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Purpose in life and cognitive functioning in adulthood

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ABSTRACT

With an increasingly aging population, more work is needed to identify factors which may promote the maintenance of normal cognitive functioning. The current study tested the concurrent association between sense of purpose in life and the cognitive variables of episodic memory, executive functioning, and composite cognitive functioning in adults (N = 3489, M_{age} = 56.3 years, SD = 12.27, Range = 32–84 years) from the Midlife in the United States study (MIDUS). Correlational analyses suggested that purpose in life was associated with higher scores for memory, executive functioning, and overall cognition. Bootstrapping tests of moderation found no evidence for a moderating effect of age on purpose and the cognitive variables. Future studies should attempt to explain the mechanisms behind this relationship and explore the potential for interventions to promote healthy cognitive and purposeful aging.

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Purpose in life; cognitive functioning; executive function; episodic memory; adulthood

Introduction

With rapidly aging adult populations, there is greater urgency for research to identify factors promoting the maintenance of cognitive functioning into the later adult years. Despite considerable efforts to identify predictors of cognitive functioning, there remains a significant amount of variation in cognitive ability that cannot be solely explained by age (Salthouse, 2006). While past research has linked factors such as level of education with cognition (e.g., Le Carret et al., 2003), there is a need to explore additional factors which may promote the cognitive functioning of adults. A growing body of evidence has supported the role of having a sense of purpose in life as a protective factor against age-related decline in health and physiological functioning. Purpose in life refers to the sense that one's life has direction and that their actions are guided by some overarching life aim (Ryff, 1989). Furthermore, purpose helps to guide individuals' life goals and can promote engagement in health-protective behaviors (McKnight & Kashdan, 2009). A greater sense of purpose has been found to decrease one's risk for numerous degenerative and age-associated disorders such as stroke (Kim, Sun, Park, & Peterson, 2013), myocardial infarction (Kim, Sun, Park, Kubzansky, & Peterson, 2013), and disability (Boyle, Buchman, & Bennett, 2010). Recent work has

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also demonstrated the potential for purpose to mitigate against nonnormative cognitive decline. A higher sense of purpose in life is associated with a reduced risk for Alzheimer's disease and mild cognitive impairment in older adults living in retirement and nursing facilities (Boyle, Buchman, Barnes, & Bennett, 2010). Further work by this group (Boyle et al., 2012) suggests that purpose may be protective for cognitive functioning in individuals with underlying pathological signs of Alzheimer's.

While these findings suggest a relationship between purpose in life and cognitive disorders among older adults living in retirement and assisted living facilities, further work is needed to establish the scope of the relationship between purpose and normative cognitive functioning across the adult lifespan. In particular, it remains uncertain how purpose in life may impact the cognitive functioning of adults during the period of middle adulthood, when many signs of cognitive decline first begin to develop (Singh-Manoux et al., 2012). Past work suggests a relationship between purpose in life and non-pathological cognitive functioning. For example, in work by Boyle and colleagues (2010) it was found that more purposeful individuals who were not diagnosed with Alzheimer's disease or mild cognitive impairment scored higher on tests of memory, perceptual speed, and visuospatial ability at baseline and showed less rapid decline in these functions overtime compared with those lower in purpose. Hence, in older adults, sense of purpose appears to be predictive of some aspects of normative cognitive functioning.

Further support for this association comes from McKnight and Kashdan (2009), who suggest that engaging with one's purpose in life is a process requiring higher-order cognition. For example, one can consider the domain of executive functioning, which refers to an overarching set of cognitive functions involving processes such as planning, decision-making, selective attention, and integrating new and previously learned information (Baddeley, 1996; Chan, Shum, Toulopoulou, & Chen, 2008). A sense of purpose in life likely involves a number of these executive processes to direct behavior and cognitive resources toward one's own goals. Furthermore, purpose in life also likely utilizes components of memory such as the reflection on one's own experiences and specific life events to derive a sense of direction and goals for the future. Thus, living purposefully may require individuals to engage more frequently in higher-order cognitive processes compared with individuals driven by more basic needs. Taken together, this evidence points toward an association between purpose in life and cognitive functions such as memory and executive function.

