Activities) relate to one another over 8 years, three bivariate latent difference score (LDS) SEM models using Mplus 7.3 (B. O. Muthén & Muthén, 2014) were fit to the data. A bivariate LDS model (depicted in Figure 2) can account for growth or decline (mean level change), lagged relationships, and detect covariance over time. LDS models include both constant linear effects and two sources of change. Constant linear change, though not estimated, is depicted (α, indicated by the red paths) for consistency with LDS models in the literature. Sources of change in LDS models include the effects of self-

feedback (non-linear) change associated with the same variable at the previous time point (β, indicated by the blue paths), and time-lagged change in the paired variable (ɣ, indicated by the green paths). For each variable, the model indicates an intercept and a slope (x_0 and x_S for variable *X;* and y_0 and y_S, for variable *Y*) and deviations of the intercepts and slopes (x_0* and x_S*, and y_0* and y_S*). The slope means (μ_{xs} and μ_{ys}) and the correlation between the two slopes (ρ_{xs}, ρ_{yx}) are also indicated.

General guidelines to determine adequate sample sizes for SEM models with missing data are generally insufficient because power is influenced by multiple factors; However, effects have been detected in LDS models with a sample size of fewer than 500 (Hertzog, Lindenberger, Ghisletta, & Oertzen, 2006). To maximize analytic power, FIML was used. Bayesian estimation was used because of the substantial amount of non-normal data. Bayesian estimation uses a nonparametric approach that can account for non-normal data and produce non-biased estimates. Significant path coefficients indicated effects for hypothesized paths.

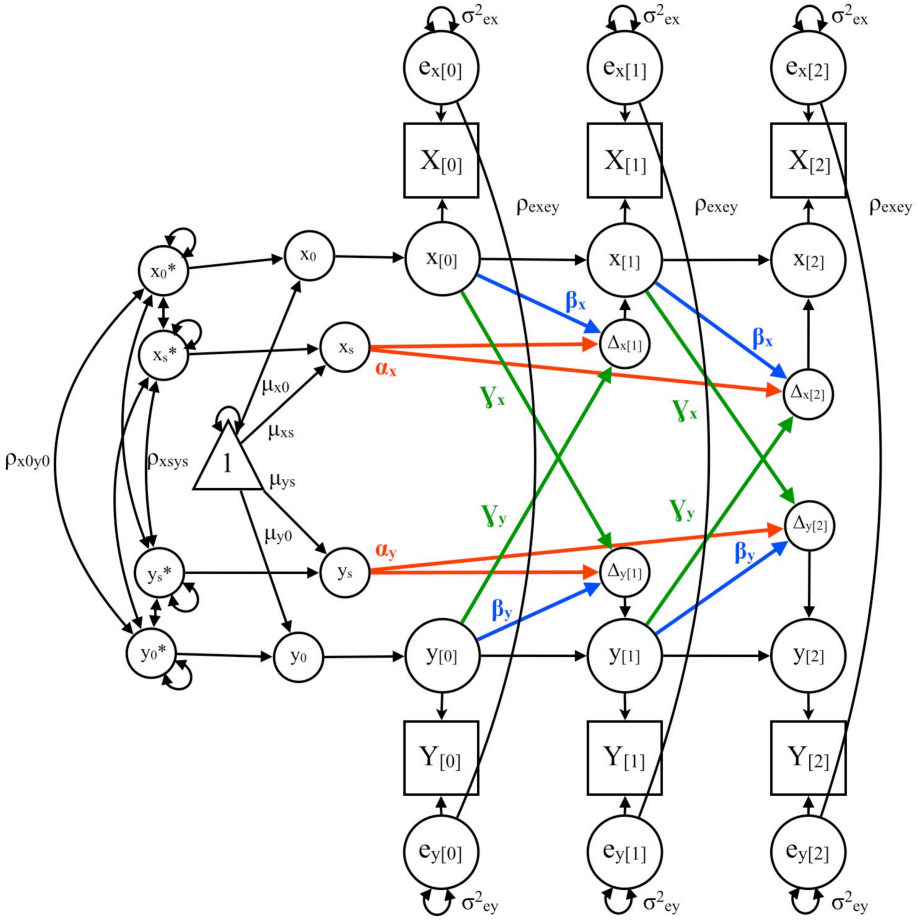

Figure 2 Bivariate Latent Difference Score Model

RESULTS

Descriptive Results

To explore the strength of the relationships among constructs within and between time points, bivariate correlations were computed among all variables using SPSS version 19. Means of all variables and their correlations were consistent with expectations and can be seen in Table 1. Within-construct correlations over time were high for Functional Limitations (r = .64, .56, and .69) and Negative Cognitions (r = .65, .56 and .68). Correlations for Depression over time were moderate (r = .46, .46, and .47). Correlations for Activities were moderate to high (r = .48, .46 and .58). Correlations between constructs within time points demonstrated small to medium effects. The strongest relationship was between Negative Cognitions and Depression (r = .45, .39 and .34), followed by Negative Cognitions and Functional Limitations (r = .31, .26, and .25), and Negative Cognitions and Activities, which were negatively correlated (r = -.21, -.27, and -.27).

Table 1 Descriptive Statistics and Correlations between Study Variables Within and Across Time Points

	1	2	3	4	5	6	7	8	9	10	11	12
n	664	669	664	661	670	664	664	663	655	673	673	673
Mean	2.54	2.44	2.38	1.19	1.16	1.19	.67	.84	1.10	9.20	9.18	8.25
SD	1.22	1.15	1.13	1.86	1.83	1.78	1.13	1.26	1.44	2.44	2.64	2.90
Minimum	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	3.00
Maximum	6.00	6.00	6.00	8.00	8.00	8.00	5.00	5.00	5.00	15.00	15.00	15.00
Cognitions												
1. Time1	--											
2. Time 2	.65**	--										
3. Time 3	.56**	.68**	--									
Depression												
4. Time 1	.45**	.29**	.23**	--								
5. Time 2	.39**	.39**	.29**	.46**	--							
6. Time 3	.37**	.35**	.34**	.46**	.47**	--						
Functioning												
7. Time 1	.31**	.25**	.20**	.31**	.36**	.32**	--					
8. Time 2	.30**	.26**	.20**	.29**	.40**	.33**	.64**	--				
9. Time 3	.32**	.29**	.25**	.26**	.33**	.41**	.56**	.69**	--			
Activities												
10. Time 1	-.21**	.21**	-.16**	-.21**	-.15**	-.17**	-.38**	-.35**	-.29**	--		
11. Time 2	-.21**	-.27**	-.24**	-.18**	-.23**	-.19**	-.36**	-.43**	-.35**	.48**	--	
12. Time 3	-.33**	-.31**	-.27**	-.20**	-.24**	-.29**	-.36**	-.43**	-.51**	.46**	.58**	--

** $p<.01$.

Research Question. In what ways do Negative Cognitions change and relate with Depression, Functional Limitations, and Activities?

To answer this research question, three bivariate latent difference score (LDS) models were used to examine the relationships of pairs of variables over time. LDS models are able to estimate both growth and covariance of constructs. The primary question in this study was about how pairs of variables covary, but change in mean levels over time was also of interest. Typically, fit statistics are compared for a series of models (an unconditional growth model without time-lagged relationships, two separate models with time-lagged associations from one variable to the other, and a combined model with time-lagged associations for the effect of each variable on the other). However, Bayesian estimation in Mplus does not provide traditional fit statistics, which would allow comparisons of nested models. Therefore, a Bayesian posterior predictive *p*-value (PPP) fit statistic was examined to assess model fit.

The PPP as computed within Mplus (B. O. Muthén & Muthén, 2014) is based on the likelihood-ratio chi-square test and compares a hypothesized model with an unrestricted alternative model while taking estimation error into account. Although guidelines for interpreting PPP values are not precise nor universally agreed upon, Aspaouhov and Muthén propose that a low PPP value (PPP = .01; .05) indicates poor fit; while a high value (PPP = .5) indicates excellent fit (Asparouhov & Muthén, 2010; B. Muthén & Asparouhov, 2011). The PPP for the Negative Cognitions-Depression LDS model indicated excellent fit of the model to the data (PPP = .6). The PPP for the Negative Cognitions-Activity LDS model indicated inadequate fit (PPP = .03). However, Negative Cognitions estimates within this model (strength and significance of intercept,

slope, autoregressive effects, and mean level change) were comparable to estimates in the other two bivariate models that also included Negative Cognitions, which increased confidence in the estimates produced by the Negative Cognitions-Activity model. The PPP for the Negative Cognitions-Functioning LDS model indicated excellent fit (PPP = .5).

Within the bivariate LDS models, parameter and path estimates were examined to assess effects. Because Negative Cognitions was estimated separately within 3 separate bivariate models, estimates for Negative Cognitions varied slightly. The modeled mean initial value for Negative Cognitions was 2.54 within the Negative Cognitions-Depression model, 2.56 within the Negative Cognitions-Activities model, and 2.50 within the Negative Cognitions-Functional Limitations model (on a 6-point scale). Modeled mean estimates for Depression was 1.18 (on an 8-point scale), Functional Limitations was .64 (on a 5-point scale), and Activities was 9.29 (on a 15-point scale). The models also estimated change in each variable over the 3 time points. Negative Cognitions and Activities decreased slightly. Depression levels remained relatively stable over the 3 time points. Functional Limitations increased from .64 at its initial level to .86 at time 2 and 1.06 at time 3. The modeled mean initial values and estimated change in each variable are indicated in the bivariate models in figures 3, 4, and 5.

Negative Cognitions and Depression

The models also tested whether there were time-lagged associations between the pairs of variables, while accounting for their correlations. Autoregressive effects were found for both Negative Cognitions and Depression. Contrary to expectations, there was

no evidence of time-lagged effects for Depression on Negative Cognitions, or Negative Cognitions on Depression. Because Negative Cognitions did not receive significant cross-lagged effects from Depression, Functional Limitations, or Activities in any of the bivariate models, change in Negative Cognitions at each time point can be computed from the initial mean value of Negative Cognitions (2.54), its linear effect (slope = 1.46), and change in Negative Cognitions related to its value at the previous time point (autoregressive nonlinear effect = -.60.). Within the bivariate Negative Cognitions-Depression model, change in Negative Cognitions included an estimated, non-significant coupled effect (-.02) from Depression at the previous time point and can be represented with the following equation (significant paths are indicated by bold type for all models):

Equation 1 Change in Negative Cognitions

$$\Delta C[t]_n = \mathbf{1.46} + \mathbf{-.60}C[t\text{-}1]_n + -.02D[t\text{-}1]_n$$

Using this information, the predicted value of Negative Cognitions at each time point was computed and was modeled to decrease from the initial value of 2.54 to 2.44 at time 2, to 2.41 at time 3. The overall decrease of .13 over 8 years was consistent with expectations.

Depression at each time point can be computed from the initial mean value of 1.18, its linear effect (slope = .92), change in Depression related to its value at the previous time point (autoregressive nonlinear effect = -1.00), and the coupling effect of Negative Cognitions at the previous time point (.11), represented by the following equation:

Equation 2 Change in Depression

$$\Delta D[t]_n = \mathbf{.92} + \mathbf{-1.00} D[t\text{-}1]_n + .11 C[t\text{-}1]_n$$

The predicted value of Depression at each time point was modeled to remain largely consistent from the initial value of 1.18 to 1.19 at time 2, to 1.18 at time 3. The lack of decrease in Depression levels was inconsistent with expectations.

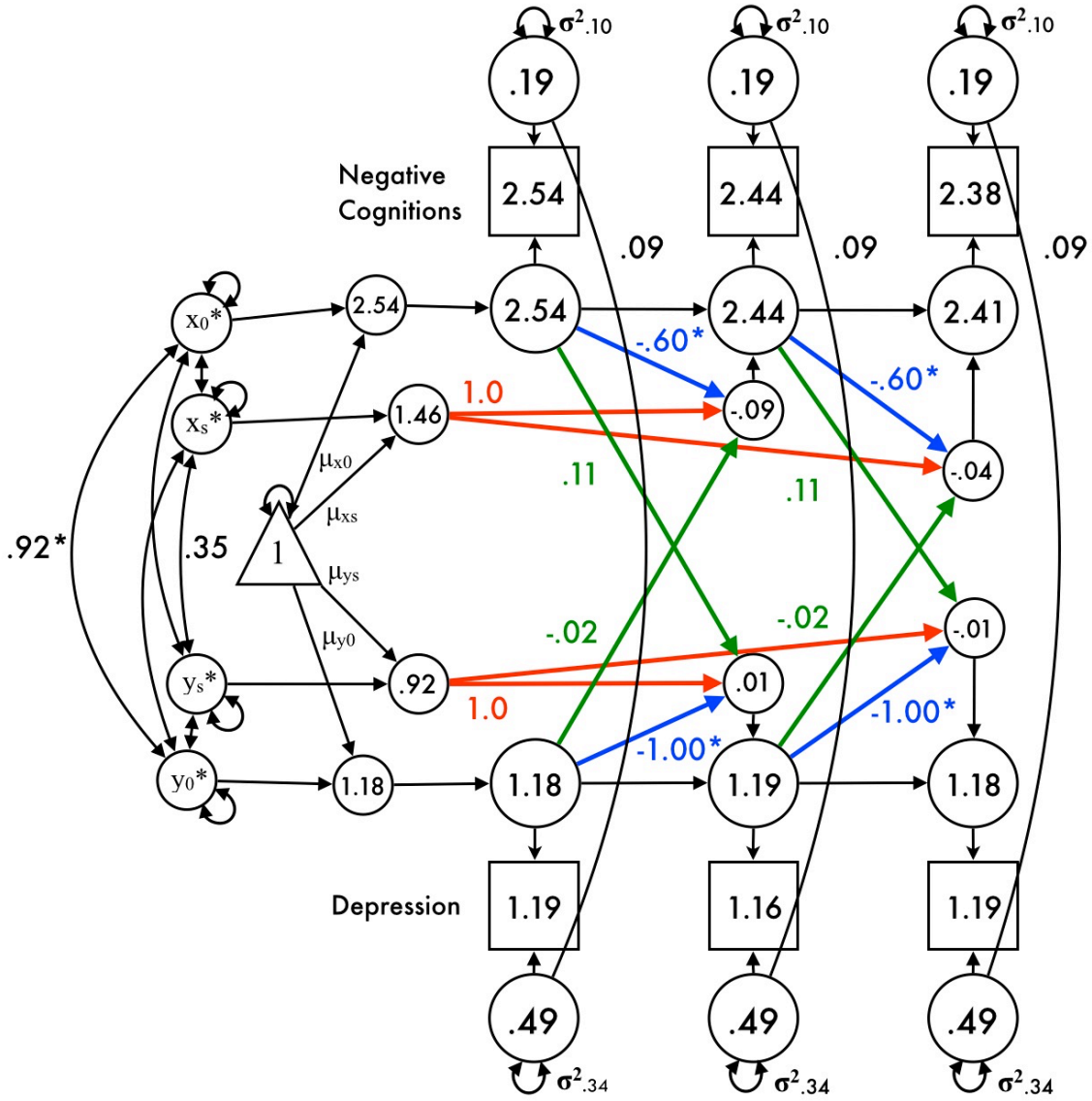

Figure 3 Negative Cognitions and Depression Estimates

Negative Cognitions and Functional Limitations

The initial number of Functional Limitations was .64 (on a 5-point scale). Contrary to expectations, there was no evidence of time-lagged effects for Negative Cognitions on Functional Limitations, or Functional Limitations on Negative Cognitions. Levels of Functional Limitations increased to .86 at time 2 and 1.06 at time 3, for an overall increase of .42 over the 3 time points, which was consistent with expectations. The estimates for the slope (.21) and autoregressive effect (-.04) of Functional Limitations were non-significant. Change in Functional Limitations can be represented by the following equation:

