HHS Public Access
Author manuscript
Motiv Sci. Author manuscript; available in PMC 2019 March 01.

Published in final edited form as:
Motiv Sci. 2018 March ; 4(1): 26–38. doi:10.1037/mot0000061.

Linkages between Resources, Motivation, and Engagement in Everyday Activities

Tara L. Queen and
School of Medicine, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, 200 N Greensboro St, Carrboro, NC 27510

Thomas M. Hess
Department of Psychology, North Carolina State University

Abstract

The goal of this research was to examine the linkage between personal resources, intrinsic motivation, and participation in everyday activities. It was hypothesized the reductions in resources in later life will be associated with reduced motivation to engage in cognitively demanding activities, leading to reduction in participation in such activities in everyday life. To test this, we utilized data from the 2010 and 2012 waves of the Health and Retirement Survey. We used structural equation modeling to construct latent factors associated with health resources, cognitive resources, and intrinsic motivation. Cognitive and health resources were positively associated with intrinsic motivation, which in turn partially mediated the association between these resources and engagement in cognitively demanding everyday activities. Some variation in the fit of the model was observed across sexes, and the predictive power of the model was somewhat attenuated in the oldest old (ages 81+). The results support expectations derived from Selective Engagement Theory (Hess, 2014), which argues that increases in the costs associated with cognitive activity in later life negatively affects the motivation to engage in these potentially beneficial activities.

Keywords

Activity; Aging; Motivation; Cognition; Selective Engagement

Cognitive engagement has been shown to be beneficial to cognitive health in later life. Specifically, high levels of engagement have been associated with maintenance of functioning, delay of decline, and decreased prevalence of dementia (Hertzog, Kramer, Wilson, & Lindenberger, 2008). In spite of these positive effects, there is also evidence of age-related decline in engagement in potentially beneficial activities in later life (e.g., Buchman et al., 2014). Some of this may be related to transitions from active work and family life into retirement, or to increased physical limitations that may restrict activity. However, declines are not specific to these realms, and there is much individual variability in engagement levels. Thus, an important question concerns what factors determine decline and the variability in participation rates across activity types. Stated another way, what factors determine the motivation to participate in activities that may bolster cognitive health in old age?

Selective engagement theory (SET; Hess, 2014) offers one perspective on this issue. This theory argues that aging-related changes in the costs associated with engaging in cognitive activity have motivational consequences. These are manifested in general reductions in intrinsic motivation and greater situational selectivity as these costs—manifested in the effort associated with engagement and subsequent consequences (e.g., fatigue)—increase with age. For example, Ennis, Hess, and Smith (2013) found that effort expenditure was significantly higher in older than in younger adults at all levels of objective difficulty in a cognitive task, and that older adults began withdrawing effort (i.e., disengaging) at a lower level of difficulty. The implication is that the greater effort required to perform the task resulted in reductions in motivation to continue. This theory suggests that, in addition to the impact of objective aspects of costs (e.g., effort requirements), subjective interpretations of costs may also influence engagement. Consistent with this idea, subjective interpretations of task demands contribute to engagement patterns in older adults above and beyond objective task difficulty. That is, older adults who perceive a task as more difficult are (a) more likely to disengage than those who perceive it as less so or (b) exert more effort than is necessary, thereby increasing the costs of engagement. Importantly, this effect appears stronger for older than for younger adults (Hess, Smith, & Sharifian, 2016). Such perceptions may be tied to aging-related beliefs. For example, negative attitudes about aging may affect the interpretation of costs (e.g., attributions of fatigue to uncontrollable aspects of aging) and perceptions of control, resulting in an inflated impact of age-related changes in costs on motivation.

