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Does Well-Being Moderate the Association of Harm Avoidance with Cognitive Decline

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DOES WELL-BEING MODERATE THE ASSOCIATION OF HARM AVOIDANCE WITH COGNITIVE DECLINE

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
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in

The Department of Psychology

by

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TABLE OF CONTENTS

Abstract.....	ii
Introduction.....	1
Method.....	10
Results.....	15
Discussion.....	19
References.....	23
Vita.....	33

Abstract

The Dual-Factor Model of mental health highlights the need to consider both constructs associated with psychopathology and subjective well-being in relation to clinical outcomes. Harm avoidance, which is associated with behavioral inhibition, has been negatively associated with cognitive change. While subjective well-being has been positively associated with cognition. The current study aimed to examine both constructs in a single model to examine well-being as a moderator of the association of harm avoidance with cognitive decline. A sample of 728 older adults from the Rush University Memory and Aging Project was used. Participants completed batteries of questionnaires and neuropsychological tests at baseline and yearly follow-ups. Mixed effects models were conducted to examine to what degree well-being moderated the association of harm avoidance with cognitive decline across multiple cognitive domains. Well-being was a more unique robust predictor of cognitive change over time. Higher well-being reduced the negative effects of harm avoidance over time for episodic memory. Taken together, the present study offers further support for targeting positive psychological interventions for successful aging.

INTRODUCTION

The US population over age 65 is expected to increase 135% and those over 85 by over 350% between 2000 and 2050 (Wiener & Tilly, 2002). With an increased longevity comes increases in cognitive impairment as age is a major risk factor for dementia. The prevalence of Alzheimer's disease increases from roughly 5% in those 64-75 to roughly 35% of those 85 and older (Alzheimer's Association, 2021). Cognitive decline is accompanied by functioning decline; cognitive abilities are critical to being functionally independent since they affect management of finances, medical appointments, meals, and ability to drive, making it a significant health concern (Murman, 2015).

Research on associations of mental health with cognitive decline focused on symptoms or diseases (e.g., depressive symptoms or a diagnosis of major depressive disorder) or traits associated with neuroticism (Curtis et al., 2015). For example, harm avoidance, a construct related to behavioral inhibition, and associated with increased pessimism, neuroticism, fatigue, shyness, and an increased aversion to new experiences (Cloninger, 1987) is associated with cognitive decline (Cameron et al., 2019). However, in order to more fully understand the relationship between mental health and cognition an approach that examines both positive and negative psychological traits is needed. One such approach is the Dual-Factor Model, first proposed by Greenspoon and Saklofske (2001). The model aims to offer a more accurate measure of mental health by examining subjective well-being with the combination of current psychopathology rather than looking at just the negative psychological factors by themselves (Suldo & Shafer, 2008). Well-being is a multifaceted construct that examines many aspects of an individual's own subjective experience. It includes both a hedonic approach defined by pleasure-seeking and the eudaimonic approach which focuses on meaningful pursuits (Ryan & Deci,

2001). Psychological well-being is associated with reduced mortality independent of demographic factors such as depressive symptoms or physical activity suggesting a protective role in health (Stephoe et al., 2015). It remains understudied in relation to normal and pathological cognitive aging (Seligman & Csikszentmihalyi, 2014; Ryff, 2018).

Aging and Cognition

This increasing older adult population will cause cases of dementia to increase to a predicted 75.63 million cases by 2030 and 135.46 million cases by 2050 (Prince et al., 2013). It is necessary to better understand the trajectory and factors associated with cognitive decline. Recent studies describe predictors of cognitive decline that focus mainly on biological components such as amyloid plaque buildup in Alzheimer's Disease (De Strooper & Karran, 2016). Psychosocial factors such as education, socioeconomic status, and gender all seem to play a role in addition to these biomarkers (Lu et al., 2019).

