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Sense of Purpose as a Psychological Resource for Aging Well

Abstract

Having a sense of purpose is recognized as an important resource for maintaining health and well-being over the lifespan. We examined associations of individual differences in sense of purpose with levels, and rates of change in indices of aging well (health, cognition, and depressive symptoms) in a large sample of 1475 older adults (M_{age} = 77.06, *SD* = 6.27; 50% female) assessed on up to six occasions over 18 years. We also conducted survival analysis to examine associations of purpose with longevity. We hypothesized that a higher sense of purpose would be associated with better performance on the aging well measures, and that those with a higher sense of purpose would show shallower declines in aging well over time. Results indicated that participants who scored higher on sense of purpose reported lower levels of functional disability, performed better on cognitive tests (episodic memory and speed of processing), reported better self-rated health, and fewer depressive symptoms. Sense of purpose was not associated with individual differences in rates of change in the aging well indices with the exception of speed of processing, where a higher sense of purpose was associated with marginally shallower rates of decline. Higher sense of purpose was also associated with increased probability of survival, although this association became weaker over time. The findings support the notion that purposeful living contributes to health and well-being. At the same time, higher sense of purpose may not buffer against more pervasive losses in health that become more common in oldest-old adulthood.

Keywords: Sense of purpose, aging well, successful aging, ALSA

Abstract word count: 250

Sense of Purpose as a Psychological Resource for Aging Well

Having a sense of purpose in life is believed to underlie various positive psychological states (e.g., positive emotions) and personality attributes (e.g., competence) that are frequently associated with health and well-being (e.g., Boehm & Kubzansky, 2012). According to Ryff (1989), a sense of purpose is characterized by "goals, intentions, and a sense of direction, all of which contribute to the feeling that life is meaningful" (p. 1071). The centrality of meaningful goals to a purposeful life is widely recognized (e.g., McKnight & Kashdan, 2009; Scheier et al., 2006), and it is a focus on goal-directedness as providing a foundation for purpose, that informs our conceptualization and operationalization of the construct in the present study.

Our interest in purpose stems from its potential to enhance developmental opportunities and capacity for adaptation across the lifespan (McKnight & Kashdan, 2009). Previous studies indicate that older adults tend to report a lower sense of purpose relative to younger and midlife adults (Pinquart, 2002; Ryff, 1989). However, it is also the case that sense of purpose could become particularly important as a protective psychological resource in later life, when goals are re-examined and re-organized in the context of aging related losses (e.g., Brandtstäder & Renner, 1990). Using data from the Australian Longitudinal Study of Aging (ALSA), we examined associations of individual differences in sense of purpose with levels and rates of change (over 18 years) in multiple indices of aging well including functional disability, fluid cognitive abilities (speed and memory), and depressive symptoms. We also examined purpose as a predictor of mortality.

Theoretical framework

Central to perspectives on sense of purpose is the notion that a coherent and enduring sense of what one values and hopes to achieve enables the setting of meaningful goals, and

the efficient organization of resources (e.g., time, effort, money; see Hobfoll, 2002) to maximize opportunities for goal attainment (McKnight & Kashdan, 2009). The focus on goals and effective resource utilization that underlies perspectives on purposeful living is also common to lifespan perspectives on self-regulation of development. For example, Baltes' (1997) Selective Optimization with Compensation (SOC) theory describes how successful development is characterized by the selection of goals, the optimization of resources needed for goal attainment, and the initiation of compensatory strategies (alternative means of goal attainment) when goals are thwarted. Considering perspectives on sense of purpose together with lifespan theories of self-regulation provides useful insights into a possible source of inter-individual differences in successful late-life development. Specifically, if individuals with a high sense of purpose are relatively better equipped to select goals and manage the processes around goal attainment, it follows that such individuals will be well placed to maximize their potential for growth, and to adapt effectively in response to developmental challenges.

The importance of a sense of purpose for effective growth and adaptation was highlighted by McKnight and Kashdan (2009), who outlined a theoretical framework that directly links sense of purpose with health and well-being. The proposed mechanisms through which purpose is believed to promote positive outcomes represent processes of both cumulative advantage and resilience to stress. For example, individuals with a coherent life aim, and the ability to efficiently allocate available resources could be well equipped to pursue opportunities that are purpose consistent, and to avoid dedicating resources to less important, or unattainable goals. In turn, purpose promotes efficiency of action that could, over time, produce cumulative benefits across a range of outcomes from positive health behaviors to emotional well-being (McKnight & Kashdan, 2009).

Purpose is also proposed to enhance health and well-being by acting as a stress buffer. Stress arising from unpredictable and uncontrollable events is thought to pose a particular threat to those without a coherent purpose to guide the effective allocation of resources in responding to the stress. Moreover, major stressors can disrupt the individual's framework for understanding themselves and their place in the world. According to McKnight and Kashdan (2009), purpose- as a higher-order construct- facilitates the effective and flexible use of various self-regulatory tools (e.g., coping strategies) thereby optimizing resilience.

Ultimately, the self-regulatory advantages conferred by a sense of purpose are thought to broadly promote well-being across a range of outcomes from mental health to immune functioning (McKnight & Kashdan, 2009). These advantages may become particularly important in older adulthood, when aging-related physical, cognitive, and social losses (e.g., Baltes & Smith, 2003) make self-regulatory processes around maximizing gains (e.g., persistence in striving for attainable, purpose consistent goals) and minimizing losses (e.g., disengaging from blocked, or resource intensive but purpose-inconsistent goals) critical to effective development into late life (Freund, Nikitin, & Ritter, 2009).

Empirical research on sense of purpose and well-being in older adulthood

Considerable research has examined associations of sense of purpose with positive outcomes across the lifespan. For example, research has shown that having a higher sense of purpose is associated with greater life satisfaction (Bronk, Hill, Lapsley, Talib, & Finch, 2009), greater positive affect, fewer symptoms of depression (Steger, Oishi, & Kashdan, 2009), and greater perceived psychological and physical well-being (Reker, Peacock, & Wong, 1987) across adolescence and adulthood. Our aim was to examine the role of sense of purpose in the context of adaptation to aging-related loss. We therefore restrict the subsequent review of the literature to studies that have examined associations of purpose with health and well-being in older adults.

A number of researchers have examined associations of sense of purpose or other conceptually similar constructs (e.g., engagement with life, Etezadi & Pushkar, 2013; personal meaning, Fry, 2001) with self-reported health and well-being outcomes in cross-sectional studies of midlife and older adults. This literature is extensive, and we provide a non-exhaustive overview of relevant cross-sectional research. Several studies have revealed positive associations of purpose in life with positive affect, life satisfaction, self-esteem and mastery, and negative associations of purpose with negative affect, perceived stress, and depressive symptoms (Ardelt, 2003; Etezadi & Pushkar, 2013; Ryff & Keyes, 1995; Scheier et al., 2006). Studies based on community samples have also revealed links between higher sense of purpose and better health. Holahan et al. (2011) found that higher purpose was related to more activity engagement and greater health investment among midlife women. Krause and Shaw (2003) reported associations of purpose with better self-rated health in an older community sample. Associations of purpose with well-being have also been reported in clinical samples. Holahan, Holahan, and Suzuki (2008) found that higher purpose was associated with better self-rated health and more activity engagement among cardiac patients. Research has also shown purpose to be independently associated with mental health (but not physical health) in a predominantly older sample of people with rheumatoid arthritis (Verduin et al., 2008).