Within SET, costs are broadly defined as anything that increases the difficulty of cognitive engagement. Thus, it would be expected that changes in factors either underlying the shift in costs or that are direct reflections of costs—which collectively we refer to as resources—would predict the motivation to engage in cognitively demanding behaviors which, in turn, would predict participation in demanding activities. Resources might include physical resources (e.g., health-related factors) as well as basic cognitive abilities, among other things. For example, age-related increases in the amount of effort necessary to perform a task and the resultant fatigue likely reflect changes in underlying physiological systems that reflect both age-related processes as well as individual differences in health. With respect to motivation, measures that tap into approach or avoidance of complex cognitive activity may be most fruitful in identifying the hypothesized relations. These might include constructs such as: (a) need for cognition, which has been characterized as an intrinsic motivational variable reflecting the degree of enjoyment associated with engaging in complex cognitive activity (for review, see Cacioppo, Petty, Feinstein, & Jarvis, 1996); or (b) personal need for structure, which measures the motivation to cognitively structure one's world in a simple and unambiguous manner, suggesting low motivation for engagement in complex thought (Neuberg & Newsom, 1993).

Some evidence exists for the hypothesized relationships. For example, increasing age in later adulthood is associated with reduced participation in cognitively demanding activities, with evidence that this age effect is strongest for discretionary activities (e.g., intellectual-cultural and social activities; M.M. Baltes & Lang, 1997; Joop & Hertzog, 2007; Lang, Rieckmann, & Baltes, 2002; Mitchell et al., 2012; Salthouse, Berish, & Miles, 2002). In addition, older adults with greater cognitive resources are more likely to participate in cognitively demanding activities in everyday life (e.g., Hultsch, Hertzog, Small, & Dixon, 1999; Lang et al., 2002; Schooler & Mulatu, 2001), and older adults in general are less likely to engage in activities rated high in cognitive demands (e.g., Rousseau, Pushkar, & Reis, 2005; Salthouse et al., 2002). To the extent that ability and ratings of difficulty reflect the costs of cognitive engagement, these findings are consistent with SET; that is, age-related declines in cognitive resources are associated with increasing selectivity in activity participation.

Unfortunately, there is little research examining the role of motivation in mediating the relationship between age-related changes in resources and activity. In one study (Hess, 2001), personal need for structure was found to mediate the relationship between age differences in health and cognitive resources and engagement in everyday abilities. Later longitudinal research (Hess, Emery, & Neupert, 2012) identified a similar relationship with motivation—assessed using a composite of need for cognition and personal need for structure—partially mediating the relationship between resources (e.g., cognitive ability, sensory functions) and activity participation. In addition, consistent with SET, this relationship increased with increasing age. Whereas these studies are supportive of the hypothesized meditational relation, at least two important issues exist. First, the assessment of everyday activity participation was limited to a few self-report items. Second, the samples were archival convenience samples, potentially limiting generalizability. The present study explicitly addresses these two concerns.

The goal of the present research was to examine the role that motivation plays in mediating the relationship between resources associated with cognitive costs and participation in cognitively demanding everyday activities in a large, nationally representative sample. Using data from the 2010 and 2012 waves of the Health and Retirement Survey (HRS), we assessed resources in terms of (a) health and physical limitations and (b) cognitive ability, with multiple indicators within each category. Motivation was assessed using need for cognition and openness to experience. Although the latter measure is typically used to assess personality, it shares many of the same characteristics as need for cognition, such as intellectual curiosity. In addition, previous studies have found moderate correlations between these two measures (e.g., von Stumm, 2013). Finally, we used multiple indices of activity across five different domains. Activity levels in four of these domains have been shown to be positively correlated with cognitive ability (Jopp & Hertzog, 2007), whereas activity in the fifth—reflecting passive participation—was not. We infer that the association with ability reflects the degree to which activities within each domain place demands on cognitive resources.

