The Relationship Between Executive Function, Hope, and Depression in Older Adults

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Abstract

According to the U.S. Department of Health and Human Services, by 2030, the population of individuals 65 years of age or older is expected to be close to 70 million people, or 20% of the country’s population. This creates a substantial demand as well as opportunity for prevention on medical and health care providers, because individuals in this population are at an increased risk of significant changes in cognitive and mental health. Decline in executive functioning skills is one of the most prevalent changes to affect older adults. Furthermore, depression is strongly associated with impairment in executive functioning, and both have a significant impact on daily living skills. However, research suggests that hope may moderate the effects of declining executive function and depression in older adults. Therefore, providing research that is grounded within a positive neuropsychological framework, will be significant to this population because it may provide evidence for a protecting mechanism against age related emotional distress and cognitive decline. The primary aim of the study was to examine the relationship between executive function and depression within a positive neuropsychological framework. Secondly, the study proposed that hope would serve as a moderating variable between these variables. Overall, this study found evidence that hope is strongly related to executive functioning and depression, such that hope may in fact act as a buffer against depression when an individual is facing deficits in executive functioning. These findings provide support for the continued study and application of counseling and positive psychology to the field of neuropsychology. This study also further provided support for increased need for the treatment of the aging population through a positive neuropsychological framework.

Keywords: Older adults, positive neuropsychology, counseling psychology, hope, executive function, depression
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Chapter I

Introduction

Currently in the United States approximately 47.8 million individuals, or 14.9% of the population, are 65 years of age or older (U.S. Bureau of the Census, 2017). According to the U.S. Department of Health and Human Services (2015), by 2030, the population of individuals 65 years of age or older is expected to be close to 70 million people, or 20% of the country’s population. Of that population, individuals that are 85 years of age or older will represent the fastest growing sector of the United States population (U.S. Bureau of the Census, 2017).

This creates a substantial demand on medical and health care providers because individuals in this population are at an increased risk of significant changes in cognitive and mental health. For example, it is estimated that roughly 15-20% of older adults 65 years and older will suffer from clinically significant cognitive impairments (Narrow, Raw, Robins, & Regier, 2002). Similarly, in terms of mental health, the American Psychological Association (2016) reported that by 2030, it is estimated that 15 million Americans age 65 years and older will suffer from mental and behavioral problems including anxiety and depression. Likewise, studies have found that as individuals increase in age, they are at an even greater risk for significant cognitive disorders and related impairments. For example, prevalence rates of these disorders for individuals 75 years of age and older are reported to be between 18.8 to 28.3% (Ward, Arrighi, Michels, & Cedarbaum, 2012). Furthermore, studies examining the impact of the aging population on health care have found that the population of individuals 85 years of age and older experience a higher prevalence of decline in both cognitive and mental health including problems with memory, attention, and chronic pain (Cohen, Fiori, Toler, & Bybee, 2006).
Despite the high prevalence of psychiatric and cognitive disorders among the older adult population, access to mental health services is far lower than its demand for this sector of the country’s population (Qualls, Segal, Niederehe, Norman, & Gallagher-Thompson, 2002). Very few psychologists in their graduate programs have received formal training in geropsychology (APA, 2016). In looking across psychology training programs, the APA Center for Workforce Studies (2008), found that fewer than one third of APA member practicing psychologists report having taken any coursework in geropsychology. Similarly, fewer than one fourth of APA member practicing psychologists report receiving any supervised practicum or internship experience working with older adults (APA Center for Workforce Studies, 2008). Relatedly, in a survey including over 1,200 APA members, 58% of the respondents reported that they needed more formal training in the area of geropsychology (Qualls et al., 2002). Therefore, with the incongruence between the demand on mental health field and the number of trained geropsychologists, older adults are less likely to obtain adequate mental health services (Wells, Schoenbaum, Unützer, Lagomasino, & Rubenstein, 1999).

With the growing demand for psychologists practicing in the field of geropsychology, it is the responsibility of current practicing psychologists and psychology students who wish to work with this population, to obtain and maintain knowledge in the multiple facets of developmental psychology and the process of aging, and how these factors affect and influence an individual’s mental and cognitive health (APA, 2016). While this is an area with substantial need of research across multiple domains, studying the impact of age related cognitive decline and subsequent cognitive disorders on emotional functioning is imperative because it can significantly influence daily living.
This chapter will provide an overview of the background of the study, presenting the prevalence rates of cognitive impairment in the older adult population, discuss changes in neurocognition in the aging brain, as well as discuss the need for a shift towards a positive counseling psychological perspective within the field of neuropsychology. This chapter will also present a statement of the problem, the purpose of the study, present the research questions and hypotheses, as well as provide a definition of the variables.

**Background of the Problem**

According to the U.S. Department of Health and Human Services (2016), Alzheimer’s disease (AD) is the sixth leading cause of death in people over the age of 65, with the risk of developing AD increasing exponentially with age. Similarly, approximately 10 to 20% of adults in this population will be diagnosed with Mild Cognitive Impairment (MCI) (Hanninen, Hallikainen, Tuomainen, Vanhanen, & Soininen, 2002). Of these individuals, approximately 10% of them will continue to show decline in cognitive function and eventually progress to AD (Mitchell & Shiri-Feshki, 2009). However, while there is a significant increase in prevalence rates for neurocognitive disorders such as AD and MCI with age, another factor, known as normal aging, affects a significant larger portion of the older adults.

**Neural Activation, Structural, and Functional Changes in the Aging Brain**

The concept of *normal aging* is particularly hard to define because there is a pronounced heterogeneity of cognitive performance among older adults (Randolph, 2013). However, despite the resiliency of the aging brain, research supports the notion that declines in memory and executive function begin shortly after adults reach maturity in the second and third decades of life (Salthouse, 2010). These declines increase more rapidly after the fifth decade and begin to show diminished processing speeds, working memory, and executive functioning (Smith &
Several studies have examined this age-related decline by exploring structural and neural activation in the aging brain. Both Cabeza (2002) and Reuter-Lorenz, Jonides, and Smith et al. (2000) studied differences between healthy older adults and young adults in neural activation during working memory tasks. Findings from both studies supported previous findings that younger adults use hemisphere asymmetry to perform tasks, where the left prefrontal cortex is activated during verbal tasks, and the right prefrontal cortex is activated during spatial tasks. On the other hand, both studies also found significantly reduced hemisphere asymmetry in healthy older adults, instead finding bilateral activation of the prefrontal cortex for both nonverbal and verbal tasks. These findings were significant to understanding the effects of aging on the human brain because they helped to support a compensatory view of bilateral activation in older adults, suggesting that older adults actually compensate for the decline seen in normal aging by recruiting additional neural networks to maintain performance on low-level executive function and working memory tasks (Kirova, Bays, & Lagalwar, 2015). This overactivation in the bilateral prefrontal cortex during working memory and executive function tasks provides evidence of how cognitive restructuring in the brain allows the older brain to compensate for these specific areas of age-related decline (Kirova, Bays, & Lagalwar, 2015). More specifically, in a similar neuroimaging study examining neuronal activation in older adults during working memory and executive functioning tasks, Payer, Marshuetz, Sutton, Hebrank, Welsh, and Park (2006) again found bilateral overactivation in the prefrontal cortex during low-level executive function and working memory tasks. However, they also found underactivation of the ventral visual cortical pathway compared to healthy young adults. These findings further supported the notion that the aging brain will compensate for age-related differences by recruiting additional neural networks to maintain performance on tasks (Kirova et al., 2015).
Notably, while the aforementioned studies found that cognitive restructuring provides support for lower level cognitive tasks, they also showed that this strategy was unable to support more difficult executive function tasks (Kirova et al., 2015, Payer et al., 2006, Schneider-Garces et al., 2010). As such, age related decline has been linked to a significant decrease in higher order executive function tasks such as divided attention, manipulation, task-switching, and inhibition, as well as lower working memory capacity (Kirova et al., 2015; Schneider-Garces et al., 2010). These studies found that as the demand of the task increases in the aging brain, more overall activation in the prefrontal cortex is observed. However, findings also support differences in this activation level between the healthy older brain and individuals with MCI and AD (Kirova, et al., 2015). As a result, these findings support the use of using neuropsychological assessments and imaging to track behavioral and functional changes to monitor and distinguish between normal aging, MCI, and AD (Summers & Saunders, 2012).

**Neuropsychological Assessment and the Aging Brain**

With the prevalence rates of AD and MCI high in the older adult population, finding ways to track and monitor behavioral and functional changes in the brain is imperative (Mitchell & Shiri-Feshki, 2009). Studies examining cognitive decline in older adults have found that monitoring working memory and executive function skills can not only help track stages of cognitive decline and progression to MCI and AD, but can also prompt for cognitive intervention during preclinical and early stages of AD and MCI (Kirova et al., 2015). At the same time, monitoring executive functioning skills in this population is crucial because higher order skills are among the earliest to decline with age (Chao & Knight, 1997, Kirova et al., 2015, Woodard, 2010). This represents a significant problem because numerous studies have found a strong relationship between intact executive function skills and the capacity for independent living
As such, many researchers have called for a need to develop robust sets of neuropsychological assessments that can be used in research and clinical practice as a way to track these changes (Kirova et al., 2015, Randolph, 2013). While many assessments exist, it is important for neuropsychologists to incorporate and use neuropsychological assessments that not only target measuring known areas of decline in the aging brain such working memory, attention, and executive function, but also have high ecological validity to everyday functioning (Kirova et al., 2015, Lezak Howieson, Bigler, & Tranel, 2012). One way to ensure that the measures not only target specific areas of decline but also have high ecological validity to daily living is to ground the basis of neuropsychological assessment in an empirically supported conceptualized theory (Lezak et al., 2012).

**Examining Executive Functioning in the Aging Brain**

Broadly defined, executive functioning refers to a variety of discrete yet interrelating higher-order cognitive skills that allow an individual to independently perform complex, goal-oriented, and self-regulating behaviors (Bell-McGinty, Podell, Franzen, & Williams, 2002; Randolph & Chaytor, 2013). Currently, there is significant variability in the literature as to how to conceptualize these higher-order cognitive abilities. While several seminal theoretical, factor analytic, and clinically oriented frameworks have been proposed, Lezak et al. (2004) proposed a framework which is a commonly used theoretical framework in research and clinical practice because it not only provides a theoretical conceptualization of these higher-order cognitive abilities, but it also provides an applied framework for the assessment of these abilities (Anderson, 2008). More specifically, Lezak (1995) proposed that executive functioning can be conceptualized as having four components: *volition and self-regulation, planning and decision*
making, purposive action, and effective performance. She also proposed that self-regulation and working memory are critical factors that influence these components of executive functioning. These components will be examined more thoroughly in later chapters. Importantly, in developing their theory, Lezak, Howieson, Bigler, and Tranel (2012) provided a thorough overview of how these components can be measured using structured empirically supported neuropsychological assessments.

While they provide an overview of numerous neuropsychological assessments, one assessment, the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001) is a wide range assessment of executive functioning that has significant empirical support for the assessment of discrete components of executive functioning outlined by Lezak et al. (2012) as well as high levels of ecological validity (generalizability of data in real life). More specifically, a study examining the ecological validity of the D-KEFS in a population specifically of older adults ages 65 to 92 found that four measures, Trail Making Test, Tower, Verbal Fluency, and Design Fluency accounted for 26% of the variance in everyday functioning (Mitchell & Miller, 2008). Notably, the Trail Making Task subtest was the most unique predictor of everyday functioning (Mitchell & Miller, 2008, Randolph & Chaytor, 2013). Using assessments that have high levels of ecological validity is crucial for this population because the change in executive functioning skills can have a significant impact on the daily lives of older adults.

Impact of Decline in Executive Functioning in Older Adults

As previously noted, while many cognitive functions can be affected by aging, disruption in executive function processes is one of the most prevalent and can significantly impact daily living (Kirova et al., 2015). This change in daily living may be one reason that there is a
significant relationship between both age-related executive decline and clinically significant cognitive impairments and depression (DeBattista, 2005).

While mood disorders and psychological distress are commonly seen across many known executive function disorders, prevalence rates for the older adult population are exceptionally high. A recent meta-analysis revealed that 16 percent of individuals with dementia report clinically significant depression, and 26.8 percent report clinically significant apathy (Lyketsos et al., 2002). Similarly, prevalence rates of anxiety disorders in this population are also strikingly high at 15.3 percent. Research examining these prevalence rates has suggested that the decline of executive functioning skills in older adults is often associated with decline in daily living and can result in significant depression (Rabinowitz & Arnett, 2013). For example, the decline in executive functioning skills in older adults can create uncertainty about the future, limit previously done daily tasks such as keeping financial records, cause mourning of the loss of their previously healthy life, and can threaten personal identity and self-esteem (Rabinowitz & Arnett, 2013). This can be extremely hard on the individual, as it requires significant adjustment in lifestyle on the patient and often their families.

While most research is examining this phenomena within the scope of a disease-related stress model, very little research exists that focuses from a strengths-based positive psychology perspective (Rabinowitz & Arnett, 2013). Until recently, much of the literature on the older adult population has been based upon a deficit model that focuses on distress and dysfunction (Randolph, 2013). For this reason, there is a plethora of research examining predictors of specific mood disorders and their relation to neurodegenerative disorders (McGuire, 2009). While this research has made an invaluable contribution to the field of geropsychology, the focus on the negative aspects, such as distress and dysfunction in the lives of older adults, has created an
incomplete and inadvertently biased understanding of the lives of aging individuals (Rabinowitz & Arnett, 2013). However, recently there has been a shift in the field of psychology to a more strengths-based positive psychology perspective.

A Shift to a Positive Neuropsychology Framework

Miley and Spinella (2006) made a major contribution to the field of positive neuropsychology by examining the relationship between executive function and the positive psychological characteristics of gratitude, satisfaction with life, and forgiveness. Their findings were significant to the field because they proposed that the underlying neurological substrates associated with executive functioning might be linked and required for successful goal formation and task completion. They also concluded that executive functioning skills might provide a foundation for Seligman’s (2002) construct of authentic happiness, which includes the factors satisfaction with life, gratitude, forgiveness, hope, and optimism. In a replication of this study, Kruger (2011) found positive correlations between executive function and gratitude, hope, and optimism. However, while there has been some increase in the strengths-based positive neuropsychology literature, further investigations are needed in the study of relationships between executive functioning and positive psychological attributes. Furthermore, research examining individual factors of positive psychological attributes, particularly hope, is almost non-existent.

According to Snyder’s Hope theory, hope is defined as “the perceived capability to derive pathways to desired goals, and motivate oneself via agency thinking to use those pathways” (Snyder, 2002, p. 249). Recent research examining hope and executive function suggests that there is a significant overlap between the skills associated with executive functioning, and the skills necessary to support hopeful thinking (Sears, 2007). More specifically, the ability to
identify a path to achieve a goal, formation of a plan to break down the goal into workable parts, cognitive flexibility, and use of social supports are all components of hope theory that involve executive functioning skills (Sears, 2006). Thus, it might be possible that individuals with higher-levels of hope may be able to compensate when faced with deficits in executive functioning (Sears, 2007). As such, higher levels of hope may be used as buffers against depression as well as provide a mechanism to compensate when an individual is faced with deficits in executive functioning (Sears, 2007). However, very few studies have been done to examine the construct of hope in older adults (Zillmer, Spiers, & Culbertson, 2008).

**Positive Neuropsychology Framework**

In his book *Positive Neuropsychology*, Randolph (2012) describes the field of positive neuropsychology as serving “to incorporate positive psychology ideas into neuropsychological research and practice, with the ultimate goal of promoting cognitive health through various means” (p. 9). While researchers such as Ryff and Singer in the field of positive neuropsychology highlighted the need for more research in this area over ten years ago in 2002, most research still continues to approach in neuropsychology within the scope of negative psychological characteristics (Randolph & Chaytor, 2013, Ryff & Singer, 2002). Lezak et al. (2012) highlight this trend in neuropsychology in their rationale for why the deficit model is still used today. More specifically, in their neuropsychological assessment textbook they state

…one distinguishing characteristic of neurological assessment is its emphasis on the identification and measurement of psychological-cognitive and behavioral-deficits, for it is in deficits and dysfunctional alterations of cognition, emotionality, and self-direction, and management (i.e., executive function) that brain disorders are manifested behaviorally (p. 101).
This statement by Lezak and colleagues (2012) provides further evidence as to the predominant focus and emphasis on deficits and negative psychological characteristics in the field of neuropsychology. Examining this trend in the literature, Randolph (2010) reviewed trends in the Archives of Clinical Neuropsychology (ACN) over a period of ten years. In this study, he found overwhelming focus on examination of deficits of neuropsychiatric populations, with 52% of the studies focusing in this area. Even further, he found that only 13% of studies examined the concept of normal cognitive function, 2% of studies examined preserved functioning in neurological illness, and only 1% focusing on cognitive rehabilitation. These findings not only highlight the predominant view of neuropsychology from a deficit model approach, but they also shed light on a very large gap in the literature. With so few studies focusing on preserved function and cognitive rehabilitation, the examination of protective factors and positive psychological characteristics that affect brain behavior functioning is substantially limited. Thus, there is a significant need for the field of neuropsychology to shift towards a more positive neuropsychological framework to better understand human brain and behavior relationships through a strength based lens. In particular, Randolph (2012) argued that there is a substantial need in the field to shift to dedicating research to understanding normative cognitive functioning, increasing promotion of cognitive health, and understanding the relationship of positive psychological constructs on higher-order cognitive function such as executive functioning skills.

**Statement of the Problem**

With age related change in executive functioning affecting most older adults and high prevalence rates of clinically significant cognitive impairments, there is a substantial need for research to better inform practice in this area. More specifically, it is important for researchers and practitioners to understand the impact of the structural and behavioral brain changes on daily
living (DeBattista, 2005). Moreover, one of the most prevalent concerns associated with both age related decline in executive function and clinically significant cognitive impairments is comorbidity with mood disorders and emotional distress.

With the significant rise in the older adult population expected to continually increase, understanding and exploring the reasons and impact of this comorbidity is imperative. While most research is examining this phenomena within the scope of a disease related stress model, very little research exists that focuses from a strengths-based positive psychology perspective (Randolph, 2013). More specifically, Huebner, Gilman, and Furlong (2009) argue that even a cursory review of the literature reveals a greater need of attention and research in this area. However, within the last two decades, there has been some increase in the strengths-based positive neuropsychology literature examining the relationship between executive function and positive psychological characteristics (Miley & Spinella, 2006).

One of these attributes, which have emerged in the literature to be linked to executive functioning skills, is hope. More specifically, Sears (2007) argued that there is a significant overlap between the skills associated with executive functioning, and the skills necessary to support hopeful thinking. This positive psychological characteristic has become increasingly noteworthy because research examining the construct of hope suggests that higher levels of hope may serve as a buffer against depression as well as provide a mechanism to compensate when an individual is faced with deficits in executive functioning (Sears, 2007). Therefore, with the growing aging population, it is imperative to continue to study and begin to fill in the gaps in the literature within a strength based positive neuropsychology perspective. More specifically, there is a growing need for a balanced view of executive functioning skills, as the vast majority of
empirical literature has generally neglected examining positive constructs with neuropsychological processes in the older adult population (Zillmer et al., 2008).

**Purpose**

Decline in executive functioning skills is one of the most prevalent changes to affect older adults. Furthermore, depression is strongly associated with impairment in executive functioning (Arnett, Higginson, & Randolph, 2001), and both have a significant impact on daily living skills. As such, providing research within a positive neuropsychological framework that assess the positive psychological constructs, hope, will be significant to this population because it may provide evidence for a protecting mechanism against age related emotional distress and cognitive decline (Sears, 2007). This study examines these constructs within a positive neuropsychological framework to better inform research in developing strength based environmental supports and interventions.

The primary aim of the study is to examine the relationship between executive function and depression within a positive neuropsychological framework. It aims to do this, by positing that the positive psychological construct of hope moderates the relationship between executive function and depression. More specifically, the study proposes that a direct relationship between executive function and depression will be observed. Drawing from the literature, the study proposes that older adults with lower scores in executive function will report higher levels of depression (as measured by a geriatric measure of depression). Secondly, the study proposes that hope will serve as a moderating variable between the independent variable executive function and the dependent variable depression. Again drawing from the literature, this study proposes that hope will act as a buffer between these variables, and reduce depression in individuals with higher levels of executive functioning.


Research Questions and Hypotheses

Hypotheses and research questions related to the relationship between executive function and depression (as measured by a geriatric measure of depression) were formulated from theory and research on the aforementioned constructs, respectively. More specifically, the theoretical framework proposed by Lezak et al. (2004) was chosen as the conceptual framework for executive function in this study because it not only provides a theoretical conceptualization, but it also provides an applied framework for the assessment of these abilities (Anderson, 2008). Likewise, hypotheses were based on a thorough review of the literature, which supported a significant relationship between age related executive decline and clinically significant cognitive impairments and depression (DeBattista, 2005). These research questions reflect gaps in concepts and findings in the previous literature in these areas.

Research Questions

1) In a population of older adults, are lower levels of executive function associated with in higher levels of depression?

2) In a population of older adults, does hope moderate the relationship between executive function and levels of depression?