Purpose in life has also been associated with biological markers of health and well-being. One study used ambulatory monitoring of blood pressure to demonstrate that those with a low sense of purpose showed an attenuated rate of decline in blood pressure overnight; a risk factor for cardiovascular-related disease and mortality (Mezick et al., 2010). Research from the Midlife in the U.S. (MIDUS) study indicates that purpose could buffer against risk factors for poor health outcomes. Morozink, Friedman, Coe, and Ryff (2010) reported that a negative association of education with the inflammatory marker interleukin-6 (IL-6) was

moderated by purpose, with the educational gradients in IL-6 not evident among those with higher purpose. Sense of purpose has also been found to moderate associations of Alzheimer's disease related brain pathologies with global cognitive test performance, suggesting that purpose in life could contribute to cognitive reserve (Boyle et al., 2012).

While a vast literature describes cross-sectional associations of sense of purpose with positive outcomes in older adults, relatively fewer studies have used longitudinal data to examine associations between sense of purpose and longer-term changes in health and well-being among samples of older adults. Recent results from the Health and Retirement Study indicated that higher sense of purpose was associated with reduced risk of stroke over a 4 year measurement interval, independent of numerous additional socio-demographic, behavioral, biological, and psychosocial characteristics (Kim, Sun, Park, & Peterson, 2013). However, a prospective study of postmenopausal women did not reveal reliable associations of purpose with baseline levels of coronary artery calcification, or changes in coronary artery calcification over 3.3 years (Low, Matthews, Kuller, & Edmundowicz, 2011). A few studies have used survival analysis to examine the extent to which sense of purpose predicts subsequent morbidity and mortality. Using a nationwide sample of older adults in the US, Krause (2009) reported that a sense of purpose was associated with reduced risk of mortality over 5 years, although the association became non-significant after adjustment for health and functional disability. Primarily using data from the Rush memory and aging project, Boyle and colleagues showed that higher levels of purpose were associated with reduced risk of mortality over 5 years (Boyle, Barnes, Buchman, & Bennett, 2009), and reduced risk of incident Alzheimer's disease (Boyle, Buchman, Barnes, & Bennett, 2010) and disability (Boyle, Buchman, & Bennett, 2010) over 7 years. In each study, the association between purpose and the outcome remained statistically reliable after adjustment for a range of socio-demographic, health, and psychosocial (e.g., depression, neuroticism, social networks)

covariates. Recent research from MIDUS demonstrated that higher purpose was associated with reduced risk of mortality over 14 years, after controlling for socio-demographic variables, positive relations with others, and affective well-being (Hill & Turiano, 2014). Interestingly, the effect of purpose in life did not differ between young, middle-aged, and older adults. We are aware of one study that assessed the association of purpose with incident depression in oldest-old adults. Results from the Umeå 85+ study showed that older adults with depression at baseline reported significantly lower purpose, however, purpose was not associated with the risk of developing depression after 5 years (Hedberg, Gustafson, Alèx, & Brulin, 2010).

Taken together, the cross-sectional and longitudinal research findings are generally consistent in showing that a higher sense of purpose is related to better health and well-being outcomes, and longevity. However, we are not aware of research to date that has examined associations of purpose with both between-person differences, and long-term within-person changes across multiple indices of health and well-being. In particular, modelling purpose as a correlate of older adults' rates of within-individual change in performance over an extended measurement interval represents an important next step in shedding light on the relevance of purposeful living in protecting against developmental losses that become normative with advancing age (Baltes & Smith, 2003; Hofer, Rast, & Piccinin, 2012).

The Present Study

In the present study, we used growth models to examine associations of sense of purpose with (1) levels (representing between-person differences), and (2) slopes (representing within-person rates of change) in aging well outcomes, using a large sample of older adults assessed on up to 6 occasions over 18 years. We selected a range of health and well-being measures that have previously been identified in the literature as representing key aspects of aging well. Consistent with Rowe and Kahn's (1987) conceptualization of

successful aging, measures of functional disability, self-rated health, and cognition (speed and memory) were selected as indices of disease and disability. We also included depressive symptoms as an additional indicator of general mental health and quality of life (Morack, Ram, Fauth, & Gerstorf, 2013). Finally, we examined associations of purpose with mortality (Menec, 2003).

Theory (e.g., McKnight & Kashdan, 2009), and the cross-sectional research evidence (e.g., Scheier et al., 2006) suggests that individuals with a higher sense of purpose are likely to have accrued cumulative benefits for health and well-being over a lifetime. We expected these cumulative benefits to be reflected in older adults with a higher sense of purpose performing better on aging well outcomes relative to those with lower sense of purpose. This finding would be reflected in positive associations of purpose with levels of well-being outcomes (reflecting cross-sectional associations). However, little is known with regard to whether within-person trajectories of late life change in indices of aging well would be expected to vary as a function of individual differences in purpose. A unique contribution of our study is the examination of the degree to which individual differences in sense of purpose are correlated with long-term trajectories of change in health and well-health outcomes in late life. In light of the few studies providing empirical support for the role of purpose in buffering against risk factors for poor health (Morozink et al., 2010) and cognition (Boyle et al., 2012), we hypothesized that a higher sense of purpose would be associated with slower rates of decline in aging well outcomes (evidenced by positive associations of purpose with rates of change), and anticipated the strongest protective effects to be evident for those self-report measures relatively less sensitive to age-related declines, including depressive symptoms (e.g., Jorm, 2000), and self-rated health (Pinquart, 2001).

Method

Participants and procedure

Participants were from the Australian Longitudinal Study of Ageing (ALSA). Sampling and design of the ALSA has been described in detail elsewhere (Andrews, Cheok, & Carr, 1989; Luszcz et al., 2007; Luszcz et al., in press). In brief, an age-stratified (70–74, 75–79, 80–84, and 85+ years) sample was drawn from the South Australian Electoral Roll. Individuals over 70, their spouses (over 65), and co-residents (over 70) were invited to participate. The present study used data from the following major ALSA waves: Wave 1 (1992), Wave 3 (1994), Wave 6 (2000), Wave 7 (2003), Wave 9 (2008), and Wave 11 (2010), collected through home-based interviews, clinical assessments, and self-complete questionnaires. Additional waves (2, 4, 8, and 10) consisted of shorter interviews, and as such did not provide data on each of the key study variables.