We hypothesized that resources would be positively associated with both motivation and participation in cognitively demanding activities, but not with passive participation. We further expected that motivation would exhibit similar associations with activity. Finally, as a test of our main hypothesis, we predicted that motivation would partially mediate the association between resources and activity. We also examined whether the strength of these associations would vary with age. Since the low end of the distribution in this study was around 50 years of age, we did not anticipate the same pattern of moderated mediation identified by Hess et al. (2012), whose sample ranged in age from 20 to 85. However, the HRS sample included a large group of individuals aged from 81 to 101, thus allowing us to test motivation-based mediation relationships at the upper reaches of the lifespan. This time of life is often referred to as the fourth age (e.g., Baltes & Smith, 2003), representing a period when the negative effects of biological aging are more pervasive across individuals, with the potential for a more global, negative impact on functioning. We examined this possibility by comparing these individuals (i.e., old-old adults) with middle-aged and young-old adults, with the expectation that the hypothesized resource-motivation-activity relationship would be stronger in the two younger groups.

Method

Participants

The HRS is a longitudinal panel study representative of adults aged 50 and older in the US. The data for the present study were drawn from two components of the HRS. The core survey is administered every two years by phone and includes assessments of health and cognitive functioning. The leave-behind questionnaire is a self-administered mail survey assessing a variety of psychosocial factors, including motivation and engagement. This component is administered to 50% of the core sample at each wave. Thus, to maximize the sample of respondents who completed the leave-behind questionnaire, we combined two waves of data collection from 2010 and 2012. These two waves were selected given that the Need for Cognition measure was included for the first time for each subsample at these points.[1] The 2010 and 2012 waves were separate samples (i.e., each respondent contributed only one data point).

We excluded respondents who were under the age of 50. In order to minimize the possibility of inclusion of individuals with severe health issues or cognitive impairment, we also excluded those who answered the survey by proxy. The total eligible sample size was 14,460 (*M* Age = 67.45; range 50-101), with 59.1% female, 60% married, 22.5% non-white, and a mean of 12.88 years of education (SD = 2.99). For later analyses, we divided the sample into three age groups: middle-aged (ages 50 – 65; *N* = 6721), young-old (ages 66 – 80; *N* = 5897), and old-old (ages 81 – 101; *N* = 1842).

Measures

Mean scores for all variables are presented in Table 1.

Health—Health status was measured with three indicators. First, we included self-rated health ("Would you say your health is excellent, very good, good, fair, or poor?"). Higher scores indicated better health. Second, we created a sum of current chronic illnesses. Respondents are asked whether they have been diagnosed with any of eight illnesses (high blood pressure, diabetes, cancer, lung disease, heart condition, stroke, psychiatric problems, or arthritis). Presence of illness was coded as 1 and absence as 0. A sum across the eight

[1]A second assessment of Need for Cognition for both subsamples was not yet available when we conducted our analyses, and thus the present focus is on cross-sectional data.

items was computed. Last, we included an assessment of functional limitations. Respondents were asked if they had difficulty with each of 23 different activities because of a health problem. These activities ranged from running or jogging a mile, walking one block, and climbing one flight of stairs, to picking up a dime, shopping for groceries, dressing, and bathing. We computed a sum of functional limitations (max = 23; Fonda & Herzog, 2004). Both sum of chronic illnesses and functional limitations were reverse scored for ease of interpretability of the health latent factor (i.e., higher scores indicated better health).

Cognition—To measure cognitive functioning, we included three assessments of fluid cognitive ability. In the Serial 7s task, respondents are asked first to subtract 7 from 100. They are then asked to subtract 7 from the next four consecutive responses. Each correct response is scored as 1 and each incorrect response as 0. Response scores are summed with higher values indicating better performance (max = 5). Verbal fluency was measured by asking respondents to name as many animals as possible without repeating any within 60 seconds. Each unique item was counted for a total count score. In the immediate recall task, interviewers read a list of 10 unrelated words. Respondents were immediately asked to recall as many of the 10 words as possible. They were asked to recall these words again later in the interview. A total recall score was created by summing the correctly recalled immediate and delayed items.