Equation 3 Change in Functional Limitations

$$\Delta F[t]_n = .21 + -.04F[t\text{-}1]_n + .01C[t\text{-}1]_n$$

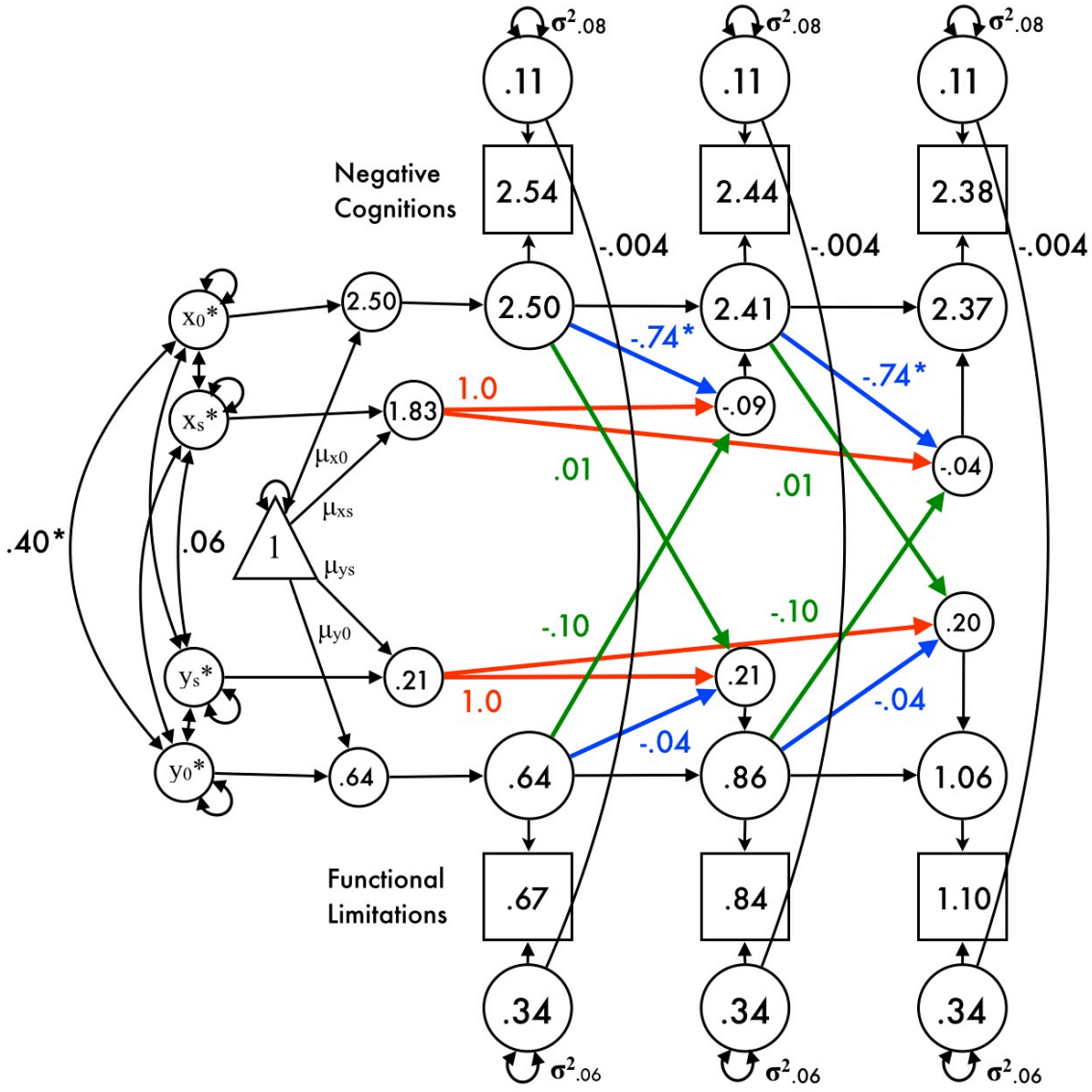

Figure 4 Negative Cognitions and Functional Limitations Estimates

Negative Cognitions and Activities

In the Negative Cognitions-Activities model there was no time-lagged association of Activities with subsequent levels of Negative Cognitions. Negative Cognitions had a

positive time-lagged association with Activities, such that lower levels of Negative Cognitions were associated with lower levels of Activities at the next time point, which was inconsistent with our hypothesis. The autoregressive effect of Activities was non-significant. Change in Activities can be represented by the following equation:

Equation 4 Change in Activities

$$\Delta A[t]_n = \mathbf{-4.06} + -.09A[t\text{-}1]_n + \mathbf{1.93}C[t\text{-}1]_n$$

Activities decreased slightly from 9.29 at time 1 to 9.26 at time 2, and 8.83 at time 3. The overall decrease in Activities of .46 was consistent with expectations.

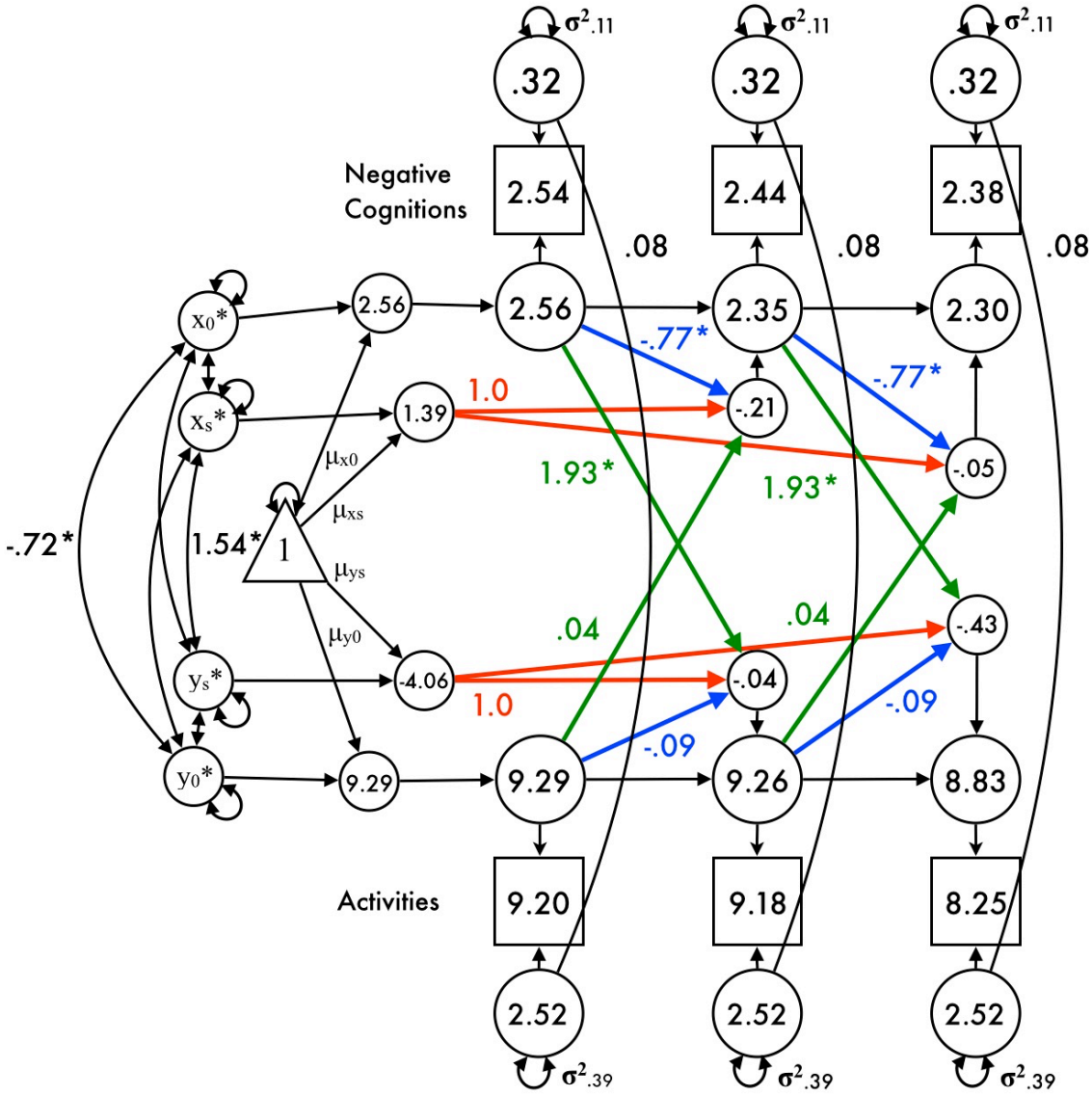

Figure 5 Negative Cognitions and Activities Estimates

DISCUSSION

The Relationship of Negative Cognitions and Depression.

The slight decrease of negative cognitions of .13 over 8 years was consistent with expectations, as mental health improves during most of late adulthood (Cotter & Lachman, 2010). In this sample, 12.1% of participants endorsed 4 or more depressive symptoms at baseline, which is indicative of clinically relevant levels of depression. This percentage was slightly lower than comparable depression levels of older adults aged 65+ observed in population studies (10-12% for men and 16-19% for women) (Federal Interagency Forum on Aging-Related Statistics, 2012). The lower percentage of depression in this study may reflect a younger age of the sample (age 50 to 88, $M = 64$) and the selection of only community dwelling adults to receive the psychosocial questionnaire. While the overall low level of depression (1.18, 1.20, and 1.19 at 3 time points on an 8-point scale) was consistent with hypotheses, the result that levels did not decrease was unexpected given the reported decreases in depressive symptoms over time in older adults (Burns, Butterworth, Luszcz, & Anstey, 2013). Yet, decreases in depression beyond this minimal level observed in this study may be unlikely.

The lack of time-lagged associations between negative cognitions and depression was surprising, given the relationship suggested by cognitive theory. Empirical evidence also suggests a relationship (Phillips et al., 2010). The observed longitudinal correlations within individuals between negative cognitions and depression in the present study also

led us to expect a longitudinal relationship (r = .34 to .39 for negative cognitions at baseline and depression at a later time point; r = .23 to .29 for depression at baseline and negative cognitions at a later time point).

This lack of interrelatedness between negative cognitions and depression suggests that present cognitive models of depression may not generalize to older adults. In addition, negative cognitions and depression followed different trajectories over time. Negative cognitions improved, while depression levels remained consistent, suggesting that negative cognitions did not influence depression levels. This finding departs from cognitive theories of depression that place cognitions at the core of depression etiology and maintenance. Moreover, negative cognitions in this study, hopelessness and pessimism, did not relate to depression, suggesting that hopelessness depression theory, which assumes that hopelessness is the precipitating cause of depression, may not generalize to older adults. Because most research on depression are based on samples with clinically significant depressive symptoms, theories may best describe how cognitions relate to depression when people are depressed. Our results suggest that negative cognitions do not lead to symptoms of depression in community dwelling older adults, who typically experience low levels of depressive symptoms.

Because few depression studies testing hypotheses based on theoretical models have considered the unique aspects of late life such as functional limitations and decline in activity levels, we believe that research to clarify theoretical models of depression for older adults is needed. To help fill this gap, the present study tested the generalizability of a cognitive theory of depression in older adults by examining the role of cognitions in

late life depression. By testing theory, we hoped to better understand the causes and factors that maintained depression in older adults, as targeting these specific mechanisms may result in more powerful and efficient treatments to help address the growing mental and physical health needs (Dimidjian et al., 2011) of older adults.

Higher levels of negative cognitions were unrelated to future depression levels, suggesting that cognitive theories of depression do not accurately capture the role of negative cognitions in depression for older adults. Cognitive theory assumes that negative cognitions lead to and maintain depression, and empirical evidence suggests that negative cognitions are mechanisms of change in depression treatment, which is consistent with the effectiveness of cognitive therapy for depression in older adults (Satre et al., 2006). Our results, however, suggest that negative cognitions are not central to the development and maintenance of depression in older adults and raise the possibility that something other than cognitive restructuring is a mechanism in depression treatment for older adults.