The full ALSA sample included 2087 participants aged 65 to 103 at baseline. Items assessing purpose in life were included in the ALSA at Wave 3. Consequently, the current analysis is restricted to the 1475 participants who provided valid purpose in life data at this assessment (as well as providing complete data on age, sex, and education). Sample descriptive statistics for the 1475 participants are shown in Table 1. Among these 1475 participants, there was relatively little missing data at Wave 3 on the aging well indices that were assessed as part of the ALSA household interview (< 2% missing on all variables). Because cognitive measures were obtained as part of clinical assessment that was conducted separately to the household interview (see Luszcz et al., 2007), a larger proportion of participants had missing data on the cognitive variables (Wave 3 digit symbol = 21.9% missing; Wave 3 immediate recall = 16.1% missing). As is typical in longitudinal studies of aging, a large proportion of the analysis sample was lost over time as a result of attrition due to mortality. For example, numbers of participants providing functional disability data at each wave were as follows: Wave 1 n = 1463; Wave 3 n = 1452; Wave 6 n = 715; Wave 7 n = 439; Wave 9 n = 196; Wave 11 n = 156. Analyses used to examine the effects of sample

selectivity are described below. All available data on the dependent variables contributed to growth model estimation (see *analysis*) via maximum likelihood estimation under the usual missing-at-random assumptions (Little & Rubin, 1987).

Measures

Sense of purpose. Individual differences in sense of purpose were assessed at Wave 3 of the ALSA using 3 items from Ryff's (1989) purpose in life scale. Ryff described a high scorer on the original purpose in life scale as one who "has goals in life and a sense of directedness; feels there is meaning to present and past life; holds beliefs that give life purpose; has aims and objectives for living" (p. 1072). Consistent with this definition, the items used in ALSA captured central features of the original scale's content concerned with goal striving and goal attainment. The selected items were also common to the shortened 10-item purpose in life measure used in the Rush memory and aging project (Boyle et al., 2012). Items included "I have a sense of direction and purpose in life", "I used to set goals for myself, but now that seems like a waste of time (reversed)", and "I enjoy making plans for the future and working to make them a reality". Participants provided responses on a scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*); items were summed to form a total index, with higher scores indicating greater sense of purpose.

Because our short index of purpose was not an already established measure, we conducted a series of additional analyses to more closely examine its psychometric properties. An initial confirmatory factor analysis showed that the 3 items loaded significantly and positively on a single factor (standardized loadings ranged from 0.44 to 0.72). We subsequently conducted multiple group confirmatory factor analysis to determine whether the sense of purpose measure exhibited measurement invariance across young-old (65-76 years) and older adults (77-105 years). A model examining scalar (strong factorial) invariance (Muthén & Muthén, 1998-2012) constrained factor loadings and item intercepts to

be equal across the age groups. This model showed excellent fit to the data (χ^2 (4) = 1.96, p = 0.74, CFI = 1.00, RMSEA = .00), supporting measurement equivalence over age. Cronbach's alpha for the measure was modest (α =.58), but compared favorably with the 3-item purpose measure comprised of different items from Ryff's original scale that was used in the Midlife in the United States (MIDUS) study (α = .36; MIDUS, 2004). Finally, we assessed convergent validity by examining bivariate associations of the purpose scale with conceptually related (see Scheier et al., 2006) measures of perceived control (Reid & Ziegler, 1981) and self-esteem (Bachman, 1970) also assessed at Wave 3. Correlations of .36 (perceived control) and .34 (self-esteem) indicated that the purpose measure is related to both control beliefs and self-esteem, but does not directly assess either construct, supporting convergent validity.

Functional disability. Consistent with recent research using the ALSA (Wagner, Gerstorf, Hoppmann, & Luszcz, 2013), *functional disability* was measured using the sum of two mobility items assessing walking ability (Rosow & Breslau, 1966) and five items assessing difficulties with physical movement and lifting/handling objects (Nagi, 1976). For each item, participants received a score of 1 if they reported any degree of difficulty. The items were summed to produce a total score with higher values representing greater levels of disability (Cronbach's alpha ranged from .74 to .83 across waves).

Self-rated health. Self-rated health was measured with the question "How would you rate your overall health at the present time?" Participants provided responses on a scale ranging from 1 (*excellent*) to 5 (*poor*). Scores were reversed so that higher scores indicate better self-rated health.

Depressive symptoms. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was used to measure depressive symptoms. Participants indicated how often in the past week they had experienced each feeling from a list of 20 statements, on a scale

ranging from 0 (*rarely* or *none of the time*) to 3 (*most or all of the time).* Scores range from 0 to 60, with higher scores indicating more symptoms of depression. Reliability of the CES-D was high in all waves, with Cronbach's alpha ranging from .81 to .87.

Speed of processing. Speed of processing was assessed with the Digit Symbol Substitution subscale of the revised Wechsler Adult Intelligence Scale (Wechsler, 1981). Participants substituted symbols corresponding to digits into a randomly ordered array of 93 digits, from left to right as quickly as possible. A coding sheet with the digit-symbol pairs was available throughout the task. Scores were calculated as the number of correct substitutions completed in 90 seconds.

Episodic memory. Episodic memory was assessed using the immediate recall items from an abbreviated version of the Boston Naming Task (Luszcz, Bryan, & Kent, 1997; Mack, Freed, Williams, & Henderson, 1992). A series of 15 drawings were presented individually to participants who were required to name each picture during presentation. Participants were then asked without warning to recall the 15 pictures. Correct responses were summed to provide a measure ranging from 0 to 15.

Covariates. Associations of purpose with indices of aging well were examined controlling for baseline age, sex (0 = male, 1 = female), and education, assessed using a binary variable that contrasted those having left school aged 14 years or younger (0) with those who left school aged 15 or older (1). Intercorrelations among the covariates, aging well indices, and sense of purpose are displayed in Table 2.

Sample selectivity

To examine longitudinal selectivity, we compared the Wave 3 scores of those who provided data at 2 or more (of a possible 4) assessments subsequent to Wave 3 (n = 444), with those of the primary sample described above (n = 1475), using an effect size metric described by Lindenberger, Singer, and Baltes (2002). Most differences were small (e.g.,

Cohen, 1988), with participants who provided data at two or more assessments having marginally lower disability (*SD* = -0.32) and depressive symptoms (*SD* = -0.24), higher self-rated health (*SD* = 0.34), and sense of purpose (*SD* = 0.29). Those who remained in the study longer were also more likely to be women (*SD* = 0.24), and to have more years of education (*SD* = 0.10). Somewhat larger differences in selectivity were evident for age and cognition, with those participating at more assessments being younger (*SD* = -0.54), and performing better on measures of processing speed (*SD* = 0.40) and immediate recall (*SD* = 0.35).