Hypotheses related to the moderating role of hope on the impact of the relationships of the constructs above were drawn from Snyder’s Hope Theory and research examining the impact of hope on similar constructs. These hypotheses reflect concepts and findings supported by the previous literature in these areas.

Hypotheses

1) It was hypothesized that lower levels of executive function are associated with higher levels of depression. Older adults participating in the study will be given assessments
measuring executive function and depression. This will assess the relationship between executive function and depression. Negative relationships between scores on the Delis-Kaplan Executive Function System tests – Trails Making (condition 4 switching task), Verbal Fluency (condition 3 category switching), Sorting Task (condition 1 sorting task), and Tower Task (total achievement score), and Digit Span (Wechsler Adult Scale of Intelligence, Fourth Edition), and the Geriatric Depression Scale are expected. Thus, it is expected that higher scores on the Geriatric Depression Scale will be associated with lower scores on measures of executive functioning. More specifically, executive functioning operationally was defined as the following five independent variables.

2) In a population of older adults, does hope moderate the relationship between executive function and levels of depression? It was hypothesized that hope will moderate the relationship between executive function and level of depression. Older adults participating in the study will be given assessments measuring executive function, hope, and depression to assess the moderating relationship between hope and executive function and depression. Therefore there will be a moderating relationship seen between scores on the Adult Trait Hope scale (total score) between scores on the Delis-Kaplan Executive Function System tests – Trails Making (condition 4 switching task), Verbal Fluency (condition 3 category switching), Sorting Task (condition 1 sorting task), and Tower Task (total achievement score), and Digit Span (Wechsler Adult Scale of Intelligence, Fourth Edition), and the Geriatric Depression Scale. More specifically, that scores on the Adult Trait Hope scale will be found to strengthen the negative relationship between scores on measures of executive functioning and The Geriatric Depression Scale.
Definition of Variables

The following terms have been defined for the purposes of this study. These terms will be referred to throughout the dissertation. A more thorough explanation of these terms will be provided later in the literature review. Operational definitions of the variables are provided in Chapter III.

Independent Variable

Executive Functioning. As defined by Randolph and Chaytor (2013), “executive functions are an interrelated set of higher-order cognitive abilities that govern goal-directed behavior, interface with other cognitive skills, and play a critical role in regulating emotional and social functioning” (p. 77). While there is variability in the literature as to how to conceptualize these higher-order cognitive abilities, this study will conceptualize executive functioning within Lezak’s (1995) model. This model is a conceptualization of executive functioning which describes the construct as a set of several complex behaviors that are the basis of many cognitive, emotional, and social skills as well as innate abilities to respond to novel situations in an adaptive manner (Lezak et al., 2012). Grounded within this model, it will be broken down and measured using four separate and distinguishable factors (therefore in this study, these factors will be referred to as executive functions as opposed to a singular factor of executive functioning) self-regulation, planning and decision-making, purposive action, and effective performance (Lezak, 1995). While volition is one of the four main factors of Lezak’s model, it will not be measured in this study as a separate independent factor because currently very few standardized neuropsychological assessments exist that can distinguish this factor. Instead, the factor of self-regulation will be measured because it refers to a critical component of executive functions that are necessary for regulating emotional and social functioning, and can be assessed...
using standardized neuropsychological assessments (Lezak, 1995). Likewise, because Lezak (1995) conceptualizes these factors as dependent on working memory, and most other prominent models include working memory as either a key component of and/or a factor in executive functioning, for the purpose of the this study, working memory will also be included as the fifth factor of executive functioning (Anderson, 2008).

Self-Regulation. The main components of self-regulation in this model are productivity and cognitive flexibility or the ability to set-shift. Productivity relies on the ability to create intention, develop the plan, and then carry out the final task. Cognitive flexibility on the other hand requires the individual to be able to shift a focus of thought or action according to the demand of the situation (Lezak et al., 2012).

Planning and decision-making. Planning and decision-making is defined as the ability to develop and achieve a goal or intention (Downing, 2015).

Purposive action. Lezak (1995) described purposive action as the ability to move from the intention or creation of a plan to actual productive activity.

Effective performance. Effective performance in Lezak’s (1995) model is a form of evaluation where the individual must be able to monitor performance, identify any errors, self-correct or make any needed adjustments, and self-monitor in the formation and accomplishment of the task or goal (Downing, 2015).

Working Memory. Working memory is the simultaneous processing or transient maintenance of information in an activated or accessible state while higher order reasoning or complex cognitive tasks are taking place (Heilman & Valenstein, 2012).
Moderating Variable

**Hope.** Hope in this study will be conceptually defined within Snyder’s Hope Theory as “the perceived capability to derive pathways to desired goals, and motivate oneself via agency thinking to use those pathways” (Snyder, 2002). As stated by Snyder, Hope theory is based on the assumption that individuals’ actions are goal directed (Snyder, 1995; Snyder, Rand, & Sigmon, 2002). According to Snyder (2000), the ability to attain goals is based on two types of cognitions: agency thinking, or thoughts about how to achieve those goals, and pathway thinking, or the motivation to achieve those goals (Edwards, Rand, Lopez, & Snyder, 2002; Juntunen & Wettersten, 2006).

Dependent Variables

**Depression.** Depression in this study will be conceptually defined based on Lovibond and Lovibond’s (1995) single construction model of depression. Thus, it will be defined based on the experience of specific symptoms, as measured by the Geriatric Depression Scale (GDS) as opposed to the diagnostic criteria for major depressive disorder. It will be defined by the experience of affective and behavioral symptoms of depression and excludes most symptoms that may be confused with somatic disease (e.g., slowness, insomnia, hyposexuality) or dementia. These symptoms together are the symptoms that are used to define the construct of depression on the GDS Scale (Budson & Solomon, 2015).
CHAPTER II

Review of the Literature

To build a foundation for the current study and provide solid support for the importance of the research to the fields of both counseling psychology and positive neuropsychology, a careful review of the literature was conducted. The literature presented in this chapter will provide a thorough overview of prominent theories of executive functioning, as well as provides an empirically supported theoretical framework of executive functioning that will be used in the study. The literature will also provide evidence for age related cognitive decline, and how structural changes in the brain can result in disruption of executive functioning processes. Moreover, an explanation of how this disruption of execution functioning in older adults can impact emotional functioning will be provided. Lastly, to build a rationale for the study, the chapter examines the deficit model, the need for positive neuropsychology research and models, and an examination of the impact on hope on emotional and behavioral strengths and its relation to executive functioning in older adults.

Overview of Executive Functioning

Broadly defined, executive functioning has been described as higher order cognitive processes mediated by activity in the prefrontal cortex, that direct and coordinate human behavior, and allow for strategic planning, cognitive flexibility, goal-directed behavior, and self-regulation (Olson & Luciana, 2008; Shimamura, 2000; Weyandt, 2005). Furthermore, theorists agree that executive functions allow for flexible and adaptive behavior during novel situations (Schmidt, Burge, Visscher, & Ross, 2016). Importantly, lesion studies, and brain imaging studies using neuropsychological assessment support the notion that executive functions can be divided into discrete fundamental sub-processes (Baddeley, 1996; Lezak et al., 2012; Miller & Cohen,
These subcomponents may include skills such as initiation, working memory, updating switching, reasoning, selective attention, and inhibition (Jurado & Rosselli, 2007; Lezak et al., 2012). However, while there is a general consensus in the literature as to a broad definition of what executive functioning is, one barrier to examining this construct is there is still no universally accepted model (Hunter & Sparrow, 2012; McCloskey et al., 2009). While there are several empirically supported theories from prominent researchers, these theories do vary in terms of taxonomy, which sub-processes are included, and how these factors should be measured (Packwood, Hodgetts, & Tremblay, 2011).

One of the biggest factors in the discrepancy in models is the difficulty in measuring the construct. More specifically, studies examining executive function often use brief and varying neuropsychological assessments. This is problematic in studying executive functioning because different assessments have been found to measure different subcomponents of executive functioning (Burgess, Alderman, Evans, Emslie, & Wilson, 1998; Schmidt et al., 2016). This creates difficulty in replication and furthering of findings because some assessments are believed to measure the unitary executive function construct, some measures that were designed to measure the unitary construct have inadvertently been found to measure several sub-processes, and some measures not only measure multiple executive sub-processes, but are also impacted by other completely separate outside factors such as motor speed (Chan, Shum, Touloupolou, & Chen, 2008). As a result, while many studies use single executive function tests to measure discrete subcomponents, it can be difficult to rely on a single test to make assumptions about a person’s overall ability level, not to mention the ecological validity they have to real world tasks (Schmidt et al., 2016).

At the same time, another significant factor that affects the study of executive functioning
is difference in test preference among researchers and across fields (Sridharan, Levitin, & Menon, 2008). For example, while many neuropsychologists tend to rely on more recent fairly standard sets of norm-referenced tests that are often also used in clinical work today, many neuroscientists or researchers solely doing imaging studies outside of clinical settings often use the older original versions of executive tasks created for research specifically, or tasks that have been modified for the purpose of research (Paxton, Barch, Racine, & Braver, 2008; Spreng, Stevens, Chamberlain, Gilmore, & Schacter, 2010). Thus, the use of different approaches to assessment of executive function has created barriers to cross-field interpretability of findings (Schmidt et al., 2016).

These challenges in measuring executive functioning were further highlighted in a recent meta-analysis that examined the concept of executive functioning in 60 studies across different fields (Packwood, Hodgetts, & Tremblay, 2011). This analysis revealed that across the literature, there are varying perspectives on how to operationalize and thus measure, the different subcomponents of executive functioning. The study actually found that throughout 60 studies, 68 different terms were used to operationalize these subcomponents. Through objective statistical analysis, the researchers were able to identify 18 total neurobehavioral functions that were used to describe subcomponents of executive functioning. Some of these components included verbal reasoning, problem-solving, planning, sequencing, working memory, inhibition, cognitive flexibility, multitasking, and sustained attention (Packwood et al., 2011). Findings from this study supported the need for researchers across disciplines to move to a more systematic approach where measurement and operationalization of sub-processes are grounded in empirically supported theories as well as use current valid and reliable assessment measures. In further support of these challenges in examining executive functioning, Chan, Shum,
Toulopoulou, & Chen (2007) reviewed the current prominent theories of executive function and their associated assessment of measurements. This study supported the need for research to use a more standard approach to the assessment of executive functioning by using more accurate, sensitive, and specific assessment tools that have been empirically supported to measure components of the construct. It also called for the need of the field to move towards the use of, as well as, development of assessments that have strong ecological validity to real life needs of the individual.

Overall, findings from these aforementioned studies support the notion that while there is a general consensus for an overarching definition of executive functioning, there is still discrepancy on a selection of a single universally supported theory. Therefore, with a call in research to move to a more systematic approach where measurement and operationalization of sub-processes are grounded in empirically supported theories, before choosing a theoretical foundation for the study, it is important to thoroughly review the prominent literature on different models of executive functioning.

**Examination of Models of Executive Functioning**

In an examination of the literature reviewing executive functioning, Miyake, Emerson, and Friedman (2000) identified three important issues for researchers to consider when selecting a research model. First, they reinforced that while there are many prominent theories, there is considerable overlap between the models suggesting a unifying construct. Second, across the different subfields of psychology including but not limited to counseling, developmental, cognitive, and neuropsychology, many researchers have used the same terms to conceptually describe different functions, or have used different terms to define the same functions. Lastly, while most research today supports the multidimensional view, which divides executive
functioning into independent but related domains, some researchers still support the view of a unitary, single construct model of executive functioning.

**Unitary Theories**

Some of the early models of executive functioning were unitary theories, assuming that executive functioning is a singular construct used to describe a set of higher order cognitive skill that distinguishes humans behaviorally and dynamically from other mammalian species (Anderson, 2008; Hunter & Sparrow, 2012). Early researches in the field, including Baddeley (1986) and Norman and Shallice (1986), originally emphasized that the structure of executive functioning was a singular mechanism that guided aspects of attentional control. Other more recent theories in support of the unitary model theories, argue that executive functioning is actually an overarching cognitive construct that encompasses fluid intelligence, working memory, and reasoning (Davis, 2011; Downing, 2015; Jurado & Rosselli, 2007). Several studies using factor analyses examining executive functioning in children support the notion that inhibition, working memory, and planning are all subcomponents of a single factor of executive functioning (Hughes, Ensor, Wilson, & Graham, 2010; Wiebe, Espy, & Charak, 2008). Similarly, structural factor analyses investigations examining the construct reveal high inter-correlations, ranging from .27 and .35, between different subcomponents of executive functioning, such as inhibition, attention shifting, and working memory (Groppe, & Elsner, 2014, Flanagan & Harrison, 2012). According to some researchers that support the unitary model, these findings in some ways provide evidence that the components of executive functioning have a significant degree of overlap (Flanagan & Harrison, 2012).

**Shifting Away from Unitary Models.**

While there is support for the notion of a localized system for executive functioning,
alternative and plausible counterarguments have been raised by neuroscientists that argue for a
distributed neural network. The latter researchers argue that unitary models of executive
functioning are lacking in specificity (Packwood et al., 2011). In fact, later work by both
Baddeley (1986) and Norman and Shallice (1986) resulted in both researchers updating their
theories to incorporate multiple factors of executive functioning, moving away from the view
that executive functioning is characterized by localized function (Baddeley, 1986; Shallice,
2002). More specifically, studies examining cognitive deficits in patients with frontal lobe
damage demonstrate that there is a broad pattern of impairment across coordination, execution,
and regulation of behaviors. While patients with frontal lobe damage in the same area show
deficits across all three of these functions, coordination, execution, and regulation of behaviors,
the pattern of performance between patients and across different tasks is not uniform. These
studies further provided evidence for the shift in the view of executive function from a unitary to
a multidimensional model (Packwood et al., 2011).

**Multidimensional Theories**

**Discrepancies across different models.** Though the majority of current research
supports the notion of a multidimensional model where executive functioning can be broken
down into separate and distinguishable factors (Banich, 2009), there is no consensus on how
many distinct factors comprise executive functioning. In fact, different prominent models range
in dividing executive functioning from three such as working memory, inhibition, and shifting to
six different factors including initiation, response inhibition, task persistence, organization,
generative thinking, and awareness (Baddeley, 2000; Floyd, Bergeron, & Hamilton, 2004; Luria,
1973; Shallice & Burgess, 1991). These discrepancies across models result from several key
issues that make executive functioning difficult to study. First, because executive functions
consist of higher-order tasks that also involve component processes, it is difficult to completely isolate individual factors of executive functioning away from other non-executive cognitive abilities such as motor functioning and perception (Downing, 2015; Hunter & Sparrow, 2012). Current neuropsychological assessment batteries that set out to measure these complex skills are in some ways confounded because they also incorporate and represent a measure of non-executive cognitive abilities. Furthermore, a surplus of executive function measures exist, and currently there is no current agreement or universal systematic approach to deciding which measures to use to best isolate and assesses these higher-order functions (Downing, 2015; Spreng et al., 2010). This lack of agreement in measures therefore makes it difficult to replicate studies and thus results in significant limitations in empirical support for the models. Lastly, and exceptionally noteworthy, most early research on executive functioning was done using adult populations, and therefore did not examine or take into account the impact of development on executive functioning (Hunter & Sparrow, 2012). Recent research looking across the developmental trajectory indicates that executive functions are not only dependent on development, but show significant variability among children, adolescents, and adults (Davis, 2011).

**Support for multidimensional models.** Several trends in the current literature provide support that executive functioning is most appropriately examined as a multidimensional model that can be broken down into separate, distinguishable subcomponents (Banich, 2009). First, measurement studies using structural equation modeling (SEM) have found that an observed explanatory variable for the variance in factor structures are dependent, in part, on the characteristics of the sample and the neuropsychological assessments instruments used to assess the construct of executive functioning (Anderson, 2008; Downing, 2015).
Secondly, in studies that examine patients with different types of executive dysfunction such as frontal lobe damage, dementia, and Attention Deficit Hyperactivity Disorder (ADHD), researchers have found that patients have impairments across specific regions, as opposed to having widespread executive dysfunction (Anderson, 2008). More specifically, studies showing reduced activation in adolescent boys with ADHD in the precuneus, the posterior cingulate, and other temporoporalietal areas have been directly related to deficits in both performance monitoring and attention reallocation networks (Rubia et al. 2007). Similarly, Smith et al. (2006) found that reductions in parietal activity during both interference suppression tasks and response switching tasks in children with ADHD may indicate abnormalities in visuospatial attentional processing. Similarly, Rogers et al. (2006) found that patients with semantic dementia have selective impairments of semantic memory, which suggests a disruption to an amodal semantic system.

Lastly, studies examining the development of executive functioning in children and adolescents indicate that there is significant variability across the lifespan of when different executive functions develop and mature. More specifically, both Gathercole (1998) and Lucianan and Nelson (1998) found that as children age, an increase in working memory capacity is seen that may underlie increase in executive functioning skills. Kloo and Perner (2003) also provided support for this variability by providing evidence that development of cognitive flexibility in preschool children compared to adolescents is closely linked to the development of theory of mind and as such increases with age. Lastly, Zelazo and Cunningham (2007) illustrated that higher level of consciousness and the ability to formulate more complex rule systems is dependent on the development of hierarchical network of pre-frontal cortex regions, and thus also dependent on age.
Overall, while there are limitations to accepting a single multidimensional model of executive functioning, most present theories grounded in empirical research share two common important factors: they describe higher order cognitive processes that guide behaviors and they are orchestrated by activity in the prefrontal cortex (Hunter & Sparrow, 2012; McCloskey, Perkins, & Van Divner, 2009).

**Conceptual Multidimensional Models of Executive Function**

**Luria’s model of self-regulation (1966)**

Alexander Luria, a prominent developmental neuropsychologist, was one of the first researchers in the field to define and document multiple factors of executive functioning. By studying problem solving strategies in adults with frontal lobe damage, he described a phenomenon of impairment in self-regulation in which the participants were unable to develop a specific problem solving plan, could not acknowledge constraints of the problem, and approached the problem in an impulsive manner (Purdy, 2011). Taking these findings together, Luria concluded that problem-solving strategies are actually dependent on specific executive skills that are regulated and dependent on the frontal lobes (1966). While he did not use the term executive functioning, his theory which he referred to as self-regulation, described four executive-dependent factors: *Anticipation* (setting realistic expectations, understanding consequences), *planning* (organization), *execution* (flexibility, maintaining set), and *self-monitoring* (emotional control, error recognition) (Purdy, 2011).

**Baddeley and Hitch’s model of working memory (central executive)**

In an effort to expand the earlier theory of short-term memory, Baddeley and Hitch (1974) first proposed that the concept of working memory could be described as a system to hold and manipulate information for a short period of time. The original model argued that working
memory was a system of limited attentional capacity, the *central executive*, that was assisted by two storage systems, the *phonological loop*, and *visuo-spatial sketchpad* (Hunter & Sparrow, 2012). However, the original concept of the central executive did not have any synthesizing mechanism, and therefore could not account for the facilitation of short-term memory by long-term memory. It also did not allow for adequate integration or feedback between the visuo-spatial sketchpad and the phonological loop (Baddeley & Hitch, 1974; Hunter & Sparrow, 2012). While this model revolutionized the study of working memory at the time, the aforementioned limitations underwent significant scrutiny from scholars in the field. As a result, Baddeley and Hitch (2000) updated the model to add a fourth component, the *episodic buffer*, which connects working memory to long-term memory (Terry, 2009). Furthermore, the revised model referred to the central executive component as “likely to engage multiple brain regions in a functionally coherent network, including dorsolateral prefrontal cortex” (Baddeley and Hitch, 2000, p. 836).

Thus, the Baddeley and Hitch (2000) model moved from a model of working memory to a model that also included and integrated the construct of executive functioning.

The new model, more specifically, proposed that the working-memory system consists of four main components (Baddeley, 2000). While both the phonological loop and the visuospatial sketchpad systems maintain information, each act as a separate storage buffer for different sensory modalities (Anderson, 2010). The other two components of the working-memory model include the *central executive*, which allocates attention, and the *episodic* memory buffer, which provides an interconnecting system between working memory and long-term memory (Terry, 2009). In order to fully understand this model as a revolutionizing theory of executive functioning, each aspect of the model is described.
Phonological Loop. The phonological loop allows for the brief storage of verbal material in order to process language and accomplish tasks such as problem solving (Terry, 2009). Baddeley proposed that the phonological loop consists of multiple components, including the articulatory loop, which rehearses verbal information, and the phonological store, which stores the information processed by the articulatory loop.

Visuospatial Sketchpad. According to Baddeley’s theory of working memory, the visuospatial sketchpad retains visual images and spatial information (Terry, 2009). Under control of the central executive, the visuospatial sketchpad is particularly specialized for the generation and manipulation of mental images (Bruyer & Scallquin, 1998). In an fMRI neuroimaging study that examined the neural processes associated with encoding of verbal information (list of words), Wagner et al. (1998) discovered that there were unique activation patterns in the left prefrontal regions. Visual information appears to be mediated by the right prefrontal cortex (Brewer et al., 1998) suggesting that this brain region is important for nonverbal information.

Central Executive. Baddeley (1986) conceptualized working memory as a cognitive system that is comprised of multiple components that support both executive control and can hold and maintain information for a short period of time. Therefore, Baddeley proposed that a central executive system could actively focus, allocate, or distribute limited attentional resources within limited capacity verbal and spatial memory storage buffers. (Terry, 2009). The executive system can manipulate and coordinate information stored in the buffers, direct attention, and engage in problem solving and planning.