Another possibility is that negative cognitions play a different role in late life depression than at younger ages. For example, one study suggests that hopelessness may interact with stress differently for older adults. A hopeless cognitive style predicted depression 6 weeks later only for individuals with *lower* levels of stress in a study of 64 older adults in extra care living facilities (Meyer, Gudgeon, Thomas, & Collerton, 2010). Moreover, optimism and pessimism appear to be more distinct and independent constructs in older adult populations compared to younger adults (Robinson-Whelen, Kim, MacCallum, & Kiecolt-Glaser, 1997), suggesting that negative cognitions might be qualitatively different in older adults. In fact, after experiencing negative events, older

adults who were optimistic at baseline reported the highest levels of depression compared to those who were pessimistic (Isaacowitz & Seligman, 2001).

Data collection in the present study may have been too infrequent to capture the interrelatedness of negative cognitions and depression, which may occur over weeks or months, rather than years. Findings from the present study identify a need for additional research to gain a better understanding of the relationship between cognitions and depression in older adults and potentially modify a cognitive theory in older adults. Specifically, studies that test the relationship of negative cognitions and depression in shorter time periods of days or weeks, such as experience sampling studies are needed to test the replicability of our findings in briefer time periods.

Results from the present study suggest that current cognitive theories of depression, which highlight the role of negative cognitions as central to the development and maintenance of depression, do not adequately explain depression in older adults. Improved theory could improve current cognitive restructuring techniques for older adults or cognitive components of interventions. Together with the recommendations for broader training of providers in evidence-based treatments for older adults and innovative delivery to extend their reach (Bartels & Naslund, 2013; Kazdin & Rabbitt, 2013), our recommendation for future research to examine the role of cognitions in late life depression could lead to more targeted and powerful treatments to help meet the current and growing health care needs of an increasing older adult population. In light of the predictive relationship of depression with cognitive, social, and physical functioning, health, and mortality, these adaptations could have far-reaching and cost-saving effects.

Relationship of Negative Cognitions and Functional Limitations.

To our knowledge, there are no published studies testing the temporal relationship of negative cognitions and functional limitations in older adults. This study helps to extend current knowledge by examining functional limitations as an aspect of late life depression that may be interrelated with negative cognitions. Our finding that negative cognitions and functional limitations were not related over time suggests that levels of functioning do not influence negative cognitions in older adults.

This result may reflect the high level of stability over 8 years in functional limitations and the low overall mean level of functional limitations in this sample (.64 at time 1 to 1.06 at time 3, on a 5-point scale). Physical abilities generally decline in late life (Cotter & Lachman, 2010) and functioning tends to be poorer in older adults who are hospitalized or in residential care settings. Because participant selection for the psychosocial questionnaire in this study was limited to community dwelling adults aged 50 to 88 (M = 64), our results may not represent typical functioning levels of older adults overall or those at older ages. Thus, a relationship between cognitions and disability might be detected with a more inclusive sample.

It may also be that self-perceptions of disability are more relevant than objective functional limitation measures, as individuals with similar levels of functioning report varying levels of perceived disability (Kelley-Moore, Schumacher, Kahana, & Kahana, 2006). Additionally, despite the finding that negative cognitions and functional limitations were not related in this study, other perceptions related to social aspects of self-concept, such as mastery and self-esteem may help explain the relationship functional limitations and subsequent depression (Redmond & Barrett, 2015). Finally, the

intervals of data collection in this study may have been too infrequent (4 years between waves) to capture changes in negative cognitions related to changes in functional levels. Studies with data collection over briefer time periods, such as months may help detect effects. We recommend studies that include both community dwelling and participants in care settings. Future research should supplement objective disability measures with self-perceptions of disability and aging, and examine effects of specific events, such as bereavement or declining health that might trigger aging-related cognitions.

Relationship of Negative Cognitions and changes in Activities.

The overall decrease in activity was expected, as previous research on older adults generally has shown decreasing activity over time (Buchman et al., 2014; Sun, Norman, & While, 2013). Our finding that less negative cognitions was related to fewer activities at subsequent time points challenges an assumption underlying cognitive theory – that negative cognitions lead to negative behaviors. The lack of association between activity and later negative cognitions is surprising given the causal relationship between increased behavior and less depression in behavioral theory and the strong empirical longitudinal relationship between physical activity and mental health.

Higher levels of negative cognitions led to more frequent activity at subsequent time points, suggesting that negative cognitions may motivate older adults to increase their activity levels. It may be that negative cognitions resulting from discontent or worries about weight or health may motivate older adults to take action to reverse these negative expectations. In addition, negative cognitions might result from receiving a

health diagnosis or poor prognosis and may be accompanied by a doctor's recommendation to increase activities.

Perhaps the degree of discrepancy between the amount of activity someone believes they should achieve compared to their actual activity is also relevant. A greater discrepancy might lead to more negative cognitions and engagement in more activity to reduce this discrepancy, especially if one believes that his health is in serious decline. Conversely, perceiving less discrepancy might lead to less pessimism and hopelessness, and subsequently, less activity.

For many older adults, being physically active is challenging and requires motivation, so it is reasonable to expect that activity levels are influenced by beliefs about the efforts and expectations associated with activities. Our result is consistent with research suggesting that beliefs are important components of interventions to promote physical activity (Lachman et al., 1997). However, rather than targeting negative cognitions to make them less distressing, our results suggest that allowing or helping individuals to crystalize their discontent cognitions may be important for increasing motivation.

There also may be other, less straightforward explanations for our result. For instance, it is possible that the relationship of less negative cognitions leading to less activity (or worse cognitions relating to more activity) reflects attempts to avoid or reduce negative cognitions by engaging in physical activity as a distraction.

Negative cognitions in this study were pessimism and hopelessness, which reflect broad expectations of negative outcomes. Hopelessness includes a negative expectation

despite one's efforts. For example, one Hopelessness scale item said, "I feel it is impossible for me to reach the goals that I would like to strive for." Exercise may be a challenging or aversive activity for some older adults, and for many people, attaining the recommended amount of physical activity is daunting.

Prescriptions to improve health by increasing physical activity may help motivate behaviors initially, but they generally do not lead to sustained behavior change and may be perceived as "should messages" that unintentionally undermine intrinsic motivation by limiting autonomy (Segar & Richardson, 2014). In fact, there are several reasons that even accurate beliefs about the benefits of activity may fail to enhance motivation to engage in physical activity. Knowledge of the numerous benefits of physical activity over the lifespan is generally insufficient to trigger increases in activity (Cress et al., 2006). In addition, health is generally an ineffective message to motivate enduring behavior change in physical activity (Segar & Richardson, 2014). Indeed, our results suggest that negative cognitions, perhaps associated with negative expectations of health serve as effective motivators to elicit change in activity.

Physical activity is essential for maintaining health in older adults and effective interventions that promote physical activity would hold promise for improving quality of life, extending lifespans, and significantly reducing health costs. Currently, few activity interventions include cognitive components (Brawley, 2003). In a review of the effectiveness of physical activity interventions for older adults, behavioral reinforcement and educational components were the most commonly employed components of change. None of the interventions reviewed included cognitive components, and gains in

interventions that were effective in increasing physical activity were short-lived (Van Der Bij, Laurant, & Wensing, 2002).

When interventions promoting physical activity do include a cognitive component, the cognitions most commonly targeted are control beliefs, performance expectancies, and outcome expectancies related to physical activity (Hui & Rubenstein, 2006). A recent meta-analysis found that interventions for older adults that included both behavioral and cognitive components outperformed those that employed just one of these approaches (Chase, 2015). However, as previously mentioned, some intuitively appealing messages designed to activate cognitions about physical activity may fail to motivate as intended. Thus, intervention research should include measures of negative cognitions, activity expectancies, perceptions such as "should messages," and motivation to better understand cognitions and motivation for physical activity.

The results of this study suggest that mechanisms underlying changes in behaviors such as physical activities may include negative cognitions that motivate older adults to increase their activity levels. Motivational interviewing, which is effective in motivating change in behaviors in adults, includes a component to emphasize the discrepancy between one's goals and actions (Cummings, Cooper, & Cassie, 2008). Cognitive dissonance that often results from this discrepancy is thought to increase motivation for change. It may be that negative cognitions led to increased activity in this study through a similar mechanism.

Our results might be influenced by measurement error. Retrospective reports of physical activity are frequently inaccurate and could potentially be influenced by

negative cognitions. For example, individuals who had increased negative cognitions may have perceived and estimated being more active then they actually were. In addition, a single item for strenuous, moderate, and light activity may contribute to this effect, as multiple item scales generally demonstrate better reliability, construct validity, and predictive validity than single item measures (DeVellis, 2012; Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012).

It may be that negative cognitions were related to activity levels but not to depression or functional limitations in the present study because individuals exert more control over their activity levels (or believe they do) than over depressive symptoms or functional limitations, which may allow cognitions to influence choices in activity levels.

Future studies should examine how rewarding (and in particular, immediately rewarding) activities are related to frequency of activity and cognitions. In addition, intervention research should include measures of negative cognitions, activity expectancies, perceptions such as "should messages," and motivation. Finally, future studies should examine cognitions and activities over hours, days, weeks, or months to capture relationships over in a briefer time span.

Limitations and Future Directions

This study had several limitations. Because no experimental manipulations were conducted, causal attributions cannot be inferred. Several variables had non-normal (though typical for this population) distributions, which was addressed using Bayesian estimation. The fit of one model (Negative Cognitions-Activity) was inadequate according to the PPP. However, modeled estimates were similar to corresponding

estimates of Negative Cognitions in the other models, increasing confidence in the Negative Cognitions-Activity estimates. It is possible that differences exist between those who completed measures and those who did not that might have influenced results. The response rate was 76.8% among participants who completed a core interview in 2004 and were eligible to complete the psychosocial questionnaire. Accounting for the 88.9% response rate for the 2004 core interview, the overall response rate was 68.3% (HRS, 2012). In the present study, FIML, which uses available information from all variables to estimate parameters and standard errors, was used to account for missing data and minimize bias.

Data were collected every four years in this sample, which may be too infrequent to detect some temporal relationships between variables. Future studies should explore the nature of these relationships over briefer time periods using experience sampling to gain a better understanding their relatedness over hours, days, weeks, and months. There may be different trajectories of these and related variables for different age groups or moderating factors (e.g. gender, retired vs. non-retired status), which could be investigated in future studies to gain a more nuanced picture of variability in aging (Charles & Pasupathi, 2003; Charles, Reynolds, & Gatz, 2001; Stanley & Isaacowitz, 2011; Stenholm et al., 2014). Future models should include additional variables, such as rewarding activities (in addition to physical activity) to better capture behavioral influences on activity.

CONCLUSION

Several new findings about the temporal relationships of negative cognitions with depression, functional limitations, and activities resulted from this study. We found that negative cognitions and depression were unrelated and followed different trajectories over time. Negative cognitions improved, while depression levels remained stable, suggesting that negative cognitions did not influence depression levels. This lack of interrelatedness between negative cognitions and depression suggests that present cognitive models of depression may not generalize to older adults.

Negative cognitions were not related functional limitations, suggesting that levels of functioning do not influence negative cognitions. Lower levels of negative cognitions were related to decreases in activity over time, suggesting that negative cognitions may motivate older adults to increase activity levels. We found that over 8 years, levels of negative cognitions and activity decreased slightly, depression remained consistent at low levels, and functional limitation levels were low but increased over time, which add to our knowledge of the expected trajectories of these important health-related predictors in older adults.

DEDICATION

To my parents, my greatest fans.

ACKNOWLEDGEMENTS

Many thanks to my husband, Mike, and children, Lindsey and Jeffrey, for filling my life with meaning and great fun. My dissertation committee's tangible support invited me to approach this project with joy. I am very grateful for my dissertation chair and advisor, Dr. Jerome L. Short, whose offer to assist in research at a retirement community led to my doctoral study focused on older adults. Dr. Short's unquenchable thirst for understanding calls me higher and his mentorship has been most transforming. I am grateful to Dr. Timothy W. Curby, whose excellent instruction and responsiveness emboldened me to undertake a challenging analysis. I am also grateful to Dr. Sarah Fischer, who clarified my thinking about theory and why it matters.

APPENDIX A

Background and Literature on Late-Life Depression, Cognition, Functioning, and Activity

This literature review will describe the prevalence of depression for older adults, risk and protective factors for depression, a conceptual model of how cognitions influence the contributions of predictors of depression.

Prevalence of Depression

The 12-month prevalence of depression among adults in the US is 8.3% overall and decreases with age (18-34=10.4%; 35-49=9.4%; 50-64=7.7%; and 65+=2.6%) (Kessler et al., 2010). Among older adults aged 75+, the prevalence of major depressive disorder (MDD) ranges from 4.6% to 9.3%, with a pooled prevalence rate of 7.2% (M. Luppa et al., 2012). In 2008, 15.7% of women aged 65+ had clinically relevant depressive symptoms, compared with 10.7% of men; however, men aged 85+ have the highest rate at 18.9% (West et al., 2014).

Although MDD becomes less prevalent with age (Blazer, 2010a), it is the most prevalent affective disorder in older adults (Gum et al., 2009) and its debilitating effects are comparable to the functional impairment of physical conditions such as diabetes or arthritis (Hirschfeld et al., 1997). The duration of major depressive episodes (MDE) increases from 25.3 weeks for adult aged 18-34 to 31.7 weeks for adults aged 65+ (Kessler et al., 2010). Recent studies indicate that depression severity decreases from

young adulthood and middle age into the late 50s and early 60s and increases through the end of life (Kennison & Cox, 2013; Sutin et al., 2013).