Although normal aging is associated with some cognitive decline including slower processing speed, it has significant heterogeneity and dementia is not an inevitable part of aging (Knight & Ricciardelli, 2003; Minkler & Fadem, 2002). While healthy aging does not impair the ability to perform most daily activities, more complex activities such as working or driving might be reduced (Harada et al., 2013; Anstey & Low, 2004). Cognitive functioning includes attention, memory, language, visuospatial skills, and executive functioning. Tucker-Drob (2019), noted certain trends in cognitive function over the lifespan which include a decline in abilities that require deliberation and control such as processing speed, episodic memory, and fluid reasoning in middle to late adulthood. It should be noted that cognitive domains such as verbal ability that rely on repeated implementation or verbalizing peak in late adulthood. While

cognitive decline is a part of normal aging, there is a point when cognitive changes are severe enough to not be related to the normal aging process and identification of the process for early treatment for behavioral intervention is important (Lo, 2017). Beyond genetic and biologic contributors, psychological factors affect cognitive status (Millan et. al, 2012). Major depression is associated with cognitive impairments, and can coexist with cognitive problems seen in dementia (Perini et. al, 2019; Kim & Park, 2017; Wang & Blazer, 2015). In summary, normal aging results in some cognitive decline, but mitigating factors are not well-understood.

Cognition Decline Over Time

Although there are individual differences, cognitive abilities such as memory, problem-solving, and processing speed decline through the process of aging (Bettio et al., 2017; Salthouse, 2012). Researchers agree that many mental abilities are intact into old age, but there is a decline in general cognitive ability after adulthood which is impacted by genetics, overall health, medical disease, diet, and exercise (Deary et al., 2009; Fama & Sullivan, 2015). Cognitive abilities that need rapid responses or working memory have been noted to be particularly vulnerable where skills such as language and overlearned skills are better maintained (Tromp et al., 2015; Murman, 2015). Non-pharmacologic interventions and lifestyle factors that promote successful aging have been studied including diet, exercise, and social engagement (Dause & Kirby, 2019). Caselli and colleagues 2016 completed a longitudinal study with adults older than 45 who completed neuropsychological testing every 2 years for up to 13 years and found that personality factors such as neuroticism were more related than apolipoprotein E (APOE) to cognitive decline associated with normal aging. Additionally, Terracciano and Sutin (2019) reviewed research on personality and Alzheimer's disease and had similar findings that personality might be useful for identifying those at risk.

Personality Trait of Harm Avoidance

Harm avoidance is a personality trait related to behavioral inhibition (Cloninger, 1987). Behavioral inhibition is the propensity to avoid new and unknown stimuli or events (Allen et al., 2017; Láng, 2020). Individuals with this trait often exhibit increased pessimism, neuroticism, fatigue, shyness and decreased novelty seeking. Studies have suggested there is a relationship between harm avoidance, the serotonergic pathways related to reward-seeking (Cloninger, 1986) and other brain regions such as the amygdala (Iidaka et al., 2006). Previous literature has shown increased harm avoidance plays a role in the development of anxiety (Chen et al., 2015), depression (Smith et al., 2005), and Obsessive Compulsive Disorder (Ecker et al., 2014).

Levels of harm avoidance have been shown to change across the life span (Wilson et al., 2011). In youth, harm avoidance has been linked to increased healthy outcomes (Masse & Tremblay, 1997; Cloninger et al., 1988) due to a higher level of this trait being associated with less risk taking and resulting in fewer injuries. In older adults, harm avoidance has been associated with reduced physical activity (Tager et al., 2004), disability (Wilson et al., 2006), and reduced social engagement (Mendes de Leon et al., 2003) which have been shown to have adverse effects on cognition (Guure et al., 2017; Penninkilampi et al., 2018).

Since harm avoidance is related to behavioral inhibition (Cloninger, 1987) and previous research has shown that reduced physical activity has negative impacts on cognition (Guure et al., 2017; Ratey & Loehr, 2011), it is logical that older adults high in harm avoidance would have reduced cognition compared to individuals with low harm avoidance. Harm avoidance has also been shown to be associated with inhibitory control leading to heightened attention to emotional stimuli resulting in reduced attentional capacity (Most et al., 2005; Izadpanah et al.,

2016). Finally, in aging populations, harm avoidance has been shown to have increased association with memory complaints and specific neurocognitive disorders such as Parkinson's (Fujii et al., 2000) and Alzheimer's disease (Wilson et al., 2011).