In order to make decisions about how to control the two buffer systems, Baddeley claimed that the central executive needs its own temporary store of information (Anderson, 2010). In a recent study done by Burgess et al. (2007), the prefrontal and parietal cortices were
both found to be critically involved in the active maintenance of task-relevant information.

Miller and Cohen (2001) proposed that the prefrontal cortex not only maintained recent sensory information, but it also integrated representations of both task contingencies and abstract rules. This theory is similar to an idea proposed by Fuster (1997) which suggests that the prefrontal cortex is critically responsible for temporal integration and the mediation of events. In this way, the prefrontal cortex may exert executive control over the information it represents when the sensory information is no longer present in the external environment (D’Esposito, 2007).

**Episodic Memory Buffer.** In Baddeley’s initial theoretical model of working-memory, he postulated that there were three components (Terry, 2009). However, as Baddeley investigated the construct of working memory, he discovered that several components of short-term memory interacted with long-term memory (Baddeley, 2000). He theorized that the episodic buffer could act as a bridge between the markers or tags retained in the phonological store and the information retained in long-term memory. Therefore, the episodic buffer is the part of the working memory model, which integrates information across the phonological and visual stores, the operations of the central executive, and the encoding, storage and retrieval of long-term memories (Terry, 2009).

Studies examining the episodic buffer have hypothesized that the prefrontal cortex plays a crucial role (Baddeley, 2002). In a neuroimaging research study, Petrides (1998) identified two areas of the prefrontal cortex that are involved in support of working memory and specifically associated with the episodic buffer. The first area, the ventrolateral prefrontal cortex is activated when an individual consciously tries to retrieve specific information. This finding indicates that the ventrolateral prefrontal cortex is directly involved in the selection, comparison, and judgment
of information held in memory. On the other hand, Petrides (1998) found that the mid-dorsolateral frontal cortex are activated when information is being maintained for the purpose of manipulation or active monitoring. Petrides (1998) determined that together these two brain areas create the basis for systematic processing involved in planning and organization of behavior.

**Lezak’s conceptualization of executive functioning (1995)**

Murial Lezak’s conceptualization of executive functioning defines the construct as complex behaviors that are the basis of many cognitive, emotional, and social skills as well as innate abilities to respond to novel situations in an adaptive manner (Lezak, Howieson, Bigler, & Tranel, 2012). The original model, Lezak (1995), was one of first models of executive functioning to describe separate factors or components in a multidimensional model. Using a similar framework as Luria (1966), Lezak proposed that executive functioning can be conceptualized as having four components: volition, planning and decision making, purposive action, and effective performance (Lezak, 1995). While all four components are distinct factors, they are all necessary for self-direction and self-regulation of appropriate, socially accepted, and responsible behaviors. Notably, research has shown that patients with impaired self-regulation or impairments in executive behavior typically have a constellation of deficiencies with one or two remarkably prominent (Lezak et al., 2012). In contrast with other theories of executive functioning, Lezak’s (1995) model was developed and is still currently used today as a prominent model for an applied framework for the assessment and practice of executive functioning analysis (Anderson, 2008).

**Self-Regulation.** While self-regulation is not a specific factor, similar to the original Luria (1966) model, Lezak uses the term self-regulation to describe the constellation of executive
functions. The main components of self-regulation in this model are *productivity* and *cognitive flexibility* or the ability to set-shift. Productivity relies on the ability to create intention, develop the plan, and then carry out the final task. Cognitive flexibility on the other hand requires the individual to be able to shift a focus of thought or action according to the demand of the situation (Lezak et al., 2012).

**Volition.** Volition, or the *capacity of intentional behavior*, is a complex process described as the awareness and choice of determining needs, wants, and conceptualization of a future realization of that specific need or want (Lezak et al., 2012; Purdy, 2011). More specifically, volition requires the capacity to formulate an intention or goal. In order for volition behavior to occur, two preconditions, *motivation*, or the ability to initiate an activity, and *awareness* of oneself in relations to one’s surroundings must exist. While both awareness and motivation are necessary for volitional behavior, both aspects are independent and therefore can be examined separately (Lezak et al., 2012). Many studies examining self-initiated behavior have shown that deficiencies can occur as a result of disturbances in cognitive processes (Lezak et al., 2012). More specifically, Struss, Van Reekum, and Murphy, 2000, proposed that damage to the frontal/subcortical or frontolimbic circuitry can result in higher levels of apathy, and thus decreased self-initiated behavior. Similarly, patients with diffuse disturbances in cognitive processes, specifically dementia, also decreases in social and emotional awareness (Kipps, Nestor, Acosta-Cabronero, Arnold, & Hodges, 2009).

Deficits in volitional capacity can result in the inability to think of something to do, apathy, inability to initiate activities unless given specific instructions to do so, and the inability to assume responsibilities that require the ability to develop or envision long-term goals (Lezak et al., 2012).
Planning and Decision Making. The ability to develop and achieve a goal or intention requires several higher order cognitive abilities that Lezak has labeled as planning and decision-making (Downing, 2015). In order to achieve a goal, several key steps must first be accomplished. First, the individual must be able to create a plan, which requires the ability to conceptualize a change from a current situation, handle oneself objectively in relation to the environment, as well as view the environment objectively (Lezak et al., 2012). More specifically, the individual must be able to break down the task into achievable steps, as well as understand, assess and predict, obstacles that may be in the way of accomplishing the task (Downing, 2015). At the same time, the individual must be able to develop alternative ideas to achieve that plan if necessary, assess consequences and make decisions, as well as to develop and hold both linear and stratified ideas that allow for the development of a conceptual framework to carry out the plan (Lezak et al., 2012). Notably, these skills are dependent on good impulse control, intact working memory function, and sustained attention (Anderson, 2008). Moreover, while some individuals are able to generate initial ideas for plans, deficits or impairments in one or more of these higher order cognitive abilities may make it challenging for the individual to achieve the goal (Lezak et al., 2012).

Purposive Action. Lezak (1995) described purposive action as the ability to move from the intention or creation of a plan to actual productive activity. This requires an individual to initiate the task, and ensure that all steps are completed in order to achieve the desired outcome (Downing, 2015). Purposive action relies on the higher order cognitive functions of initiation, switching, cognitive flexibility, and inhibition (Downing, 2015; Lezak et al., 2012). Therefore, while a person may have the motivation, knowledge, and capacity to perform an activity, deficits in other higher order functions can result in disturbances that impede the actual carrying out of a
Effective Performance. Effective performance in Lezak’s (1995) model is a form of evaluation where the individual must be able to monitor performance, identify any errors, self-correct or make any needed adjustments, and self-monitor in the formation and accomplishment of the task or goal (Downing, 2015). Patients with executive dysfunction are likely to perform tasks erratically and unsuccessfully because self-correction, self-monitoring, and self-regulation are all vulnerable to many types of damage to the brain (Lezak et al., 2012).

Relationship Among Executive Functions and Working Memory

According to Baddley (2003), working memory is a limited capacity storage system, which holds information and supports cognitive thought processes. It is considered a component of, and foundation for, higher order cognitive operations and complex goal-directed behavior (Just & Carpenter, 1992) and allows for interactions between attention, perception, and long-term memory (Baddley, 1992). While different theories of working memory exist, recent research examining executive functioning and working memory propose that the two work together in a hierarchical system.

In examining the different prominent models of executive functioning, the relationship between executive functioning components, working memory, and attention become evident. Research that supports the unitary models of executive functioning shows that working memory and attention are important to the overarching cognitive construct (Davis, 2011; Downing, 2015; Jurado & Rosselli, 2007). While the Baddeley and Hitch (1974, 2000) model of executive functioning developed out of an original three part model of working memory, Luria (1966) and Lezak (1995) both propose that components of executive functioning are dependent on intact working memory function and sustained attention (Anderson, 2008).
Executive Dysfunction

When compared to the other areas of the brain, the prefrontal lobes are unique in both organization and function. More specifically, the frontal lobes have interconnections with almost all other brain regions and guide, direct, integrate, and monitor goal-directed behavior (Zillmer, Spiers, & Culbertson, 2008). Therefore, the main role of the frontal lobe is to exert executive control or functioning of behavior. Due to the significant afferent and efferent connectivity of the frontal lobes with other brain regions, disruption to any other connecting system as well as structural changes may result in major deficits in executive functioning (Zillmer et al., 2008).

While there are many factors that can disrupt functioning in the prefrontal lobes and lead to executive dysfunction, age related cognitive change is a prominent factor and significantly affects the older adult population. With a significant increase expected in the older adult population in the United States over the next four decades, there is a significant need for research examining the impact of normal and abnormal age related changes in executive functioning (O’Connor & Kraft, 2013).

Cognitive Aging

The concept of normal aging is particularly hard to define because there is a pronounced heterogeneity of cognitive performance among older adults (Randolph, 2013). However, despite the resiliency of the aging brain, research supports the notion that declines in memory and executive function begin shortly after adults reach maturity in the second and third decades of life (Salthouse, 2010). These declines increase more rapidly after the fifth decade and begin to show diminished processing speeds, working memory, and executive functioning (Smith & Bondi, 2008). Several studies have examined this age related decline by exploring structural and neural activation in the aging brain. Both Cabeza (2002) and Reuter Lorenz, Jonides, and
Smithetal (2000) studied differences between healthy older adults and young adults in neural activation during working memory tasks. Findings from both studies supported previous findings that younger adults use hemisphere asymmetry to perform tasks, where the left prefrontal cortex is activated during verbal tasks, and the right prefrontal cortex is activated during spatial tasks. On the other hand, both studies also found significantly reduced hemisphere asymmetry in healthy older adults, instead finding bilateral activation of the prefrontal cortex for both nonverbal and verbal tasks. These findings were significant to understanding the effects of aging on the human brain because they helped to support a compensatory view of bilateral activation in older adults, suggesting that older adults actually compensate for the decline seen in normal aging by recruiting additional neural networks to maintain performance on low level executive function and working memory tasks (Kirova, Bays, & Lagalwar, 2015). This over activation in the bilateral prefrontal cortex during working memory and executive function tasks provides evidence of how cognitive restructuring in the brain allows the older brain to compensate for age related decline (Kirova et al., 2015). More specifically, in a similar neuroimaging study examining neuronal activation in older adults during working memory and executive functioning tasks, Payer, Marshuetz, Sutton, Hebrank, Welsh, and Park (2006) again found bilateral over activation in the prefrontal cortex during low-level executive function and working memory tasks. However, they also found under activation of the ventral visual cortical pathway compared to healthy young adults. These findings further supported the notion that the aging brain will compensate for decline by recruiting additional neural networks to maintain performance on tasks (Kirova et al., 2015).

Notably, while the aforementioned studies found that cognitive restructuring provides support for lower level cognitive tasks, they also determined that this strategy was unable to
support more difficult executive function tasks (Kirova et al., 2015; Payer et al., 2006, Schneider-Garces et al., 2010). As such, age related decline has been linked to a significant decrease in higher order executive function tasks such as divided attention, manipulation, task-switching, and inhibition, as well as lower working memory capacity (Kirova et al., 2015; Schneider-Garces et al., 2010). These studies found that as the demand of the task increases in the aging brain, more under activation in the prefrontal cortex is observed. However, findings also support differences in this activation level between the healthy older brain and individuals with MCI and AD (Kirova et al., 2015). As a result, these findings support the use of using neuropsychological assessments and imaging to track behavioral and functional changes to monitor and distinguish between normal aging, MCI, and AD (Summers & Saunders, 2012).

**Executive Functions and the Aging Brain**

Studies comparing behavioral impairments in patients with frontal lobe lesions and older adults have found that both patients show difficulty with executive processing such as inhibition, monitoring, interference resolution, and task switching (Persson & Reuter-Lorenz, 2008). These results indicate that impairments in the prefrontal regions are likely the underlying cause of cognitive aging, specifically dysfunction in executive skills (West, 1996). Because many cognitive tasks rely on executive functioning skills, cognitive aging related executive dysfunction can significantly impact performance across a wide variety of tasks, including daily living skills (Persson & Reuter-Lorenz, 2008). Functional MRI studies using the Stroop task have found that age related cognitive changes results in a reduced ability to inhibit processing of task-irrelevant information and response time (Milham et al., 2002). Other studies examining executive functioning tasks have found similar impairments in task switching, inhibition, and planning (Persson & Reuter-Lorenz, 2008). These findings support that notion that prefrontal
functions, specifically aspects of executive functioning are especially compromised with age (Persson & Reuter-Lorenz, 2008).

**Working Memory and the Aging Brain**

As an individual reaches adulthood, changes in cognitive functioning, particularly in the case of working memory occur (Persson & Reuter-Lorenz, 2008). Memory tasks over short-term retention intervals reveal a decrease in memory with age. The working memory model proposed by Baddeley suggests that there could be several factors of aging that adversely affect memory (Terry, 2009). The first factor, slower processing, suggests that on certain tasks older adults need more study time to achieve the same level of performance as younger adults. As Baddeley suggested, older adults are found to encode information in the brain slower than younger adults. However, once the information is encoded, the rate of decay is the same across all ages (Persson & Reuter-Lorenz, 2008). A second factor that may be directly associated with aging is related to working memory in the domain of language processing. A study done by Hasher and Zacks (1988) found that older adults have trouble inhibiting extraneous material, when an individual is trying to process a given task. Compared to the younger adults, the older adults struggled to maintain active attention. Hasher and Zacks (1988) proposed that unrelated thoughts may foster weaker encodings of target material in the brain, ultimately creating interference among the target material.

While Baddeley’s working memory model provides several reasons for why age-related declines in memory function occur, recent neuroimaging studies have suggested substantial age-related declines in brain function. As the brain increases in age, brain cells gradually die. However, some areas are particularly more susceptible to cell death than others (Anderson, 2008). The hippocampus, which is known to play a crucial role in the initial encoding and
consolidation phases of memory, loses about 5% of cells every decade (Selkoe, 1992). Although other cells, particularly in the prefrontal cortex, may not die, they have been observed to shrink and atrophy (Anderson, 2008). In an effort to study the age-related effects on memory decline in the brain, studies on aged monkeys have found decreases in the number of neurons and the amount of input in the dorsolateral prefrontal cortex (Smith, Rapp, McKay, Roberts, & Tuszyński, 2004). Interestingly, older humans who show declines in working memory show reduced activity in the prefrontal cortex. However, older humans with intact working memories show greater activity in the prefrontal cortex than young adults (Rosen et. al., 2002; Rosen et. al., 2003). Rosen (2003) suggests that the increased activity in the prefrontal cortex is due to the brain working harder in these adults in order to compensate for impairments in other brain regions.

**Emotional Functioning and the Aging Brain**

It is estimated that roughly 15-20% of older adults 65 years and older will suffer from clinically significant cognitive impairments (Narrow, Raw, Robins, & Regier, 2002). Similarly, individuals aged 71 years and older are reported to be at an even higher risk of significant cognitive disorders and related impairments, with prevalence rates reported to be about 22 percent of this population (Lautenschlager, Cox, & Cyarto, 2012). While individuals in the older adult population are at a higher risk for significant cognitive disabilities across all settings, individuals who reside in long-term care facilities are at the highest risk with a prevalence rate of 65-90% (McGuire, 2009). While there are several contributing factors to this prevalence rate in long-term care facilities, the link between critical illness (e.g., such as cardiac disease, traumatic brain injuries, acute respiratory distress, etc.) and cognitive impairments is a leading factor. More specifically, Pandharipande et al., (2013) examined the link between long-term cognitive
impairment after critical illness and determined that 24-34% of all patients one-year post illness still showed significant changes in cognition scores independent of age. With patients 65 years or older representing approximately 40% of hospitalized adults annually in the United States, and the older adult population at an increased risk for medical complications, the impact of critical medical illness on cognition represents a major factor when examining the cognitive health of individuals in long-term care facilities (Mattison, Schmader, & Sullivan, 2018).

With age related change affecting most older adults, and prevalence rates of clinically significant cognitive impairments high, it is important for researchers and practitioners to understand the impact of these structural and behavioral brain changes on daily living. Therefore, it is important to continue to do increase research and track behavioral and functional changes to monitor and distinguish between normal aging, MCI, and AD (Randolph, 2013). While there are many factors to consider, one prevalent concern associated with both age related executive dysfunction and clinically significant cognitive impairments are comorbidity with mood disorders and depression (DeBattista, 2005).

Research examining executive dysfunction across multiple patient populations, supports the notion that there is a significantly greater rate of depression seen in individuals with executive functioning impairments (Randolph, 2013). Literature examining prevalence rates of depression among known executive function disorders have shown significantly higher rates across many populations. More specifically, prevalence rates for patients with Parkinson’s disease are 8 to 24 percent, 18.6 percent for adult patients with Attention-Deficit/Hyperactivity Disorder (ADHD), and 53.1 percent for patients with traumatic brain injuries (TBI) (Rabinowitz & Arnett, 2013). These studies have shown that executive deficits such as problem solving,
planning, initiation, and completion of goal-directed activities are significantly correlated with depression (DeBattista, 2005).

While mood disorders are commonly seen across many known executive function disorders, prevalence rates for the older adult population are exceptionally high. A recent meta-analysis revealed that 16 percent of individuals with dementia report clinically significant depression, and 26.8 percent report clinically significant apathy (Lyketsos et al., 2002). Similarly, prevalence rates of anxiety disorders in this population are also strikingly high at 15.3 percent. Research examining these prevalence rates has suggested that the decline of executive functioning skills in older adults is often associated with decline in daily living (Rabinowtiz & Arnett, 2013). This can be extremely difficult on the individual, as it requires a significant adjustment in lifestyle on the patient and often their families. Similarly, the decline in executive functioning skills in older adults can create uncertainty about the future, mourning of the loss of their previously healthy life, and can threaten personal identity and self-esteem (Rabinowtiz & Arnett, 2013). In addition to psychosocial stressors, brain imaging studies also provide evidence that changes in neurological circuits and structures, including the prefrontal cortex and amygdala in older adults with executive dysfunction disorders, also disrupt emotional functioning (Feinstein et al., 2004).

In sum, there is a wealth of research supporting the notion that emotional functioning and executive dysfunction is strongly correlated, especially in the older adult population. With the significant rise in the older adult population expected to continually increase, understanding and exploring the reasons and impact of this comorbidity is imperative. While most research is examining this phenomena within the scope of a disease related stress model, very little
neuropsychological research exists that focuses from a positive psychology perspective (Rabinowitz & Arnett, 2013).

**Positive Psychology Framework**

**Development of Positive Psychology**

In the decade following World War II, the Veterans Administration (VA) developed training opportunities for counseling psychologists. The purpose was to provide counseling services for a variety of medical and surgical patients, as well as to publicly promote benefits to counseling for individuals that suffered from severe psychiatric disorders (Lopez et al., 2006). With the rapid expansion of the field in the VA system, as well as counseling centers and universities, the field of counseling psychology emerged as a branch of psychology that focused on vocational guidance, advances in psychological testing, and for the first time, an emphasis on personal growth in the form of strengths and assets (Lopez et al., 2006; Super, 1955; Watkins, 1983). This development of the branch of counseling psychology marked one of the first shifts in attention of psychologists to focus on positive psychological constructs.

Similarly, in 1954, Maslow published the book *Motivation and Personality*, which emphasized a major gap in psychology by highlighting the fields’ predominant focus on dysfunction and disorder. More specifically, he argued that by only narrowly focusing on the dysfunction of human behavior and mental illnesses, psychologists had failed to accurately understand human potential. He emphasized that because psychologists predominantly focus on the human illness and negative psychological characteristics, they fail to understand and appreciate human strengths, virtues, and aspirations (Maslow, 1954, p. 354). Although Maslow was not the first psychologist to highlight the need for the field to focus on positive psychological characteristics, his book was influential because he was one of the early
psychologists to develop a theoretical model within this framework (Lopez et al., 2006; Seligman & Csikszentmihalyi, 2000). This trend of a movement towards a positive psychology focus continued with leading theorists such as Erikson (1959) and Kohlberg (1969) who developed strength based developmental theories into practice (Blocher, 1966). However, despite an increase in attention to positive psychological constructs, much of the research from within this framework was scattered throughout different branches of psychology (Lopez et al., 2006; Seligman, 2002) and was overshadowed by the predominant focus of psychology to practice within the deficit model.

Nevertheless, in 1998 Martin Seligman became president of the American Psychology Association. He made a major contribution to the emphasis of counseling psychology principles when he called for the field to move towards a positive framework in which there was a need for a “scientific pursuit of optimal human functioning” (Lopez et al., 2006). Seligman emphasized that while research within a deficit scope has allowed for an understanding of psychological dysfunction and mental illness, it has not moved the field closer to prevention of these deficits and disorders. Instead, Seligman showcased major findings across different studies of psychological constructs such as hope, optimism, interpersonal skills, courage, honestly, and flow and argued that human strengths can act as a buffer against mental illness (Seligman, 2002). As a result, the branch of Positive Psychology within the Division 17 of APA was established in 2004.