In a representative sample of 8,175 Irish adult aged 50+ living in the community, 10% of participants had clinically significant depressive symptoms with more women at all ages. Physical illness was associated with depression in adults aged 65+; in adults aged 50-64 medication use mediated this relationship. For all participants, chronic pain and incontinence predicted depression, especially for men. Prevalence of depressive symptoms was 20% among individuals reporting incontinence (Regan, Kearney, Savva, Cronin, & Kenny, 2013).

A review of studies of the incidence rate raged from .2 to 14.1 cases per 100 person-years (Büchtemann, Luppa, Bramesfeld, & Riedel-Heller, 2012). The incidence of depressive symptoms in 1.265 German adults aged 75+ was 34 per 1,000 person-years. In that study, depressive symptoms were assessed every 1½ years over 8 years. Symptoms remitted for 60% of participants, exhibited an intermittent course of for 17%, and a chronic course for 23%. Predictors of depressive symptoms included being female, poor self-rated health, alcohol consumption, stroke, more specialist visits, functional impairment, a poor social network, and baseline depressive symptoms (Melanie Luppa, Luck, König, Angermeyer, & Riedel-Heller, 2012).

Studies comparing symptoms and profiles of MDD in younger and older adults have yielded mixed findings about whether depression in older adults is different than in younger adults (Thomas, 2013). A review of studies of the phenomenology of depression in younger and older adults found that older adults experienced more somatic and

gastrointestinal symptoms, hypochondriasis, and agitation but less loss of sexual interest and guilt (Hegeman, Kok, van der Mast, & Giltay, 2012). A study of 664 middle-aged and adults 60+ found no age-specific differences in depressive symptoms profiles, but older adults more frequently reported poor appetite and loss of sexual interest than did younger adults. Younger adults more frequently endorsed crying spells, sadness, fear, feeling bothered, or that life was a failure (Hybels, Landerman, & Blazer, 2012).

A review of neurobiological differences in early and late onset depression found no clinical feature differences except a higher frequency of family history of depression in early onset depression (Grayson & Thomas, 2013). Neurocognitive deficits are more severe in older depressed adults. Although they are not included in diagnostic criteria for depression, these deficits are important because they may contribute to a poorer treatment response and worse clinical outcome (Thomas, 2013). Depression appears to be a risk factor, and in some instances, a prodromal symptom of dementia. Earlier depressive onset and recurrent episodes carry the greatest risk (Aziz & Steffens, 2013).

Chronic physical conditions become more common with age. A US census report found that just 8% of adults aged 65+ had no chronic conditions; 51% had 1 or 2, and 41% had at least 3 (West et al., 2014). Chronic physical conditions are less predictive of MDE in late life, perhaps due in part to a weakening effect of physical disorders on MDE in old age (Kessler et al., 2010). Late life depression is related to increased physical illness, chronic disease, self-neglect, non-suicidal mortality, risk of suicide, and decreased physical, cognitive, and social functioning, which are all associated with increased mortality (Blazer, 2003; Chapman & Perry, 2008; Collard et al., 2014).

White men, aged 80+ have the highest rate of suicide, at 47 deaths per 100,000. From 1999 to 2010, suicide rates in older adults increased considerably (age 50-54=Δ48.4%; 55-59= Δ49.1%; and 60-64= Δ37.0%) ("Federal Interagency Forum on Aging-Related Statistics. Older Americans 2012: Key Indicators of Well-Being," 2012; Sullivan et al., 2013). Psychological autopsies suggest that among older adults who complete suicide, depression is more common and substance abuse less prevalent than for those who complete suicide at other ages (Conwell & Brent, 1995). Compared to physical and other mental disorders, MDD is associated with the highest number of out-of-role days, when individuals are unable to work or continue normal activities. Estimates of US salary human capitol losses due to MDE and MDD range from $30 to more than $51 billion annually (Kessler, 2012). Direct costs associated with depression in 305 adults aged 70+ were nearly one third higher than for non-depressed individuals and were highest among those with chronic depressive symptoms. Inpatient care, home care, and medication were the key cost drivers (Melanie Luppa et al., 2013).

Risk Factors for Depression

The onset and maintenance of late life depression is likely an interaction of vulnerabilities, cognitive diathesis, aging-related neurobiological changes, and stressful life events that become more frequent with age (Fiske et al., 2009). The most accurate models explaining the etiology of late-life depression incorporate multiple risk factors that represent interdependent and dynamic processes (Blazer, 2002; Zarit & Zarit, 2007). Risk factors emerge at different points over the lifespan. Earlier contributions include genetic vulnerabilities, stressful life events, and previous depressive episodes. Biological

risk factors include genetic predisposition, vascular lesions in the sub-cortex, age-related neurobiological changes, medical illnesses and chronic stress that may lead to elevated cortisol and hippocampal atrophy (Aziz & Steffens, 2013; Blazer, 2010b). Impaired hippocampal response to rewarding and aversive outcomes has been observed in depressed individuals and in non-depressed immediate family members (Macoveanu et al., 2014).

Medical illnesses and physical symptoms associated with late life depression include cardiovascular disease, chronic pain, Alzheimer's disease, stroke, urinary incontinence, and shortness of breath (Blazer, 2010b). Chronic physical conditions become more common with age. A US census report found that just 8% of adults aged 65+ were free from chronic conditions; 51% had 1 or 2, and 41% had at least 3 (West et al., 2014). Chronic physical conditions are less predictive of MDE in late life, perhaps due in part to a weakening effect of physical disorders on MDE in old age (Kessler et al., 2010).

Of the biological risk factors, comorbid medical illness, vascular brain lesions, and structural brain changes due to chronic stress are the most important (Blazer, 2010b). Late onset depression could be partially explained by increased stressors and losses in late life or vulnerability for depression combined with accumulating life stressors in late life, such as functional impairment (Monroe & Harkness, 2005; Yang, 2006). Social risk factors include low perceived social support, a sudden loss in quantity or change in quality of important relationships, and fewer contacts with friends. The effects of problems in the neighborhood are mixed (Blazer, 2010b).

Theories of Depression

A behavioral explanation of depression assumes that insufficient engagement in rewarding events leads to decreased engagement in activities, which limits opportunities for future rewarding interactions and leads to depressed mood (Lewinsohn & Graf, 1973). Restricted daily activity has been proposed as a universal pathway to depression for older adults (Fiske et al., 2009). Some recent research suggests that major depression may be accompanied by altered sensory perception such as visual processing of emotional expression and dulled perception of sexual attraction cues. These abnormalities in perception may contribute to an inability to experience pleasure and loss of interest in activities by impairing reward circuits in the brain (Fitzgerald, 2013). The motivation to approach positive outcomes and avoid negative outcomes is important for understanding behavior in depression. Both approach deficits and avoidance motivation may contribute to the onset and maintenance of depression by limiting positive reinforcing experiences and increasing negative experiences. Avoidance processes may also increase vulnerability to depression by influencing information processing biases. Dysregulation of the pathway connections between approach and avoidance systems may also lead to maladaptive perseverance of unattainable goals, which may also contribute to depression (Trew, 2011). Compared to healthy controls, adults with MDD did not adjust approach or avoidance behaviors in response to happy vs. angry expressions, or direct vs. indirect gaze, suggesting that flexible responding is impaired in depressed individuals (Radke, Güths, André, Müller, & de Bruijn, 2014).

Cognitive models posit that schematic biases with themes of worthlessness, failure, rejection, loss, and separation are common in depressed individuals. Exaggerated

negative appraisals of oneself, others, and the future are considered distorted and can be interpersonally or achievement-related. The hopelessness model of depression posits that a negative cognitive style attributes negative events to stable and global factors, anticipates a negative future, and infers negative characteristics in oneself (Beck, 1979; Beck et al., 1987; Gotlib & Joormann, 2010). A negative cognitive style is believed to increase the risk of hopelessness, which increases risk of depression (Abramson et al., 1989). In addition, a negative cognitive style may generate depressive symptoms and hopelessness that then lead to negative events (Kleiman et al., 2014).

Older adults think differently than at younger ages due to biological changes in the brain leading to cognitive and memory changes (Stuart-Hamilton, 2006) that may increase vulnerability to depression. In their review of cognitive biases in depression, Gotlib and Joorman (2010) argued that cognitive biases in memory and attentional processing of emotional information (key features in depression) are interrelated and contribute to emotional dysregulation through multiple pathways such as rumination, reduced cognitive control in processing negative information, and reduced ability to disengage from negative information (Gotlib & Joormann, 2010). Cognitive biases may influence emotion regulation differently in older adults because older adults can better regulate emotions, perhaps by shifting values to prioritize the present moment over the future, investing in a few intimate relationships rather than many, and focusing on positive emotions (Carstensen et al., 1999; Laidlaw, 2013).

Specific Cognitions in Depression

Specific cognitions are less vulnerable to aging-related changes than are behavioral and somatic factors, but cognitions may not differentiate depression and anxiety in older populations (Ayers & Riskind, 2014). However, optimism and pessimism appear to be distinct constructs that may be more independent in older adult populations. In older caregiving adults and controls, neither optimism nor pessimism predicted depression a year later, but pessimism predicted stress 1 year later (Robinson-Whelen et al., 1997). Elevated scores on the Beck Hopelessness Scale (BHS) are positively associated with severity of depressive symptoms, suicidal ideation, and self-harm. In a sample of adults aged 50 to 92, an exploratory factor analysis of the BHS produced a 2-factor structure of disappointment-powerlessness and negative future expectancies (Neufeld, O'Rourke, & Donnelly, 2010). Cognitions in older adults may include internalized ageist stereotypes. Pervasive ageist stereotypes, for example, that elderly people are warm but incompetent (Cuddy et al., 2005) may be activated in older adults when receiving care, and lead to increased depressive symptoms (Kwak et al., 2014).

Disability and Depression

In 2010, more than 38% of US adults aged 65+ had a disability. Disability status was defined as having difficulty in one or more of 6 categories, including hearing and vision, cognition, ambulation (walking or climbing stairs), self-care (dressing or bathing), and independent living (doing errands alone) (Office of American Community Survey, 2010). The most common difficulties were walking, doing errands alone, and climbing stairs (West et al., 2014). Functional limitation predicts functional decline and loss of

independence, but there is considerable fluctuation in short-term levels of functioning (Guralnik et al., 2012).

Measurement of Disability

Researchers use different terms such as disability, functional limitations, and functional impairment interchangeably (Altman, 2014), making comparisons of research findings problematic. Functional status is the combined effects of disease and physiological, psychological, social, and environmental factors (Guralnik et al., 2012). Within a disability framework, domains of functioning include physical, sensory, social, and psychological. Within physical functioning, domains that are most relevant are physical capacity, social roles, and personal roles. Personal roles are most often assessed with items about activities of daily living (ADLs), which include moving from a bed to a chair, using the toilet, bathing, dressing, and eating. Personal roles are also assessed with items about abilities that are essential for independent living, called instrumental activities of daily living (IADLs). IADLs include housekeeping, preparing food, taking medication, using a phone, managing money, and shopping. Usually individual who have ADL disability also have IADL disability; receiving help for both ADLs and IADLs indicates more severe impairment in functioning (Guralnik et al., 2012).

Social role functioning includes staying in touch with others, visiting friends, participating in social activities and recreation, inviting others to the home, volunteering, and traveling (Guralnik et al., 2012). Physical ability refers to moving and lifting large or heavy objects, handling small objects, reaching, and kneeling. Mobility is assessed with vigorous, moderate, and mild activities, climbing stairs, and walking (Guralnik et al.,

2012). Functional limitations become more common with age and are positively associated with depression. Some studies suggest that, except for prior levels of depression, disability and changes in disability are the most important risk factors for increased depression (Kennison & Cox, 2013; Yang, 2006) but evidence for a longitudinal relationship is mixed (Chao, 2014; Pearlin & Skaff, 1996; Yang, 2006).

Some studies of disability outcomes examine the percentage of individuals who recover from all ADL limitations. Others use a hierarchical measure of functioning to compare levels of disability (e.g., no disability, disability in 1 or 2 ADLs, and severe disability), which may better distinguish levels of disability and impairment than a sum of task difficulties. This is because tasks vary in their association with functional impairment (e.g., difficulty lifting a heavy object may not be impairing as difficulty walking 2 blocks). Comparing depression levels of those without disability, recent disability, stable disability, worsening disability, and disability recovery may be useful to understand how disability influences daily activities and depression over time (Guralnik et al., 2012).

Overlapping symptoms of disability and mood may introduce measurement error (Bruce, 2001). For example, one item on the Centers for Epidemiological Study, Depression Scale (CES-D) asks whether "you felt that everything you did was an effort", which could be endorsed because of physical limitations. In addition, older adults may attribute depressive symptoms to physical problems or endorse more physical than mental illness symptoms compared to younger adults. Cognitive impairment makes these distinctions more difficult (Bruce, 2001).

Functional Limitation and Depression

Cross-sectional studies have consistently reported a relationship between disability and depression in older adults that is sometimes moderated by age (Verhaak, Dekker, de Waal, van Marwijk, & Comijs, 2014). In older adults with disabilities, 37% of men and 36% of women are classified as depressed (Ormel et al., 2002) and are nearly three times more likely to have depressive symptoms (Meltzer et al., 2012). Each additional ADL and IADL limitation and disability type increases the likelihood of depression. Specific types of disability related to depression include restricted mobility, disability in participation in society, social activities, and self-care (Meltzer et al., 2012; Verhaak et al., 2014).

A review of 24 longitudinal population studies from 2001 to 2007 examined the relationship of disability and depression and found that most results were potentially biased because the studies failed to account for non-normal distributions of depression and disability, lacked attrition analyses, or modeled mediational effects improperly (Carrière et al., 2009). Recent improvements in longitudinal methodology have led to more reliable findings.