Previous literature has shown a connection between harm avoidance and subjective well-being (Ruini et al., 2003). Specifically, a negative association between subjective well-being and harm avoidance has been demonstrated (Eley et al., 2013). This relationship, however, is not straightforward. Besharat and colleagues (2016) have shown that well-being and harm avoidance are related but mediated by separate psychological factors such as emotion regulation. This shows that there is a greater need to understand how these personality and psychological factors interact with each other when examining cognitive decline.

As noted, in older adults, harm avoidance is associated with depression and anxiety and the adverse impact of negative psychological factors, like depression, on cognitive decline have been documented (Marchant et al., 2020). Specifically, increased levels of these negative psychological factors have been associated with more severe cognitive decline. It has been shown that psychological distress including self-reported anxiety, negative affect, hostility, pessimism, hopelessness, and perceived constraints increased risk of dementia 20-30% and increased cognitive impairment not dementia (CIND) by 10-20% (Sutin et al., 2018). The interaction between harm avoidance and negative psychosocial factors is uncertain.

Personality Trait of Well-being

“Well-being” does not have a universal definition although researchers are starting to agree that it comprises both objective and subjective components including family, community, society, and individual variables (McNaught & Malhan, 2011). It is composed of positive factors

of happiness and life satisfaction, not simply the absence of negative factors such as depression although they are inversely related (Zheng 2016). This model suggests that although well-being encompasses aspects of health, it also includes more of the total human experience (Placa et al., 2013). Positive psychological factors have also been reviewed as they relate to well-being and cognition. Previous research has shown positive psychological constructs related to well-being are predictive of less cognitive changes, and specifically include friendship (Zahodne et al., 2021), social support (Seeman et al., 2001), and self-efficacy (Zahodne et al., 2014; Seeman et al., 1996). Additionally, higher social engagement has been associated with lower cognitive decline in long-term care settings (Sham et al., 2021).

Well-being is a multifaceted construct that examines many aspects of an individual's own subjective experience (Deci & Ryan, 2008). With this tendency to focus on subjective experience, researchers have constantly debated over the general definition of well-being (Dodge et al., 2012). Well-being has become a topic of increased research over the past 30 years (Fleuret & Atkinson, 2007; Curtis et al., 2015; Ryff, 2018) as a push to look at positive psychological factors in mental health has become popular (Aspinwall & Tedeschi, 2010).

Well-being is a subjective variable based on self-reported experiences. Subjective quality of life is noted to be impacted by economic factors, relationships, and activities in addition to health (Steptoe et al., 2015; Debrecezen & Bailey, 2021). Typically, a U-shaped curve is described with younger and older adults reporting higher overall well-being (Blanchflower & Oswald, 2008). Well-being has also been broken down into subcategories. Hedonic (e.g. current feelings) and evaluative (e.g. consideration of one's whole life) well-being appeared to be associated (Kahneman & Deaton, 2010; Butler, 1977). In this study, income and education were related to life evaluation, and health, caregiving, and loneliness predicted hedonic well-being,

with an overall result that those with a higher income had greater life satisfaction but not emotional well-being. This construct was further refined to suggest that psychological well-being could be defined by three aspects including evaluative, hedonic, and eudaimonic (e.g. sense of purpose and meaning) (Steptoe et al., 2015). These authors reviewed multicultural literature and concluded that high subjective well-being overall had a positive and protective role on survival. More recently, during worldwide lockdowns of the COVID-19 epidemic, predictors of well-being such as social interaction were halted. The older adults were most impacted, where those able to work from home, engage in outdoor activities, or volunteer were least impacted (Briguglio et al., 2021).

Although well-being is a subjective variable, it appears to suggest and predict cognitive functioning (Wilson, Boyle, & Segawa et al., 2013). Recent research suggests that emotional well-being and overall cognitive performance have a strong positive relationship (Furtado et al., 2020). Furtado and colleagues (2020) found a strong negative relationship between physical frailty and both global cognitive status and well-being as determined by the subjective happiness and life satisfaction scales (General Self-Efficacy Scale (McKay et al., 2014)). Psychological well-being as measured by low feelings of happiness and a negative attitude towards aging, but not a depressive mood state, independently contributed to physical frailty and ultimately overall cognitive status.