**Positive Psychology in Research**

Positive psychology can be defined as “the scientific study of what goes right in life, from birth to death and all stops in between…and that takes seriously those things in life that make life most worth living” (Peterson, 2006, p.4 as cited in Furlong, Filman & Huebner, 2006).
More specifically, it is a “study and promotion of positive emotion, character strengths, happiness, and optimism” (Randolph, 2013, p. 1). In an effort to examine the historical focus of positive psychology throughout the literature in the past 50 years, Lopez et al. (2006) conducted a content analysis of several journals of counseling psychology scholarship. A focus on the counseling psychology literature was selected because it was the branch of psychology during this time that had a specific hallmark of the field to focus within a positive strength based perspective. The goal of the analysis was to quantify the amount of study that has focused on human strengths, positive processes, and positive outcomes. The study found that 29% of all research conducted within the counseling themed journals had a positive focus. This study was important because it indicted that since the development of the field of counseling psychology, there has been a fairly consistent focus from a positive perspective (Magyar-Moe, Owens, & Scheel, 2015). However, in 2015 a follow up content analysis was conducted using the same methodology as Lopez et al. (2006), and examined the amount of research focusing on psychological constructs and processes from 2004 until 2014. This study found that only 13% of the randomly selected research from counseling psychology themed journals had a positive focus (Magyar-Moe et al., 2015). These findings are significant because they highlight that despite the significant gaps in positive psychology literature, research focusing within a positive psychology framework has decreased. More broadly, it has been posited that counseling psychologists are losing their unique perspective, with the emphasis becoming more clinically and biologically oriented.
Positive Neuropsychology Framework

Positive Neuropsychology and Executive Functions

As previously noted, executive functions are an interrelated set of higher-order cognitive abilities that refer to goal directed functions such as planning, problem solving, self-monitoring, motivation, and self-assessment (Kruger, 2011; Randolph & Chaytor, 2013). Numerous brain-imaging studies have implicated prefrontal activity as the center for high-order regulation of behavior (Rains, 2002). Because the frontal lobes have interconnections with many other brain regions and guide, direct, integrate, and monitor goal-directed behavior (Zillmer, Spiers, & Culbertson, 2008), executive functioning is also likely to relate to and impact positive and negative emotional and social behaviors (Zillmer et al., 2008).

More specifically, studies examining patients with damage to the prefrontal cortex have frequently associated negative psychological characteristics with executive dysfunction (Kruger, 2011; Phan, Wager, Taylor, & Liberzon, 2002; Stuss & Levine, 2002). However, fewer studies have focused on positive psychological characteristics with association to executive functioning or brain behavior functioning in general. This is a trend across the field of neuropsychology, with the predominant concentration of neuropsychological research focusing within the deficit model (Randolph, 2010).

Nevertheless, some research has started to try to fill the gaps in strengths-based positive neuropsychology literature. Stuss and Knight (2013) supported the notion that the prefrontal cortex is crucial to understanding human cognition both in health and disease. Similarly, research examining biological mechanisms of personality supports the idea that executive functioning can be used to study differences in positive personality functioning such as resiliency, optimism, and well-being (Suchy, Williams, Kraybill, Butner, 2010). Miley and Spinella (2006) made a major
contribution to the field of positive neuropsychology by examining the relationship between executive function and the positive psychological characteristics: gratitude, satisfaction with life, and forgiveness. Their findings were significant because they proposed that the underlying neurological substrates associated with executive functioning might be linked and required for successful goal formation and task completion. They also concluded that executive functions had a strong correlation with attributes Seligman’s (2002) construct of authentic happiness, which includes the factors satisfaction with life, gratitude, forgiveness, hope, and optimism. In a replication of this study, Kruger (2011) found positive correlations between executive function and gratitude, hope, and optimism. However, while there has been some increase in the strengths-based positive neuropsychology literature, further investigations are needed in the study of relationships between executive functioning and positive psychological attributes. Furthermore, as showcased the content analysis by Lopez et al. (2006) Magyar-Moe et al. (2015), research examining individual factors of positive psychological attributes, particularly Hope, is almost non-existent.

Hope

Hope in Research

While Seligman argued that specific positive constructs such as hope may act as a buffer against mental illness (Seligman, 2002), very few empirical studies have been done (Snyder et al., 1991). Furthermore, in the aforementioned content analyses of positive psychology in the literature, both studies also examined the frequency and extent to which specific positive constructs were measured (Lopez et al., 2006; Magyar-Moe et al., 2015). When looking at the construct of hope, both content analyses showed a significant lack of research in this area. More specifically, Lopez et al. (2006) found that in all of the articles they sampled over fifty years of
research in counseling psychology, only five articles total examined the construct of hope. Magyar-Moe et al. (2015) further highlighted the present lack of research on this construct with their study only finding a total of 4 articles that examined the construct of hope. As such, these results suggest that while large gaps in the field of positive psychology exist across the field, very little research to date has been done on the positive psychological construct of hope.

Overview of Hope

Early literature examined the construct as positive expectations for goal attainment and argued for its role in human adaptation (Magaletta & Oliver, 1999; Menninger, 1959). Similarly, research examining therapeutic factors that influence change, argued that hope was important for the initiation of change, willingness to learn, and sense of well-being (Menninger, 1959). In more recent years, more literature has supported the examination of the construct of hope within a cognitive framework suggesting that hope is an important factor grounded in goal obtainment (Snyder, Lopez, & Teramoto-Pedrotti, 2003). More specifically, hope has been considered a one-dimensional construct that operates on the assumption that goals can be met (Grewal & Porter, 2007). While this literature conceptualized hope with the assumption that goal directed behavior is adaptive, it did not provide a conceptualization for how these goals are pursued (Snyder et al., 1991). As a result, Snyder (1994, 2000) sought to provide a systematic explanation of the construct of hope that could be used to conceptualize how goals are pursued. This conceptual model, Snyder’s Hope theory, has become the central theoretical framework by which the construct of hope is understood today.

Snyder’s Hope Theory

Rather than a one-dimensional model, Snyder (2000) proposed that hope is actually a more complex construct and conceptualized it as a bi-dimensional phenomenon (Grewal &
Porter, 2007). As stated by Snyder, Hope theory is based on the assumption that individuals’ actions are goal directed (Snyder, 1995; Snyder, Rand, & Sigmon, 2002). According to Snyder (2000), the ability to attain goals is based on two types of cognitions: agency thinking, or thoughts about how to achieve those goals, and pathway thinking, or the motivation to achieve those goals (Edwards, Rand, Lopez, & Snyder, 2002; Juntunen & Wettersten, 2006). When individuals are motivated but are unable to identify ways to reach their goals, this is considered “agentic thought” or “without pathways thought.” On the other hand, when an individual can identify the pathway to obtain a desired goal, but does not have the motivation or belief that they can achieve or sustain this goal, “pathway thought” or “without agentic thought” occurs (Juntunen & Wettersten, 2006). Hope depends on both agency and pathways thinking (Edwards et al., 2002). By confronting challenges, individuals with high levels of hope are more likely to sustain human agency by developing alternative pathways to overcome barriers to success (Snyder, 1994). Similarly, hope theory also highlights the impact of the feedback loop on level of hope (Snyder, 1995). That is, as one has successful experiences, positive feedback helps increase the likelihood of future successes (perceived ability).

**Goals.** Snyder’s hope theory was grounded in the assumption that human actions are goal directed, and as such it is the core of theory. The theory posits that goals can be visual, virtual, or verbal, and may be a combination of these modalities. While they may vary from short to long-term, goals must be of a moderate importance in order to occupy conscious thought and be actively pursued (Snyder, 2002). While they may contain some degree of uncertainty, even what may be perceived as an impossible goal can be attainable through planning and determination (Lopez et al., 2003). As such, and important principle of this theory proposes that goal attainment is positively associated with higher levels of agentic and pathway thinking, and
results in greater psychological adjustment (Chang & DeSimone, 2001).

**Pathways Thinking.** Pathway thinking is a process in which individuals must view themselves as being able to create feasible routes to the goal (Snyder, Rand, Sigmon, 2005). This requires the ability for the individual to generate at least one workable route to the desired goal. However, the ability to create several pathways to the desired goal is important to overcome barriers (Snyder, 2002). As such, individuals are considered high-hope persons when they are able to create alternative pathways to their desired goal, and thus are more likely to achieve it (Irving, Snyder, Crowson, 1998).

**Agency Thinking.** In hope theory, agency thinking is considered the motivational component because it is the perceived capacity one holds to use their created pathways to achieve their goal (Snyder et al., 2005). Agency thinking involves both the initiation and follow-through of the pathway to achieve one’s goal. As such, high hope individuals use agency thinking when facing barriers and are able to apply more effective alternative pathways (Snyder et al., 2005).

**Adding Pathways and Agentic Thinking.** Snyder’s Hope theory revolutionized the construct of hope because it proposed that two factors, agency and pathways are necessary for goal-directed behavior (Grewal & Porter, 2007). Therefore, in order for one to move towards goal obtainment, both a sense of agency and pathways must exist (Snyder et al., 1991). Snyder further argued that hopeful thought is a process that is learned and established during early development, and its maturity is crucial for survival and thriving (Grewal & Porter, 2007; Snyder, 1994). Because a sense of both agency and pathway thinking must exist for goal attainment, Snyder argued that two are additive whereas an increase in one results in an increase in the other (Snyder et al., 1991).
Full Hope Model. In their chapter on hope in *The Handbook of Positive Psychology*, Snyder, Rand, and Sigmon (2002) describe the full hope model, which was grounded in Snyder et al., (1991)’s hope theory. In more detail, shortly after birth, infants begin to engage in pathway thinking as a way to organize the world and understand how to correlate time and events with each other (Schulman, 1991). As infants develop, they continue to use pathway thinking in learning the process of causation, and eventually develop the understanding that the self can be the initiator and elicit chains of events to happen. This development leads to a personal sense of agency, where children understand the role and impact they have on this chain and outcomes. This development of goal-directed hopeful thought is crucial not only for survival, but for the individual to be able to thrive (Snyder et al., 2002).

Hope and Emotional Functioning

Over the past two decades, research has examined the core construct of hope and its important implications to the field of positive psychology. Recent research has determined that higher levels of hopeful thinking are more positively associated with both perceived competence and self-esteem (Marques, Pais-Ribeiro, & Lopez). At the same time, Kwon (2000) demonstrated that lower levels of hope predict more depressive symptoms (independent of coping strategy) (Chang & DeSimone, 2001). Similarly, Snyder, et al., (1997) found that individuals with higher hope levels were typically more optimistic, focus on success when pursuing goals, develop more life goals, and perceive themselves as being able to problem solve.

Research examining hope and affect found that there is a strong positive relationship between these two variables; where higher levels of hope were related to high levels of positive affect (Snyder et al., 1997). Similarly the active strategy to manipulate and increase hope level has also been shown to be positively correlated with increased positive affect (Snyder et al.,
In a study examining levels of hope and affect in a population of college students, Snyder et al. (1991) found that students with high-hope reported feeling more inspired, energized, confident, and positively challenged by their goals.

Similarly, research has examined the impact of hope of emotional functioning with a stressor concept. More specifically, this model looks at coping as the ability to effectively respond to a stressor in an effort to reduce psychological distress (Snyder et al., 2002). Within the context of hope theory, a stressor is barrier that challenges goal attainment. As such, individuals with higher levels of hope are more likely to develop alternative pathways to overcome the barrier in order to achieve the goal (Snyder et al., 2002). Furthermore, because they are able to more effectively develop pathways, higher-hope individuals are less likely to use maladaptive strategies such as avoidance, which have been directly linked to psychological adjustment and depression (Snyder et al., 2002). These findings are similar to findings that examined the impact of hope on physical and psychological health.

Snyder et al. (2000) found that higher levels of hope are related to a more positive view of future well-being and higher confidence levels. This study also determined that high hope individuals actually view hope itself as a protective buffer against future life stressors. On the other hand, individuals with lower levels of hope were more likely to have negative views of the future, tending to catastrophize when stressors arose.

Similar research found that individuals with higher levels of hope can engage in effective agency and pathway thinking where they can identify and use new flexible strategies to overcome any barriers (Snyder et al., 2000). On the other hand, individuals with low levels of hope, tend to ruminate on these barriers, are unable to develop alternate pathways, and thus may
disengage or give up on goal attainment. As such, low hope individuals are more likely to experience psychological distress when faced with barriers (Snyder et al., 2002).

**Hope and Emotional Functioning in Older Adults**

Several studies examining quality of life in older adults have found a link between goal-directed behavior and proactive planning processes to improved health and sense of well-being (Sörensen, Mak, Chapman, Duberstein, & Lyness, 2011; Sörensen & Zarit, 1996). Similarly, the presence of hopefulness in older adults has been found to be linked to positive mental and physical health outcomes (Duggleby et al., 2007). Likewise, Sutherland et al., (2016) found that greater levels of hopefulness appear to be linked to goal directed planning behavior. However, like much of the research in hope theory, very few studies have been done to examine the construct of hope in older adults. As such because higher levels of hope may be used as buffers against depression, more research is needed on the construct of hope and emotional functioning for the older adult population.

**Executive Function and Hope**

Recent research examining hope and executive function argues that there is a significant overlap between the skills associated with executive functioning, and the skills necessary to support hopeful thinking (Sears, 2007). More specifically, the ability to identify a path to achieve a goal, formation of a plan to break down the goal into workable parts, cognitive flexibility, and use of social supports are all components of hope theory that involve executive functioning skills (Sears, 2007). Similarly, task persistence, behavioral regulation, and time management are also components of hope theory that involve executive functioning skills (Sears, 2005). As such, it might be possible that individuals with higher-levels of hope may be able to compensate when faced with deficits in executive functioning (Sears, 2007).
In a study examining the relationship between hope, executive function, and behavioral and emotional strengths in adolescents, Sears (2007) found that there was a strong relationship between hope and executive function. Hope was not only correlated strongly with all measures of executive function, as measured by the Behavior Rating Inventory Executive Function, but students with higher levels of executive dysfunction were more likely to report lower levels of hope (Sears, 2007). Similar to findings by Colvin, Dunbar, and Grafman (2001), a strong relationship was seen between executive function variables of working memory, planning, organizing, and tasks completion (Sears, 2007). These findings were also akin to research by Clair-Thompson and Gathercole (2006), who argued that because working memory is an essential component to goal achievement, it has strong impact on hope. Lastly, in a study examining executive function and positive psychological characteristics in college students, strong positive correlations were found between executive function, hope, and optimism. Using a multiple regression analysis, this study found that hope and optimism contributed significantly to the explanation of executive functioning (Kruger, 2011).

**Summary and Conclusions**

With a significant increase expected in the older adult population in the United States over the next few decades, a substantial demand will be placed on the medical and mental health fields. As such, it is important to understand the needs of the aging population. With age related change affecting most older adults, and prevalence rates of clinically significant cognitive impairments great, it is important for researchers and practitioners to understand the impact of these structural and behavioral brain changes on daily living. While many cognitive functions can be affected by aging, disruption in executive function processes are common and can significantly impact daily living. Moreover, one of the most prevalent concerns associated with
both age related executive dysfunction and clinically significant cognitive impairments are comorbidity with depression.

The literature presented in this chapter provides a thorough overview of executive functioning, and provides an empirically supported theoretical framework of executive functioning that will be used in the study. The literature also provides evidence for age related cognitive decline, and reviews specific studying showing that structural changes in the brain can result in disruption of executive functioning processes. Moreover, an explanation of how this disruption of execution functioning in older adults can impact emotional functioning and result in higher levels of depression is provided. In sum, there is a wealth of research supporting the notion that emotional functioning and executive is strongly correlated, especially in the older adult population. With the significant rise in the older adult population expected to continually increase, understanding and exploring the reasons and impact of this association is imperative.

While most research is examining this phenomena within the scope of a disease related stress model, very little research exists that focuses from a strengths-based positive psychology perspective. Although the literature provides evidence that executive functioning is also likely to impact positive and negative emotional and social behaviors, most research still continues to approach executive functioning within the scope of negative psychological characteristics. However, research examining the positive psychological construct or Hope, suggests that higher levels of hope may be used as a buffer against depression as well as provide a mechanism to compensate when an individual is faced with deficits in executive functioning. Therefore, with the growing aging population, it is imperative to continue to study and begin to fill in the gaps in the literature that within a strength based positive neuropsychology perspective.
Thus the present study aims to address this gap by examining the relationship between executive and depression (as measured by a geriatric measure of depression) from a strength based positive neuropsychology perspective. It aims to do this by positing that the positive psychological construct of hope moderates the relationship between executive functioning and depression.
Chapter III

Methodology

The following chapter provides an outline of the methodology of the study. The study design, participants, data collection method, and procedures are described. A thorough review, including the validity and reliability of each measurement instrument that was used in the study is provided. Lastly, the proposed hypotheses and statistical analyses for the study are explained.

Study Design

A cross-sectional research design was used to answer the study research questions and hypotheses. Cross-Sectional research designs are used to explain how and why a particular phenomenon occurs (Heppner, Wampold, & Kivlighan, 2008). The study was investigating the relationship among participants’ level of executive function and emotional distress (as measured by the GDS) as moderated by level of hope. As such, Multivariate Multiple Linear Regressions were performed to examine the relationships between variables being investigated. More specifically, bivariate correlations between the primary study variables, pertinent demographic variables, and possible confounding variables were conducted to determine which variables needed to be controlled for when completing inferential statistics. Next, a simultaneous multiple regression analysis was conducted to investigate the relationship between executive functioning and depression. Lastly, hierarchical regression analysis was used to assess the predictive effects of executive functioning on depression, as well as moderating effects of hope.

Specifically, in the current study, the independent variable for this study was executive functioning, which was examined through five separate and distinguishable factors. These factors included self-regulation, planning and decision-making, purposive action, effective performance and working memory. These factors were chosen because they are grounded in
Lezak’s (1995) conceptual model of executive functioning. Executive functioning was represented by scores on the following subtests of the D-KEFS: Verbal Fluency, Trail Making Test, Tower Test, and Sorting Test as well as Digit Span from Wechsler Adult Intelligence Scale-Fourth Edition. The dependent variable is depression using the GDS (Geriatric Depression Scale) - Long Form (Yesavage, et al., 1983). As there was no current way to measure a total executive function score, each subtest score provided a discrete measure of executive functioning and represent each of the factors of executive functioning in Lezak’s (1995) model.

This study also examined the construct of Hope, using scores from The Adult Trait Hope Scale (Snyder et al., 1991), as a moderating variable that provided explanatory power in accounting for the relationship between the independent and dependent variables.

There was no random sampling or assignment of participants in the current study. When prospective participants met study criteria and agreed to take party in the study, they were asked to complete two brief psychometric instruments (The Adult Trait and the GDS) as well as a brief neuropsychological assessments to assess the aforementioned variables.

Participants

The target population for this study was cognitively healthy older men and women between the ages of 60-90 years old who have completed a minimum education level of at least high school. According to the World Health Organization, the United Nations uses the criterion of 60 years or older to refer to the older population (World Health Organization, 2016). As this study was specifically looking at the older adult population, the criterion to define minimum age of older adults for this study was based on the United Nations accepted criterion. Because the neuropsychological measures that are available today only have a normative sample up to 90
years of age (Wechsler, 2011), the age cutoff for this study was 90 years of age. Similarly, because the neuropsychological measures currently available for this age range do not have reliable normative data based on education level below high school, the minimum education level for participants was a high school diploma (Groth-Marnat & Wright, 2016). No exclusion was made based on gender, sexuality, religion, race, or ethnicity.

To ensure participant inclusion criteria were met, participants were recruited from the orthopedic and acute rehabilitation parts of the centers, which have a population of cognitively healthy adults (patients in this section of the centers are given brief MMSE inventories by the facility on admission to ensure cognitive functioning). If participants did not pass, or showed levels of impairment, they were unable to stay in this unit of the facilities and instead are placed in a higher level of care unit, as such, participants in this study were only be recruited from this section of the center. At the beginning of the study, participants were asked their age. If they were not in the 60-90 year age range, did not have a minimum education level of at least high school, or were unable to give consent due to cognitive impairment outside of normal aging (e.g., specifically they were unable to provide consent because they did not pass the MMSE exam, which was re-administered by the researcher to verify healthy, cognitive functioning), they were unable to continue with the study.

Participants were recruited from two private short and long term nursing rehabilitation facilities. The director of the nursing of the facilities posted a notice of the research recruitment request to participate in the residential common areas to recruit for the sample. The letter of solicitation for research recruitment request to participate was posted in the residential common areas of the orthopedic rehabilitation center. The letter of solicitation introduced and described the purpose of the study and included the possibility of participation in the study. Potential
participants were provided with a written and verbal description of the study, as well as an informed consent form. Participants were provided the option to voluntarily take part in the study if they met the study inclusion criteria, and there were no penalties for not participating in the research or for withdrawing from the study at any time. Study participants did not receive an incentive or compensation for their participation.

**Instruments**

**Demographic information.** Demographic information was collected at the time of consent. More specifically, information regarding participant’s age, race, sexual orientation, income, and education was collected. Demographic information reason for admission, employment history, marital status, and education level was collected (see Appendix B).