Trajectories of disability and depressive symptoms are interrelated concurrently and longitudinally (Kennison & Cox, 2013; Ormel et al., 2002; Taylor & Lynch, 2004). Depression trajectories are slightly more variable than disability trajectories (Ormel et al., 2002). High levels of functional abilities, visual acuity, and stability of functioning predict stable low depressive symptoms (Schilling et al., 2013). Physical inactivity and disability predicted persistently high and increasing depressive symptoms over 20 years

in women aged 65 and older (Byers et al., 2012) but no relationship of disability and depression was found over 3 months in older men and women (Conradsson et al., 2013).

Although disability has long been recognized as a major risk factor for depression, only recently have researchers examined the role of psychosocial factors in this relationship (Jang et al., 2002) and results are inconsistent. In a cross-sectional study, after adjusting for disability severity, dependence on others was not related to depression, suggesting that increased functional limitation was the key risk factor for depression (Meltzer et al., 2012); however, another cross-sectional study found that self-efficacy in managing one's environment, autonomy, and purpose in life better predicted depression than did medical illness and disability (Davison et al., 2012).

Over time, functional loss accompanied by chronic strain may deplete psychosocial coping resources, lead to negative self-perceptions, tax coping abilities, and increase depressive risk (Yang, 2006). Longitudinal findings suggest that perceived social support mediates disability and depression bi-directionally (Taylor & Lynch, 2004) but other longitudinal relationships are less clear. Mediators of disability on subsequent depression may include pain, discrimination, sense of control, and self-esteem (Gayman et al., 2008; Yang, 2006); however, loss of control did not mediate receiving more care and depression (Kwak et al., 2014). In one study, SES influenced individuals' trajectories of disability risk, which then influenced depressive symptoms (Bierman & Pearlin, 2011). In another study, when levels of functioning were equal, Caucasian and high SES groups reported more depressive symptoms compared to African-American and low SES groups,

suggesting they were less familiar and less equipped to cope with disability (Schieman & Plickert, 2007).

Depression predicts future disability (Hybels, Pieper, Blazer, Fillenbaum, & Steffens, 2009) and may be among the most important risk factors of functional decline (Bruce, 2001). Improvement in depressive symptoms is associated with improvement in ADL and IADL over 12 months (Nyunt et al., 2012). However variability in functional status among depressed older adults suggests that individuals do not follow a typical course of functioning (Hybels, Pieper, & Blazer, 2009). Compared to the effects of disability on depression, the effects of depression on subsequent disability may be more complex, nonlinear, weaker, or non-significant, and may vary by functional domain and chronic disease status (Chen et al., 2012; Gayman et al., 2008; Geerlings et al., 2001; Guralnik et al., 2012; Hybels, Pieper, & Blazer, 2009; Yang, 2006). A specific cognition that appears to be predictive of functioning is a positive perception of aging, which was related to better functional health over 18 years and was partially mediated by perceived control (Levy et al., 2002).

Activities and Depression

Bidirectional longitudinal associations of up to 10 years have been identified with physical activity and mental health (Griffiths et al., 2014; Steinmo et al., 2014). A study of activity participation over 6 years found that 6.5% of older adults had stable low participation in all activities, 46% had moderate social activity, and 47% had high activity. The high activity class demonstrated the most protective effects for depression (Hong, Hasche, & Bowland, 2009). Emerging depression is associated with a decrease in

minutes of physical activity and is a risk factor for adopting a sedentary lifestyle in older adults, regardless of disease status (van Gool et al., 2003). Sedentary women aged 50-55 had nearly twice the risk of depressive symptoms up to 9 years later compared to women who either sat 4 or fewer hours per day or engaged in 2½ hours of moderate physical activity per week. Compared to women who sat 4 or fewer hours per day *and* engaged in 2½ hours of moderate physical activity per week, the sedentary group had 3 times the risk of depression (van Uffelen et al., 2013). In treatment studies, physical activity demonstrates beneficial effects on depressive symptoms in older adults (Mura & Carta, 2013) but no treatment studies have been published on the effects of depression treatment on physical activities (Cuijpers et al., 2014).

Engaging in a wide variety of activities is associated with health and wellbeing, and the type of meaning of an activity may also matter. For example, phone conversations with family, friends, or others, using the internet, volunteering, exercise, and creative activity are associated with lower depression; reduced physical or social activity and caregiving are associated with higher levels of depression and depression onset; and caring for grandchildren, working, intellectual, social and passive activity are not associated with depression (Capistrant, Berkman, & Glymour, 2013; Chao, 2014; Choi, Stewart, & Dewey, 2013; Cotten, Ford, Ford, & Hale, 2014; Hong et al., 2009; Parisi et al., 2014). Individuals reporting activity levels that were "enough" rather than "too much" or "wanting more social activities" had lower baseline depression levels and a slight decrease in depression, suggesting that comfort with the level of activities is more important than a threshold number of activities (Hong et al., 2009).

Some activities may include physical, mental, or social demands, such as social activities that require physical mobility (Adams, Leibbrandt, & Moon, 2011). These demands may influence the level of positive outcomes experienced during the activity, which suggests that physical or mental ability may moderate the association between activity and depression (Adams et al., 2011). A cross-sectional study found that differences in amount of physical activity in depressed older adults were explained by disability and a lower sense of mastery (Wassink-Vossen et al., 2014). Frequency of leisure activities and rumination independently predicted depression in older adults but the relationship of leisure activities and depression was only significant for those high on rumination (Fernández-Fernández, Márquez-González, Losada-Baltar, & Romero-Moreno, 2014).

Pain and Depression

Depressed older adults report more chronic, intense, and disabling pain than non-depressed individuals (Hanssen, Naarding, Collard, Comijs, & Oude Voshaar, 2014). However, one study found that pain intensity and depressive symptoms were only related when pain restricted activity (López-Lopez, González, Alonso-Fernández, Cuidad, & Matías, 2014). Gender modifies some associations of pain and depression. For men, the strongest associations of pain with depression are pain frequency, number of pain sites, chronic pain, and incontinence; for women, the strongest association with depression is pain severity (Denkinger, Lukas, Nikolaus, Peter, & Franke, 2014; Regan et al., 2013). Sleep efficiency, sleep quality, and self-efficacy to cope with pain helped explain the effects of pain on depression in women with fibromyalgia (Diaz-Piedra et al., 2013).

Recent studies suggest a decreased sensitivity to externally induced pain in MDD depending on pain type, and a decreased tolerance of pain despite reduced pain perception (Bär et al., 2005; Boettger, Greiner, Rachow, Brühl, & Bär, 2010; Schwier, Kliem, Boettger, & Bär, 2010).

In a study of adults aged 45-65, trajectories of depression from 1 year prior to and 5 years following pain onset found that most individuals (72%) were resilient with no or minimal depressive symptoms before or following pain onset. A smaller number experienced depression following pain onset (11.4%), chronic depression before and after pain onset (6.8%), or improvement in depressive symptoms following pain onset (9.8%) (Zhu, Galatzer-Levy, & Bonanno, 2014). For adults aged 16 to 69, pain from lower leg trauma predicted depression within 1 year following the trauma but not thereafter (Castillo et al., 2013). No direct longitudinal effects between pain and depression were found in 529 older adults with osteoarthritis. However, the relationship of pain with depression 2 years later was completely mediated by increased fatigue and disability (Hawker et al., 2011). A study of 716 older adults found that mastery mediated the relationship between pain and depression over 4 years only for adults older than 75 (Bierman, 2011).

Protective Factors for Depression

Decreasing depression rates among community dwelling older adults despite increases in neurocognitive and biological risk factors of depression may be explained by late-life protective factors such as good health and cognitive functioning (Blazer, 2010a). Early protective factors include socioeconomic advantages and high levels of education.

In midlife, engagement is protective. In the 60s and older, improved emotion regulation and reduced reactivity to stressors, a close social network, perceived adequate social support, religious attendance, and meaning in life are protective (Blazer, 2010a; Fiske et al., 2009). Blazer (2010b) proposed 3 protective factors unique to older adults. First, socio-emotional selectivity theory posits that older adults have improved experiences of life events because they prioritize and enjoy emotionally meaningful goals. Second, older adults gain wisdom that includes rich factual and procedural knowledge, increased tolerance of societal differences, better management of uncertainty, and perceiving one's life as a coherent narrative. Third, older adults experience fewer stressors associated with depression and can better adapt to them, perhaps by considering how they would cope with stressors expected in late life.

Current evidence suggests that the onset and maintenance of late life depression are influenced by interdependent and dynamic processes of by multiple risk factors. However, few models of depression include factors unique to older adults. Depression is less prevalent in late life than at younger ages, despite aging-related challenges that are believed to increase vulnerability to depression. This suggests that current cognitive models of depression may not adequately explain the role of cognitions in depression for older adults. In addition, whether negative cognitions are related to functional limitations and activity levels in older adults is unknown.

APPENDIX B

Measures

Activities of Daily Living (ADL) 6 items

Response options were 1 = yes or can't do, 0 = no or don't do

1. (Because of a health or memory problem do you have any difficulty with) getting in or out of bed?
2. (Because of a health or memory problem do you have any difficulty with) walking across a room?
3. (Because of a health or memory problem do you have any difficulty with) using the toilet, including getting up and down?
4. (Because of a health or memory problem do you have any difficulty with) bathing or showering?
5. (Because of a health or memory problem do you have any difficulty with) dressing, including putting on socks and shoes?
6. (Because of a health or memory problem do you have any difficulty with) eating, such as cutting up your food?

Instrumental Activities of Daily Living (IADL) 6 items

Here are a few other activities which some people have difficulty with because of a physical, mental, emotional, or memory problem. Please tell me whether you have any

difficulty with each activity I name. If you don't do the activity at all just tell me so. Exclude any difficulties that you expect to last less than three months.

1. (Besides any help you have told me about,) Do you get any help with work around the house or yard because of your health problems?
2. (Because of a health or memory problem, do you have) any difficulty preparing a hot meal?
3. (Because of a health or memory problem, do you have) any difficulty taking medications? Do you think you would have any difficulty taking medications if you needed to do so?
4. (Because of a health or memory problem, do you have) any difficulty with making phone calls?
5. (Because of a health or memory problem,) do you have any difficulty with managing your money – such as paying your bills and keeping track of expenses?
6. (Because of a health or memory problem do you have) any difficulty with shopping for groceries?

Mobility 9 items

We need to understand difficulties people may have with various activities because of a health or physical problem. Please tell me whether you have any difficulty doing each of the everyday activities that I read to you. Exclude any difficulties that you expect to last less than three months.

INTERVIEWER: IF R IS IN A NURSING HOME OR CONFINED TO BED OR A WHEELCHAIR, YOU MAY READ THE FOLLOWING STATEMENT: (I am required

to ask about all of these activities. I realize that you may not be able to do some of them, but I would appreciate it if you would just confirm that with me as we go through the list.)

1. Because of a health problem do you have any difficulty with walking several blocks?
2. (Because of a health problem do you have any difficulty) with sitting for about two hours?
3. (Because of a health problem do you have any difficulty) with getting up from a chair after sitting for long periods?
4. (Because of a health problem do you have any difficulty) with climbing several flights of stairs without resting?
5. (Because of a health problem do you have any difficulty) with stooping, kneeling, or crouching?
6. (Because of a health problem do you have any difficulty) with reaching or extending your arms above shoulder level?
7. (Because of a health problem do you have any difficulty) with pulling or pushing large objects like a living room chair?
8. (Because of a health problem do you have any difficulty) with lifting or carrying weights over 10 pounds, like a heavy bag of groceries?
9. (Because of a health problem do you have any difficulty) with picking up a dime from a table?

Frequency of Vigorous Physical Activities

1 item: “How often do you take part in sports or activities that are vigorous, such as running or jogging, swimming, cycling, aerobics or gym workout, tennis, or digging with a spade or shovel?”

Frequency of Moderate Physical Activities

1 item: “How often do you take part in sports or activities that are moderately energetic such as, gardening, cleaning the car, walking at a moderate pace, dancing, floor or stretching exercises?

Frequency of Mild Physical Activities

1 item: “How often do you take part in sports or activities that are mildly energetic, such as vacuuming, laundry, or home repairs?” Responses for frequency of vigorous, moderate, or mild activities were 1 = hardly ever or never, 2 = one to three times a month, 3 = once a week, 4 = more than once a week, and 5 = every day.

Pessimism

These items tap dispositional pessimism.

Source: Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology, 67*(6), 1063-1078.

(*Please say how much you agree or disagree with the following statements:*)

3 items

1. If something can go wrong for me it will.

2. I hardly ever expect things to go my way.

3. I rarely count on good things happening to me.

Coding: 1=Strongly disagree, 2=Somewhat disagree, 3=Slightly disagree, 4=Slightly agree, 5=Somewhat agree, 6=Strongly agree

Scaling:

Create an index of pessimism by averaging the scores across items. Set the pessimism score to missing if there is more than one item with missing values.

Psychometrics: Optimism Alpha = .80 Pessimism Alpha = .77

Background: Peterson, C. (2000). The future of optimism. *American Psychologist, 55*(1), 44-45.

Taylor, S. E., Kemeny, M. E., Reed, G. M., Bower, J. E., & Gruenewald, T. L. (2000). Psychological resources, positive illusions, and health. *American Psychologist, 55*(1), 99-109.

Hopelessness

This measure consists of two items from (Beck et al., 1974) and two items from (Everson et al., 1997). The Beck Hopelessness Scale (BHS) measures negative, pessimistic expectations of the future. Exploratory factor analysis in a sample of older adults produced a 2-factor structure of disappointment-powerlessness and negative future expectancies (Neufeld et al., 2010).

Sources: Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: The hopelessness scale. *Journal of Consulting and Clinical Psychology, 42*(6), 861-865.

Everson, S. A., Kaplan, G. A., Goldberg, D. E., Salonen, R., & Salonen, J. T. (1997). Hopelessness and 4-year progression of carotid atherosclerosis: The Kuopio Ischemic Heart Disease Risk Factor Study. *Arteriosclerosis, Thrombosis, and Vascular Biology, 17*, 1490-1495.