Previous research has shown positive psychological constructs related to well-being are predictive of fewer cognitive changes, specifically friendship (Zahodne et al., 2021) social support (Seeman et al., 2001; Zahodne et al., 2019), and self-efficacy (Zahodne et al., 2014; Seeman et al., 1996). Additionally, higher social engagement has been associated with lower cognitive decline in long-term care settings (Sham et al., 2021).

Some researchers are changing their focus from preventing age-related cognitive decline to promoting healthy aging. Healthy aging has been defined from physiological, psychological, societal, and personal perspectives as: “...the process of slowing down, physically and cognitively, while resiliently adapting and compensating in order to optimally function and participate in all areas of one’s life (physical, cognitive, social, and spiritual)” (Hansen-Kyle, 2005). Waldman-Levi and colleagues (2015) offered evidence that playfulness, defined as a way of thinking with humor in addition to spontaneity and extroversion, relates to healthy aging. Additionally, well-being and cognitive function might affect each other in a feedback loop, wherein greater well-being leads to greater cognitive engagement and better health, which in turn leads to increased life satisfaction (Ochsner & Gross, 2005).

Applying the Dual-Factor Model

Much of the literature that looks at this Dual-Factor Model utilizes children (Greenspoon & Saklofske, 2001) and young adults (Carver et al., 2021; Eklund et al., 2010) to examine how well-being and negative indicators of mental illness could affect other subjective qualities such as life satisfaction. There were limited studies that used this approach in older adults (Westerhof & Keyes, 2010) where older adults did not endorse more mental health concerns but did endorse lower well-being scores. Previous literature also looks at how certain psychopathology symptoms affect cognition including depression (Coyne & Gotlib, 1983), anxiety (Maloney et al., 2014), and psychosis (Chang et al., 2013). However, previous literature does not take into consideration how positive psychological factors could reduce the negative relationship between psychopathology and cognition.

The goal of the current study was to compare changes in cognition amongst those with varying levels of harm avoidance and levels of well-being. It was hypothesized that compared to those with low well-being, individuals with higher levels of well-being will see a greater reduction in cognitive decline at all levels of harm avoidance between each yearly follow up evaluation.

METHOD

Participants

All 728 participants are from the Rush Memory and Aging Project (MAP), which is an ongoing longitudinal cohort study since 1997 examining healthy older adults at baseline to look at changes in cognition (Bennett et al., 2012). Participants took part in annual clinical evaluations and brain autopsy at death. Participants were recruited from the Chicago metropolitan area including retirement communities, subsidized housing facilities, churches and other aging agencies. Requirements to be in the study included being at least 55 years old, no previous diagnosis of dementia, agreeing to taking part in an annual clinical evaluation, and brain donation at death. Although older adulthood is considered to start at a later age (e.g., 65), prior work has shown that longitudinal cognitive changes can be observed in this cohort (e.g., Wilson, Boyle, & Yu, et al., 2013) which includes those at least 55 years of age and therefore to maximize sample size a higher age cutoff was not used for this study. These specific participants were chosen because they had no missing data and baseline harm avoidance, baseline well-being, demographics and cognitive data for each visit.

Protocol approvals and Patient consents

The Rush Memory and Aging Project was approved by the Institutional Review Board of Rush University Medical Center. After a thorough explanation of the study, written informed consent was obtained from all participants. The use of this archival data was approved by the LSU Institutional Review Board.