**Wechsler Abbreviated Scale of Intelligence-Second Edition (WASI-II).** The Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II; Wechsler, 2011), is published by Pearson and is an updated abbreviated measure of intelligence. The WASI-II was designed to be used in clinical, psychoeducational, and research settings for individuals 6 to 90 years of age (Wechsler, 2011). The WASI-II also provides a quick and reliable screening of verbal and nonverbal performance discrepancy (Groth-Marnat & Wright, 2016). The test consists of four standard Wechsler subtests, Block Design, Vocabulary, Matrix Reasoning, and Similarities. These subtests were selected because they correlated strongly with general intelligence. The WASI-II can be administered with either two or four subtests. The two part subtest, FSIQ-2, which includes the Vocabulary and Matrix Reasoning subtests, were used in this study and discussed below. The 2 subtest FSIQ provides a brief estimate of gross intellectual functioning and produces verbal and nonverbal intelligence scores.
Administration of the FSIQ-2 subtest, which consists of the Vocabulary and Matrix Reasoning subtests, takes approximately 15 minutes to complete (Wechsler, 2011). Thorough descriptions of the WASI-II along with administration details are provided in the manual. In order to minimize the time needed for administration, age related starting points, reversal rules, ceilings and basal rules are all provided for ease of administration. The Vocabulary subtests measures word knowledge and verbal concept formation (Wechsler, 2011). The subtest was administered by having the participant look at pictures or define words that are read aloud by the examiner. The participant then must explain what it was or define words. The Matrix Reasoning subtest, measures fluid intelligence, spatial ability, and perceptual organization. The subtest was administered by having the participant choose a picture that best completes the matrix (Sattler, 2001). A FSIQ-2 subtest was derived by computing the respective T score for each subtest which is then converted to an overall FSIQ-2 score (Wechsler, 2011).

Standardization of the WASI-II was completed on a stratified national sample of 2,300 examinees that was consistent with the representative proportion of the population based on age, sex, race/ethnicity, educational level, and geographic region. The sample also included a representative proportion of the population of children and adults with special classifications such as traumatic brain injury, Attention-Deficit/Hyperactivity Disorder, learning disorder, and various levels of cognitive impairment (Wechsler, 2011).

A detailed explanation and analysis of the reliability and validity estimates of the WASI-II are provided in the manual, and are based on United States normative data. Internal consistency was measured utilizing the split-half method. In the adult sample, ages 17-90 years, reliability coefficients were high ranging from .9- to .92. The reliability coefficient for the FSIQ-2 was .94. Test-retest stability for adults 17-54 was good .87, and excellent for adults 55-
90 with a coefficient.95. Inter-rater reliability for Matrix reasoning and vocabulary were excellent, .98-.99 and .94-.95 respectively (Wechsler, 2011).

Validation was done in comparison to the Wechsler Adult Scale of Intelligence, Fourth Edition (WAIS-IV) and Wechsler Intelligence for Children-Fourth Edition (WISC-IV), as a good estimate of intelligence. Internal structure was strong with all subtests and composites. Factor analysis provided strong confirmation and support for a nonverbal and verbal intelligence score. Test structure and concurrent validity of both FSIQ-2 and FSIQ-4 were strong, with correlations between the WAIS-IV excellent .92 (Wechsler, 2011).

**Digit Span.** The Wechsler Adult Scale of Intelligence, Fourth Edition (WAIS-IV; Wechsler, 2008), is published by Pearson and provides a measure of general intellectual functioning. The WAIS-IV was designed to be used in clinical, psychoeducational, and research settings for individuals 6 to 90 years of age (Wechsler, 2008). While it provides an overall IQ score and four index IQ scores, individual subtests can be used independently by deriving an individual subtests level scaled score (Wechsler, 2011). The Digit Span, subtest is a subtest that measures rote learning and memory, auditory processing, auditory simple attention, and working memory. It is administered by having the participant repeat digits back forward, backward, and in ascending order. Administration of the Digit Span subtest, takes approximately 10 minutes to complete (Wechsler, 2011). Thorough descriptions of the subtest, along with administration details are provided in the manual. In order to minimize the time needed for administration, age related starting points, reversal rules, ceilings and basal rules are all provided for ease of administration.

Standardization of the WAIS-IV was completed on a stratified national sample of 2,200 examinees that was consistent with the representative proportion of the population based on age,
sex, race/ethnicity, educational level, and geographic region. The sample also included a representative proportion of the population of children and adults with special classifications such as traumatic brain injury, Attention-Deficit/Hyperactivity Disorder, learning disorder, and various levels of cognitive impairment (Wechsler, 2008).

Reliability and validity were strong within single subtest analysis. A detailed explanation and analysis of the reliability and validity estimates of the WAIS-IV are provided in the manual, and are based on United States normative data. Internal consistency was measured utilizing the split-half method. The reliability coefficient for Digit Span in the older generation was .93 ages 65-69, .90 ages 70-74, .90 ages 75-79, .87 ages 80-84, and .84 ages 85-89. The standard error of measurement for Digit Span in the older population was .79 ages 65-69, .95 ages 70-74, .95 ages 75-79, 1.08 ages 80-84, and 1.20 ages 85-89 (Weschler, 2008). Test-retest reliability within the WASI-IV was .83 and internal consistency reliability was .93 (Gignac & Weiss, 2015). Test structure and concurrent validity within the WAIS-IV were strong (Weschler, 2011).

**Delis–Kaplan Executive Function System (D-KEFS).** The Delis–Kaplan Executive Function System (D-KEFS) is a neuropsychological battery of tests for individuals within the ages 8 to 89. It was developed specifically to evaluate deficits in Executive Functioning (Delis, Kaplan, & Kramer, 2001; Homack, Lee, & Riccio, 2005). It was designed to be given as a full battery or by individual subtests that provide subtest level scaled scores (Delis, Kaplan, & Kramer, 2001; Homack, Lee, & Riccio, 2005). Total administration time is 60-90 minutes for entire test, but varies within each individual subtest administration. Standardization of the D-KEFS was completed on a stratified national sample of over 1500 examinees, that was consistent with the representative proportion of the population based on age, sex, race/ethnicity, educational level, and geographic region (Delis et al., 2001). A thorough description of administration details
is provided in the manual as well as detailed explanation and analysis of the reliability and validity estimates for United States based normative data. This study only used the specific subtests that are discussed in more detail below.

**Sorting Test.** The sorting test is a subtest of the D-KEFS which is designed to assess initiation of problem solving behavior, concept formation skills, abstract reasoning, planning, cognitive flexibility, and inhibition (Delis, et al., 2001; Homack, Lee, & Riccio, 2005). The test is comprised of two testing conditions, free sorting and sort recognition. The examinee is asked to sort into two groups, according to as many different concepts or rules as possible. The cards contain either verbal-semantic information or visual spatial patterns. The examinee is also asked to provide explanation as to why and how they created the categorizations (Homack et al., 2005). Standardized scoring was done by evaluating the examinee’s performance in terms of accuracy as well as description of concepts (Delis et al., 2001; Homack et al., 2005). Reliability and validity were strong within single subtest analysis for older adults 60 years and older. Internal consistency was strong and examined across age populations, 60-69 (.81), 70-79 (.81), and 80-89 (.77). Retest reliability for ages 58-89 was 0.62 (Delis et al., 2001).

**Trail Making Test.** The D-KEFS Trail Making Test is a visuo-motor task that is designed to assess cognitive flexibility and inhibition (Delis et al., 2001). The test is comprised of into four testing conditions, which assess visual scanning, number sequencing, letter sequencing, and motor speed. On each condition the examine is asked to either connect numbers in numerical order, letters in alphabetic order, trace lines for motor speed, or to switch between numbers and letters simultaneously (Homack et al., 2005). Standardized scoring was achieved by evaluating the examinee’s reaction time per testing condition as well as errors made on each trial (Delis et al., 2001). Reliability and validity were strong within single subtest analysis for older
adults 60 years and older. Internal consistency was strong and examined across age populations, 60-69 (.80), 70-79 (.60), and 80-89 (.77). Retest reliability for ages 58-89 was 0.55 (Delis et al., 2001).

**Verbal Fluency Test.** The D-KEFS Verbal Fluency Test is designed to assess aspects of abstract verbal reasoning, self-regulation, self-monitoring, cognitive flexibility, set shifting, and spontaneous production of words (Delis et al., 2001; Lezak et al., 2012). The test is comprised of into three testing conditions, letter fluency, category fluency, and category switching.

The letter fluency condition evaluates the spontaneous production of words with a given letter within a set amount of time. The category fluency condition evaluates the spontaneous production of words within a category in a set amount of time. The category switching condition evaluates the ability to spontaneously switch between two types of word categories (Delis et al., 2001). Standardized scoring was done by evaluating the number of responses produced within each testing conditioning as well as errors made on each condition (Delis et al., 2001). Reliability and validity were strong within single subtest analysis for older adults 60 years and older. Internal consistency was strong and examined across age populations, 60-69 (.85), 70-79 (.87), and 80-89 (.86). Retest reliability for ages 58-89 was 0.88 (Delis et al., 2001).

**Tower Test.** The D-KEFS Tower Test is designed to assess aspects of planning, monitoring, self-regulation, rule learning, establishing and maintaining instructional set, nonverbal abstract reasoning, and problem solving (Delis et al., 2001; Lezak et al., 2012). The test provides the examinee with five discs of different sizes and three vertical rods or “towers.” The test is administered by having the examiner place two to five discs on the rods in a preset starting condition, and the examinee is then asked to make the tower look like the target picture by moving the discs using the least amount of moves within a set of given rules (Delis et al.,
2001). Standardized scoring were evaluated based on the amount of time it takes to complete the target, the number of moves made, and the number of rule violated (Delis et al., 2001). Reliability and validity were strong within single subtest analysis for older adults 60 years and older. Internal consistency was strong and examined across age populations, 60-69 (.72), 70-79 (.78), and 80-89 (.61). Retest reliability for ages 58-89 for total achievement score was 0.38 (Delis et al., 2001).

The Mini-Mental State Examination (MMSE). The Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975) is a simple way to quantify cognitive function, ability to provide consent, and screen for cognitive loss. It is a standard assessment tool used by entry-level therapists. It tests an individual’s orientation, attention, calculation, recall, language and motor skills. A maximum possible score on the MMSE is 30/30. Good test–retest and inter-rater reliability with the correlation coefficients being 0.8 have been reported (Folstein et al., 1975). A score of 23 or lower is indicative of cognitive impairment. The MMSE takes only 5-10 minutes to administer and is therefore practical to use repeatedly and routinely. For the purpose of this study, each participant had to have a score of 24 or above. Those falling below the score of 23 were not eligible to participate in the study.

GDS (Geriatric Depression Scale). The GDS (Geriatric Depression Scale)- Long Form (Yesavage, et al., 1983) is a 15-item measure of participants’ level of depression originally designed for administration to individuals 65 years of age or older (Gloster et al., 2009). However, more recent normative data shows strong psychometric properties and comparable validity in younger and older adults (Weintraub, Saboe, & Stern, 2007). The scale consists of 30 items with “yes” or “no” items. Scores of 0-9 are considered normal, depending on age, education, and complaints; 5-8 indicate mild depression; 10-19 indicate moderate depression;
and 20-30 indicate severe depression (Greenberg, 2012). The long form takes approximately 10-14 minutes to complete. Notably, this scale does not assess for suicide. Several studies have found strong psychometric properties of the GDS in healthy, medically ill and mild to moderately cognitively impaired older adults. It has been extensively used in community; acute and long-term care setting with strong psychometrics (Greenberg, 2012). The GDS was found to have a 92% sensitivity and an 89% specificity when evaluated against diagnostic criteria. The validity and reliability have been supported through both clinical practice and research. In a validation study comparing the Long and Short Forms of the GDS for self-rating of symptoms of depression, both were successful in differentiating depressed from non-depressed adults with a high correlation($r = .84, p < .001$; Sheikh & Yesavage, 1986; Weintraub et al., 2007). The discriminant validity of the GDS-30 was high for nonelderly, young-elderly, and old elderly subjects (0.92, 0.91, and 0.95) respectively. Examination of the psychometric properties in older adults demonstrated excellent internal consistency, convergent validly, and discriminant validity (Knight et al., 2004).

**Adult Trait Hope Scale.** The Adult Hope Scale was developed by Snyder et al., (1991). It is a 12-item measure of participants’ level of hope, and is designed for administration to individuals 16 years of age or older. The scale is divided into two subscales based on Snyder’s cognitive model of hope, specifically, Agency (i.e., goal direct energy) and Pathways (i.e., planning to accomplish goals). The Agency subscale consists of 4 items and the Pathways subscale consists of 4 items, while the remaining 4 are filler items. Each item is answered using an 8-point Likert-type scale which ranges in responses from “Definitely False” to “Definitely True.” Agency and Pathway scores may be summed to create a total hope score, and can range from 8 to 64, with higher scores indicating higher levels of hopeful thought. Snyder et al. (1991)
reported adequate internal reliability (alpha = .74 - .84 for total hope, alpha = .70 - .84 for agency, and alpha = .63 - .86 for pathways) as well as adequate test-retest reliability (.76-.82) over ten weeks. Evidence of concurrent validity was supported by Cheavens, Gum, and Snyder (2000).

**Research Questions and Hypotheses**

Hypotheses and research questions related to the relationship between decline in executive function and depression, anxiety, and stress were formulated from theory and research on the aforementioned constructs. More specifically, Lezak et al.’s (2004) proposed theoretical framework was chosen as the conceptual framework for executive function in this study because it not only provides a theoretical conceptualization, but it also provides an applied framework for the assessment (Anderson, 2008). Likewise, the hypotheses were based on a thorough review of the literature which supported a significant relationship between age related executive decline and clinically significant cognitive impairments and depression (DeBattista, 2005). These research questions reflect gaps in concepts and findings in the previous literature in these areas.

**Research Questions**

1) In a population of older adults, are lower levels of executive function associated with in higher levels of depression?

2) In a population of older adults, did hope moderate the relationship between the executive function and levels of depression?

Hypotheses related to the moderating role of hope on the impact of the relationships of the constructs above were drawn from Snyder’s Hope Theory and research examining the impact of hope on similar constructs. These hypotheses reflect concepts and findings supported by the previous literature in these areas.
1) It was hypothesized that lower levels of executive function were associated with higher levels of depression. Older adults participating in the study were given assessments measuring executive function and depression. This assessed the relationship between executive function and depression. A negative relationship between scores on the Delis-Kaplan Executive Function System tests – Trails Making (condition 4 switching task), Verbal Fluency (condition 3 category switching), Sorting Task (condition 1 sorting task), and Tower Task (total achievement score), and Digit Span (Wechsler Adult Scale of Intelligence, Fourth Edition), and the Geriatric Depression Scale were expected.

2) In a population of older adults, did hope moderate the relationship between executive function and levels of depression? It was hypothesized that hope would moderate the relationship between executive function and level of depression. Older adults participating in the study were given assessments measuring executive function, hope, and depression. This assessed the moderating relationship between hope and executive function and depression. Therefore, it was expected that there was a moderating relationship seen between scores on the Adult Trait Hope (total score) scale between scores on the Delis-Kaplan Executive Function System tests – Trails Making (condition 4 switching task), Verbal Fluency (condition 3 category switching), Sorting Task (condition 1 sorting task), and Tower Task (total achievement score), and Digit Span (Wechsler Adult Scale of Intelligence, Fourth Edition), and the Geriatric Depression Scale.

**Operational Definition of Variables**

The following terms have been defined operationally to explain how they were measured in the study.
Independent Variable

Executive Functioning. In the current study, the independent variable for this study was executive functioning, which was examined through five separate and distinguishable factors which include self-regulation, planning and decision-making, purposive action, effective performance and working memory; factors that are grounded in Lezak’s (1995) conceptual model of executive functioning. Executive functioning were scores based on the following subtests of the D-KEFS: Verbal Fluency, Trail Making Test, Tower Test, and Sorting Test as well as Digit Span from Wechsler Adult Intelligence Scale. The dependent variable was depression using the GDS (Geriatric Depression Scale)- Long Form (Yesavage, et al., 1983). As there was no current way to measure a total executive function score, each subtest score provided a discrete measure of executive functioning and represent each of the factors of executive functioning in Lezak’s (1995) proposed model. These specific instruments were chosen to measure each factor of executive functioning because they have been found to have high content validity with each factor, as well as ecological validity in lives of older adults (Lezak, et al., 2012; Mitchell & Miller, 2008; & Randolph & Chaytor, 2013).

More specifically, executive functioning operationally was defined as the following five independent variables:

1) Self-regulation - Score from Verbal Fluency (condition 3 category switching)
2) Planning and decision-making - Score from Tower Test (total achievement score)
3) Purposive action - Score from Trail Making Test (condition 4 switching task)
4) Effective performance - Score from Sorting Task (condition 1 sorting task)
5) Working Memory – Total score from Digit Span from WAIS-IV
Moderating Variable

**Hope.** Hope in this study was operationally defined as the total hope score obtained on the Hope Scale.

Dependent Variables

**Depression.** Depression in this study was operationally defined as the total score on the geriatric depression scale (GDS).

Procedure

All participants were recruited from two private short and long-term orthopedic and acute rehabilitation facilities in the northeast. Participants included patients between the ages of 60-90 years old who had completed a minimum education level of at least high school. No residents who were unable to give consent due to cognitive impairment were included. The letter of solicitation for research recruitment request to participate was posted in the residential common areas of the orthopedic rehabilitation center. Potential participants were provided with a thoroughly explained written and verbal description of the study by the principal investigator, as well as an informed consent form. If the participant agreed to partake, an informed consent was given to the participant and was thoroughly explained by the principal investigator, before the participant could sign the form. Following completion of informed consent and assent procedures, tests were administered. The evaluation measurements, which consisted of paper and pencil measurements, was administered either in the participant’s private bedroom at the facilities or in a private office provided by the administrator, according to the preference of each participant. This allowed for confidentiality and an environment free from significant distractions. The assessments were administered in the following order by the principal investigator: (1) Mini Mental Status Exam (2) Demographics, (3) Wechsler Abbreviated Scale of
Intelligence, Second Edition (WASI-II; Wechsler, 2011) FSIQ-2, (4) Digit Span subtest of the WAIS-IV (Pearson, 2008), (5) Sorting subtest of the D-KEFS (Delis et al., 2001), (6) Trails subtest of the D-KEFS (Delis et al., 2001), (7) Verbal Fluency subtest of the D-KEFS (Delis et al., 2001), (8) Adult Hope Scale (Snyder et al., 1991) (9) GDS (Geriatric Depression Scale) (Yesavage, et al., 1983). The entire assessment session lasted approximately 45-60 minutes in duration, with the total time including a standard fifteen-minute break given between administration of the Trails and Verbal Fluency subtest.

Upon completing the research protocol, participants were thanked for their time and provided with the principal investigator’s contact information for any follow-up questions. No follow-up study of the participants will occur as part of this study. In order to preserve the anonymity and confidentiality of the participant’s data, all identifiable information was recorded by administering an anonymous randomized number to each participant protocol. In accordance with the nursing facilities’ protocol, any participant that scored in a clinical level, which was a score of 10 or above for the Geriatric Depression Scale received follow-up health and behavior assessment by the facilities’ psychological teams.

**Protection of Human Subjects**

The current research study design received Seton Hall University Institutional Review Board (IRB) approval prior to its initiation. Deception was not used in this study, therefore no debriefing of participants was necessary. The study was not expected to have minimal negative consequences for participants. However, any participant endorsing at least a minimal level of psychological distress had an immediate consultation with a member of the psychological team. Information transmitted from the questionnaires and the neuropsychological assessments was entered into the Statistical Package for Social Sciences (SPSS) format and stored on a password
protected USB memory key, which was kept in a locked secure location in the principal investigator’s office. This study was conducted using random numbers to code data for the participants. A master list of matching codes to participants, as well as all other information and data received from the study was stored on a password protected and encrypted USB memory key, and was kept in a locked, secure location in the principal investigator’s office (e.g., which was provided by the facilities). Ms. Brittney Fallucca and Dr. Pamela Foley were the only ones who had access to this information. This information will be safely stored for a minimum of three years. Participants were informed that their names will not be used in connection with the study and that their responses will not be linked to their identity. To ensure confidentiality, consent forms were kept separate from the participant data.

**Data Preparation**

Data collected from participants was manually inputted into Statistical Program for the Social Sciences (SPSS) version 25.0 under the assigned participant number. Once the data was inputted into the software, a standard data validation procedure was conducted. More specifically, the *Explore function* in SPSS was used to generate statistics on extreme data points, potential outliers, and missing data. The Frequency function within the SPSS-25 analysis package was used to generate frequency distributions and measures of skew and kurtosis in order to establish the distribution of primary study variables and their appropriateness for parametric statistical testing. If data was not normally distributed, the proper statistical measures were employed to appropriately transform data into a format that was suitable for analysis.

**Statistical Analysis**

**Descriptive Statistics**

Descriptive statistics were calculated to describe the demographic characteristics of the
participants including age, race, employment history, reason for admission, and education level. More specifically, means standard deviations of each of these characteristics were assessed to summarize the overall participant characteristics of the study. Means and standard deviations for these variables were also calculated to determine the possibility of being an extraneous or confounding variables that influenced the study.