Motivation—Three indicators of intrinsic motivation were assessed in the psychosocial leave-behind questionnaire (Smith et al, 2013). Two aspects of need for cognition (NFC) were measured using three items assessing the extent to which respondents enjoyed cognitive tasks (e.g., “I really enjoy tasks that involve coming up with new solutions to problems”; 1 [not at all like me] – 5 [very much like me]; $\alpha = .79$) and three items assessing cognitive effort (e.g., “I only think as hard as I have to.” $\alpha = .81$). Higher scores indicated higher need for cognition. Openness to new experiences, one of the Big 5 personality traits, was measured by asking respondents how well each of seven adjectives—broad-minded, creative, curious, imaginative, intelligent, sophisticated, adventurous—described them (1 [Not at all] - 4 [A lot]; Lachman & Weaver, 1997). An item average was computed ($\alpha = .80$).

Engagement—Activity participation and engagement were measured using a 19-item list[2] in which respondents reported how frequently they engaged in each activity (0 [Never], 1 [Not in the last month], 2 [At least once a month], 3 [Several times a month], 4 [Once a week], 5 [Several times a week], 6 [Daily]). Activities were categorized and a mean frequency of engagement score was computed. Activity categories were developed to be somewhat comparable to those included in the Victoria Longitudinal Study Activities Scale (VLSAQ; Jopp & Hertzog, 2010). When too few items from individual VLSAQ categories were present in the HRS data, we grouped items from different categories based on observed correlations between categories found in Joop and Hertzog. The social category included activities with grandchildren, volunteer work, charity work, and attending both social clubs and religious organizations. Physical activities included exercising/sports, walking, and

[2]A 20th item—caregiving for sick/disabled adult—was dropped given its focus on a very specific context that seemed inconsistent with the other items.

maintenance/gardening activities. Experiential activities included reading, baking/cooking, sewing/knitting, and hobbies. The developmental category included education activities, writing, using a computer, word games, and card and other games. Finally, the passive activity included watching TV and praying privately.

Analytic Strategy

We used structural equation modeling (SEM) to simultaneously examine the relationships between health and cognitive resources, intrinsic motivation, and activity engagement. In each model, average frequencies of engaging in social, physical, passive, experiential, and developmental activities were separate observed endogenous variables. Health, cognition, and motivation were latent factors and were composed of the individual indicators described above.

All models were conducted in Mplus v7.4 (Múthen & Múthen, 1998-2011). A measurement model constructed of the three latent variables was estimated and the fit examined. Because of the large sample size, we considered fit indices other than the chi-square test of model fit. The Root Mean Square Error of Approximation (RMSEA; 0.042, $p = 1.00$), Tucker Lewis Index (TLI; 0.961), Comparative Fit Index (CFI; .974), and Standardized Root Mean Square Residual (SRMR; 0.026) indices all suggested excellent model fit.

To ensure this model appropriately characterized the data within both the 2010 and 2012 waves used in our analyses, we examined the fit of the model within waves and then tested for invariance across waves. We found that the model was an excellent fit for both the 2010 data (RMSEA = .041, $p = 1.00$; TLI = .964; CFI = .976; SRMR = .025) and the 2012 data (RMSEA = .044, $p = .99$; TLI = .958; CFI = .972; SRMR = .028). In addition, we found evidence for both configural (RMSEA = .042, $p = 1.00$; TLI = .962; CFI = .974; SRMR = .026) and metric (RMSEA = .040, $p = 1.00$; TLI = .965; CFI = .973; SRMR = .028) invariance across waves. We also tested to see whether the model fit varied with age. To do this, we examined fit within age groups and invariance across ages. We found that the model provided a good fit for all three groups: (a) middle-aged—RMSEA = .049, $p = .65$; TLI = .950; CFI = .967; SRMR = .031; young-old—RMSEA = .040, $p = 1.00$; TLI = .962; CFI = .974; SRMR = .025; and (c) old-old—RMSEA = .045, $p = .81$; TLI = .926; CFI =.951; SRMR = .036. We also found evidence for both configural (RMSEA = .045, $p = .997$; TLI = .953; CFI = .965; SRMR = .030) and metric (RMSEA = .044, $p = 1.00$; TLI = .955; CFI = .965; SRMR = .034) invariance across age groups. Thus, the measurement model appears valid across sources of data relating to both time of test and age.