Statistical analysis

To examine associations of sense of purpose with levels (intercepts) and rates of change (slopes) in aging well outcomes, we fitted a series of growth models using multilevel modelling procedures (e.g., Singer & Willett, 2003). Multilevel models facilitate examination of longitudinal data comprised of measurement occasions nested within individuals by partitioning variance in the dependent variable into separate between-person (Level 2) and within-person (Level 1) components. As a first step, average rates of change in the aging well outcomes were quantified by fitting unconditional linear growth models that included the aging well outcomes as the dependent variables, and time modelled at Level 1 as the sample average of time (in years) elapsed since baseline at each assessment (Wave 1 = 0; Wave 3 = 2; Wave 6 = 8; Wave 7 = 11; Wave 9 = 15.3; Wave 11 = 17.6). Random effects (for the intercept and for the slope for time) were modelled to account for individual deviations in level, and slope for the aging well outcomes. We subsequently examined non-linearity in average rates of change by adding a quadratic term (Time^2) to the models. The quadratic growth models (using functional disability as an example of one of the aging well indices) took the form of:

$$\textit{Functional disability}_{ti} = \beta_{0i} + \beta_{1i}\,(\textit{time}_{ti}) + \beta_{2i}\,(\textit{time}^2_{ti}) + r_{ti},$$

where functional disability for a given individual *i*, at a given time point *t*, *functional disability*$_{ti}$ is a combination of an individual-specific intercept, β_{0i}; individual-specific slope parameters representing linear, β_{1i}, and quadratic, β_{2i}, growth over time in study, and a residual term, r_{ti}. Inclusion of fixed and random effects in the model specifications allowed estimation of sample mean values (fixed effects) for the intercept (γ_{00}), and linear (γ_{10}) and quadratic slopes (γ_{20}), as well as variance components (random effects) that represented individual deviations from the mean intercept (u_{0i}), mean linear slope (u_{1i}), and mean quadratic slope (u_{2i}). Where the quadratic term was not reliably different from zero, it was excluded from the model. If the quadratic was retained, the statistical significance of its random effect was assessed using the likelihood ratio test, and retained if it contributed to model fit.

After establishing the form of the basic growth models, we then included mean-centered sense of purpose as a Level 2 predictor variable to examine its associations with levels (intercepts), and rates of linear and quadratic change (slopes) in aging well outcomes. Additional Level 2 covariates included sex and education. We also controlled for mean-centered age at baseline, to disaggregate within-person development over the study interval from cross-sectional age differences (i.e., birth cohort effects; e.g., Hofer et al., 2012). The models included tests of interactions of purpose and the covariates with linear and quadratic slopes. For simplicity, in the final models reported we retained only those interactions with quadratic time that were statistically reliable. To aid interpretation of differences in rates of change across aging well measures, the outcome variables were standardized and converted to T-scores (M = 50, SD = 10) based on Ms and SDs calculated using the total ALSA sample at baseline as the reference. Stata 11.2 (xtmixed; Rabe-Hesketh & Skrondal, 2008) was used for fitting growth models. Cox proportional hazard models (Cox, 1972) were used to assess associations of purpose in life with hazard of death (controlling for age, sex, and education)

over a period of 20 years. Time to event was calculated as time in years from wave 3 (when sense of purpose was assessed) to time of death (ALSA death data were obtained at December 2013). Models were fit in Stata 13.1, using the Breslow method to handle observed ties

Results

Associations of sense of purpose with aging well

Results of multilevel models used to examine associations of individual differences in sense of purpose with levels, and rates of change in aging well outcomes (with adjustment for baseline age, sex and education) are shown in Tables 3 and 4. Results for the models that included disability and the cognitive measures as outcomes are presented in Table 3. Sense of purpose was reliably associated with the intercept in each model. Individuals with higher sense of purpose on average reported lower levels of disability, and showed better performance on tests of speed and memory relative to those with lower sense of purpose. Purpose was not associated with rates of change in disability or memory over time. However, purpose was reliably associated with the linear slope for speed, with a positive association indicating that participants with higher purpose showed marginally slower rates of decline over the study interval. Figure 1 shows predicted trajectories of change in functional disability (panel a), memory (panel b), and speed of processing (panel c) for individuals scoring high (+1 *SD*) and low (-1 *SD*) on sense of purpose.

Results for the models used to assess associations of purpose with self-rated health and depressive symptoms are shown in Table 4. Once again, purpose was reliably associated with the intercept in each model. Participants with higher purpose scores reported better self-rated health and fewer depressive symptoms relative to those with lower purpose scores. Sense of purpose was not associated with rates of change in self-rated health or depressive symptoms (Figure 2). To quantify the unique contribution of sense of purpose in accounting

for variance in levels of the aging well outcomes, we calculated the proportion reduction of unexplained variance in the intercept, comparing models that included only time and the covariates, with the final models (Tables 3 and 4) that also included sense of purpose see (Gerstorf et al., 2013). Results indicated that including purpose in the models reduced unexplained variance in the intercept by 3.4% for functional disability; 2.5% for speed; 4.0% for memory; 7.0% for self-rated health; and 13.8% for depressive symptoms.

Among the covariates, older age was associated with higher disability and a steeper rate of increase in disability over time, as well as poorer initial performance, and steeper rates of decline in performance on the cognitive tests. Older participants also reported more depressive symptoms. Females reported more disability, and showed better memory performance, and higher levels of depressive symptoms. Higher level of education was related to better levels of performance on the cognitive tests, and lower levels of depressive symptoms. Those with more education also rated their health as better, but showed steeper declines in self-rated health over time.

Associations of sense of purpose with mortality

During the 20-year period subsequent to Wave 3 (when purpose was assessed), 1234 participants died (84%). The mean time to death was 8.0 years (*SD* = 5.0). Purpose in life was reliably associated with delayed mortality; the hazard of death was 4% lower for each 1-unit increase on the purpose in life scale after adjustment for the covariates (Sense of purpose HR = 0.96, 95% CI = 0.94, 0.97). Older baseline age was associated with increased risk of death (HR = 1.11, 95% CI = 1.10, 1.12), and female sex reduced risk of death (HR = 0.69, 95% CI = 0.62, 0.78). Education was not associated with mortality. Tests of assumptions (Singer & Willett, 2003) revealed that hazards were somewhat non-proportional over time, with a stronger association of purpose with mortality evident in the first few years after Wave 3. For example, over the first 5 years the hazard of death was 7% lower for each 1-unit increase in

purpose in life after adjustment for the covariates (HR = .93, 95% CI = 0.91, 0.96). Hazard ratios gradually decreased with an increased length of follow-up (e.g., adjusted HR over 10 years = .946, 95% CI = 0.927, 0.965; adjusted HR over 15 years = .950, 95% CI = 0.934, 0.967).

Additional analyses

The total ALSA sample included a subset of co-residents (mostly spouses) who were invited to participate in the study in addition to the randomly selected primary respondents (see (Luszcz et al., in press). Among the subset of 1475 ALSA participants included in the current analysis, 462 (31.3%) were co-residents of primary respondents. To determine whether the non-independence among a subset of participants influenced our results, we re-ran the final models reported in Tables 3 and 4 including just the 1013 primary respondents. The pattern of associations involving sense of purpose for the growth, and survival analyses was generally consistent with the results reported for the larger sample, with the exception of the association between purpose and rates of change in processing speed which was reduced in magnitude (Estimate = 0.005, *SE* = 0.010) and no longer statistically reliable in the smaller primary respondent subsample.