Past research has demonstrated similar life-course trajectories for both purpose and cognitive functioning, providing further support for an association between the constructs. Sense of purpose appears to decline around the time of retirement, and shows steeper decline into older adulthood (Hedberg, Gustafson, & Brulin, 2010; Pinquart, 2002). Pinquart (2002) attributed such declines in purpose to reduced structure and role-specific obligations brought about by common changes at this stage of life such as retirement and loss of a spouse. Similarly, numerous studies have observed a peak in cognitive functioning around middle adulthood, followed by declining memory and executive processes with increasing age (e.g., Head, Rodrigue, Kennedy, & Raz, 2008; Tun & Lachman, 2006).

Given these similar life course trends another important question may be whether such an association would vary at different stages of adult life. Previous work has shown that purpose in life predicts mortality risk across the lifespan, regardless of participant

age (Hill & Turiano, 2014). Thus, it may be the case that the connections between sense of purpose and adaptive outcomes remain consistent across the adult lifespan. On the other hand, older adulthood is a period in which many individuals experience significant changes in life structure such as retirement, loss of a spouse, and changes in health and cognition. One key aspect of purpose in life is that it promotes adaptability and resilience to change (McKnight & Kashdan, 2009), suggesting that older adults with a strong sense of purpose in life may be better equipped to adapt in the face of these common challenges. If purposeful life engagement helps one to reorganize their cognitive resources, one could also theorize that purpose may become more closely associated with cognitive functioning as individuals age and become more likely to experience changes in their health, lifestyle, and social network.

The current study seeks to extend the literature by examining the relationship between sense of purpose and cognitive functioning in a large national sample of participants across the span of adulthood. The current study sought to address whether sense of purpose was associated with scores on executive functioning, episodic memory, and general cognitive functioning, and whether such relationships differ based on participant age. It was hypothesized that purpose in life would be associated with better cognitive functioning in each of the domains across the adult lifespan after controlling for relevant demographic characteristics.

Methods

Participants

The present study utilized data from 3489 participants in the second wave of the Midlife in the United States longitudinal study (MIDUS II), who had completed both the purpose in life measure and the cognitive battery. Participants were contacted by telephone and asked to complete a 30-minute phone survey and self-administered questionnaires assessing psychosocial, demographic, and health variables. See Radler and Ryff (2010), for a more complete description of participants and procedures in the second wave of MIDUS. The resulting sample included in these analyses were aged 32–84 years, with age distributed as follows: 10% aged 32–40, 25% aged 41–50, 27% aged 51–60, 22% aged 61–70, and 16% aged 71 and older. The majority of participants had at least a high school degree (93%) and 68% of the sample had some form of post-secondary education. Demographic characteristics of the study sample are displayed in Table 1. The mean education of 7.30 represents approximately 3 years of post-secondary education.

Table 1. Demographic characteristics.

	Mean/*n* (%)	*SD*	Range
Age (years)	56.4	12.33	32–84
Gender (% female)	1919 (55.0%)	–	–
Education	7.30	2.54	1–12
Self-rated health	3.58	1.00	1–5
Purpose in life	5.50	0.99	1.43–7.00
Composite cognition	.06	0.99	−2.8–3.63
Executive functioning	.07	0.96	−4.64–3.36
Episodic memory	.04	1.00	−3.04–3.83

Cognitive variables reflect z-scores for the full MIDUS sample, and thus the range reflects standard deviation units around the mean.

Measures

Purpose in life

Purpose in life was assessed during the second MIDUS wave via a seven-item version of the Ryff Scales of Psychological Wellbeing (1989). Participants indicated on a scale from one (strongly disagree) to seven (strongly agree) in response to statements such as: "I live life one day at a time and don't really think about the future"; "Some people wander aimlessly through life, but I am not one of them"; and "I sometimes feel as if I've done all there is to do in life". This scale was found to have acceptable reliability (Cronbach's $\alpha = .70$).