The goals of the study were addressed with two structural models. First, we examined the relationships between health and cognitive resources and motivation, and the potential mediational role of motivation between these resources and activity engagement. Second, we conducted multi-group comparisons to examine whether the relationships in this initial model differed for middle-aged, young-old, and old-old respondents. In all models, we used maximum likelihood estimation and requested 5000 bootstrap iterations.

Results

Motivation as a mediator

The goal of the first model was to examine whether better health and cognitive resources were related to higher intrinsic motivation and whether higher motivation was, in turn, associated with rates of participation in physical, social, intellectual, hobby, and passive activities. The latent factors of health and cognitive resources were exogenous variables in this model (Figure 1). We also controlled for the potential influence of participant characteristics on our latent constructs. Specifically, we included years of education, sex (0 = male, 1 = female), race (0 = nonwhite, 1 = white), and marital status (0 = not married, 1 = married) as covariates in this model. This resulted in a poorly fitting model: RMSEA = 0.062, $p < .001$; TLI = 0.840; CFI = .894; SRMR = 0.042. Further testing revealed that the poor fit was primarily due to the inclusion of sex, exclusion of which resulted in a more reasonable fit: RMSEA = 0.047, $p = .99$; TLI = 0.908; CFI = .940; SRMR = 0.031. As seen in Table 2, health and cognitive resources were positively associated with levels of intrinsic motivation (*ps* < .001), and all three latent factors were positively associated with frequency of engagement in social and experiential activities (*p*s < .001). Health and motivation were also positively associated with frequency of engagement in physical activities ($p < .001$), whereas cognitive resources and motivation were positively associated with engagement in developmental activities ($p < .001$). Notably, motivation and cognitive resources were not significantly associated with engagement in passive activities, and better health was associated with less passive activity engagement ($p < .001$).

Subsequent tests revealed the overall model was somewhat better fitting for women (RMSEA = 0.046, $p = 1.00$; TLI = 0.918; CFI = .941; SRMR = 0.030) than for men (RMSEA = 0.049, $p = .81$; TLI = 0.901; CFI = .935; SRMR = 0.032). To identify the source of the sex differences, as well as to test the extent to which motivation mediated the relationship between resources and activity, we next tested specific mediation effects using the Model Indirect command in Mplus. This allowed us to calculate the direct and indirect effects of each resource factor on each type of activity. As can be seen in Tables 3 (men) and 4 (women), these tests support the partial mediation—as reflected in significant indirect effects—suggested in the overall model for all activity categories except passive ones. Several differences between men and women were evident as well. For men, motivation partially mediated the effects of both health and cognitive resources on social and experiential activities; however, motivation mediated only the effect of health on physical activities and only the effect of cognitive resources on developmental activities. For women, partial or complete mediation (i.e., direct effect was not significant after accounting for the indirect effect) involving both health and cognitive resources were observed for all but passive activities. When the overall models were adjusted to eliminate nonsignificant pathways, the fit improved for both men (RMSEA = 0.047, $p = .97$; TLI = 0.907; CFI = .935; SRMR = 0.032) and women (RMSEA = 0.045, $p = 1.000$; TLI = 0.921; CFI = .946; SRMR = 0.030).

Multi-group comparisons

In our second set of analyses, we examined age differences in the observed mediation effects. To do so, we estimated a multi-group comparison model—using the relationships included in the original models above—to test for invariance of the structural model across age groups (e.g., middle-aged, young-old, and old-old). The fit for this model was poorer than that observed with the base models for both men (RMSEA = 0.056, $p < .001$; TLI = 0.868; CFI = .901; SRMR = 0.047) and women (RMSEA = 0.053, $p = .01$; TLI = 0.886; CFI = .916; SRMR = 0.045). To examine the source of age variation, we estimated a model in each age group identical to our initial model with covariates (i.e., it included all pathways between the latent constructs and each type of activity). The resulting standardized coefficients for each path by age group are presented in Tables 5 (men) and 6 (women).