Discussion

Our aim was to examine associations of a sense of purpose with a broad range of aging well outcomes. Using 18 year longitudinal data from 1475 participants in the ALSA, we examined associations of sense of purpose with levels, and rates of change in functional disability, cognition (speed and episodic memory), self-rated health, and depressive symptoms. Our results showed consistent associations of purpose with more positive outcomes, adjusting for baseline age, sex, and education. Individuals who scored higher on sense of purpose reported lower functional disability, better self-rated health, and fewer depressive symptoms relative to those who scored lower on purpose. Those with higher

purpose scores also performed better on cognitive tests. Survival analysis indicated that a higher sense of purpose was associated with delayed mortality, although the strength of association diminished over time. Whereas our findings provided consistent evidence for cross-sectional associations, there was little evidence for sense of purpose being associated with differential rates of change (slopes) in the aging well outcomes. Among the five outcomes assessed, purpose was only reliably associated with rates of change in speed, with higher purpose related to marginally shallower rates of decline in speed of processing over time. However, this association was not statistically reliable among the subsample of primary ALSA participants. Taken together, our results provide consistent evidence that older adults with a higher sense of purpose show better health, and cognition. At the same time, a high sense of purpose may not be sufficient to buffer against the normative aging-related losses in health and cognition that become more pervasive among the oldest-old (e.g., Baltes & Smith, 2003; Gerstorf et al., 2013).

Our findings showing more favorable outcomes among those with a higher sense of purpose are consistent with previous studies that have shown associations of purpose with better health, well-being, and longevity. The findings also align with theoretical perspectives that outline how purposeful living is thought to promote health and well-being by providing a coherent basis for the selection of goals, and by guiding the effective management of the resources needed for goal attainment (McKnight & Kashdan, 2009). Having a greater sense of meaning and value attached to one's daily activities is likely to result in a greater desire to preserve one's capacity for engagement in those activities. Thus, engaging in positive health behaviors could be one means by which those with a high sense of purpose endeavor to preserve and prolong an existence that they see as meaningful (Ryff & Singer, 1998). Conversely, those with a low sense of purpose may see less value in pursuing positive, or avoiding risky health behaviors (Park, 2007). A small number of studies have reported

evidence suggesting that associations of purpose with health could operate indirectly via health behaviors such as physical activity engagement (Holahan et al., 2008; Holahan et al., 2011). Further research is needed to determine whether this is the primary mechanism through which a sense of purpose contributes to positive health outcomes, or whether other processes (e.g., stress buffering; see Krause, 2009) also play a role.

Our findings revealed stronger associations of sense of purpose with levels of self-rated health and depressive symptoms, relative to associations with levels of functional disability and the cognitive measures. This could reflect the extent to which self-perceptions of health and affective well-being are relatively more subject to the influence of self-regulatory processes than the performance-based cognitive measures, and the relatively objectively defined activity restrictions that comprised our functional disability measure. One of the ways in which older adults preserve well-being is through flexible processes of goal adjustment and expectation management. This allows older adults to maintain positive self-evaluations in spite of aging-related losses (Brandtstäder, 1999). Given that purposeful living is thought to be linked to the individual's capacity to flexibly and effectively manage their goals through changing life contexts, it is possible that the stronger links between purpose and self-evaluative measures of aging well reflects the degree to which those with higher purpose tend to be more effective self-regulators. The further explication of theoretical and empirical links between a sense of purpose and self-regulatory perspectives on lifespan development represents a potentially fruitful area for future research.

In light of the theorized role of purpose in contributing to resilience to, and recovery from stress (McKnight & Kashdan, 2009), we expected that participants with higher purpose would show slower rates of decline in aging well. However, as discussed above, purpose only buffered against decline in speed, and the association was small. There are a number of possible explanations for the absence of compelling evidence for purpose buffering against

late life declines. First, the potential for purpose to act as a buffer against aging-related losses might become reduced in late life in the context of the more pervasive biological and psychosocial declines that characterize the fourth age (Baltes & Smith, 2003; Gerstorf et al., 2013). This is pertinent to the ALSA sample, the majority of whom died over the 18 year follow-up interval. Considered in the context of our more robust findings concerning levels, this interpretation would support the notion of purposeful living contributing to cumulative advantages for health and well-being throughout younger and middle-adulthood, with these advantages being maintained into late life, but not extending to the differential preservation (e.g., Salthouse, 2006) of health, cognition, and well-being in very old adulthood.

Second, (and consistent with most previous studies) sense of purpose was assessed at a single time point in the ALSA. As a result, our approach to analysis is based on the assumption that purpose is a relatively stable, trait-like characteristic. To date, there is limited evidence regarding the extent to which purpose is likely to be subject to either short-term fluctuations (i.e., intra-individual variability), and/or longer-term developmental changes. Cross-sectional research points to sense of purpose being lower among older relative to younger cohorts (Pinquart, 2002; also see Table 2), and some recent longitudinal evidence has shown small but statistically reliable declines in purpose over time among older adults (Hedberg, Brulin, Aléx, & Gustafson, 2011; Springer, Pudrovska, & Hauser, 2011; for exception see Pearson et al., 2013). If sense of purpose shows an appreciable degree of within-person variability in the population, it is plausible that associations of purpose in life with aging well outcomes are dynamic and bi-directional, and as such were not captured by our time-invariant measure of purpose. Longitudinal studies that assess purpose in life at repeated assessments are needed to establish the extent to which purpose changes with aging, and the extent to which changes in purpose are coupled with, or responsive to changes in aspects of health and well-being. Finally, the absence of consistent associations between

sense of purpose and rates of change in aging well could be a result of limitations to statistical power. Simulation studies have shown that measurement error can substantially reduce the reliability of slope estimates in growth models (Hertzog, von Oertzen, Ghisletta, & Lindenberger, 2008) and this may have been pertinent to our analysis despite our large sample size.

Limitations and conclusion

The present study featured several strengths, including a large sample of older adults followed over 18 years, and measures representing multiple domains of aging well. However, it is important to consider our findings in the context of a number of limitations. As is typically the case in longitudinal studies of aging, a substantial proportion of participants were lost to follow-up (primarily as a result of mortality in the ALSA). As a result, the participants who contributed data at more assessments are likely to have been higher functioning. Although missing data were accounted for in our statistical models, differential attrition may have resulted in underestimates of rates of decline across the aging well measures (Gerstorf, Hoppmann, Anstey, & Luszcz, 2009). Our study was primarily descriptive in nature, with associations of purpose with aging well considered with adjustment for socio-demographic characteristics. Future studies could shed light on the potentially unique self-regulatory role of sense of purpose by establishing whether it predicts late life health and well-being independently of other conceptually related psychological constructs such as optimism and positive affect.

As discussed above, sense of purpose was assessed once in the ALSA (at Wave 3) which meant that we were unable to examine change in purpose, or consider issues of reverse causality. The extent to which aging-related losses and role transitions (such a retirement) undermine a sense of purpose, and the extent to which any such losses in purpose can be reversed by adopting new roles in later life remain open questions. Future studies might

benefit from using intensive longitudinal designs to assess short-term variability of purpose, and the extent to which fluctuations co-occur with daily experiences around goal progress (e.g., Hooker, Choun, Mejía, Pham, & Metoyer, 2013; Hooker, Hoppmann, & Siegler, 2010). Finally, given time constraints in the context of the larger ALSA protocol, our measure of purpose was based on a smaller 3-item version of Ryff's (1989) scale. Several studies have used shorter versions of Ryff's original scale (Boyle et al., 2009; MIDUS, 2004), and the items selected for ALSA (see *method*) align closely with conceptual definitions of purpose outlined in the literature (McKnight & Kashdan, 2009). However, use of more items may have enhanced scale reliability (Graham, 2006), which was relatively low. There is currently a lack of consensus regarding optimal measures for the assessment of purpose (e.g., Scheier et al., 2006), and some controversy exists regarding the psychometric properties of Ryff's scales (Ryff & Singer, 2006; Springer & Hauser, 2006). Better establishing the reliability and validity of measures used to assess sense of purpose should remain a focus for researchers in the area.