**Statistical Analysis**

This proposed study was investigating the relationship among participants’ level of executive function and depression (as measured by the GDS) as moderated by level of hope. Multivariate Multiple Linear Regressions were performed to examine the relationships between variables being investigated. More specifically, bivariate correlations between the primary study variables, pertinent demographic variables, and possible confounding variables (FSIQ-2 and MMSE) were conducted to determine which variables needed to be controlled for when completing inferential statistics. Next, a simultaneous multiple regression analysis was conducted to investigate the relationship between executive functioning and depression. Lastly, hierarchical regression analysis was used to assess the predictive effects of executive functioning on depression, as well as moderating effects of hope. This model would be useful in understanding the underlying mechanisms that may influence high rates of depression, anxiety, and stress in older adult patients prone to impairments in executive functioning.

**Sample Size.** In order to reduce the likelihood of Type II error and optimally assess the study hypotheses, an a priori statistical power analysis was conducted to determine the number of participants required for this study. Publically available freeware, G-power, was used for this purpose (Erdfelder, Faul, & Buchner, 1996).

In order to determine the appropriate sample size for this present study and to have
meaningful outcomes, three power analyses were conducted. This study’s power analysis uses the computer program G*Power 3 (Faul & Buchner, 2007) and employs Cohen’s (1988) criteria for effect size, which for a multiple regression is the Cohen’s $f^2$. Assuming values of $\alpha = 0.05$ and power = 0.80 with a medium effect size (0.25), and 6 predictors, the required sample size is 48. An a priori power analysis revealed that in order for a medium effect of this size to be detected (80% chance) at a significance level of .05, a sample of 48 participants would be required. As this study was grounded within previous literature, the effect size of (0.25) was chosen based on previous research supporting that most correlations between self-reported measures of depression and executive function measures indicated effect sizes between 0.33 to 0.23 (Kizilbash, Vanderploeg, & Curtiss, 2002; Smitherman, Huerkamp, Miller, Houle, & O’Jile, 2007).

**Limitations to the Study**

It is important to note that two of the scales used in the present study, GDS and Adult Hope Scale, were self-report measures. While self-report data can be extremely beneficial and is one of the most commonly used tools in counseling psychology research, there are several disadvantages. When researchers choose to use self-report data, they are relying on the assumption that the report accurately reflects the trust state, or that participants respond honestly and accurately (Devos & Banaji, 2003). However, self-report data can be vulnerable to distortions, whether intentional or unintentional by the participant. Unfortunately, for numerous reasons, participants may consciously or unconsciously respond to self-report data in a way that reflects a response bias rather than the construct actually being measured (Quilty, Oakman, & Risko 2006). This can happen due to social desirability effects where participants may try to answer questions in a way that makes them look good or try to answer questions in a way that
makes them appear more distressed (Heppner et al., 2008). Another disadvantage of survey data is the sample size. While increasing the sample size would increase the power, it may be extremely difficult to obtain enough individuals who are willing to participant.

Importantly, another major limitation of the study was the cross-sectional design. More specifically, in a cross-sectional design study, data are collected at a single point in time to examine the relationship between the predictor and criterion or outcome variable. Therefore, because the predictor and outcome variable were simultaneously assessed, and no baseline data existed to compare the predictor variable too, there was generally no evidence to establish a true cause and effect relationship (Solem, 2015). Therefore, it is difficult to draw predictive conclusions based on this relationship. Additional data from future studies would be help to support any findings or conclusions drawn from this study.

Additionally, as this study was specifically looking at a population of older adults, it is important to note that based on US Census data, women substantially outnumber men among older Americans. Specifically, among older adults not living in a geriatric facility, in the United States population age 65-74, for every 100 men there are 120 women, among those age 75-84, for every 100 men there are nearly 150 women, and among those age ≥85, for every 100 men there are nearly 220 women. Similarly, this sex ratio difference becomes even more dramatic when looking at the older population residing in nursing homes or similar facilities. Specifically, for those age 65-74 who reside in U.S. nursing homes, for every 100 men there are 132 women, age 75-84, for every 100 men there are 246 women, and among those age ≥85, for every 100 men there are 425 women (Gurwitz, 2005). Taken together, as recruitment for this study was from an orthopedic and acute rehabilitation facility, as predicted, there was a significant gender discrepancy in the participant population.
Lastly, the population of interest in the current study was a heterogeneous group. As such, individual reactivity differences were likely given the diverse instruments and population. In order to attempt to control this issue, the investigator based all instruments and demographic questions on scales grounded and supported in the literature. It is also important to note that, the sample was restricted to English-speaking participants only, thus limiting generalizability.

Summary

In brief, this chapter provided a thorough review of the methodological information for the study. The chapter provided an overview of the type of research design, as well as fully defined the independent, dependent, and moderating variables. All hypotheses and research questions that were explored in the study were reviewed, as well as the corresponding statistical analysis that will be used to examine them. A detailed overview of the brief neuropsychological battery and self-report instrument measures that was used is provided including available psychometric data for each instrument. Lastly, an overview of the limitation of the study design was provided.
CHAPTER IV

Results

The following chapter will provide an outline of the results of the study. The primary purpose of the present study was to examine the relationship between a change in executive function and depression within a positive neuropsychological framework. More specifically, the study proposed that a direct relationship between executive function and depression would be observed. Drawing from the literature, this study proposed that hope would act as a buffer between these variables, and reduce depression. Hypotheses and research questions related to the relationship between executive function and depression (as measured by a geriatric measure of depression) were formulated from theory and research on the aforementioned constructs, respectively. The theoretical foundation of this study was a positive neuropsychological framework conceptualized within Lezak et al. (2004) theoretical framework of executive functioning and Snyder’s Hope Theory. Likewise, hypotheses were based on a thorough review of the literature which supported a significant relationship between age related executive decline and clinically significant cognitive impairments and depression (DeBattista, 2005). These research questions reflected gaps in concepts and findings in the previous literature in these areas. Findings from this study can be used as a way to enhance and further the knowledge of the aging brain within a strength based positive neuropsychological perspective. Findings can also be used to inform geriatric providers of tools that may be used to buffer against depression as well as provide a mechanism to compensate when an individual is faced with deficits in executive functioning. In this chapter, a thorough review of the design of the study will be reviewed, the descriptive statistics of the sample will be described, and the findings from both of the tested hypotheses will be presented and discussed.
Statement of the Design

A cross-sectional research design was used to answer the study research questions and hypotheses. The study was investigating the relationship among participants’ level of executive function and depression (as measured by the GDS) as moderated by level of hope. As such, Multivariate Multiple Linear Regressions were performed to examine the relationships between variables being investigated. In the current study, the independent variable for this study was executive functioning, which was examined through five separate and distinguishable factors which include self-regulation, planning and decision-making, purposive action, effective performance, and working memory; factors that are grounded in Lezak’s (1995) proposed conceptual model of executive functioning. As there is no current way to measure a total executive function score, each subtest score provided a discrete measure of executive functioning. Therefore there were a total of five independent variables comprised of individual scores of discrete subtests. More specifically, scores were based on the following subtests of the D-KEFS (Delis et al., 2001): Verbal Fluency (condition 3 category switching), Trail Making Test (condition 4 switching task), Tower Test (total achievement), Sorting Test (condition 1 sorting task) as well as Digit Span (total Score) from the WAIS-IV (Wechsler, 2008). These specific instruments were chosen to measure each factor of executive functioning because they have been found to have high content validity with each factor, as well as ecological validity in lives of older adults (Lezak, et al., 2012; Mitchell & Miller, 2008; & Randolph & Chaytor, 2013). The dependent variable was depression using the GDS (Geriatric Depression Scale)- Long Form (Yesavage, et al., 1983). This study also examined the construct of Hope as the moderating variable, using scores from The Adult Trait Hope Scale (Snyder, Harris, Anderson, Holleran, Irving, Sigmon, et al., 1991).
Preliminary Analysis

Preliminary analyses to screen the data were performed using the SPSS-25 Explore function. To verify normality, ratios of skew and kurtosis with standard error were checked for all measures and revealed acceptable levels. Histogram and stem-leaf plots were also viewed for non-normal data. Prior to conducting hierarchical multiple regression, the relevant assumptions of this statistical analysis were tested. Firstly, a sample size of 56 was deemed adequate given five independent variables to be included in the analysis (Tabachnick & Fidell, 2001). The assumption of absence of singularity was also met and an examination of correlations revealed that no independent variables were highly correlated. The collinearity statistics (i.e., Tolerance and VIF) were all also within accepted limits, the assumption of multicollinearity was deemed to have been met (Coakes, 2005; Hair et al., 1998). An examination of the Mahalanobis distance scores indicated no multivariate outliers. Residual and scatter plots indicated the assumptions of normality, linearity and homoscedasticity were all satisfied (Hair et al., 1998; Pallant, 2001).

Descriptive Statistics

Sixty-Seven participants from two private short and long-term orthopedic and acute rehabilitation facilities in the northeast were recruited for the present study. Of those participants, 56 met the criterion for inclusion of the study. Participants were male and females between the ages of 60-90 years old who had completed a minimum education level of at least high school. No residents who were unable to give consent due to cognitive impairment were included. An a priori power analysis indicated that 48 participants were required to adequately power the study.

Table 1 presents demographic data for the overall sample. As indicated in the table, the overall sample was comprised of 35 (62.5 %) females and 21 (37.5%) males, between the ages of 65 and 88. The mean age of participants was 74.25 years old. The participants’ level of education
ranged from high school equivalency diploma to Juris Doctor degree (J.D), with the majority earning a high school diploma or equivalency (28, 50.0%). In regard to racial identity, 42 (75.0%) self-identified as White/Caucasian; 9 (16.1%) self-identified as Hispanic/Latino; 4 (7.1%) of the participants self-identified as Black/African American; and 1 (31.8 %) self-identified as Asian. In terms of relationship status, 34 (60.7%) of the participants were married; 2 (3.6%) self-identified as single, never married; 1 (1.8%) was divorced; and 19 (33.9%) were widowed. In terms of employment, 47 (83.9%) of the participants were retired; 5 (8.9%) were employed full-time; and 4 (7.1%) were employed part-time. In terms of language fluency, 49 (87.5%) of the participants were monolingual (e.g., speaking only English) and 7 (12.5%) reported that they were bilingual. Lastly, of the 56 total participants, 50 (89.3%) were born in the United States, whereas 6 (10.7%) were born outside of the United States.
Table 1
*Demographic Characteristics of the Sample*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21</td>
<td></td>
<td>37.5</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
<td></td>
<td>62.5</td>
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</tr>
<tr>
<td><strong>Participant Age</strong></td>
<td>74.25</td>
<td>6.06</td>
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<tr>
<td><strong>Level of Education</strong></td>
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</tr>
<tr>
<td>12 years</td>
<td>28</td>
<td></td>
<td>50.0</td>
<td></td>
</tr>
<tr>
<td>13 years</td>
<td>5</td>
<td></td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>14 years</td>
<td>6</td>
<td></td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>16 years</td>
<td>11</td>
<td></td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>18 years</td>
<td>6</td>
<td></td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
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<td></td>
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<tr>
<td>Black/African American</td>
<td>4</td>
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<td>7.1</td>
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<tr>
<td>White/Caucasian</td>
<td>42</td>
<td></td>
<td>75.0</td>
<td></td>
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<td>Hispanic/Latino</td>
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<td>16.1</td>
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<tr>
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<td>1.8</td>
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<tr>
<td><strong>Martial Status</strong></td>
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<tr>
<td>Married</td>
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<td>60.7</td>
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</tr>
<tr>
<td>Single</td>
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<td>3.6</td>
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<tr>
<td>Divorced</td>
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<td>1.8</td>
<td></td>
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<tr>
<td>Widowed</td>
<td>19</td>
<td></td>
<td>33.9</td>
<td></td>
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<tr>
<td><strong># of Languages Spoken</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Monolingual</td>
<td>49</td>
<td></td>
<td>87.5</td>
<td></td>
</tr>
<tr>
<td>Bilingual</td>
<td>7</td>
<td></td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td><strong>Place of Birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born in US</td>
<td>50</td>
<td></td>
<td>89.3</td>
<td></td>
</tr>
<tr>
<td>Born out of US</td>
<td>6</td>
<td></td>
<td>10.7</td>
<td></td>
</tr>
</tbody>
</table>
Primary Study Variables

Prior to conducting inferential statistics, descriptive statistics for the primary variables of the study were also obtained. The descriptive statistics of means and standard deviations for all of the independent, dependent, and moderating variables are presented in Table 2. More specifically, the independent variables are presented based on the following scores of executive functioning: Verbal Fluency (condition 3 category switching), Trail Making Test (condition 4 switching task), Tower Test (total achievement), Sorting Test (condition 1 sorting task), and Digit Span (total score). The dependent variable is presented as measured by depression using the GDS (Geriatric Depression Scale)- Long Form as well as the moderating variable, hope as measured by The Adult Trait Hope Scale.

Table 2
Descriptive Statistics for Primary Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>7.54</td>
<td>3.133</td>
</tr>
<tr>
<td>Trails Making</td>
<td>5.93</td>
<td>2.67</td>
</tr>
<tr>
<td>Tower Test</td>
<td>6.98</td>
<td>1.73</td>
</tr>
<tr>
<td>Sorting Test</td>
<td>7.23</td>
<td>1.97</td>
</tr>
<tr>
<td>Digit Span</td>
<td>8.55</td>
<td>2.92</td>
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<td><strong>Dependent Variable</strong></td>
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<td></td>
</tr>
<tr>
<td>GDS Score</td>
<td>5.25</td>
<td>4.92</td>
</tr>
<tr>
<td><strong>Moderating Variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hope Scale</td>
<td>47.93</td>
<td>8.08</td>
</tr>
</tbody>
</table>
Bivariate correlations between the primary study variables, demographic variables, and possible cofounding variables (e.g., MMSE and FSIQ-2) were conducted to determine which variables needed to be controlled for when completing inferential statistics. Significant correlations between pertinent demographic variables and possible confounding variables were found including a significant correlation between education level and Verbal Fluency (condition 3 category switching), education level and Digit Span (total score) and gender and the Tower Test (total achievement). The results of the correlational analyses are presented in Table 3.

Significant correlation between pertinent possible cofounding variables were found including between FSIQ-2 and Verbal Fluency (condition 3 category switching), and FSIQ-2 and Digit Span (total score).

Table 3
Bivariate Correlations between Primary Variables and Demographic Variables

<table>
<thead>
<tr>
<th>Primary Variables</th>
<th>Gender</th>
<th>Age</th>
<th>Education Level</th>
<th>Mini Mental Status</th>
<th>FSIQ-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>.074</td>
<td>-.134</td>
<td>.341*</td>
<td>.067</td>
<td>.375*</td>
</tr>
<tr>
<td>Trails Making</td>
<td>.063</td>
<td>.032</td>
<td>.139</td>
<td>-0.061</td>
<td>.238</td>
</tr>
<tr>
<td>Tower Test</td>
<td>-.287*</td>
<td>-0.64</td>
<td>.141</td>
<td>-.125</td>
<td>.112</td>
</tr>
<tr>
<td>Sorting Test</td>
<td>-.134</td>
<td>-.009</td>
<td>.217</td>
<td>-.065</td>
<td>.199</td>
</tr>
<tr>
<td>Digit Span</td>
<td>.005</td>
<td>-.192</td>
<td>.353**</td>
<td>-.009</td>
<td>.525**</td>
</tr>
</tbody>
</table>

Dependent Variable

| GDS Score | -0.13 | .215 | -.045 | -.006 | -.274* |

Moderating Variable

| Hope Scale    | -.007 | -.118 | .175  | .051  | .123   |

Note. N = 56; *p < .05, **p < .001
Table 4

*Bivariate Correlations between Demographic Variables*

<table>
<thead>
<tr>
<th>Primary Variables</th>
<th>Gender</th>
<th>Age</th>
<th>Education Level</th>
<th>Mini Mental Status</th>
<th>FSIQ-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1.00</td>
<td>.015</td>
<td>-.069</td>
<td>.107</td>
<td>.189</td>
</tr>
<tr>
<td>Age</td>
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<td>1.00</td>
<td>-.376**</td>
<td>-.050</td>
<td>-.243</td>
</tr>
<tr>
<td>Education Level</td>
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<td>-.376**</td>
<td>1.00</td>
<td>.114</td>
<td>.237</td>
</tr>
<tr>
<td>Mini Mental Status</td>
<td>.107</td>
<td>-.050</td>
<td>.114</td>
<td>1.00</td>
<td>.256</td>
</tr>
<tr>
<td>FSIQ-2</td>
<td>-.243</td>
<td>-.243</td>
<td>.237</td>
<td>.256</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Notes. N = 56; *p < .05, **p<.001*

A correlation matrix was conducted to determine the relationship between each discrete measure of executive function and the dependent and moderating variables. The results suggested that there was a negative correlation between depression (as measured by the GDS total score) and several measures of executive functioning including Verbal Fluency (condition 3 category switching), Trail Making Test (condition 4 switching task), and the Tower Test (total achievement). The results also suggest that there is a positive correlation between the moderating variable hope (as measured by the total hope score) and several discrete measures of executive functioning including Trail Making Test (condition 4 switching task), the Tower Test (total achievement), and Digit Span (total score). Lastly, a negative correlation between hope (as measured by total hope score) and depression (as measured by the GDS total score) was found.
Table 5

Bivariate Correlations between Primary Variables (N=56)

<table>
<thead>
<tr>
<th>Primary Variables</th>
<th>Independent Variables</th>
<th>Dependent Variable</th>
<th>Moderating Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Verbal Fluency</td>
<td>Trail Making</td>
<td>Tower Test</td>
</tr>
<tr>
<td>Independent Variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>1.00</td>
<td>.323*</td>
<td>.156</td>
</tr>
<tr>
<td>Trail Making Test</td>
<td>.323*</td>
<td>1.00</td>
<td>.522**</td>
</tr>
<tr>
<td>Tower Test</td>
<td>.156</td>
<td>.522*</td>
<td>1.00</td>
</tr>
<tr>
<td>Sorting Test</td>
<td>-.026</td>
<td>.493**</td>
<td>.684*</td>
</tr>
<tr>
<td>Digit Span</td>
<td>.512**</td>
<td>.335*</td>
<td>.301*</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDS Score</td>
<td>-.467**</td>
<td>-.432**</td>
<td>-.310*</td>
</tr>
<tr>
<td>Moderating Variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hope Score</td>
<td>.279*</td>
<td>.444*</td>
<td>.236</td>
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</tbody>
</table>

Note: N = 56; *p < .05, **p < .001
Multiple Regressions

A simultaneous multiple regression analysis was conducted entering the five tests of executive function simultaneously to predict the total depression score. The linear combination of the five measures of executive function was significantly related to the total depression score, $R^2 = .320$, adjusted $R^2 = .252$, $F(5, 50) = 4.701$, $p = .001$. Of the executive function measures, verbal fluency and the trails making test were the most strongly correlated to depression. More specifically, Verbal Fluency (condition 3 category switching) was a significant negative predictor of depression (as measured by the total GDS score), $\beta (5, 50) = -.569$, $p < .05$, $R^2 = .320$. Trail Making Test (condition 4 switching task) was also a significant negative predictor of depression (as measured by the total GDS score), $\beta (5, 50) = -.609$, $p < .05$, $R^2 = .320$.