Assessment of Harm Avoidance

Participants completed the 35 item Harm Avoidance scale from the Temperament and Character Inventory (Cloniger et al., 1994). Items grouped into four subscales and rated as true or false: fatigability (9 items; e.g. “I have less energy and get tired more quickly than most people”; range: 0-9), shyness (8 items; e.g. “I often avoid meeting strangers because I lack confidence with people I do not know”; range: 0-8), fear of uncertainty (7 items; e.g. “I often feel intense and worried in unfamiliar situations, even when others feel there is little to worry about”; range: 0-7), and anticipatory worry (11 items; e.g. “I often have to stop what I am doing because I start worrying about what might go wrong”; range: 0-11). The full measure is scored as the combination of all subscales (range: 0-35) and this continuous variable is used in analyses. Internal consistency of this scale for the initial cohort was shown to be good with a Cronbach coefficient alpha of 0.89 for the full measure. Previous evidence also shows good construct validity as previous studies have found a similar factor structure and loading when using confirmatory factor analysis (Nixon & Parsons, 1989; Kijima et al., 2000).

Assessment of Well Being

Participants completed the 18 item version of the Ryff’s Scales of Psychological Well Being (RPWB) (Ryff, 1989). Items grouped into six subscales with 3 items each and each item scored on a 7-point Likert rating scale: Self-acceptance (e.g. “I like most part of my personality”), Autonomy (e.g. “I have confidence in my own opinions, even if they are different from those of others”), Environmental Mastery (e.g. “The demands of everyday life often get me down”), Purpose in Life (e.g. “Some people wander aimlessly through life, but I am not one of them”), Positive Relations with Others (e.g. “Maintaining close relationships has been difficult

and frustrating for me”), and Growth (e.g. “For me, life has been a continuous process of learning, changing, and growing”). Overall well-being is calculated using an average of all 18 items on the scales. Internal consistency of the total score on the 18 item short version of the RPWB has been reported to be high (Abbott et al., 2006); internal consistency of individual subscales is low to modest which likely reflects the low number of items comprising each scale in the short form and the items were chosen to account for a wide range of the construct rather than maximize the internal consistency (Ryff & Keyes, 1995). However, supporting the use of a total score, a model in which each subscale loads on a general well-being factor provides good model fit (Ryff & Keyes, 1995). Therefore, for this analysis, overall well-being was used rather than analyzing each subscale. Of note, subscales have, at most, moderate correlations with depression providing evidence of discriminant validity for this assessment of well-being (Hsu et al., 2017).

Assessment of Cognitive Function

Cognitive function was examined annually with a battery of 19 individual tests. Five cognitive domains were measured specifically, Episodic Memory, Working Memory, Semantic Memory, Perceptual Speed, and Visuospatial Ability/Perceptual Orientation. These five domains for these tests are based on prior factor analysis (Wilson et al., 2005). Raw scores from individual tests were converted to z scores using the mean and standard deviation of the cohort, and composite scores for each domain were calculated using the average of z scores that corresponded to that domain. The Episodic Memory Domain is made of 7 tests including; word list immediate/recall/recognition (Morris et al., 1989), East Boston Immediate/Delayed recall (Albert et al., 1991; Wilson et al., 2002), and Logical Memory Story A immediate/delayed recall (Wechsler, 1987). The Working Memory Domain is made of 3 tests including; digits forward,

digits backward, and digits ordering (Wechsler, 1987; Cooper & Sagar, 1993; Wilson et al., 2002). The Semantic Memory domain is made of 3 tests including; Boston Naming (Morris et al., 1989), Category Fluency (animals- fruits/vegetables) (Morris et al., 1989; Wilson et al., 2002), and the National Adult Reading Test (NART). The Perceptual Speed Domain is made of 4 tests including; Symbol Digits Modality Test (oral) (Smith, 1982), number comparison (Ekstrom et al., 1976; Wilson et al., 2002), Stroop Color Naming, and Stroop Word Reading (Trenerry et al., 1989). The Visuospatial Ability/Perceptual Orientation domain is made of 2 tests; Judgment of Line Orientation, and Progressive Matrices (Benton et al., 1994; Raven et al., 1992). Each of the domains was measured using neuropsychological assessments that accounted for changes in cognition that were related to age (Wilson & Bennett, 2005; LaBarge et al., 1986; Kear-Colwell & Heller, 1978). These specific measures or ones that are related in design have shown high test-retest reliability across multiple time points including a few days to multiple years (Calamia et al., 2013).