To conclude, our findings indicated that older adults with a higher sense of purpose showed higher levels of functioning across a range of aging well measures, and greater longevity relative to those with a lower sense of purpose. The apparent advantages associated with higher purpose persisted over time, with purpose generally unrelated to rates of longitudinal change in the indices of aging well. Future studies might clarify whether the lack of associations between purpose and rates of change in aging well indices reflects the stress buffering role of purpose becoming diminished in late life in the context of pervasive biological decline (e.g., House et al., 1994), or the extent to which sense of purpose is dynamic, and changes in response to developmental gains and losses. Taken together, our findings support the role of purposeful living in contributing to health and well-being in older

adulthood. Better establishing the extent to which purpose promotes resilience to aging-related losses remains a task for future research.

Text word count: 6754

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Table 1. Descriptive statistics for 1475 ALSA participants who provided data on sense of purpose at Wave 3

	Wave 1 (1992)		Wave 3 (1994)		Wave 6 (2000)		Wave 7 (2003)		Wave 9 (2008)		Wave 11 (2010)	
Variable	*M/%*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Sense of purpose			12.03	3.50								
Age	77.06	6.27										
Female (%)	50.0											
Left school aged 15+ (%)	45.4											
Functional disability	2.33	2.02	2.73	2.13	3.16	2.34	3.41	2.24	3.62	2.11	4.21	2.01
Self-rated health	3.21	1.05	3.06	1.05	3.15	1.03	2.86	0.93	3.10	0.91	2.82	0.95
Depressive symptoms	7.64	6.94	8.13	7.17	8.92	6.56	8.41	7.47	9.87	7.14	11.01	8.26
Speed	30.39	10.78	30.07	11.11	29.88	10.41	28.19	10.65	28.88	9.60	28.49	9.75
Episodic memory	5.69	2.35	5.20	2.42	5.37	2.59	4.96	2.64	5.25	2.48	4.93	2.50

Note. Ranges: Sense of purpose (3-18); Age (65-103); Functional disability (0-7); Self-rated health (1-5); Depressive symptoms (0-48); Speed (0-72); Episodic memory (0-14).

Table 2. Intercorrelations among study variables

Variable	1	2	3	4	5	6	7	8	9
1. Sense of purpose	-								
2. Age	-.23*	-							
3. Female	.05	-.16*	-						
4. Left school aged 15+	.10*	-.03	.07	-					
5. Functional disability	-.23*	.32*	.15*	-.04	-				
6. Self-rated health	.26*	-.12*	.03	.08*	-.49**	-			
7. Depressive symptoms	-.37*	.17*	.08*	-.08*	.48**	-.47*	-		
8. Speed	.24*	-.50*	.13*	.19*	-.26*	.22*	-.21*	-	
9. Memory	.21*	-.38*	.16*	.10*	-.17*	.14*	-.14*	.51*	

Note. Correlations include Wave 3 measures (contemporaneous with assessment of sense of purpose) with the exception of age, sex, and age left school, which were assessed at Wave 1.

*$p < .01$.

Table 3. Associations of sense of purpose with levels, and rates of change in functional disability, speed, and memory

	Functional disability			Speed			Memory		
	Intercept	Linear slope	Quadratic slope	Intercept	Linear slope	Quadratic slope	Intercept	Linear slope	Quadratic slope
	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)
Fixed effects	46.953*	0.771*	0.007	49.178*	-0.524*	-0.015*	48.588*	-0.558*	-0.007
	(0.359)	(0.081)	(0.006)	(0.388)	(0.077)	(0.004)	(0.392)	(0.097)	(0.006)
Sense of purpose	-0.401*	-0.000		0.358*	0.017*		0.382*	0.016	
	(0.063)	(0.008)		(0.069)	(0.008)		(0.069)	(0.010)	
Covariates									
Age at Time 1	0.401*	0.063*	-0.002*	-0.644*	-0.039*		-0.442*	-0.027*	
	(0.036)	(0.012)	(0.001)	(0.040)	(0.006)		(0.040)	(0.007)	
Female sex	4.823*	-0.085		0.238	0.020		1.993*	-0.048	
	(0.435)	(0.057)		(0.466)	(0.056)		(0.468)	(0.069)	
Age left school (15 or older)	-0.972*	-0.003		3.293*	-0.028		1.266*	0.082	
	(0.433)	(0.055)		(0.461)	(0.053)		(0.464)	(0.067)	

Random effects			
Intercept	46.943*	52.061*	35.977*
	(2.701)	(2.974)	(3.300)
Linear slope	0.885*	0.770*	0.493*
	(0.217)	(0.180)	(0.326)
Quadratic slope	0.002*	0.001*	0.002*
	(0.001)	(0.001)	(0.001)
Intercept & linear slope cov.	0.284	-1.806*	1.568
	(0.618)	(0.597)	(0.855)
Intercept & quadratic slope cov.	-0.097*	0.052	-0.096
	(0.041)	(0.035)	(0.056)
Linear slope & quadratic slope cov.	-0.037*	-0.030*	-0.025
	(0.013)	(0.010)	(0.020)
Residual	30.175*	21.710*	42.999*
	(1.037)	(0.907)	(1.738)

Note. Est. = Unstandardized estimate; cov. = covariance; significance of random effects is based on 95% C.I.s; *$p < .05$.

Table 4. Associations of sense of purpose with levels, and rates of change in self-rated health and depressive symptoms

	Self-rated health			Depressive symptoms	
	Intercept	Linear slope	Quadratic slope	Intercept	Linear slope
	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)	Est. (SE)
Fixed effects	50.506*	-0.450*	0.010*	48.464*	0.439*
	(0.3670)	(0.079)	(0.005)	(0.346)	(0.054)
Sense of purpose	0.547*	-0.011		-0.741*	-0.002*
	(0.064)	(0.008)		(0.061)	(0.009)
Covariates					
Age at Time 1	-0.054	-0.004		0.121*	0.005
	(0.036)	(0.006)		(0.035)	(0.006)
Female sex	-0.200	0.080		2.102*	-0.110
	(0.443)	(0.054)		(0.421)	(0.060)
Age left school (15 or older)	1.570*	-0.146*		-1.027*	0.021
	(0.441)	(0.052)		(0.419)	(0.058)
Random effects					