Cognitive functioning

In addition to the phone survey and self-administered questionnaires, a subset of MIDUS participants were asked to complete a 20-minute phone-based cognitive assessment. The Brief Test of Adult Cognition by Telephone (BTACT; Tun & Lachman, 2006) and the Stop and Go Switch Task (SGST) were used to measure cognitive functioning. The BTACT is comprised of a series of telephone-administered cognitive tests including immediate and delayed word list recall, category fluency, digits backward, number series, and backward counting tasks. The SGST assesses participants' response time to say either "stop" or "go" to the associated cues of "red" and "green". In the MIDUS, each participant responded to a congruent test block in which stop was the correct response to red and go for green, as well as an incongruent set in which the appropriate response was reversed. Participants were then given a mixed test block in which they responded to an alternating set between congruent and incongruent rules to assess their task switching and inhibitory control processes. Participant scores on the SGST were based on mean response times across the congruent and incongruent trials. A more complete description of cognitive test procedures in the MIDUS, as well as a description of the reliability of the measures can be found in Tun and Lachman (2006, 2008).

These measures were used to create factor scores for episodic memory and executive functioning, as well as an overall composite cognitive functioning score. The episodic memory factor was created via average composite scores on the immediate and delayed word recall tasks in the BTACT, while executive functioning scores comprised mean scores on the SGST and the number series, category fluency, digit span backwards, and backward counting items from the BTACT. Past factor analysis has supported the grouping of these measures under the episodic memory and executive functioning factors (Lachman, Agrigoroaei, Tun, & Weaver, 2013). The three BTACT scores were standardized prior to analysis to ease interpretation of the results.

Covariates

The current analyses controlled for the demographic characteristics of chronological age, gender, and education level, as well as participant self-rated health. Age and gender were both measured via self-report in the first wave of MIDUS. Past research (Le Carret et al., 2003) has suggested that individuals with higher education are more likely to score higher on tests of cognition. As such, the current analyses controlled for participant education. Participants were asked to identify their highest level of education and were grouped into 12 categories ranging from no education to completion of a professional degree such as

MD or PhD. In addition, given that self-rated health is associated with both purpose in life (Scheier et al., 2006) and cognitive functioning (Anson, Shteingrad, & Paran, 2011), the current analyses also control for participant self-rated health. Participants rated their current health on a 5-point scale with higher scores indicating better health.

Statistical analyses

Associations between sense of purpose in life and composite cognitive functioning, executive functioning, and episodic memory were first tested using Pearson correlations. Linear regressions were then used to test these associations above and beyond the covariates of age, gender, education level, and self-rated health. Next, regression analyses with bootstrapping were run using the PROCESS macro for SPSS (Hayes, 2013) to test whether age moderated these relationships. The PROCESS macro uses an ordinary least squares regression framework to estimate effects of potential moderators and includes bootstrapping resampling methods to improve the reliability of these estimates. For the current analyses, sense of purpose was entered as the independent variable along with the covariates of sex, education, and self-rated health, and participant age was entered as a moderator.

Results

The main objectives of the current study were to explore the extent to which purpose in life predicted cognitive ability in individuals between the ages of 32 and 84 and whether differences in this relationship exist based on age. Correlational analyses were performed for purpose in life and the three cognitive variables; executive functioning, episodic memory, and overall composite cognitive function. Greater scores for purpose in life were associated with higher scores for executive functioning ($r = .16$, $p < .001$), episodic memory ($r = .13$, $p < .001$), and composite cognitive functioning ($r = .17$, $p < .001$).