Notably, there was some variation between men and women in the patterns of associations across age groups. In men, the most noticeable age difference involved the weakening of associations involving motivation in the old-old compared to the middle-aged and young-old participants. Specifically, the strength of the relationship between health and motivation was reduced, and only one of the direct pathways between motivation and activity (i.e., developmental activities) was significant. The differences between age groups in women were more subtle. For example, the link between health and motivation was somewhat weaker in the old-old. However, with the exception of the significant positive association between motivation and passive activities that was only observed in the middle-aged participants, the associations between motivation and activity observed in the two younger groups were preserved in the old-old.

Discussion

The goal of this study was to examine the relationships between health and cognitive resources, motivation, and activity engagement in a sample of adults aged from 50 to 101. Overall, our findings indicated good support for the selective engagement perspective (Hess, 2014). Across the full sample of middle-aged, young-old, and old-old adults, better health and more cognitive resources were associated with engagement in more demanding activities. The relationships between health, cognition, and activity engagement were partially mediated by intrinsic motivation, suggesting that motivational resources (such as need for cognition and being open to new experiences) are an important link between cognitive and health resources and engagement in activities that have been associated with successful aging. The results of this study expand upon previous cross-sectional and longitudinal findings (Hess, 2001; Hess et al., 2011), which suggested that intrinsic motivation mediates the relationship between health, cognitive ability, and everyday activities. The current study extends this work both by utilizing a more varied and comprehensive assessment of activity engagement and by using a large, representative sample of older adults.

Our main model in this study (across age groups) demonstrated that the linkage between resources, motivation, and frequency of activity engagement was strongest for those activities that are most cognitively (e.g., intellectual and social activities) and physically demanding. In contrast, our analyses indicated an absence of a resource-motivation linkage for passive activities that have minimal association with cognitive ability—and by inference, are low in cognitive demands. Further examination revealed some variation in pattern of associations across both sexes and ages.

With respect to the sex of participants, mediation was observed in both men and women, but the effects were somewhat stronger and more consistent across activity categories for women. A major source of variation was with respect to social activities, where the direct effect of health was stronger in women than in men, as was the degree to which motivation mediated the effect of cognitive resources on activity level. Health also had a stronger direct effect on experiential activities for women. The reasons for these differences are not entirely clear, but could simply reflect sex differences in the focus on social and experiential activities. These differences aside, it is important to emphasize that similar mediation effects were observed for men and women, with the main difference being the degree of association.

Of more interest are the obtained age differences. As with the previously discussed sex differences, there was a fair degree of consistency in the general patterns of results across the three age groups. For the old-old participants, however, the linkages with motivation were weaker than those observed in the other two age groups, in terms of both the direct effects of resources on motivation and the direct effects of motivation on activities. A possible explanation for this age effect may have to do with characteristics associated with the so-called fourth age, which refers to the period of late life following a period of relative healthfulness, activity, and social engagement in late midlife to early old age—roughly encompassing the two younger age groups in our study. The fourth age is related to the extension of the lifespan, along with the associated compression of morbidity. In other words, due to changes in health practices and lifestyle, and the concomitant increase in lifespan, the physiological and functional declines traditionally associated with aging are delayed until late life (e.g., after age 80). These decremental forces may have a more pervasive effect on overall functioning, limiting flexibility in an individual's behavior that, in turn, might be reflected in the form of reduced associations between motivation and behavior. This effect may be similar to the dedifferentiation of cognitive abilities observed toward the end of life, whereby the structure of intelligence becomes less complex than in earlier adulthood—as reflected in factor structures and strength of correlations between domains of ability (e.g., Ghisletta & Lindenberger, 2003; Hülür, Ram, Willis, Schaie, & Gerstorf, 2015). This is thought to reflect the effect of age-related changes in cognitive and cortical functioning (e.g., reductions in processing speed, working memory, or executive control) that increasingly impact (i.e., place limits on) all functions, resulting in more homogeneity in performance across ability domains. Support for our related interpretation in the present study comes from the fact that the associations between resources and activities are either preserved or enhanced in the old-old, suggesting that resources have a more direct impact on functioning in late life.