Other Data Collection

At baseline, self-report data on depressive symptoms was obtained. Depressive symptoms were assessed using the Center for Epidemiological Studies Depressive Scale (CES-D), specifically the 10 item scale (Lewinsohn et al., 1997). Previous research showed good internal consistency with alpha being 0.92, and test-retest reliability with a Pearson r of 0.83 showing adequate criterion validity in a sample of older adults with depression (Irwin et al., 1999).

Data Analysis

Linear mixed effects models with fixed effects of demographic variables (e.g., age, education), harm avoidance, depression, time, and well-being as well as a random effect of

participant were used. Separate models were run for each cognitive domain. Three-way interactions of harm avoidance, well-being, and time were examined for each cognitive domain to test the hypothesis that well-being moderates the negative association of harm avoidance with cognitive decline.

RESULTS

Participant demographics show that the sample was comprised of 75% women with a mean age of 80.13 and it is notable that 36.8% had greater than 16 years of education (See Table 1). Participants were excluded if they had a diagnosis of dementia.

Six multilevel mixed-effects models reveal that after accounting for depression and demographics (age, sex, and years of education) lower well-being was associated with worse cognitive functioning globally, working memory, perceptual speed, and semantic memory, surprisingly harm avoidance was not uniquely associated with cognition (See Table 2). For episodic memory the interaction of harm avoidance and follow-up year was significant, which indicated that higher harm avoidance predicted more cognitive decline over time for episodic memory. For all six models, the interaction of well-being and follow up year was significant, which indicated that higher well-being scores predicted less cognitive decline over time globally and across the specific cognitive domains. A three-way interaction between harm avoidance, well-being, and follow up year was significant for episodic memory, which indicated that those with higher levels of harm avoidance and higher levels of well-being predicted lower rates of episodic memory decline than those with lower levels of harm avoidance and lower levels of well-being (See Figure 1).

Table 1. Baseline Demographic Profile of Older Adult Sample (N = 728)

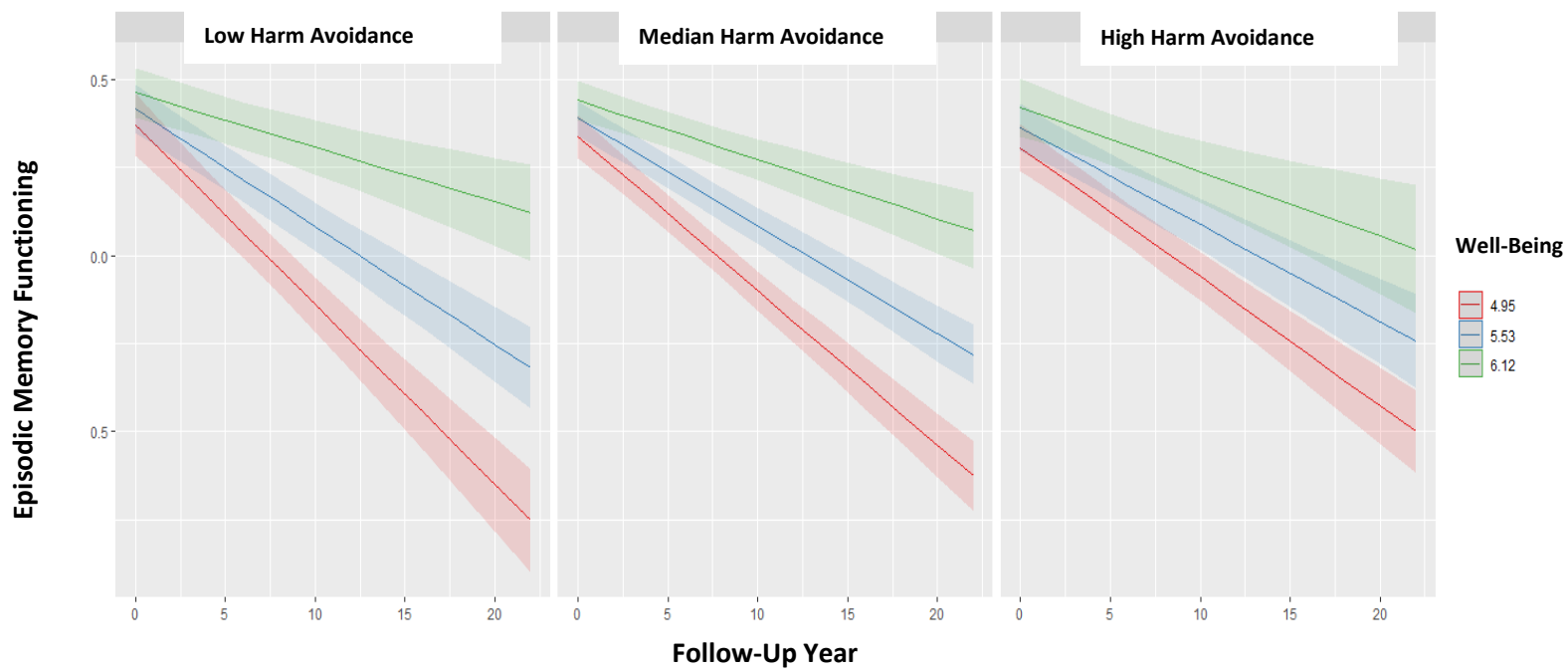
<i>Variable Name</i>	<i>Mean (SD) / %</i>
Age (Years)	80.13 (7.14)
Age Range	58-100
Female	75.0%
Years of Education	
<12	2.6%
12	13.8%
13	7.0%
14	11.5%
15	4.8%
16	23.4%
>16	36.8%
Note: <i>SD</i> = standard deviation	