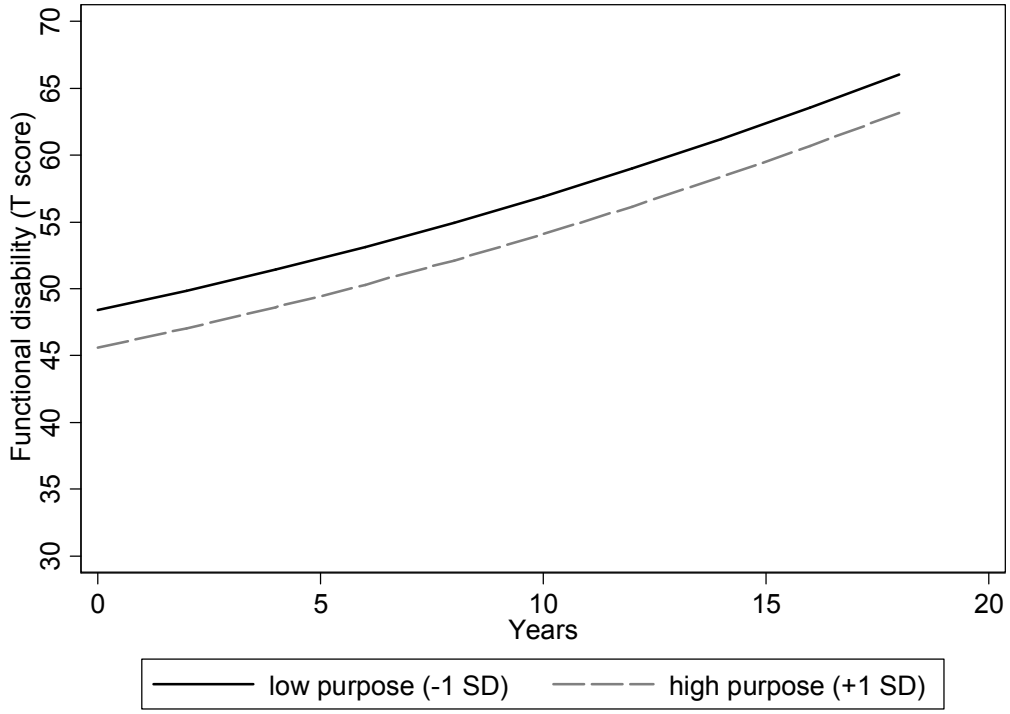
Intercept	44.584*	39.466*
	(2.952)	(2.455)
Linear slope	0.482*	0.145*
	(0.254)	(0.033)
Quadratic slope	0.002*	
	(0.001)	
Intercept & linear slope cov.	-0.400	-0.255
	(0.720)	(0.273)
Intercept & quadratic slope cov.	-0.048	
	(0.046)	
Linear slope & quadratic slope cov.	-0.026	
	(0.016)	
Residual	40.661*	40.060*
	(1.375)	(1.204)

Note. Est. = Unstandardized estimate; cov. = covariance; significance of random effects is based on 95% C.I.s; *$p < .05$.

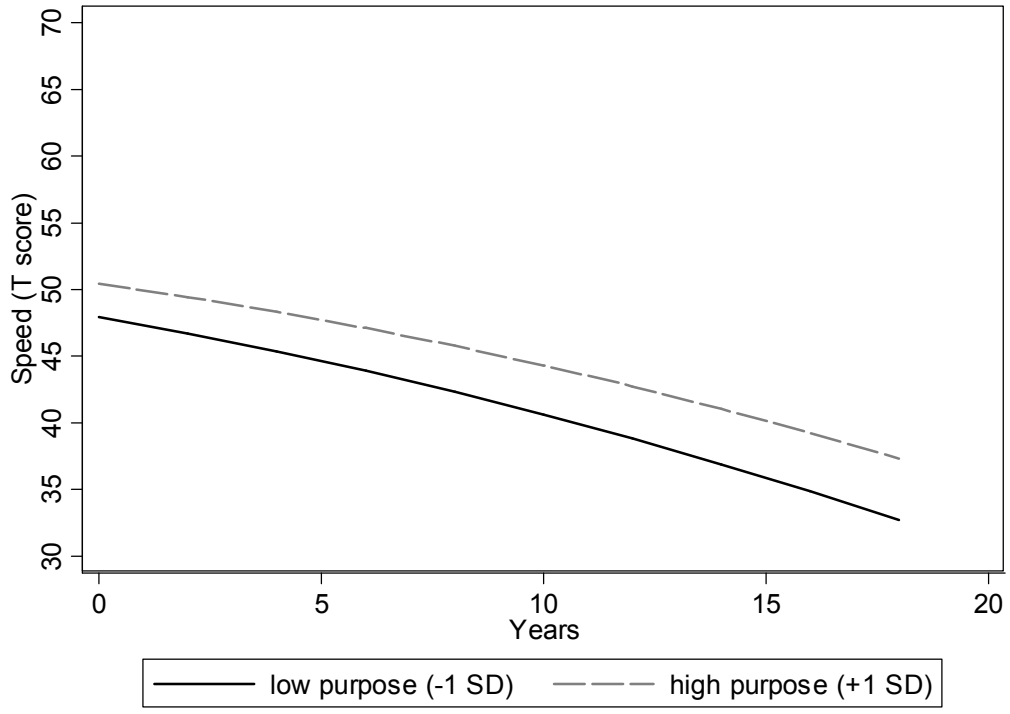
Figure Caption

Figure 1. Average trajectories of change in (a) functional disability, (b) processing speed, and (c) episodic memory over time in study for participants with low (-1 *SD*, solid black lines) and high (+1 *SD*, dashed grey lines) sense of purpose. Individuals scoring higher on sense of purpose showed more positive outcomes on each measure relative to those scoring lower on sense of purpose. Sense of purpose was not reliably associated with rates of change with the exception of processing speed, where those scoring higher on purpose showed shallower rates of decline over time.