Table 6
Summary of Multiple Regression Analysis for Prediction of Depression

<table>
<thead>
<tr>
<th>Variables</th>
<th>$B$</th>
<th>$SE\beta$</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>-.569</td>
<td>.222</td>
<td>-.362*</td>
</tr>
<tr>
<td>Trails Making</td>
<td>-.609</td>
<td>.273</td>
<td>-.331*</td>
</tr>
<tr>
<td>Tower Test</td>
<td>-.953</td>
<td>.571</td>
<td>-.335</td>
</tr>
<tr>
<td>Sorting Test</td>
<td>.704</td>
<td>.486</td>
<td>.282</td>
</tr>
<tr>
<td>Digit Span</td>
<td>.271</td>
<td>.256</td>
<td>.161</td>
</tr>
</tbody>
</table>

*Note: *$p < .05$, **$p < .01$

Hierarchical Regression

A four stage, hierarchical regression analysis was used to assess the predictive effects of executive functioning on depression. The order of variable entry was purposely determined based on preliminarily bivariate correlations data (Table 3) and the simultaneous multiple regression analysis (Table 6). Based on the preliminarily bivariate correlations analysis,
significant correlations between pertinent demographic variables were found including a
significant correlation between education level and Verbal Fluency (condition 3 category
switching), and significant correlations between FSIQ-2 and Verbal Fluency (condition 3
category switching) and Digit Span (total score). In order to control for any effect education level
or FSIQ-2 may have on the regression model, education level and FSIQ-2 were entered as
predictors in the first step. Because the simultaneous multiple regression analysis revealed that
Verbal Fluency (condition 3 category switching), and the Trail Making Test (condition 4
switching task) were significant negative predictors of depression, they were entered as predictor
variables in the second and third step. Lastly, Tower Test (total achievement), Sorting Test
(condition 1 sorting task), and Digit Span were entered as predictor variables in the fourth step.
The hierarchical multiple regression revealed that at stage one, or the first regression model, $F$
$(2, 53) = 1.598, p = .212$, education level and FSIQ-2 alone did not predict scores on Depression
(as measured by the GDS) to a statistically significant degree, accounting for only 5.7% of the
variance. The stage 2, or second model of regression, revealed that the Verbal Fluency (condition
3 category switching), contributed significantly to the regression model, $F (1, 52) = 8.299, p < .01$ and accounted for 13.0% of the variation in Depression. Adding Trail Making Test
(condition 4 switching task) to the regression model explained an additional 9.4% of the
variation in Depression and this change in $R^2$ was significant, $F (1, 51) = 6.336, p < .05$. Finally,
the fourth model revealed the addition of Tower Test (total achievement), the Sorting Test
(condition 3), and Digit Span (total score) did not contribute significantly to the regression
model, $F (3, 48) = 1.632, p = .194$), accounting for only 6.7% of the variance.
Table 7

Summary of Results of Hierarchical Regression Analysis for Prediction of Depression (N=56)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE B$</td>
<td>$\beta$</td>
<td>$B$</td>
<td>$SE B$</td>
<td>$\beta$</td>
<td>$B$</td>
<td>$SE B$</td>
<td>$\beta$</td>
<td>$B$</td>
</tr>
<tr>
<td>Education</td>
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<td>.006</td>
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<td>.291</td>
<td>.126</td>
<td>.145</td>
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<tr>
<td>FSIQ-2</td>
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<td>-.240</td>
<td>-.035</td>
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<td>-.111</td>
<td>-.021</td>
<td>.041</td>
<td>-.065</td>
<td>-.060</td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>-.637</td>
<td>.221</td>
<td>-.406*</td>
<td>-.515</td>
<td>.215</td>
<td>-.328*</td>
<td>-.555</td>
<td>.230</td>
<td>-.353*</td>
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</tr>
<tr>
<td>Trails Making</td>
<td>-.596</td>
<td>.231</td>
<td>-.324*</td>
<td>-.570</td>
<td>.274</td>
<td>-.310*</td>
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<tr>
<td>Sorting Task</td>
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<td>.758</td>
<td>.501</td>
<td>.304</td>
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<tr>
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<td>.590</td>
<td>-.387</td>
<td></td>
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<tr>
<td>Digit Span</td>
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<td>.237</td>
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<tr>
<td>$F$ for change in $R^2$</td>
<td>1.598</td>
<td></td>
<td>8.299*</td>
<td></td>
<td>6.636*</td>
<td></td>
<td></td>
<td>1.632</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *$p < .05$, **$p < .01$
Moderator Analysis

To test the hypothesis that hope moderates the relationship between executive functioning and depression, hierarchical multiple regression analyses were conducted. Simultaneous multiple regression analysis (Table 6) as well as a secondary hierarchical regression analysis controlling for education (Table 7), only revealed significant prediction of Verbal Fluency (condition 3 category switching), and the Trail Making Test (condition 4 switching task) on Depression. Therefore, two separate hierarchical multiple regression analyses were conducted using these significant predictor variables to test the hypothesis that hope moderates the relationship between executive functioning and depression.

The first hierarchical multiple regression analyses examined the hypothesis that hope moderates the relationship between executive functioning and depression, with executive function being measured by that Verbal Fluency (condition 3 category switching). Because previous hierarchical multiple regression analysis (Table 7) revealed that education level and FSIQ-2 alone did not predict scores on Depression (as measured by the GDS) to a statistically significant degree, they were not included in this model. Therefore, in the first step, the following variables were included: Verbal Fluency (condition 3 category switching) and Hope. These variables revealed that the Verbal Fluency (condition 3 category switching) and Hope, contributed significantly to the regression model, $F(2, 53) = 7.449 \ p < .001$ and accounted for 21.9% of the variation in Depression. To avoid potentially problematic high multicollinearity with the interaction term, the variables were centered and an interaction term between Verbal Fluency (condition 3 category switching) and Hope was created following a standard procedure (Aiken & West, 1991). Next, the interaction term between Verbal Fluency (condition 3 category switching) and Hope was created and was added to the regression model. Results revealed that
this interaction accounted for a significant additional 6.8 % of the variation in Depression $F(1,52) = 4.59, p < .05$.

Table 8

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
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</thead>
<tbody>
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<td>$SE B$</td>
<td>$\beta$</td>
<td>$B$</td>
<td>$SE B$</td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>-.576</td>
<td>.193</td>
<td>-.367*</td>
<td>-.675</td>
<td>.193</td>
</tr>
<tr>
<td>Hope</td>
<td>-.143</td>
<td>.075</td>
<td>-.234</td>
<td>-.193</td>
<td>.076</td>
</tr>
<tr>
<td>Interaction</td>
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<td>-.046</td>
<td>.022</td>
<td>-.276*</td>
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<tr>
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<td>.219</td>
<td></td>
<td>7.449**</td>
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</tr>
<tr>
<td>$F$ for change in $R^2$</td>
<td>.283</td>
<td></td>
<td>4.590*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Hope and Verbal Fluency were centered at their means. *$p < .05$, **$p < .01$*

To further confirm the significance of the moderating effect of hope on the relationship between executive functioning and depression, a secondary moderation analysis was run following the ‘PROCESS Procedure’ release 3.0 (Hayes, 2017). It was calculated using the PROCESS Procedure’ release 3.0 (Hayes, 2017) macro in SPSS-25. According to Field (2013), the use of the PROCESS Procedure’ release 3.0 (Hayes, 2017) when running moderation analysis is advantageous over normal regression analysis tools in SPSS because it centers predictors automatically, computes interaction terms automatically, does a simple slope analysis, as well allows for the simultaneous control of variables. Therefore, in this analysis, education level and FSIQ-2 were entered as covariates, to further ensure that neither variable had any significant impact on the model. The moderation analysis revealed a significant interaction effect, $F(4, 51) = 4.127, p < .01$, further indicating that the relationship between executive
executive functioning (as measured by Verbal Fluency) and Depression is moderated by Hope.

\[
\begin{align*}
B &= .174 \ (p > .05) \\
B &= -.046 \ (p < .05) \\
B &= -.363 \ (p < .05) \\
B &= -.298 \ (p < .05)
\end{align*}
\]

Figure 1. Moderation effect of hope on the relationship between executive functioning (as measured by Verbal Fluency) and Depression

Figure 1 highlights the moderation effect of hope on the relationship between executive functioning (as measured by Verbal Fluency) and depression. Standardized regression coefficients for the relationship between each variable are presented in an effort to highlight the significance of each relationship. Furthermore, standardized regression coefficients (e.g., represented by the down middle error), highlight the significance in the moderation effect of hope in the overall model.

The second hierarchical multiple regression analyses examined the hypothesis that hope moderates the relationship between executive functioning and depression, with executive function being measured by Trail Making Test (condition 4 switching task). In this regression, the first step variables included: Trail Making Test (condition 4 switching task) and Hope. These variables revealed that the Trail Making Test (condition 4 switching task) and Hope, contributed significantly to the regression model, \( F(2, 53) = 6.213, p < .05 \) and accounted for 19.0% of the
variation in Depression. To avoid potentially problematic high multicollinearity with the interaction term, the variables were centered and an interaction term between Trail Making Test (condition 4 switching task) and Hope was created following a standard procedure (Aiken & West, 1991). Next, the interaction term between Trail Making Test (condition 4 switching task) and Hope was created and was added to the regression model. Results revealed that this interaction was also significant $F(1,52) = 4.46, p < .05$.

Table 9

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
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<tr>
<td></td>
<td>$B$</td>
<td>$SE B$</td>
<td>$\beta$</td>
<td>$B$</td>
<td>$SE B$</td>
<td>$\beta$</td>
</tr>
<tr>
<td>Trail Making</td>
<td>- .664</td>
<td>.258</td>
<td>- .361*</td>
<td>- .671</td>
<td>.258</td>
<td>- .365*</td>
</tr>
<tr>
<td>Hope</td>
<td>- .077</td>
<td>.085</td>
<td>- .126</td>
<td>- .043</td>
<td>.092</td>
<td>- .070</td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td></td>
<td></td>
<td>.029</td>
<td>.030</td>
<td>.133</td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td></td>
<td></td>
<td>.190</td>
<td></td>
<td>6.213*</td>
</tr>
<tr>
<td>$F$ for change in $R^2$</td>
<td>.205</td>
<td></td>
<td></td>
<td>4.462*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes. Hope and Trail Making Test were centered at their means. *$p < .05$, **$p < .01$.

To further confirm the significance of the moderating effect of hope on the relationship between executive functioning and depression, a secondary moderation analysis was run following the ‘PROCESS Procedure’ release 3.0 (Hayes, 2017). The moderation analysis revealed a significant interaction effect, $F(2,53) = 6.213, p < .005$, further indicating that the relationship between executive functioning (as measured by Trail Making Test) and Depression
is moderated by Hope.

![Image of Figure 2](image)

**Figure 2.** Moderation effect of hope on the relationship between executive functioning (as measured by Trail Making Test) and Depression

Figure 2 highlights the moderation effect of hope on the relationship between executive functioning (as measured by Trail Making Test) and depression. Standardized regression coefficients for the relationship between each variable are presented in an effort to highlight the significance of each relationship. Furthermore, standardized regression coefficients (e.g., represented by the down middle error), highlight the significance in the moderation effect of hope in the overall model.

**Support of Hypotheses**

**Hypothesis 1**

The first hypothesis predicted an associated relationship between executive function and depression. A negative relationship between scores on the Delis-Kaplan Executive Function System tests – Trail Making, Verbal Fluency, Sorting Task, and Tower Task and the Geriatric Depression Scale was expected. This hypothesis was tested using bivariate correlations data (Table 3) and the simultaneous multiple regression analysis (Table 6). Results revealed that
Verbal Fluency (condition 3 category switching), and the Trail Making Test (condition 4 switching task) were significant negative predictors of depression. On the other hand, Tower Test (total achievement) and Sorting Test (condition 1 sorting task) were not significant predictors of depression.

**Hypothesis 2**

The second hypothesis predicted that hope would moderate the associated relationship between executive function and depression. A negative relationship between scores on the Delis-Kaplan Executive Function System tests – Trail Making, Verbal Fluency, Sorting Task, and Tower Task and the Geriatric Depression Scale was expected. This hypothesis was tested using hierarchical multiple regression analyses (Table 6, Table 8, and Table 9). Results revealed that the Tower Test (total achievement) and Sorting Test (condition 1 sorting task) were not significant predictors of depression and therefore could not have had moderating impact on the relationship. However, in support of the hypothesis a hierarchical multiple regression analyses (Table 8) revealed that relationship between executive functioning (as measured by Verbal Fluency) and Depression is moderated by Hope. Furthermore, in support of the hypothesis a hierarchical multiple regression analyses (Table 8) revealed that relationship between executive functioning (as measured by Trails Making Test) and Depression is moderated by Hope.

**Summary**

In brief, this chapter provided a thorough review of the results and findings of the study. The chapter provided a thorough review of the design of the study, described the descriptive statistics of the sample, examined any statistical impact of demographic variables, and the findings from both of the tested hypotheses were presented. While the results of the study were mixed, several significant findings and support of the hypothesis were revealed.
CHAPTER V

Discussion

The present study investigated the relationship between hope, executive function, and depression. More specifically, the study proposed that an associated relationship between executive function and depression would be observed. Drawing from the literature, this study also proposed that hope would act as a moderator between these variables. While the results of the study were mixed, this study found evidence that hope is strongly related to executive functioning and depression, such that hope may in fact act as a buffer against depression when facing deficits in executive functioning. These findings provide support for the continued study and application of counseling and positive psychology to the field of neuropsychology. This studied also further provided support for increased need for the treatment of the aging population through a positive neuropsychological framework. This chapter will examine and interpret the findings of the present study, discuss the limitations of the study, provide clinical implications, and present directions for future research.

Interpretations of Findings

Hypothesis 1

The first question investigated by this study examined the associated relationship between executive functioning and depression. For the purpose of measuring executive functioning, executive functioning was broken up into five separate factors including self-regulation, planning and decision-making, purposive action, effective performance and working memory; that were grounded in Lezak’s (1995) conceptual model of executive functioning. These factors of executive functioning were measured based on scores on the following subtests of the D-KEFS: Verbal Fluency, Trail Making Test, Tower Test, and Sorting Test as well as
Digit Span from WAIS-IV. While self-regulation was measured via Verbal Fluency (condition 3
category switching), purposive action was measured via Trail Making Test (condition 4
switching task), planning and decision making were measured via the Tower Test (total
achievement), effective performance was measured via the Sorting Test (condition 1 sorting
task), and working memory Digit Span (total Score) from the WAIS-IV. These specific
instruments were chosen to measure each factor of executive functioning because they have been
found to have high content validity with each factor, as well as ecological validity in lives of
older adults (Lezak, et al., 2012; Mitchell & Miller, 2008; Randolph & Chaytor, 2013).

Research examining executive function across multiple patient populations, supports the
notion that there is a significantly greater rate of depression seen in individuals with executive
functioning impairments (Randolph, 2013). Moreover, one of the most prevalent concerns
associated with both age related decline in executive function and clinically significant cognitive
impairments is comorbidity with mood disorders and emotional distress. Given these findings, it
was hypothesized that lower levels of executive function would result in higher levels of
depression. This hypothesis was tested using bivariate correlations data and the simultaneous
multiple regression analysis.

Bivariate correlations between the primary study variables, demographic variables, and
possible cofounding variables (e.g., MMSE and FSIQ-2) revealed significant correlations
between education level and Verbal Fluency, education level and Digit Span, and gender and the
Tower Test. Bivariate correlations analysis of possible cofounding variables also revealed
significant correlation between FSIQ-2 and Verbal Fluency as well as FSIQ-2 and Digit Span.

Mapping these findings on to specific factors of executive functioning, these results
suggested that there was a significant correlation between education level and self-regulation,
education level and working memory, as well as gender and planning and organizing. Bivariate correlations analysis of possible cofounding variables also revealed significant correlation between FSIQ-2 and self-regulation as well as FSIQ-2 and working memory. This analysis revealed that controlling for both FSIQ-2 and education level were essential to ensure they did not contribute significant variance to the model.

Simultaneous multiple regression analysis with all five factors of the independent variable revealed that the combination of all five factors of executive function does significantly predict depression levels. Further analysis of these factors revealed that Verbal Fluency and Trails Making Test were the best predictors of depression levels. Both Verbal Fluency and Trails Making Test accounted for a significant variance in the total depression score. Taken together, these findings suggest that while all five factors of executive functioning together have a significantly negative correlation with depression, self-regulation and purposive action both independently and in combination were significant negative predictors of depression. More specifically, results revealed that individuals with higher levels of self-regulation and purposive action will display lower levels of depression. These findings are not only supportive of the first hypothesis of the study, but are also congruent with previous literature that have found that executive deficits such as problem solving, planning, initiation, and completion of goal-directed activities are significantly correlated with depression (DeBattista, 2005).

**Hypothesis 2**

The second question investigated by this study examined if hope would moderate the associated relationship between the executive function and levels of depression. Recent research examining hope and executive function have argued that there is a significant overlap between the skills associated with executive functioning, and the skills necessary to support hopeful
thinking (Sears, 2007). Thus, findings suggest that it might be possible that individuals with higher-levels of hope may be able to compensate when faced with deficits in executive functioning (Sears, 2007). As such, higher levels of hope may be used as buffers against depression as well as provide a mechanism to compensate when an individual is faced with deficits in executive functioning (Sears, 2007). Given these findings, it was hypothesized that hope would moderate the relationship between executive function and depression, whereas hope would act as a buffer against depression when individuals had lower levels of executive functioning. This hypothesis was tested using hierarchical multiple regression analyses. Results revealed that independently, the Tower Test, Sorting Test, and Digit Span were not significant predictors of depression and therefore did not have moderating impact on the relationship. More specifically, results suggested that hope did not buffer the relationship between depression and executive functioning when measured using the discrete factors, working memory, effective planning, or planning and organizing. However, of note, bivariate correlations between hope and working memory did reveal a significant correlation, suggesting a relationship between the skills needed for working memory and hope.

On the other hand, in support of the hypothesis a hierarchical multiple regression analyses revealed that relationship between executive functioning (as measured by Verbal Fluency) and Depression is moderated by hope. Also, in support of the hypothesis, a hierarchical multiple regression analyses revealed that relationship between executive functioning (as measured by Trails Making Test) and Depression is moderated by hope. Taken together, these results indicate that hope significantly moderates the relationship between depression and executive functioning when measured using the discrete factors, self-regulation and purposive action.
Mapping these findings on to specific factors of executive functioning, these results suggested hope has a significant buffering effect against depression when older adults have deficiencies or lower capacity for self-regulation and purposive actions. While the findings of the moderation effect of hope with each specific factor of executive functioning were mixed, the moderating relationship of hope with two specific factors of executive function were found in support of the hypothesis. Congruence of study findings with previous literature is mixed. While previous literature has found strong moderating relationships of hope and all factors of executive functioning on depression (Sears, 2007), findings from this study yielded significant moderating impacts for only two factors of executive function: self-regulation and purposive actions.

**Hope and Self-Regulation.** As previously stated, studying findings revealed that there was not only a strong correlation found between hope and self-regulation, but hope was also found to moderate the relationship between this factor of executive functioning and depression. This relationship was strongly anticipated and is congruent with previous findings in the literature. More specifically, self-regulation requires both productivity or the ability to create intention, develop the plan, and then carry out the final task as well as cognitive flexibility or the ability to set-shift a focus of thought or action according to the demand of the situation (Lezak, et al., 2012). Previous studies have found that individuals with impairments in self-regulation were unable to develop a specific problem solving plan, could not acknowledge constraints of the problem, and approached the problem in an impulsive manner (Purdy, 2011). When mapping these components of executive functioning onto Hope theory, there is a significant overlap between these skills associated with the factor self-regulation and the skills associated with hope. More specifically, as previously stated Hope theory is based on the assumption that individuals’ actions are goal directed (Snyder, 1995; Snyder, Rand, & Sigmon, 2002). According to Snyder
(2000), the ability to attain goals is based on two types of cognitions: agency thinking, or thoughts about how to achieve those goals, and pathway thinking, or the motivation to achieve those goals (Edwards, Rand, Lopez, & Snyder, 2002; Juntunen & Wettersten, 2006). Where pathway thinking is a process in which individuals must view themselves as being able to create feasible routes to the goal (Snyder et al., 2005). Likewise, Southerland et al. (2016) found that greater levels of hopefulness appear to be linked to goal directed planning behavior. Taken together, these findings provide further support that there is a significant overlap between the skills associated with executive functioning, and the skills necessary to support hopeful thinking (Sears, 2007).

**Hope and Purposive Action.** Similarly, studying findings revealed that there was not only a strong correlation found between hope and purposive action, but hope was also found to moderate the relationship between this factor of executive functioning and depression. This relationship was also strongly anticipated and is congruent with previous findings in the literature. Lezak (1995) described purposive action as the ability to move from the intention or creation of a plan to actual productive activity. This requires an individual to initiate the task, and ensure that all steps are completed in order to achieve the desired outcome (Downing, 2015). Therefore, while a person may have the motivation, knowledge, and capacity to perform an activity, deficits in purposive action, can result in disturbances that impede the actual carrying out of a plan (Lezak, Howieson, Bigler, & Tranel, 2012). Similarly, previous literature has proposed that the underlying neurological substrates associated with major components of executive functioning, such as purposive action, might be linked and required for successful goal formation and task completion (Miley and Spinella, 2006). Thus, as goal formation and task completion are also both major components of hope theory, findings from this study provide
further support in the significant overlap between executive functioning and hope.

**Hope and Working Memory.** This study predicted that a moderating relationship would exist between depression and executive functioning as measured by the factor working memory. However, while study findings revealed a significant correlation between hope and working memory, hope was not found to be a significant moderator in the relationship between depression and executive functioning as measured by working memory. Previous literature has found that working memory, the ability to hold information for successful task completion, is an essential component of goal achievement (Colvin et al., 2001). Thus, a strong moderating relationship was expected in study findings. However, mixed findings in this study may be linked to research examining working memory in the aging brain. More specifically, studies have found that older adults who show declines in working memory, show reduced activity in the prefrontal cortex. However, older humans with intact working memories, show greater activity in the prefrontal cortex than young adults (Rosen et. al., 2002; Rosen et. al., 2004). Rosen and colleagues (2004) suggests that the increased activity in the prefrontal cortex is due to the brain working harder in these adults in order to compensate for impairments in other brain regions. Therefore, when applying this literature to the current study findings, it may be possible that because this study consisted of cognitively healthy older adults, who likely have increased activity in the prefrontal cortex, a moderating relationship was not found. However, if studying this relationship in older adults who are experiencing greater levels of cognitive decline, such as in a MCI population, a stronger moderating relationship may be expected.

**Clinical Implications**

It is estimated that roughly 15-20% of older adults 65 years and older will suffer from clinically significant cognitive impairments (Narrow, Raw, Robins, & Regier, 2002). With age
related change affecting many older adults, and prevalence rates of clinically significant
cognitive impairments high, it is important for researchers and practitioners to understand the
impact of these structural and behavioral brain changes on daily living. While there are many
factors to consider, one prevalent concern associated with both age related executive dysfunction
and clinically significant cognitive impairments are comorbidity with mood disorders and
depression (DeBattista, 2005). Research examining executive function across multiple patient
populations, supports the notion that there is a significantly greater rate of depression seen in
individuals with executive functioning impairments (Randolph, 2012). Literature examining
prevalence rates of depression among known executive function disorders have shown
significantly higher rates across many populations (Rabinowitz & Arnett, 2013). These studies
have shown that executive deficits such as problem solving, planning, initiation, and completion
of goal-directed activities are significantly correlated with depression (DeBattista, 2005).