It is interesting to compare the present results with those of Hess et al. (2012), who also found age differences in the relationships between resources, motivation, and activity. However, in that study, mediating effects were strongest in older adults. It is important to point out, however, that their study included individuals as young as 20, but no older than

85. Thus, the ages at which mediation effects were observed were similar to those in the present study where such effects were strongest. Of course, the two studies are also different in a number of respects, and these results require replication. However, the general curvilinear pattern observed for mediation across age groups is interpretable within the context of SET and other perspectives on aging. Specifically, SET argues that motivational processes such as those studied here become more consequential and more closely linked to resources—or factors associated with the costs of cognitive engagement—as the individual approaches and enters the period of old age—the third age. This explains the shift observed in Hess et al. However, the present results suggest an addendum to SET that argues for a weakening of this relationship as individuals enter the fourth age, and diminishing resources further limit behavior and flexibility in functioning.

It is also important to consider what constitutes a resource in older adulthood. SET argues that the costs of cognitive engagement increase with age, with the assumption that these costs reflect underlying resources. Health certainly seems to be relevant in this regard, and sensory functioning was identified by Hess et al. (2011) as a potential important resource. This idea is further supported by research by Tun, McCoy, and Wingfield (2009), which has suggested that effort associated with sensory processing strains older adults' resources. In the present study, we also identify cognitive ability as a resource; however, it might be just as reasonable to include cognitive ability as an activity outcome (e.g., engaging cognitive resources to perform on a potentially meaningless cognitive ability test in the lab may also be influenced by perceived costs and motivation). Indeed, Hess et al. (2011) found that models in which ability was an outcome rather than a resource accounted for more variance. The cross-sectional data in the present research does not permit a similar examination—this awaits availability of longitudinal data relating to motivation.

In conclusion, our results support the basic prediction of SET that personal resources influence older adults' motivation to engage in cognitively demanding, but potentially beneficial activities. It also extends the theory by suggesting that these effects diminish in later life. Some limitations of the study should be kept in mind. First, although using data from a large population-based survey expands on previous work using convenience samples, we were constrained to using the activities surveyed in HRS. These measures were superior to those used in previous studies examining resource-motivation-activity relations, but were not specifically designed to test the SET framework. Second, the cross-sectional nature of the data limits our ability to understand how these processes unfold across the later lifespan. Future waves of HRS data will be needed to examine the relationships between changes in resources and changes in activity engagement. That being said, the fact that we obtained supportive findings using a large sample that is representative of the older adult population in the USA is encouraging in terms of testing the theory.

Acknowledgments

We would like to thank Brian T. Smith for his assistance in assembling the datasets for use in this study.

Funding: This work was partially supported by the National Institute on Aging at the National Institutes of Health (R01 AG05552 to T.M.H).

References

Baltes MM, Lang FR. Everyday functioning and successful aging: the impact of resources. Psychology and Aging. 1997; 12:433–443. DOI: 10.1037/0882-7974.12.3.433 [PubMed: 9308091]

Baltes PB, Smith J. New frontiers in the future of aging: From successful aging of the young old to the dilemmas of the fourth age. Gerontology. 2003; 49:123–135. DOI: 10.1159/000067946 [PubMed: 12574672]

Buchman AS, Wilson RS, Yu L, James BD, Boyle PA, Bennett DA. Total daily activity declines more rapidly with increasing age in older adults. Archives of Gerontology and Geriatrics. 2014; 58:74–79. DOI: 10.1016/j.archger.2013.08.001 [PubMed: 24007938]

Cacioppo JT, Petty RE, Feinstein JA, Jarvis WBG. Dispositional differences in cognitive motivation: The life and times of individuals varying in need for cognition. Psychological Bulletin. 1996; 119:197–253. DOI: 10.1037//0033-2909.119.2.197