(*Please say how much you agree or disagree with the following statements:*)

4 items

1. I feel it is impossible for me to reach the goals that I would like to strive for.
2. The future seems hopeless to me and I can't believe that things are changing for the better.
3. I don't expect to get what I really want.
4. There's no use in really trying to get something I want because I probably won't get it.

Coding: 1=Strongly disagree, 2=Somewhat disagree, 3=Slightly disagree, 4=Slightly agree, 5=Somewhat agree, 6=Strongly agree

Scaling: Create an index of hopelessness by averaging the scores across all items. Set the final score to missing if there are more than two items with missing values.

Psychometrics: Alpha = .86

Depression was measured with an 8-item version of the Centers for Epidemiological Study, Depression Scale (CES-D) and the sum of items ranged from 0 to 8, with higher numbers indicating more depressive symptoms (Radloff, 1977). Psychometric testing conducted in earlier waves of the HRS on the 8-item CES-D found that Cronbach's alpha ranged from .834 to .804. Evidence of construct validity for measuring psychological distress and depression was strong.

Centers for Epidemiological Study, Depression Scale (CES-D)
8 items
Now think about the past week and the feelings you have experienced. Please tell me if each of the following was true for you much of the time during the past week.

Much of the time during the past week…

1. You felt depressed.
2. You felt that everything you did was an effort.
3. Your sleep was restless.
4. You were happy.
5. You felt lonely.
6. You enjoyed life.
7. You felt sad.
8. You could not get going.

REFERENCES

Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: A theory-based subtype of depression. *Psychological Review*, *96*(2), 358–372. http://doi.org/doi:10.1037/0033-295X.96.2.358

Adams, K. B., Leibbrandt, S., & Moon, H. (2011). A critical review of the literature on social and leisure activity and wellbeing in later life. *Ageing and Society*, *31*(04), 683–712.

Alloy, L. B., & Riskind, J. H. (2005). *Cognitive vulnerability to emotional disorders*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Almeida, O. P., Alfonso, H., Pirkis, J., Kerse, N., Sim, M., Flicker, L., … Goldney, R. (2011). A practical approach to assess depression risk and to guide risk reduction strategies in later life. *International Psychogeriatrics*, *23*(02), 280–291.

Altman, B. M. (2014). Definitions, concepts, and measures of disability. *Annals of Epidemiology*, *24*(1), 2–7. http://doi.org/10.1016/j.annepidem.2013.05.018

APA Presidential Task Force on Evidence-Based Practice. (2006). Evidence-based practice in psychology. *American Psychologist*, *51*, 271–285.

Asparouhov, T., & Muthén, B. (2010). Bayesian analysis using Mplus: Technical implementation. *Manuscript Submitted for Publication*.

Ayers, C. R., & Riskind, J. H. (2014). Testing the psychometric properties of the Cognitions Checklist, a measure to differentiate anxiety and depression among older adults. *Geriatric Nursing*. http://doi.org/10.1016/j.gerinurse.2014.05.002

Aziz, R., & Steffens, D. C. (2013). What Are the Causes of Late-Life Depression? *Psychiatric Clinics of North America*, *36*(4), 497–516. http://doi.org/10.1016/j.psc.2013.08.001

Bär, K.-J., Brehm, S., Boettger, M. K., Boettger, S., Wagner, G., & Sauer, H. (2005). Pain perception in major depression depends on pain modality. *Pain*, *117*(1-2), 97–103. http://doi.org/10.1016/j.pain.2005.05.016

Barlow. (2008). Clinical handbook of psychological disorders: A step-by-step treatment manual.

Bartels, S. J., & Naslund, J. A. (2013). The Underside of the Silver Tsunami—Older Adults and Mental Health Care. *New England Journal of Medicine*, *368*(6), 493–496.

Beck. (1967). *Depression: clinical, experimental, and theoretical aspects*. Harper & Row. New York, NY, US.

Beck. (1976). *Cognitive therapy and the emotional disorders*. International Universities Press.

Beck, A. T. (1979). *Cognitive therapy and the emotional disorders*. Penguin.

Beck, A. T. (2002). Cognitive models of depression. *Clinical Advances in Cognitive Psychotherapy: Theory and Application*, *14*, 29–61.

Beck, A. T., Brown, G., Steer, R. A., Eidelson, J. I., & Riskind, J. H. (1987). Differentiating anxiety and depression: A test of the cognitive content-specificity hypothesis. *Journal of Abnormal Psychology*, *96*(3), 179–183. http://doi.org/10.1037/0021-843X.96.3.179

Beck, A. T., & Haigh, E. A. (2014). Advances in Cognitive Theory and Therapy: The Generic Cognitive Model*. *Annual Review of Clinical Psychology*, *10*, 1–24.

Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: the hopelessness scale. *Journal of Consulting and Clinical Psychology*, *42*(6), 861.

Beck, Rush, A., Shaw, B. F., & Emery, G. (1979). Cognitive therapy of depression. new york: Guilford. *Nabkasorn, C., Miyai, N., Sootmongkol, A., Junprasert, S., Yamamoto, H., Arita, M. and Miyashita, K.(2006)Effects of Physical Exercise on Depression, Neuroendocrine Stress Hormones and Physiological® Fitness in Adolescent Females with Depressive Symptoms', European Journal of Public Health*, *16*, 179–184.

Ben-Ezra, M., & Shmotkin, D. (2010). Physical versus mental predictors of mortality among the old-old in Israel: the CALAS study. *Research on Aging*, *32*(5), 595–617.

Bierman, A. (2011). Pain and Depression in Late Life: Mastery as Mediator and Moderator. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *66B*(5), 595–604. http://doi.org/10.1093/geronb/gbr070

Bierman, A., & Pearlin, L. I. (2011). SES, Trajectories of Physical Limitations, and Change in Depression in Late Life. *Society and Mental Health*, *1*(3), 139–152. http://doi.org/10.1177/2156869311419676

Blazer, D. G. (2002). *Depression in late life (3rd ed.).* New York, NY, US: Springer Publishing Co.

Blazer, D. G. (2003). Depression in late life: Review and commentary. *The Journals of Gerontology: Series A: Biological Sciences and Medical Sciences*, *58A*(3), 249–265.

Blazer, D. G. (2010a). Protection from late life depression. *International Psychogeriatrics*, *22*(2), 171–173. http://doi.org/10.1017/S1041610209990895

Blazer, D. G. (2010b). The Origins of Late-Life Depression. *Psychiatric Annals*, *40*(1), 13–18. http://doi.org/10.3928/00485718-20091229-01

Boettger, M. K., Greiner, W., Rachow, T., Brühl, C., & Bär, K.-J. (2010). Sympathetic skin response following painful electrical stimulation is increased in major depression. *Pain*, *149*(1), 130–134. http://doi.org/10.1016/j.pain.2010.01.022

Brawley, L. (2003). Promoting physical activity for older adultsThe challenges for changing behavior. *American Journal of Preventive Medicine*, *25*(3), 172–183. http://doi.org/10.1016/S0749-3797(03)00182-X

Bruce, M. L. (2001). Depression and disability in late life: directions for future research. *The American Journal of Geriatric Psychiatry*, *9*(2), 102–112.

Buchman, A. S., Wilson, R. S., Yu, L., James, B. D., Boyle, P. A., & Bennett, D. A. (2014). Total daily activity declines more rapidly with increasing age in older adults. *Archives of Gerontology and Geriatrics*, *58*(1), 74–79. http://doi.org/10.1016/j.archger.2013.08.001

Büchtemann, D., Luppa, M., Bramesfeld, A., & Riedel-Heller, S. (2012). Incidence of late-life depression: A systematic review. *Journal of Affective Disorders*, *142*(1-3), 172–179. http://doi.org/10.1016/j.jad.2012.05.010

Burns, R. A., Butterworth, P., Luszcz, M., & Anstey, K. J. (2013). Stability and change in level of probable depression and depressive symptoms in a sample of middle and older-aged adults. *International Psychogeriatrics*, *25*(02), 303–309.

Burns, & Seligman, M. E. (1989). Explanatory style across the life span: evidence for stability over 52 years. *Journal of Personality and Social Psychology*, *56*(3), 471.

Byers, A. L., Vittinghoff, E., Lui, L.-Y., Hoang, T., Blazer, D. G., Covinsky, K. E., … Fredman, L. (2012). Twenty-year depressive trajectories among older women. *Archives of General Psychiatry*, *69*(10), 1073–1079.

Capistrant, B. D., Berkman, L. F., & Glymour, M. M. (2013). Does Duration of Spousal Caregiving Affect Risk of Depression Onset? Evidence from the Health and Retirement Study. *The American Journal of Geriatric Psychiatry*.

Carrière, I., Villebrun, D., Pérès, K., Stewart, R., Ritchie, K., & Ancelin, M. L. (2009). Modelling complex pathways between late-life depression and disability: evidence for mediating and moderating factors. *Psychological Medicine*, *39*(10), 1587. http://doi.org/10.1017/S0033291709005273

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist*, *54*(3), 165–181. http://doi.org/doi:10.1037/0003-066X.54.3.165

Castillo, R. C., Wegener, S. T., Heins, S. E., Haythornthwaite, J. A., MacKenzie, E. J., & Bosse, M. J. (2013). Longitudinal relationships between anxiety, depression, and pain: Results from a two-year cohort study of lower extremity trauma patients. *PAIN®*, *154*(12), 2860–2866. http://doi.org/10.1016/j.pain.2013.08.025

Cesari, M., Onder, G., Zamboni, V., Manini, T., Shorr, R. I., Russo, A., … Landi, F. (2008). Physical function and self-rated health status as predictors of mortality: results from longitudinal analysis in the ilSIRENTE study. *BMC Geriatrics*, *8*(1), 34.

Chao, S.-F. (2014). Functional disability and depressive symptoms: longitudinal effects of activity restriction, perceived stress, and social support. *Aging & Mental Health*, *18*(6), 767–776.

Chapman, D. P., & Perry, G. S. (2008). Depression as a Major Component of Public Health for Older Adults. *Preventing Chronic Disease*, *5*(1).

Charles, S. T., & Pasupathi, M. (2003). Age-related patterns of variability in self-descriptions: Implications for everyday affective experience. *Psychology and Aging*, *18*(3), 524–536. http://doi.org/doi:10.1037/0882-7974.18.3.524

Charles, S. T., Reynolds, C. A., & Gatz, M. (2001). Age-related differences and change in positive and negative affect over 23 years. *Journal of Personality and Social Psychology*, *80*(1), 136–151. http://doi.org/doi:10.1037/0022-3514.80.1.136

Chase, J.-A. D. (2015). Interventions to Increase Physical Activity Among Older Adults: A Meta-Analysis. *The Gerontologist*, *55*(4), 706–718. http://doi.org/10.1093/geront/gnu090

Chen, C.-M., Mullan, J., Su, Y.-Y., Griffiths, D., Kreis, I. A., & Chiu, H.-C. (2012). The Longitudinal Relationship Between Depressive Symptoms and Disability for Older Adults: A Population-Based Study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *67*(10), 1059–1067. http://doi.org/10.1093/gerona/gls074

Choi, K.-S., Stewart, R., & Dewey, M. (2013). Participation in productive activities and depression among older Europeans: Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Geriatric Psychiatry*, *28*(11), 1157–1165.

Cognitive Therapy for Depression. (2013). Retrieved August 22, 2015, from http://www.div12.org/psychological-treatments/treatments/cognitive-therapy-for-depression/

Cole, M. G., & Dendukuri, N. (2003). Risk Factors for Depression Among Elderly Community Subjects: A Systematic Review and Meta-Analysis. *Am J Psychiatry*, *160*(6), 1147–1156. http://doi.org/ 10.1176/appi.ajp.160.6.1147

Collard, R. M., Comijs, H. C., Naarding, P., & Oude Voshaar, R. C. (2014). Physical frailty: vulnerability of patients suffering from late-life depression. *Aging & Mental Health*, *18*(5), 570–578. http://doi.org/10.1080/13607863.2013.827628

Conradsson, M., Littbrand, H., Boström, G., Lindelof, N., Gustafson, Y., & Rosendahl, E. (2013). Is a change in functional capacity or dependency in activities of daily living associated with a change in mental health among older people living in residential care facilities? *Clinical Interventions in Aging*, 1561. http://doi.org/10.2147/CIA.S53270

Conwell, Y., & Brent, D. (1995). Suicide and aging: I. Patterns of psychiatric diagnosis. *International Psychogeriatrics*, *7*(2), 149–164. http://doi.org/doi:10.1017/S1041610295001943

Cotten, S. R., Ford, G., Ford, S., & Hale, T. M. (2014). Internet Use and Depression Among Retired Older Adults in the United States: A Longitudinal Analysis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. http://doi.org/10.1093/geronb/gbu018

Cotter, K. A., & Lachman, M. E. (2010). No strain, no gain: Psychosocial predictors of physical activity across the adult lifespan. *Journal of Physical Activity & Health*, *7*(5), 584.

Cress, M. E., Buchner, D. M., Prohaska, T., Rimmer, J., Brown, M., Macera, C., … Chodzko-Zajko, W. (2006). Best practices for physical activity programs and

behavior counseling in older adult populations. *European Review of Aging and Physical Activity*, *3*(1), 34–42.

Cuddy, A. J., Norton, M. I., & Fiske, S. T. (2005). This old stereotype: The pervasiveness and persistence of the elderly stereotype. *Journal of Social Issues*, *61*(2), 267–285.

Cuijpers, P., de Wit, L., & Taylor, A. (2014). The effects of psychological treatments for adult depression on physical activity: A systematic review. *Mental Health and Physical Activity*, *7*(1), 6–8. http://doi.org/10.1016/j.mhpa.2014.01.002

Cummings, S. M., Cooper, R. L., & Cassie, K. M. (2008). Motivational Interviewing to Affect Behavioral Change in Older Adults. *Research on Social Work Practice*, *19*(2), 195–204. http://doi.org/10.1177/1049731508320216

Davison, T. E., McCabe, M. P., Knight, T., & Mellor, D. (2012). Biopsychosocial factors related to depression in aged care residents. *Journal of Affective Disorders*, *142*(1), 290–296.