Next, regression analyses tested whether the effect of purpose in life held above and beyond demographic variables such as gender, self-rated health, and education. A summary of these analyses is displayed in Table 2. Purpose in life significantly predicted composite scores, episodic memory, and executive functioning, even above and beyond these additional covariates.[1]

Bootstrapping analyses of moderation (e.g., Hayes, 2013), using 1000 bootstrapped samples, were used to investigate whether these relationships differed across adulthood. Again, sex, education, and self-rated health were included as covariates. No significant

Table 2. Multiple regressions predicting cognitive functioning outcomes from sense of purpose and covariates of interest.

	Composite			Episodic memory			Executive functioning		
Predictor	B (s.e.)	β	*t*	B (s.e.)	β	*t*	B (s.e.)	β	*t*
Age	−.03 (.001)	−.37*	−25.98	−.02 (.001)	−.29*	−18.79	−.03 (.001)	−.36*	−25.36
Sex (0 – male; 1 – female)	−.03 (.03)	−.02	−1.08	−.47 (.03)	−.23*	−15.34	.15 (.03)	.08*	5.58
Highest education	.13 (.01)	.33*	22.82	.06 (.01)	.16*	9.70	.12 (.01)	.33*	22.20
Self-rated health	.13 (.02)	.13*	8.61	.07 (.02)	.07*	3.96	.14 (.01)	.14*	9.64
Sense of purpose	.05 (.02)	.05*	3.42	.07 (.02)	.07*	4.13	.04 (.01)	.04*	2.53

* indicates $p < .05$, β indicates a standardized beta value.

age moderation was found for purpose and episodic memory ($t = 1.91$, $p = .06$), executive functioning ($t = 1.00$, $p = .32$), or for purpose and composite cognitive functioning ($t = 1.46$, $p = .14$).

Discussion

A growing body of research points to the role of purpose in life in supporting cognition and late-life risk for cognitive disorders (e.g., Boyle, Buchman, Barnes, & Bennett, 2010; Boyle et al., 2012), yet to date, no research has explored the relationship between sense of purpose and general cognitive functioning in adults across the lifespan. The current work expands upon the existing literature in three notable ways. First, sense of purpose was found to be significantly associated with cognitive functioning in individuals across the adult lifespan, even after controlling for age, sex, level of education, and self-rated health. Second, purpose was associated with higher scores on overall cognitive function, as well as the domains of executive functioning and episodic memory. Third, we demonstrate that this relationship between purpose and cognitive functioning remains relatively consistent across the adult years.

Identifying the mechanisms behind the association between purpose in life and cognitive functioning should serve as a primary aim for future longitudinal research. On that front, it is likely that a number of psychological, biological, and behavioral factors underlie this relationship. One potential mechanism may be that purposeful individuals engage more frequently in activities. Past work suggests a relationship between participation in leisure activities and psychological well-being; a construct related to purpose in life (Adams, Leibbrandt, & Moon, 2011). Moreover, individuals with a higher sense of purpose in life are believed to be more proficient in allocating resources to address their most pertinent aims (McKnight & Kashdan, 2009), suggesting that purposeful individuals may better direct their time and energy toward activities congruent with their sense of purpose. Given that research has linked increased leisure activity participation to reduced age-related declines in cognitive functioning (Ghisletta, Bickel, & Lövdén, 2006), this may in part explain the link between purpose and cognition. Similarly, purposeful individuals are more likely to engage in physical activity, with purpose in life being linked to both subjective (Holahan, Holahan, & Suzuki, 2008) and objective measures of physical activity (Hooker & Masters, 2014). Furthermore, purposeful individuals are also more likely to utilize preventative health care (Kim, Strecher, & Ryff, 2014). Taken together, these findings suggest a proclivity of purposeful individuals to be more active and engage in health-protective behaviors. Given the beneficial effects of activity (Colcombe & Kramer, 2003), as well as the close relationship between physical health and cognition, greater engagement in such behaviors may be a mechanism through which purpose influences adult cognition.