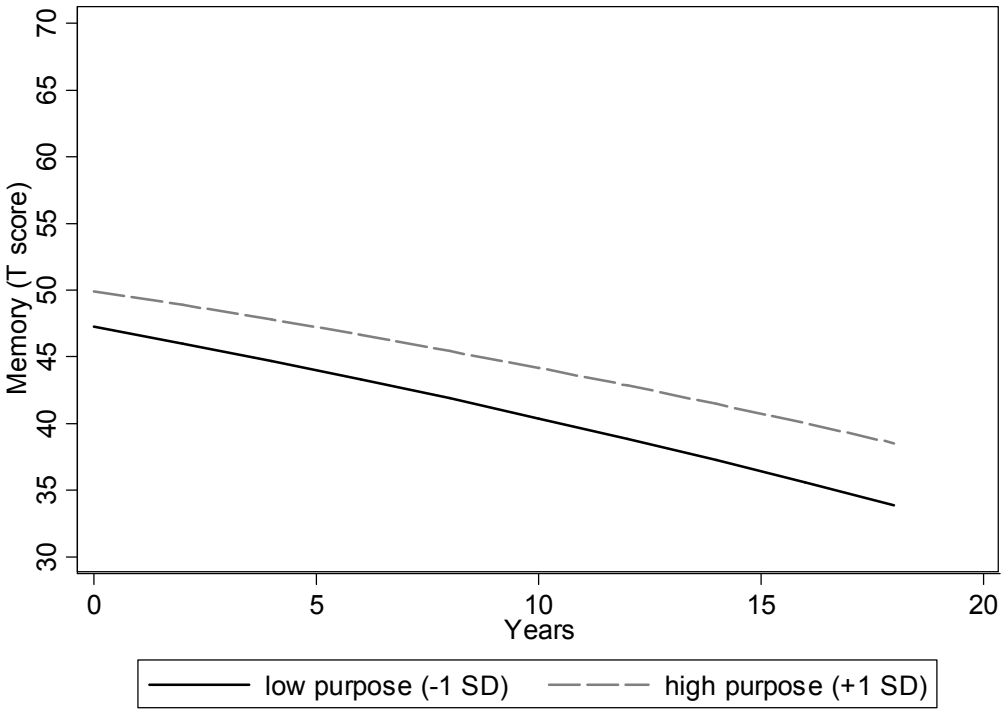
Figure 2. Average trajectories of change in (a) self-rated health and (b) depressive symptoms over time in study for participants with low (-1 *SD*, solid black lines) and high (+1 *SD*, dashed grey lines) sense of purpose. Individuals scoring higher on sense of purpose showed more positive outcomes on each measure relative to those scoring lower on sense of purpose. Sense of purpose was not reliably associated with rates of change.


Functional disability (T score)
30
35
40
45
50
55
60
65
70
0
5
10
15
20
Years
low purpose (-1 SD)
high purpose (+1 SD)

(a)

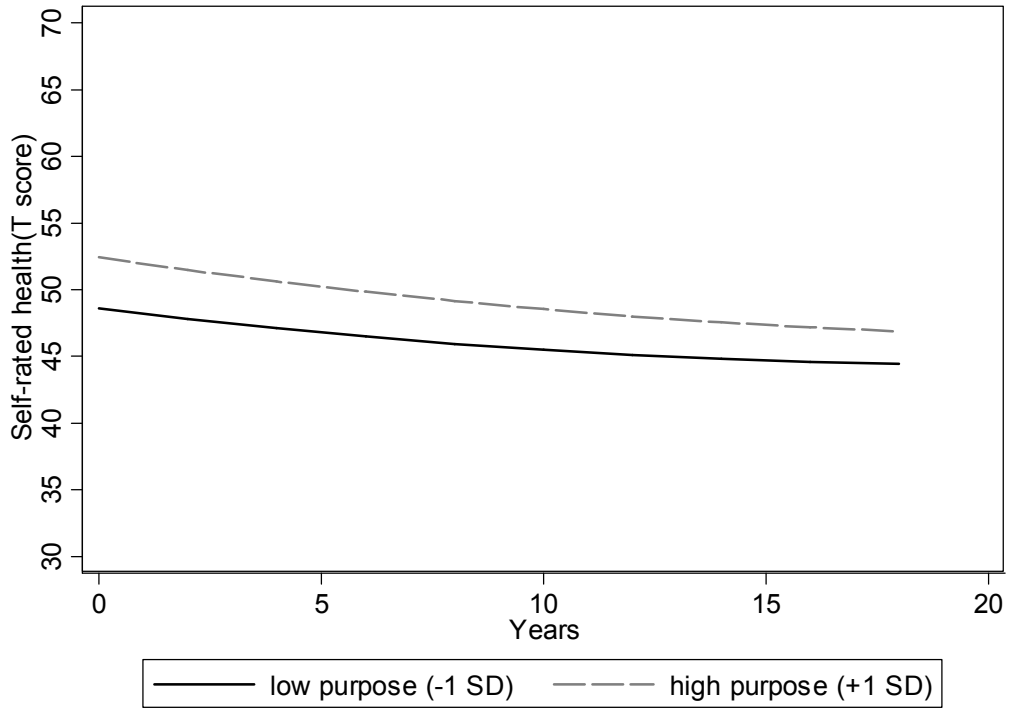

Speed (T score)
30
35
40
45
50
55
60
65
70
0
5
10
15
20
Years
low purpose (-1 SD)
high purpose (+1 SD)

(b)

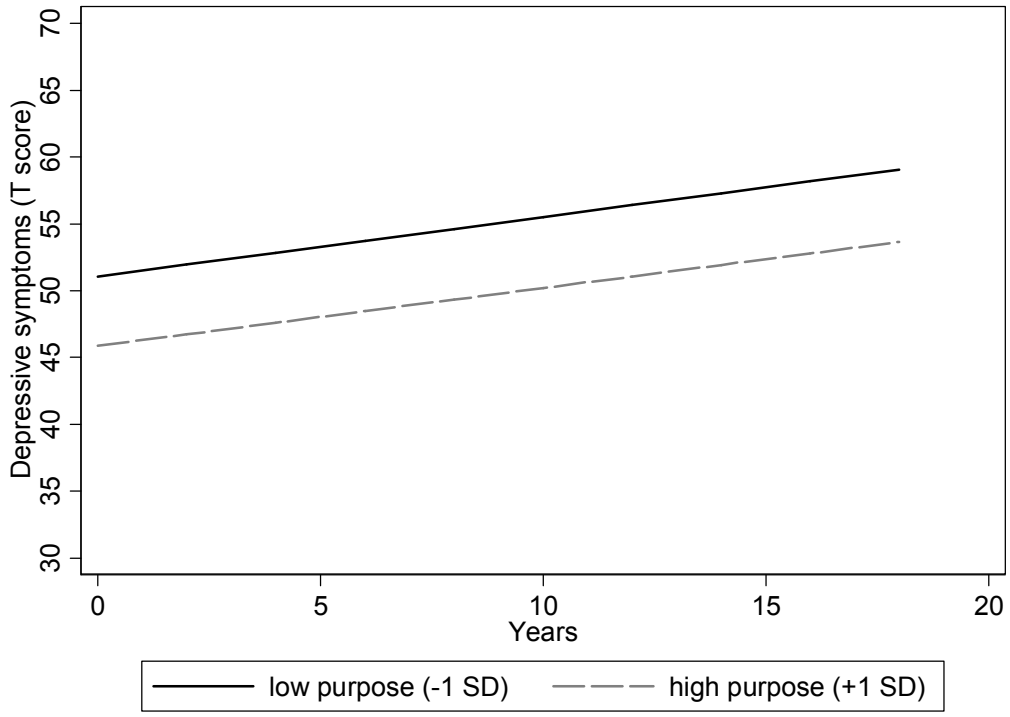

Memory (T score)
30
35
40
45
50
55
60
65
70
0
5
10
15
20
Years
low purpose (-1 SD)
high purpose (+1 SD)

(c)

(Figure 2)


Self-rated health(T score)
30
35
40
45
50
55
60
65
70
0
5
10
15
20
Years
low purpose (-1 SD)
high purpose (+1 SD)

(a)


Depressive symptoms (T score)
30
35
40
45
50
55
60
65
70
0
5
10
15
20
Years
low purpose (-1 SD)
high purpose (+1 SD)

(b)