Denkinger, M. D., Lukas, A., Nikolaus, T., Peter, R., & Franke, S. (2014). Multisite pain, pain frequency and pain severity are associated with depression in older adults: results from the ActiFE Ulm study. *Age and Ageing*, afu013.

DeVellis, R. F. (2012). *Scale development: Theory and applications* (Vol. 26). Sage publications.

Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., & Kaiser, S. (2012). Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective. *Journal of the Academy of Marketing Science*, *40*(3), 434–449. http://doi.org/10.1007/s11747-011-0300-3

Diaz-Piedra, C., Catena, A., Miro, E., Pilar Martinez, M., Sanchez, A. I., & Buela-Casal, G. (2013). The Impact of Pain On Anxiety and Depression is Mediated by Objective and Subjective Sleep Characteristics in Fibromyalgia Patients: *The Clinical Journal of Pain*, 1. http://doi.org/10.1097/AJP.0000000000000040

Dimidjian, S., Barrera, M., Martell, C., Muñoz, R. F., & Lewinsohn, P. M. (2011). The Origins and Current Status of Behavioral Activation Treatments for Depression. *Annual Review of Clinical Psychology*, *7*(1), 1–38.

DiNapoli, E. A., LaRocca, M., & Scogin, F. (2015). Cognitive behavior therapy and behavioral activation for late-life depression. In P. A. Areán (Ed.), *Treatment of late-life depression, anxiety, trauma, and substance abuse.* (pp. 49–70). Washington: American Psychological Association. Retrieved from http://content.apa.org/books/14524-003

Everson, S. A., Kaplan, G. A., Goldberg, D. E., Salonen, R., & Salonen, J. T. (1997). Hopelessness and 4-Year Progression of Carotid Atherosclerosis The Kuopio Ischemic Heart Disease Risk Factor Study. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *17*(8), 1490–1495.

Federal Interagency Forum on Aging-Related Statistics. (2012). Federal Interagency Forum on Aging-Related Statistics. Older Americans 2012: Key Indicators of Well-Being. U.S. Government Printing Office. Washington, DC,.

Federal Interagency Forum on Aging-Related Statistics. Older Americans 2012: Key Indicators of Well-Being. (2012, July). Federal Interagency Forum on Aging-Related Statistics, Government Printing Office. Washington, DC: U.S. Retrieved from http://www.agingstats.gov

Fernández-Fernández, V., Márquez-González, M., Losada-Baltar, A., & Romero-Moreno, R. (2014). Frequency of leisure activities and depressive symptomatology in elderly people: the moderating role of rumination. *International Psychogeriatrics*, *26*(02), 297–305.

Fiske, A., Wetherell, J. L., & Gatz, M. (2009). Depression in Older Adults. *Annual Review of Clinical Psychology*, *5*(1), 363–389. http://doi.org/10.1146/annurev.clinpsy.032408.153621

Fitzgerald, P. J. (2013). Gray colored glasses: is major depression partially a sensory perceptual disorder? *Journal of Affective Disorders*, *151*(2), 418–422.

Gallagher, D., Mhaolain, A. N., Greene, E., Walsh, C., Denihan, A., Bruce, I., … Lawlor, B. A. (2009). Late life depression: a comparison of risk factors and symptoms according to age of onset in community dwelling older adults. *International Journal of Geriatric Psychiatry*, *25*(10), 981–987. http://doi.org/10.1002/gps.2438

Gayman, M. D., Turner, R. J., & Cui, M. (2008). Physical limitations and depressive symptoms: exploring the nature of the association. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *63*(4), S219–S228.

Geerlings, S. W., Beekman, A. T. F., Deeg, D. J. H., Twisk, J. W. R., & Van Tilburg, W. (2001). The longitudinal effect of depression on functional limitations and disability in older adults: an eight-wave prospective community-based study. *Psychological Medicine*, *31*(08), 1361–1371.

Gill, T. M., Allore, H. G., Gahbauer, E. A., & Murphy, T. E. (2010). Change in disability after hospitalization or restricted activity in older persons. *JAMA*, *304*(17), 1919–1928.

Goodwin, R. D. (2003). Association between physical activity and mental disorders among adults in the United States. *Preventive Medicine*, *36*(6), 698–703.

Gotlib, I. H., & Joormann, J. (2010). Cognition and depression: Current status and future directions. *Annual Review of Clinical Psychology*, *6*, 285–312. http://doi.org/doi:10.1146/annurev.clinpsy.121208.131305

Grayson, L., & Thomas, A. (2013). A systematic review comparing clinical features in early age at onset and late age at onset late-life depression. *Journal of Affective Disorders*, *150*(2), 161–170. http://doi.org/10.1016/j.jad.2013.03.021

Griffiths, A., Kouvonen, A., Pentti, J., Oksanen, T., Virtanen, M., Salo, P., … Vahtera, J. (2014). Association of physical activity with future mental health in older, mid-life and younger women. *The European Journal of Public Health*. http://doi.org/10.1093/eurpub/ckt199

Gum, A. M., King-Kallimanis, B., & Kohn, R. (2009). Prevalence of Mood, Anxiety, and Substance-Abuse Disorders for Older Americans in the National Comorbidity Survey-Replication. *American Journal of Geriatric Psychiatry*, *17*(9), 769–781. http://doi.org/10.1097/JGP.0b013e3181ad4f5a

Guralnik, J. M., Patel, K., & Ferrucci, L. (2012). Assessing Functional Status and Disability in Epidemiologic Studies. In *The Epidemiology of Aging* (pp. 91–117). Springer.

Hanssen, D. J., Naarding, P., Collard, R. M., Comijs, H. C., & Oude Voshaar, R. C. (2014). Physical, Lifestyle, Psychological and Social Determinants of Pain Intensity, Pain Disability and the Number of Pain Locations in Depressed Older Adults. *PAIN®*.

Hawker, G. A., Gignac, M. A. M., Badley, E., Davis, A. M., French, M. R., Li, Y., … Lou, W. (2011). A longitudinal study to explain the pain-depression link in older adults with osteoarthritis. *Arthritis Care & Research*, *63*(10), 1382–1390. http://doi.org/10.1002/acr.20298

Hegeman, J. M., Kok, R. M., van der Mast, R. C., & Giltay, E. J. (2012). Phenomenology of depression in older compared with younger adults: meta-analysis. *The British Journal of Psychiatry*, *200*(4), 275–281. http://doi.org/10.1192/bjp.bp.111.095950

Hertzog, C., Lindenberger, U., Ghisletta, P., & Oertzen, T. von. (2006). On the power of multivariate latent growth curve models to detect correlated change. *Psychological Methods*, *11*(3), 244–252. http://doi.org/10.1037/1082-989X.11.3.244

Hirschfeld, R. M. A., Keller, M. B., Panico, S., Arons, B. S., Barlow, D., Davidoff, F., … Wyatt, R. J. (1997). The National Depressive and Manic-Depressive Association Consensus Statement on the Undertreatment of Depression. *JAMA: The Journal of the American Medical Association*, *277*(4), 333 –340. http://doi.org/10.1001/jama.1997.03540280071036

Hong, S.-I., Hasche, L., & Bowland, S. (2009). Structural relationships between social activities and longitudinal trajectories of depression among older adults. *The Gerontologist*, *49*(1), 1–11.

HRS. (2012). Health and Retirement Study, 2004, 2008, and 2012 Core public use datasets.Produced and distributed by the University of Michigan with funding from the National Institute on Aging (grant number NIA U01AG009740). Ann Arbor, MI, (2012).

Hui, E. K.-H., & Rubenstein, L. Z. (2006). Promoting Physical Activity and Exercise in Older Adults. *Journal of the American Medical Directors Association*, *7*(5), 310–314. http://doi.org/10.1016/j.jamda.2006.03.006

Hybels, C. F., Landerman, L. R., & Blazer, D. G. (2012). Age differences in symptom expression in patients with major depression: Age differences in depressive symptoms. *International Journal of Geriatric Psychiatry*, *27*(6), 601–611. http://doi.org/10.1002/gps.2759

Hybels, C. F., Pieper, C. F., & Blazer, D. G. (2009). The complex relationship between depressive symptoms and functional limitations in community-dwelling older adults: the impact of subthreshold depression. *Psychological Medicine*, *39*(10), 1677–1688.

Hybels, C. F., Pieper, C. F., Blazer, D. G., Fillenbaum, G. G., & Steffens, D. C. (2009). Trajectories of mobility and IADL function in older patients diagnosed with major depression. *International Journal of Geriatric Psychiatry*, n/a–n/a. http://doi.org/10.1002/gps.2300

Isaacowitz, D. M., & Seligman, M. E. P. (2001). Is pessimism a risk factor for depressive mood among community-dwelling older adults? *Behaviour Research and Therapy*, *39*(3), 255–272.

Jacobson, N. S., Dobson, K. S., Truax, P. A., Addis, M. E., Koerner, K., Gollan, J. K., … Prince, S. E. (1996). A component analysis of cognitive-behavioral treatment for depression. *Journal of Consulting and Clinical Psychology*, *64*(2), 295.

Jang, Y., Haley, W. E., Small, B. J., & Mortimer, J. A. (2002). The role of mastery and social resources in the associations between disability and depression in later life. *The Gerontologist*, *42*(6), 807–813.

Johnsen, T. J., & Friborg, O. (2015). The effects of cognitive behavioral therapy as an anti-depressive treatment is falling: A meta-analysis. *Psychological Bulletin*, *141*(4), 747–768. http://doi.org/10.1037/bul0000015

Kazdin, A. E., & Rabbitt, S. M. (2013). Novel Models for Delivering Mental Health Services and Reducing the Burdens of Mental Illness. *Clinical Psychological Science*, *1*(2), 170–191. http://doi.org/10.1177/2167702612463566

Kelley-Moore, J. A., Schumacher, J. G., Kahana, E., & Kahana, B. (2006). When do older adults become "disabled"? Social and health antecedents of perceived disability in a panel study of the oldest old. *Journal of Health and Social Behavior*, *47*(2), 126–141.

Kennison, R., & Cox, J. (2013). Health and Functional Limitations Predict Depression Scores in the Health and Retirement Study: Results Straight from MARS. *Californian Journal of Health Promotion*, *11*(1), 97–108.

Kessler, R. C. (2012). The costs of depression. *The Psychiatric Clinics of North America*, *35*(1), 1.

Kessler, R. C., Birnbaum, H. G., Shahly, V., Bromet, E., Hwang, I., McLaughlin, K. A., … Demyttenaere, K. (2010). Age differences in the prevalence and co-morbidity of DSM-IV major depressive episodes: results from the WHO World Mental Health Survey Initiative. *Depression and Anxiety*, *27*(4), 351–364.

Kleiman, E. M., Liu, R. T., Riskind, J. H., & Hamilton, J. L. (2014). Depression as a mediator of negative cognitive style and hopelessness in stress generation. *British Journal of Psychology*. http://doi.org/10.1111/bjop.12066

Kwak, M., Ingersoll-Dayton, B., & Burgard, S. (2014). Receipt of Care and Depressive Symptoms in Later Life: The Importance of Self-Perceptions of Aging. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *69*(2), 325–335. http://doi.org/10.1093/geronb/gbt128

Lachman, M. E., Jette, A., Tennstedt, S., Howland, J., Harris, B. A., & Peterson, E. (1997). A cognitive-behavioural model for promoting regular physical activity in older adults. *Psychology, Health & Medicine*, *2*(3), 251–261.

Laidlaw, K. (2013). Self-Acceptance and Aging: Using Self-Acceptance as a Mediator of Change in CBT with Older People. In *The Strength of Self-Acceptance* (pp. 263–279). Springer.

Levy, B. R., Slade, M. D., & Kasl, S. V. (2002). Longitudinal benefit of positive self-perceptions of aging on functional health. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*(5), P409–P417.

Lewinsohn, P. M., & Graf, M. (1973). Pleasant activities and depression. *Journal of Consulting and Clinical Psychology*, *41*(2), 261–268. http://doi.org/doi:10.1037/h0035142

López-Lopez, A., González, J. L., Alonso-Fernández, M., Cuidad, N., & Matías, B. (2014). Pain and symptoms of depression in older adults living in community and in nursing homes: the role of activity restriction as a potential mediator and moderator. *International Psychogeriatrics*, 1–13. http://doi.org/10.1017/S1041610214000970

Lorenzo-Luaces, L., German, R. E., & DeRubeis, R. J. (2014). It's complicated: The relation between cognitive change procedures, cognitive change, and symptom change in cognitive therapy for depression. *Clinical Psychology Review*.

Luppa, M., König, H.-H., Heider, D., Leicht, H., Motzek, T., Schomerus, G., & Riedel-Heller, S. G. (2013). Direct costs associated with depressive symptoms in late life: a 4.5-year prospective study. *Int Psychogeriatr/IPA*, *25*(2), 292–302.

Luppa, M., Luck, T., König, H.-H., Angermeyer, M. C., & Riedel-Heller, S. G. (2012). Natural course of depressive symptoms in late life. An 8-year population-based prospective study. *Journal of Affective Disorders*, *142*(1-3), 166–171. http://doi.org/10.1016/j.jad.2012.05.009

Luppa, M., Sikorski, C., Luck, T., Ehreke, L., Konnopka, A., Wiese, B., … Riedel-Heller, S. G. (2012). Age- and gender-specific prevalence of depression in latest-life – Systematic review and meta-analysis. *Journal of Affective Disorders*, *136*(3), 212–221. http://doi.org/10.1016/j.jad.2010.11.033

Macoveanu, J., Knorr, U., Skimminge, A., Søndergaard, M. G., Jørgensen, A., Fauerholdt-Jepsen, M., … Kessing, L. V. (2014). Altered reward processing in the orbitofrontal cortex and hippocampus in healthy first-degree relatives of patients with depression. *Psychological Medicine*, *44*(06), 1183–1195.