Table 2. Linear Mixed Effects Models of Harm Avoidance, Well-being, and Time Predicting Cognitive Functioning

	Objective Cognitive Functioning Domains					
	Global Cognition	Episodic Memory	Working Memory	Perceptual Speed	Visual Spatial	Semantic Memory
Harm Avoidance	0.003	-0.004	0.020	0.012	0.004	0.003
Well-Being	0.074*	0.084	0.090*	0.118**	0.033	0.069*
Time	-0.181***	-0.226***	-0.098**	-0.201***	-0.125***	-0.153***
Harm Avoidance x Well-Being	-0.001	<0.001	0.012*	-0.003	-0.002	<-0.001
Harm Avoidance x Time	0.003	0.007**	< 0.001	< 0.001	< -0.001	0.002
Well-Being x Time	0.025***	0.05***	0.012*	0.023***	0.018**	0.022***
Harm Avoidance x Well-Being x Time	<-0.001	-0.001**	<-0.001	<-0.001	<0.001	<-0.001
Sex	-0.157***	-0.288***	0.003	-0.201***	0.231***	-0.182***
Years of Education	0.042***	0.029***	0.046***	0.034***	0.077***	0.055***
Age	-0.031***	-0.037***	-0.016***	-0.043***	-0.022***	-0.022***
Depression	<-0.001	-0.002	0.003	0.002	-0.003	-0.001

* p < .05, ** p < .01, *** p < .001

Note: Unstandardized beta weights for each predictor are reported below each predicted cognitive domain. Well-Being = Subjective Well-being at baseline, Time = follow-up year.



Note: Well-Being = record of subjective well-being at baseline, Follow-Up Year = year of follow-up assessment

Figure 1. Harm Avoidance and Well-being by Follow-Up Year Predicting Episodic Memory Function

DISCUSSION

The present study builds on previous findings regarding the impact of personality traits on cognition in older adults (Curtis et al., 2015; Widiger, 2017). Numerous longitudinal studies have documented a relationship between cognitive decline and neuroticism. Neuroticism is defined as a fundamental aspect of personality found in individuals who react strongly to day-to-day stressors with anxiety, depression, and anger (Widiger & Oltmanns, 2017; Kumar et al., 2022; De Jager et al., 2021; Zullo, et al., 2021; Montoliu et al., 2022). High levels of harm avoidance, which is a tendency toward behavioral inhibition, is associated with neuroticism and an increased risk of developing cognitive decline in older adults (Wilson et al. 2011). On the other hand, the positive trait of well-being has been associated with better cognition even when controlling for age and depression (Allerhand et al., 2014). A better understanding of this important relationship between personality traits and cognition has implications for anticipating, treating, and promoting successful aging. To our knowledge, no one has studied the interaction of harm avoidance, subjective well-being, and cognition over time in older adults.