Similarly, research examining these prevalence rates has suggested that the decline of
executive functioning skills in older adults is often associated with decline in the variety and
complexity of daily living activities (Rabinowitz & Arnett, 2013). This can be extremely difficult
on the individual, as it requires a significant adjustment in lifestyle on the patient and often their
families. Similarly, the decline in executive functioning skills in older adults can create
uncertainty about the future, mourning of the loss of their previously healthy life, and can
threaten personal identity and self-esteem (Rabinowitz & Arnett, 2013). In addition to
psychosocial stressors, brain imaging studies also provide evidence that changes in neurological
circuits and structures, including the prefrontal cortex and amygdala in older adults with
executive dysfunction disorders, also disrupt emotional functioning (Feinstein et al., 2004).
Similarly, findings from this study found further support in the significant relationship between factors of executive functioning and depression. Therefore, with the significant rise in the older adult population expected to continually increase, understanding and exploring the reasons and impact of this comorbidity is imperative. While most research is examining this phenomena within the scope of a disease related stress model, very little research exists that focuses from a strengths-based positive psychology perspective (Randolph, 2013). Therefore, this studied aimed to examine these constructs within a positive neuropsychological framework to better inform research in developing strength based environmental supports and interventions.

Consistent with previous literature, results from this study found significant evidence that hope is strongly correlated with factors of executive functioning including purposive action, self-regulation, and working memory. Furthermore, consistent with previous literature this study found significant moderating effects of hope on the relationship between depression and executive functioning specifically when measured as self-regulation and purpose action. These findings are significant for clinical implications in the older adult population because they provide evidence for a protecting mechanism against age related cognitive decline and depression. More specifically, similar to findings in Sears (2007), this study provided further support that it is possible that individuals with higher levels of hope may have a protective factor, or buffer against depression. Similarly, study findings suggest that interventions targeted at increasing hope, may be used as one possible mechanism to compensate when an individual is faced with deficits in executive functioning.

Given the evidence that factors of executive functioning including self-regulation, purposive action, and working memory are strongly correlated with factors of hope, an improved model of cognitive rehabilitation may combine hope-facilitation interventions with the
development and/or preservation of executive functioning skills. Similarly, according to Snyder and colleagues (2003), hope in one person may have the power to transfer to another person, such that spending time with higher hope individuals may create more enthusiastic and hopeful pursuit in goals in the lower hope person. Applications from this literature as well findings from this study, might support the use of hope-facilitated group therapy interventions for individuals who are experiencing decline in executive functioning. Likewise, as many primary care facilities and assisted living communities do routine screens for depression, developing a need based hope-facilitated intervention for individuals identified with higher levels of depression may help reduce emotional distress.

Furthering the implications of these findings, previous literature examining hope in children have found that when devoid of early interventions, delayed development of hope may begin as early as the toddler years and remain stable throughout the individual’s lifetime (Snyder, 1995). However, several studies have shown that lower levels of hope have been responsive to hope based interventions (Snyder et al., 2003, Snyder, Feldman, Taylor, Schroeder, & Adams, 2000). Thus, interventions targeted at identifying individuals from a young age who may have lower levels of hope, are imperative to long-term psychological health. Similarly, identifying and providing hope based interventions for individuals with known impairments of executive functioning, such as ADHD, Parkinson’s Disease, and MCI may provide a buffer against the experience of depression and emotional distress for these patients.

The American Psychological Association reported that by 2030, it is estimated that 15 million Americans age 65 years and older will suffer from mental and behavioral problems including anxiety and depression (2016). With older adults representing one of the fastest growing sectors of the United States’ population (U.S. Bureau of the Census, 2014), a substantial
demand will be placed on medical and health care providers. Therefore, providing preventive health care early on is crucial to alleviating some of the stress on medical and health care providers. While hope based interventions are important for the psychological health of older adults, public education may also play an important factor in addressing the overwhelming needs in the older adult population. More specifically, recently several neuropsychological organizations have played an important role in developing programs to educate the public about cognition and cognitive health (Randolph, 2013). However, despite these efforts, very few programs have targeted the buffering effects of positive psychological constructs such as hope on depression and age related cognitive decline. Therefore, future implications of this study may be the development of public health programing within a positive neuropsychological framework.

Lastly, an important component of hope theory highlights the impact of the feedback loop on level of hope (Snyder, 1995). More specifically, as one has successful experiences, positive feedback helps increase the likelihood of future successes. This major component of hope theory may be used when thinking about executive function based interventions or cognitive rehabilitation. For example, studies have shown that just one hour of cognitive training in older adults can lead to significant gains in executive functioning (Levine et al., 2000). Therefore, the development and use of routine targeted brief executive functioning based interventions by counseling and neuropsychologists may be enough to foster meaningful change in patients who are at risk. More specifically, if targeted executive functioning interventions lead to improvements in everyday cognitive functioning of older adults, older adults may be more likely to continue to use learned strategies as well engage in future executive functioning training interventions. With the significant link between executive functioning and hope, having counseling and neuropsychologists develop targeted brief executive functioning into their routine
treatment models may be one way to combat age related deficits in executive functioning, which would may also be a preventive measure against the loss of hope in these individuals. Targeting hope and executive functioning through these interventions, in the future, may be one way to help decrease the likelihood of the experience of depression in older adults.

**Study Strengths**

Despite some limitations, there were several significant strengths in the overall study. As previously stated, with the significant rise in the older adult population expected to continually increase, understanding and exploring the reasons and impact of this comorbidity is imperative. While most research has examined this phenomena within the scope of a disease related stress model, very little research exists that focuses from a strengths-based positive psychology perspective (Randolph, 2013). Therefore, a major strength in this study was the focus of this study to examine age related cognitive decline within a strengths based positive neuropsychological framework. This study not only aimed to fill significant gaps in the positive neuropsychology literature, but also may used to inform future research examining age related changes in cognitive decline within strengths based perspective. Similarly, this study found evidence that hope is strongly related to executive functioning and depression, such that hope may in fact act as a buffer against depression when facing deficits in executive functioning. While the buffering effect has been proposed in recent positive psychology literature (Sears, 2007), very few studies to date have shown empirical data to support this hypothesis. Therefore, a major strength in this study is the finding of this possible buffering relationship of hope on several factors of executive functioning. Therefore, this study may be used to inform future research examining the buffering relationship of hope on constructs such as executive functioning and depression.
Similarly, another major strength of the study was the support for the continued study and application of counseling and positive psychology to the field of neuropsychology. While much of the research within the older adult population focuses on the deficit model, this study focuses on this population within a strengths based perspective. As such, a major strength of the study was the increased support for the need for the treatment of the aging population through a positive neuropsychological framework. By providing support for more strength based research in this area, targeted interventions may be developed in the future that focus on healthy brain aging as opposed to age related deficits.

**Limitations**

There were a number of limitations in the present study. First, while this study examined cognitively healthy older adults and used the MMSE to ensure this criterion, recruitment of individuals was solely from long-term nursing rehabilitation facilities. Therefore, this study may not be generalizable to older adults in the general population.

Additionally, a major limitation of the study was the sole use of self-report measures to measure the key moderating and dependent variables. While these measures were chosen based one high reliability and validity in the older adult population, as well as easiness of administration, self-report data can be vulnerable to distortions, whether intentional or unintentional by the participant. Unfortunately, for numerous reasons, participants may consciously or unconsciously respond to self-report data in a way that reflects a response bias rather than the construct actually being measured (Quilty, Oakman, & Risko 2006). This can happen due to social desirability effects where participants may try to answer questions in a way that makes them look good or try to answer questions in a way that makes them appear more distressed (Heppner, Wampold, & Kivlighan, 2008).
Importantly, another major limitation of the study was the cross-sectional design. More specifically, in a cross-sectional design study, data are collected at a single point in time to examine the relationship between the predictor and criterion or outcome variable. Therefore, because the predictor and outcome variable are simultaneously assessed, and no baseline data exists to compare the predictor variable too, there is generally no evidence to establish a true cause and effect relationship (Solem, 2015). While the aim of the study was to assess age related cognitive decline, baseline data for participants was unavailable. As such, this study could only assess current levels of executive functioning scores. Therefore, it is difficult to draw predictive conclusions based on this relationship. Additional data from future studies would be helpful to support any findings or conclusions drawn from this study.

Additionally, a major limitation of this study was the demographic makeup of the participants. Not only was there a major discrepancy between genders as expected, but a majority of the participants were Caucasian. While a growing number of studies confirm Snyder’s research findings that hope does not significantly relate to demographic variables such as sex, race, and age (Sears, 2007, Snyder, 2005), the overwhelming biases of the sample population provides a major limitation in the generalizability of findings within a multicultural framework. Therefore, with so few studies examining depression within a positive neuropsychological framework, future studies with a more diverse sample are imperative. Notably, previous research suggests that women are two times more likely to report symptoms of depression than men (Addis, 2008). Therefore, an expected limitation of the study was a reporting disparity between symptoms of depressions experienced by men versus women. Notably, this disparity was not found in this study.
Lastly, while the specific instruments were chosen to measure each factor of executive functioning because they have been found to have high content validity with each factor, as well as ecological validity in lives of older adults (Lezak, et al., 2012; Mitchell & Miller, 2008; & Randolph & Chaytor, 2013), only one measure was used to assess each factor. Therefore, future research should focus on replicating data using different and/or multiple measures to assess each factor.

**Recommendations for Future Research**

The goal of the current research was to examine the relationship between executive function and depression within a positive neuropsychological framework. It aimed to do this, by positing that the positive psychological construct of hope would moderate the relationship between executive function and depression. While this study provided further support in the significant overlap between executive functioning and hope, and the importance of hope in the relationship between executive functioning and depression, gaps in the positive psychology literature still remain.

With significant limitations of the study, future research examining these constructs within the general population of older adults, and representing a more culturally appropriate sample is imperative. Likewise, research assessing multiple aspects of emotional distress (e.g., anxiety, stress, etc.) is important to addressing the impact of hope on other related mood disorders. Similarly, research using different measures of executive functioning that also includes participants perceived levels of executive functioning (e.g., using self-reported measures) may be helpful in furthering the understanding of the relationship between factors of executive functioning and hope. Furthermore, this study focused only on the positive psychological construct of hope. However, with previous studies finding positive correlations
between executive function and other positive psychological constructions such as gratitude and optimism (Kruger, 2011), future studies aimed at understanding the relationship between other protective factors and executive functioning may be useful in the development of positive neuropsychological interventions.

Lastly, this study provided recommendations for the development and implementation of multiple hope-facilitated and/or executive functioning based interventions. Therefore, while it is important for future to continue to study and examine the relationship between positive psychological attributes and cognitive functioning, research targeted at examining the usefulness of interventions is imperative.
EXECUTIVE FUNCTION, HOPE, AND DEPRESSION

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Bloomington, MN: The Psychological Corporation.


Appendix A (Informed Consent)

Informed Consent

Study Title:
The Relationship between Executive Function, Hope, and Emotional Distress in Older Adults.

Purpose of the Study
Ms. Brittney Fallucca is a student in the Counseling Psychology PhD program in the Department of Professional Psychology and Family Therapy at Seton Hall University. The study looks at how normal aging affects the lives of older adults.

Who can be in this study
All older adults joining the study must be between the ages of 60-90 years old and be at least a high school graduate.

What the study asks
This study will take 45 minutes to 1 hour of time. The participants will be asked to complete a demographic questionnaire, two surveys, and a group of tests measuring memory and thinking. Examples of questions on the surveys and the tests are:

(a) Mini Mental State Exam: This asks you questions like “what state are you in?”
(b) Demographic questionnaire. This asks about your age, education, and work history.
(c) Wechsler Abbreviated Scale of Intelligence, Second Edition. This asks you questions like “What does distract mean?” and asks you to complete puzzles by looking at pictures.
(d) Digit Span subtest of the Wechsler Adult Intelligence Scale-IV. This asks you to repeat a list of numbers that you just heard.
(e) Delis-Kaplan Executive Function System Subtests. This asks you to do things like name words you can think of that start with a letter, complete puzzles, and sort cards into groups.
(f) Adult Hope Scale. This asks you to rate statements like “I can think of many ways to get out of a jam.”
(g) Geriatric Depression Scale. This asks you to circle how you feel using yes or no, like “I feel happy most of the time?”
Being in this study is voluntary
Taking part in this study is voluntary. The participant may choose to stop or leave this study at any time.

Who will see the study data:
All participants' personal information will be protected in many ways. All names will be kept separate from the data. All study pages are labeled with a number. No information that can identify the participant will be connected to the participant's answers. Results of the study will be reported based on group data only.

Where will the data be kept:
Data will be kept in locked, secure office. It will only be viewed by Brittney Fallucca M.S., and her research mentor Dr. Pamela Foley, PhD. Data will be stored electronically on a USB memory key.

Study Benefits
There is no direct benefit to the participant. Taking part in this study may help scientists understand how normal aging affects the lives of older adults.

Study Risks:
This study may make you uncomfortable or bored. If the participant becomes upset in any way, she or he can call 1-800-273-TALK (8255) at any time. If the participant wishes to speak with a professional, the American Psychological Association offers free location based referral services at http://locator.apa.org If the participant wants to talk to a mental health counselor at XXX, they can reach the facility administrator, XXX at XXX.

Contact Information
If the participant requires any information about this study, or would like to speak to one of the researchers, she or he may call Brittney Fallucca at XXX. Participants with questions about their rights as research participants may call the Director of the Institutional Review Board at Seton Hall University: Dr. Mary F. Ruzicka, Ph.D. at XXX.

By signing this consent form, the participant agrees that she or he has read and understood the information and has had the opportunity to ask questions. The participant understands that participation is voluntary. The participant is free to stop at any time, without giving a reason and without cost. The participant will receive a copy of this consent form. The participant voluntarily agrees to take part in this study.

Participant’s Name (Printed):__________________________
Signature:___________________________________________

Date:_____________________________________________
Appendix B (Demographic Questionnaire)

1. **Age:** What is your age?

2. **Why were you admitted here?**

3. **Ethnicity origin (or Race):** Please specify your ethnicity.
   - White
   - Hispanic or Latino
   - Black or African American
   - Native American or American Indian
   - Asian / Pacific Islander
   - Other

4. **Where were you born (State and Country if other than the United States)?**

5. **Languages spoken other than English?**

6. **Education:** What is the highest degree or level of school you have completed? *If currently enrolled, highest degree received.*
   - No schooling completed
   - Nursery school to 8th grade
   - Some high school, no diploma
   - High school graduate, diploma or the equivalent (for example: GED)
   - Some college credit, no degree
   - Trade/technical/vocational training
   - Associate degree
• Bachelor’s degree
• Master’s degree
• Professional degree
• Doctorate degree

7. Marital Status: What is your marital status?
   • Single, never married
   • Married or domestic partnership
   • Widowed
   • Divorced
   • Separated

8. Employment Status: Are you currently…?
   • Employed for wages
   • Self-employed
   • Out of work and looking for work
   • Out of work but not currently looking for work
   • A homemaker
   • A student
   • Military
   • Retired
   • Unable to work
Appendix C (Hope Scale)

Scale (taken from http://www.ppc.sas.upenn.edu/hopescale.pdf)

Directions: Read each item carefully. Using the scale shown below, please select the number that best describes YOU and put that number in the blank provided.

1. = Definitely False  
2. = Mostly False  
3. = Somewhat False  
4. = Slightly False  
5. = Slightly True  
6. = Somewhat True  
7. = Mostly True  
8. = Definitely True

___ 1. I can think of many ways to get out of a jam.  
___ 2. I energetically pursue my goals.  
___ 3. I feel tired most of the time.  
___ 4. There are lots of ways around any problem.  
___ 5. I am easily downed in an argument.  
___ 6. I can think of many ways to get the things in life that are important to me.  
___ 7. I worry about my health.  
___ 8. Even when others get discouraged, I know I can find a way to solve the problem.  
___ 9. My past experiences have prepared me well for my future.  
___10. I’ve been pretty successful in life.  
___11. I usually find myself worrying about something.  
___12. I meet the goals that I set for myself.

Scoring:
Items 2, 9, 10, and 12 make up the agency subscale.
Items 1, 4, 6, and 8 make up the pathway subscale.
Researchers can either examine results at the subscale level or combine the two subscales to create a total hope score.
Appendix D (Geriatric Depression Scale)

Choose the best yes or no answer for how you have felt over the past week.

1. Are you basically satisfied with your life?
2. Have you dropped many of your activities and interests?
3. Do you feel that your life is empty?
4. Do you often get bored?
5. Are you hopeful about the future?
6. Are you bothered by thoughts you can’t get out of your head?
7. Are you in good spirits most of the time?
8. Are you afraid that something bad is going to happen to you?
9. Do you feel happy most of the time?
10. Do you often feel helpless?
11. Do you often get restless and fidgety?
12. Do you prefer to stay at home, rather than going out and doing new things?
13. Do you frequently worry about the future?
14. Do you feel you have more problems with memory than most?
15. Do you think it is wonderful to be alive now?
16. Do you often feel downhearted and blue?
17. Do you feel pretty worthless the way you are now?
18. Do you worry a lot about the past?
19. Do you find life very exciting?
20. Is it hard for you to get started on new projects?
21. Do you feel full of energy?
22 Do you feel that your situation is hopeless?

23 Do you think that most people are better off than you are?

24 Do you frequently get upset over little things?

25 Do you frequently feel like crying?

26 Do you have trouble concentrating?

27 Do you enjoy getting up in the morning?

28 Do you prefer to avoid social gatherings?

29 Is it easy for you to make decisions?

30 Is your mind as clear as it used to be?
Appendix E (Mini Mental Status Exam)

The Mini Mental Status Exam used in this study was accessed from The Hartford Institute for Geriatric Nursing, Division of Nursing, New York University and is available on the internet via www.hartfordign.org.
The Mini Mental State Examination (MMSE)

By: Lenore Kurlowicz, PhD, RN, CS and Meredith Wallace, PhD, RN, MSN

WHY: Cognitive impairment is no longer considered a normal and inevitable change of aging. Although older adults are at higher risk than the rest of the population, changes in cognitive function often call for prompt and aggressive action. In older patients, cognitive functioning is especially likely to decline during illness or injury. The nurses’ assessment of an older adult’s cognitive status is instrumental in identifying early changes in physiological status, ability to learn, and evaluating responses to treatment.

BEST TOOL: The Mini Mental State Examination (MMSE) is a tool that can be used to systematically and thoroughly assess mental status. It is an 11-question measure that tests five areas of cognitive function: orientation, registration, attention and calculation, recall, and language. The maximum score is 30. A score of 23 or lower is indicative of cognitive impairment. The MMSE takes only 5-10 minutes to administer and is therefore practical to use repeatedly and routinely.

TARGET POPULATION: The MMSE is effective as a screening tool for cognitive impairment with older, community dwelling, hospitalized and institutionalized adults. Assessment of an older adult’s cognitive function is best achieved when it is done routinely, systematically and thoroughly.

VALIDITY/RELIABILITY: Since its creation in 1975, the MMSE has been validated and extensively used in both clinical practice and research.

STRENGTHS AND LIMITATIONS: The MMSE is effective as a screening instrument to separate patients with cognitive impairment from those without it. In addition, when used repeatedly the instrument is able to measure changes in cognitive status that may benefit from intervention. However, the tool is not able to diagnose the case for changes in cognitive function and should not replace a complete clinical assessment of mental status. In addition, the instrument relies heavily on verbal response and reading and writing. Therefore, patients that are hearing and visually impaired, intubated, have low English literacy, or those with other communication disorders may perform poorly even when cognitively intact.

MORE ON THE TOPIC:


Permission is hereby granted to reproduce this material for not-for-profit educational purposes only, provided The Hartford Institute for Geriatric Nursing, Division of Nursing, New York University is cited as the source. Available on the internet at www.hartfordign.org. E-mail notification of usage to: hartford.ign@nyu.edu.
The Mini-Mental State Exam

Patient___________________________________ Examiner ____________________________ Date____________

Maximum Score

Orientation
5 ( ) What is the (year) (season) (date) (day) (month)?
5 ( ) Where are we (state) (country) (town) (hospital) (floor)?

Registration
3 ( ) Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he/she learns all 3. Count trials and record.
   Trials ___________

Attention and Calculation
5 ( ) Serial 7’s. 1 point for each correct answer. Stop after 5 answers. Alternatively spell “world” backward.

Recall
3 ( ) Ask for the 3 objects repeated above. Give 1 point for each correct answer.

Language
2 ( ) Name a pencil and watch.
1 ( ) Repeat the following “No ifs, ands, or buts”
3 ( ) Follow a 3-stage command: “Take a paper in your hand, fold it in half, and put it on the floor.”
1 ( ) Read and obey the following: CLOSE YOUR EYES
1 ( ) Write a sentence.
1 ( ) Copy the design shown.

____

Total Score
ASSESS level of consciousness along a continuum ____________
   Alert   Drowsy   Stupor   Coma