Meeks, T. W., Vahia, I. V., Lavretsky, H., Kulkarni, G., & Jeste, D. V. (2011). A tune in "a minor" can "b major": a review of epidemiology, illness course, and public health implications of subthreshold depression in older adults. *Journal of Affective Disorders*, *129*(1), 126–142.

Meltzer, H., Bebbington, P., Brugha, T., McManus, S., Rai, D., Dennis, M. S., & Jenkins, R. (2012). Physical ill health, disability, dependence and depression: Results from the 2007 national survey of psychiatric morbidity among adults in England. *Disability and Health Journal*, *5*(2), 102–110. http://doi.org/10.1016/j.dhjo.2012.02.001

Meyer, T. D., Gudgeon, E., Thomas, A. J., & Collerton, D. (2010). Cognitive style and depressive symptoms in elderly people–Extending the empirical evidence for the cognitive vulnerability–stress hypothesis. *Behaviour Research and Therapy*, *48*(10), 1053–1057.

Monroe, S. M., & Harkness, K. L. (2005). Life Stress, the "Kindling" Hypothesis, and the Recurrence of Depression: Considerations From a Life Stress Perspective. *Psychological Review*, *112*(2), 417–445. http://doi.org/10.1037/0033-295X.112.2.417

Mura, G., & Carta, M. G. (2013). Physical activity in depressed elderly. A systematic review. *Clinical Practice and Epidemiology in Mental Health: CP & EMH*, *9*, 125.

Muthén, B., & Asparouhov, T. (2011). Bayesian SEM: A more flexible representation of substantive theory. *Psychological Methods*.

Muthén, B. O., & Muthén, L. K. (2014). Mplus Version 7.3 Statistical Analysis with Latent Variables: User's Guide. *Los Angeles, CA: Muthen & Muthen*.

National Center for Injury Prevention and Control. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2013). Retrieved August 7, 2015, from http://www.cdc.gov/injury/wisqars/

Neufeld, E., O'Rourke, N., & Donnelly, M. (2010). Enhanced measurement sensitivity of hopeless ideation among older adults at risk of self-harm: Reliability and validity of Likert-type responses to the Beck Hopelessness Scale. *Aging & Mental Health*, *14*(6), 752–756. http://doi.org/10.1080/13607860903421052

Nyunt, M. S. Z., Lim, M. L., Yap, K. B., & Ng, T. P. (2012). Changes in depressive symptoms and functional disability among community-dwelling depressive older adults. *International Psychogeriatrics*, *24*(10), 1633–1641. http://doi.org/10.1017/S1041610212000890

Office of American Community Survey. (2010). American Community Survey. Retrieved August 5, 2014, from http://www.census.gov/acs/www/data_documentation/documentation_main/

Ormel, J., Rijsdijk, F. V., Sullivan, M., van Sonderen, E., & Kempen, G. I. (2002). Temporal and reciprocal relationship between IADL/ADL disability and depressive symptoms in late life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*(4), P338–P347.

Pahor, M., Guralnik, J. M., Ambrosius, W. T., Blair, S., Bonds, D. E., Church, T. S., … Williamson, J. D. (2014). Effect of Structured Physical Activity on Prevention of Major Mobility Disability in Older Adults: The LIFE Study Randomized Clinical Trial. *JAMA*, *311*(23), 2387. http://doi.org/10.1001/jama.2014.5616

Parisi, J. M., Xia, J., Spira, A. P., Xue, Q.-L., Rieger, M. L., Rebok, G. W., & Carlson, M. C. (2014). The Association Between Lifestyle Activities and Late-Life Depressive Symptoms. *Activities, Adaptation & Aging*, *38*(1), 1–10.

Pearlin, L. I., & Skaff, M. M. (1996). Stress and the life course: A paradigmatic alliance. *The Gerontologist*, *36*(2), 239–247.

Peterson, C., & Seligman, M. E. (1984). Causal explanations as a risk factor for depression: theory and evidence. *Psychological Review*, *91*(3), 347.

Phillips, W. J., Hine, D. W., & Thorsteinsson, E. B. (2010). Implicit cognition and depression: A meta-analysis. *Clinical Psychology Review*, *30*(6), 691–709. http://doi.org/10.1016/j.cpr.2010.05.002

Polenick, C. A., & Flora, S. R. (2013). Behavioral Activation for Depression in Older Adults: Theoretical and Practical Considerations. *The Behavior Analyst*, *36*(1), 35.

Radke, S., Güths, F., André, J. A., Müller, B. W., & de Bruijn, E. R. (2014). In action or inaction? Social approach-avoidance tendencies in major depression. *Psychiatry Research*.

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385–401. http://doi.org/10.1177/014662167700100306

Redmond, R. A., & Barrett, A. E. (2015). The Link between Functional Limitations and Depressive Symptoms: The Explanatory Role of Self-conceptions. *Society and Mental Health*, *5*(1), 33–48. http://doi.org/10.1177/2156869314568200

Regan, C. O., Kearney, P. M., Savva, G. M., Cronin, H., & Kenny, R. A. (2013). Age and sex differences in prevalence and clinical correlates of depression: first results from the Irish Longitudinal Study on Ageing: Age and sex differences in clinical correlates of depression. *International Journal of Geriatric Psychiatry*, *28*(12), 1280–1287. http://doi.org/10.1002/gps.3955

Research-Supported Psychological Treatments. (2013). Retrieved August 22, 2015, from https://www.div12.org/psychological-treatments/

Robinson-Whelen, S., Kim, C., MacCallum, R. C., & Kiecolt-Glaser, J. K. (1997). Distinguishing optimism from pessimism in older adults: Is it more important to be optimistic or not to be pessimistic? *Journal of Personality and Social Psychology*, *73*(6), 1345.

Sargent-Cox, K. A., Anstey, K. J., & Luszcz, M. A. (2012). The relationship between change in self-perceptions of aging and physical functioning in older adults. *Psychology and Aging*, *27*(3), 750–760. http://doi.org/10.1037/a0027578

Satre, D. D., Knight, B. G., & David, S. (2006). Cognitive-behavioral interventions with older adults: Integrating clinical and gerontological research. *Professional Psychology: Research and Practice*, *37*(5), 489–498. http://doi.org/10.1037/0735-7028.37.5.489

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology*, *67*(6), 1063–1078. http://doi.org/doi:10.1037/0022-3514.67.6.1063

Schieman, S., & Plickert, G. (2007). Functional limitations and changes in levels of depression among older adults: A multiple-hierarchy stratification perspective. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *62*(1), S36–S42.

Schilling, O. K., Wahl, H.-W., & Reidick, O. (2013). Trajectories of Depressive Symptoms in Advanced Old Age: A Functional Approach Concerning the Role of Physical Functioning. *GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry*, *26*(1), 29–38. http://doi.org/10.1024/1662-9647/a000079

Schwier, C., Kliem, A., Boettger, M. K., & Bär, K.-J. (2010). Increased Cold-Pain Thresholds in Major Depression. *The Journal of Pain*, *11*(3), 287–290. http://doi.org/10.1016/j.jpain.2009.07.012

Segar, M. L., & Richardson, C. R. (2014). Prescribing pleasure and meaning: cultivating walking motivation and maintenance. *American Journal of Preventive Medicine*, *47*(6), 838–841.

Seligman, M. E. (1975). Helplessness: On depression, development, and death.

Stanley, J. T., & Isaacowitz, D. M. (2011). Age-related differences in profiles of mood-change trajectories. *Developmental Psychology*, *47*(2), 318.

Steinmo, S., Hagger-Johnson, G., & Shahab, L. (2014). Bidirectional association between mental health and physical activity in older adults: Whitehall II prospective cohort study. *Preventive Medicine*.

Stenholm, S., Westerlund, H., Salo, P., Hyde, M., Pentti, J., Head, J., … Vahtera, J. (2014). Age-related trajectories of physical functioning in work and retirement: the role of sociodemographic factors, lifestyle and disease. *Journal of Epidemiology and Community Health*, *68*(6), 503–509.

Stuart-Hamilton, I. (2006). *The psychology of ageing: An introduction (4th ed.)*. London, England: Jessica Kingsley Publishers.

Sullivan, E., Annest, J. L., Luo, F., Simon, T. R., & Dahlberg, L. L. (2013). Suicide among adults aged 35–64 years—United States, 1999–2010. *Center for Disease Control and Prevention. Morbidity and Mortality Weekly Report*, *62*, 321–325.

Sun, F., Norman, I. J., & While, A. E. (2013). Physical activity in older people: a systematic review. *BMC Public Health*, *13*(1), 449. http://doi.org/10.1186/1471-2458-13-449

Sutin, A. R., Terracciano, A., Milaneschi, Y., An, Y., Ferrucci, L., & Zonderman, A. B. (2013). The Trajectory of Depressive Symptoms Across the Adult Life Span. *JAMA Psychiatry*, *70*(8), 803. http://doi.org/10.1001/jamapsychiatry.2013.193

Taylor, M. G., & Lynch, S. M. (2004). Trajectories of Impairment, Social Support, and Depressive Symptoms in Later Life. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences*, *59B*(4), S238–S246.

Thomas, A. (2013). Is depression really different in older people? *International Psychogeriatrics*, *25*(11), 1739–1742. http://doi.org/10.1017/S1041610213001038

Trew, J. L. (2011). Exploring the roles of approach and avoidance in depression: An integrative model. *Clinical Psychology Review*, *31*(7), 1156–1168. http://doi.org/10.1016/j.cpr.2011.07.007

Turvey, C. L., Conwell, Y., Jones, M. P., Phillips, C., Simonsick, E., Pearson, J. L., & Wallace, R. (2002). Risk Factors for Late-Life Suicide: A Prospective, Community-Based Study. *The American Journal of Geriatric Psychiatry*, *10*(4), 398–406. http://doi.org/10.1097/00019442-200207000-00006

US Census Bureau Public Information. (2012). U.S. Census Bureau Projections Show a Slower Growing, Older, More Diverse Nation a Half Century from Now - Population - Newsroom - U.S. Census Bureau. Retrieved January 21, 2015, from https://www.census.gov/newsroom/releases/archives/population/cb12-243.html

Vahia, I. V., Meeks, T. W., Thompson, W. K., Depp, C. A., Zisook, S., Allison, M., … Jeste, D. V. (2010). Subthreshold Depression and Successful Aging in Older

Women. *American Journal of Geriatric Psychiatry*, *18*(3), 212–220. http://doi.org/10.1097/JGP.0b013e3181b7f10e

Van Der Bij, A. K., Laurant, M. G., & Wensing, M. (2002). Effectiveness of physical activity interventions for older adults: a review. *American Journal of Preventive Medicine*, *22*(2), 120–133.

van Gool, C. H., Kempen, G. I., Penninx, B. W., Deeg, D. J., Beekman, A. T., & van Eijk, J. T. (2003). Relationship between changes in depressive symptoms and unhealthy lifestyles in late middle aged and older persons: results from the Longitudinal Aging Study Amsterdam. *Age and Ageing*, *32*(1), 81–87.

van Uffelen, J. G. Z., van Gellecum, Y. R., Burton, N. W., Peeters, G., Heesch, K. C., & Brown, W. J. (2013). Sitting-Time, Physical Activity, and Depressive Symptoms in Mid-Aged Women. *American Journal of Preventive Medicine*, *45*(3), 276–281. http://doi.org/10.1016/j.amepre.2013.04.009

Verhaak, P. F. M., Dekker, J. H., de Waal, M. W. M., van Marwijk, H. W. J., & Comijs, H. C. (2014). Depression, disability and somatic diseases among elderly. *Journal of Affective Disorders*, *167*, 187–191. http://doi.org/10.1016/j.jad.2014.05.057

Wagner, D. C., & Short, J. L. (2014). Longitudinal Predictors of Self-Rated Health and Mortality in Older Adults. *Preventing Chronic Disease*, *11*, E93. http://doi.org/10.5888/pcd11.130241

Wassink-Vossen, S., Collard, R. M., Oude Voshaar, R. C., Comijs, H. C., de Vocht, H. M., & Naarding, P. (2014). Physical (in)activity and depression in older people. *Journal of Affective Disorders*, *161*, 65–72. http://doi.org/10.1016/j.jad.2014.03.001

West, L., Cole, S., Goodkind, D., & He, W. (2014). 65+ in the United States: 2010. Current Population Reports, P23-212. U.S. Census Bureau. Washington, DC: U.S. Government Printing Office. Retrieved from http://www.census.gov/library/publications/2014/demo/p23-212.html

Yang, Y. (2006). How does functional disability affect depressive symptoms in late life? The role of perceived social support and psychological resources. *Journal of Health and Social Behavior*, *47*(4), 355–372.

Zarit, S. H., & Zarit, J. M. (2007). *Mental disorders in older adults: fundamentals of assessment and treatment*. Guilford Press.

Zhao, K.-X., Huang, C.-Q., Xiao, Q., Gao, Y., Liu, Q.-X., Wang, Z.-R., … Xie, Y.-Z. (2012). Age and risk for depression among the elderly: a meta-analysis of the published literature. *CNS Spectrums*, *17*(03), 142–154.

Zhu, Z., Galatzer-Levy, I. R., & Bonanno, G. A. (2014). Heterogeneous depression responses to chronic pain onset among middle-aged adults: A prospective study. *Psychiatry Research*, *217*(1), 60–66.

BIOGRAPHY

Diane C. Wagner graduated from Oswego High School in Oswego, Illinois and received her Bachelor of Science in Music Education from the University of Illinois at Urbana-Champaign. She received a Master of Science in General Psychology from Walden University and a Masters in Psychology (Concentration in Clinical Psychology) from George Mason University.