In the present study, well-being had robust results. Specifically, it was a significant predictor of global cognitive functioning, working memory, perceptual speed, and semantic memory. Higher well-being had a significant two-way interaction with follow-up year across all cognitive factors. There is a growing literature on positive psychology and well-being, and these aspects are noted to be important for cognitive functioning in older adults (Ryff, 2018). People with higher subjective well-being tend to have lifestyles that are more engaging compared to individuals with low well-being which has been associated with preserving cognition over time (Huppert, 2009). This seemingly protective power of well-being is also seen beyond cognition including biological mechanisms such as cardiovascular risk, neuronal changes, and

inflammatory responses (Bar-Tur, 2021). This study provides further evidence that psychological well-being may be associated with cognition and these effects remain significant even when accounting for a construct related to neuroticism (i.e., harm avoidance) which has been a greater area of focus in the literature.

Harm avoidance had a significant two-way interaction with follow-up year in relation to episodic memory. However, this interaction was moderated by well-being such that high levels of well-being buffered the decline in episodic memory overtime in individuals with high levels of harm avoidance. Those high in harm avoidance typically avoid new experiences (Cloninger, 1987), and individuals with higher well-being look for more positive experiences (MacLeod & Conway, 2005). Our results suggest that the lifelong tendency to look for more positive experiences, seen in well-being, reduces the tendency to avoid new experiences, seen in higher harm avoidance, which likely preserves episodic memory. Episodic memory is thought to play an important role in social interactions that are often based on previous experience and moderated by emotional state (Dolcos et al., 2017). Our results are consistent with the idea that well-being plays a pivotal role in successful aging as those high in well-being tend to seek out more positive interactions which is thought to be important for both countering negative behavioral traits and positively impacting memory ability. Of note, memory decline is the primary initial cognitive feature of the most common neurocognitive disorder in aging (i.e., Alzheimer's disease) and memory is a key predictor of everyday functioning. Therefore, identifying ways to reduce memory decline has important clinical applications.

Healthcare has typically focused on the treatment of negative symptomatology and this study contributes to the new expectation that positive psychological interventions are an untapped opportunity for therapeutic benefit. Previous literature examines positive psychology as

an intervention in relation to mood disorders (Hendriks et al., 2020). Specifically, that positive psychological interventions had benefit for perceived stress and fatigue in older adults (Greenawalt et al. 2019). Though previous literature shows a connection between positive psychological traits and cognition, there is a lack of literature that examines positive psychology as an intervention as it relates to cognition (Stone & Schmidt, 2020). Our study suggests that positive psychological interventions, aimed at well-being in particular, could have a therapeutic benefit in relation to cognition. Our study also shows that the Dual-Factor Model of mental health is seen in older adults and can play a role in changes in cognition.

Limitations of this study include the fact that well-being and harm-avoidance were only evaluated at baseline, therefore within-person variation could not be assessed. However, previous literature suggests that within-person changes on well-being on a particular occasion were not as important as between-person mean levels of well-being (Allerhand et al., 2014). However, further research on individual changes versus cohort mean levels is important. The results of this study show that positive and negative traits interact and contribute to the rate and nature of changes in cognition in older adults. Another limitation was there was limited racial diversity in the sample with a large majority of participants identifying as white and with a high average level of education of 14 years. Future research should examine other factors that can lead to a positive outlook. These include reminiscence, which is the enjoyment of past events and positive rumination, which is the repetitive thoughts centered around a person's current positive affective state. Additionally, culturally appropriate care for the growing number of older adults is important and future research should further examine well-being and cognition in individuals in communities of color. Examining these relationships is critical as well-being is a subjective construct related to personal experiences.

Positive psychological factors such as subjective well-being, may have the potential to buffer cognitive decline in older adults suggesting an important avenue for increasing the opportunity for successful aging.

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Vita

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