Yet another potential pathway through which purpose could promote cognitive functioning is via reduced stress and immune reactivity. Sense of purpose has been linked to reduced levels of inflammatory factors such as the soluble IL-6 receptor (Friedman, Hayney, Love, Singer, & Ryff, 2007). This is particularly important given that increased presence of the IL-6 family of cytokines is associated with numerous disorders including Alzheimer's disease (Ershler & Keller, 2000). Further underscoring the link

between purpose and biomarkers of health, purpose has recently been shown to longitudinally predict lower allostatic load in the same sample as the present study (Zilioli, Slatcher, Ong, & Gruenewald, 2015). Allostatic load refers to a composite of a number of biomarkers indicating activation of cardiovascular, immune, and other physiological systems in response to stress. A reduced allostatic load in purposeful individuals suggests less strain on these physiological systems, which could have downstream effects on health and cognition. However, it is important to note that longitudinal work is needed to better test these mechanisms. Given the cross-sectional nature of the current study, the directionality of the relationship between purpose and cognitive functioning is unclear and it would be difficult to make any mechanistic claims without multiple assessment points.

Additionally, multiple mechanistic accounts are likely in part because one would expect the relationship between purpose and cognition is bidirectional. Indeed, research looking at psychological well-being (a conceptual correlate of purpose) and cognitive functioning found that these two variables are longitudinally predictive of each other in middle and older adults (Allerhand, Gale, & Deary, 2014). With respect to purpose, this relationship becomes clearer when looking at different subcomponents of cognition. For example, various aspects of executive functioning are reflective of one's ability to allocate resources across multiple situations. Resource allocation may help to facilitate engagement in goals and reengagement in new goal pursuits during times when individuals have multiple competing responsibilities. Past work exploring adaptive self-regulation of one's own goal pursuits have found that engagement and reengagement in goals are associated with a greater sense of purpose (Haase, Heckhausen, & Wrosch, 2013; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Furthermore, the processes of goal engagement and reengagement are also likely influenced by components of memory such as reflection on past experience. Thus, cognitive processes such as adaptive resource allocation and memory may promote engagement and reengage in goals, both of which have been shown to promote sense of purpose. Accordingly, future research may wish to more closely examine the relationship between purpose and the different subcomponents of executive functioning and memory.

A primary limitation of the current study is the availability of only one time point, limiting our ability to formally test the direction of the association between purpose and cognitive functioning. As noted above, these findings suggest an association between purpose and cognition, though a case could be made for this relationship operating in either direction. As such, the addition of further assessments would allow for testing of the directionality of this relationship and should serve as a major objective for future work on this topic. Longitudinal observations of these variables would also permit researchers to test potential mediating factors such as activity engagement and allow for better understanding of the mechanisms behind the relationship. Second, while we have discussed that these findings are relevant for normal cognitive aging, it is important to note that the MIDUS did not include any clinical tests which would detect cognitive impairment. As such, future studies may wish to include screening tools to account for participants who may fall outside the range of normative cognitive functioning. Third, although the current study employed a large, representative sample of adults, it consists mostly of middle-aged adults with comparably fewer older individuals. Given that sense of purpose appears to be much lower in individuals over the age of 85

(Hedberg et al., 2010), the association between purpose and cognition in this age group may be of interest. Future longitudinal work is needed to explore the directionality and mechanisms behind this relationship as well as empirically test the relationship between sense of purpose and other cognitive domains.

The current work extends the literature by demonstrating that purpose in life predicts greater overall cognitive functioning as well as episodic memory and executive functioning in a large representative sample of participants across the span of adulthood. In conjunction with previous work, these findings suggest that a greater sense of purpose in life is not only protective against cognitive diseases such as Alzheimer's disease, but may support the cognitive abilities of individuals across adulthood.

Note

1. Given the cross-sectional nature of the current analyses, we cannot attest to the directionality of this association. We also ran regressions using the same covariates with the cognitive variables as the independent variable and purpose as the outcome. The results yielded nearly identical standardized regression coefficients with the differences being less than .02 in magnitude compared to the analyses with cognitive functioning as the outcome.

Disclosure statement

No potential conflict of interest was reported by the authors.

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