Ennis GE, Hess TM, Smith BT. The impact of age and motivation on cognitive effort: Implications for cognitive engagement in older adulthood. Psychology and Aging. 2013; 28:495–504. DOI: 10.1037/a0031255 [PubMed: 23421325]

Fonda, S., Herzog, AR. Documentation of Physical Functioning Measures in the Health and Retirement Study and the Asset and Health Dynamics among the Oldest Old Study. 2004. Retrieved from: http://hrsonline.isr.umich.edu/index.php?p=userg

Ghisletta P, Lindenberger U. Age-based structural dynamics between perceptual speed and knowledge in the Berlin Aging Study: Direct evidence for ability dedifferentiation in old age. Psychology and Aging. 2003; 18:696–713. DOI: 10.1037/0882-7974.18.4.696 [PubMed: 14692858]

Hertzog C, Kramer AF, Wilson RS, Lindenberger U. Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? Psychological Science in the Public Interest. 2008; 9:1–65. [PubMed: 26162004]

Hess TM. Aging-related influences on personal need for structure. International Journal of Behavioral Development. 2001; 25:482–490. DOI: 10.1080/01650250042000429

Hess TM. Selective engagement of cognitive resources: Motivational influences on older adults' cognitive functioning. Perspectives on Psychological Sciences. 2014; 9:388–407. DOI: 10.1177/1745691614527465

Hess TM, Emery L, Neupert SD. Longitudinal relationships between resources, motivation, and functioning. The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences. 2012; 67:299–308. DOI: 10.1093/geronb/gbr100

Hess TM, Smith BT, Sharifian N. Aging and effort expenditure: the impact of subjective perceptions of difficulty, motivation, and performance. Psychology and Aging. 2016; 31:653–660. DOI: 10.1037/pag0000127 [PubMed: 27831709]

Hultsch D, Hertzog C, Small B, Dixon R. Use it or lose it: engaged lifestyle as a buffer of cognitive decline in aging? Psychology and Aging. 1999; 14:245–263. DOI: 10.1037/0882-7974.14.2.245 [PubMed: 10403712]

Hülür G, Ram N, Willis SL, Schaie KW, Gerstorf D. Cognitive dedifferentiation with increasing age and proximity of death: Within-person evidence from the Seattle Longitudinal Study. Psychology and Aging. 2015; 30:311–323. DOI: 10.1037/a0039260 [PubMed: 25961879]

Jopp D, Hertzog C. Activities, self-referent memory beliefs, and cognitive performance: Evidence for direct and mediated relations. Psychology and Aging. 2007; 22:811–825. DOI: 10.1037/0882-7974.22.4.811 [PubMed: 18179299]

Jopp D, Hertzog C. Assessing adult leisure activities: An extension of a self-report activity questionnaire. Psychological Assessment. 2010; 22:108–120. DOI: 10.1037/a00176622 [PubMed: 20230157]

Lachman, ME., Weaver, SL. Unpublished Technical Report. Brandeis University; 1997. Midlife Development Inventory (MIDI) personality scales: Scale construction and scoring. http://www.brandeis.edu/projects/lifespan/scales.html

Lang FR, Rieckmann N, Baltes MM. Adapting to aging losses: Do resources facilitate strategies of selection, compensation, and optimization in everyday functioning? The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences. 2002; 57B:501–509. DOI: 10.1093/geronb/57.6.P501

Mitchell MB, Cimino CR, Benitez A, Brown CL, Gibbons LE, et al. Piccinin AM. Cognitively Stimulating Activities: Effects on Cognition across Four Studies with up to 21 Years of Longitudinal Data. Journal of Aging Research. 2012; 2012:1–12. DOI: 10.1155/2012/461592

Muthén, LK., Muthén, BO. Mplus User's Guide. Sixth. Los Angeles, CA: Muthén & Muthén; 1998-2011.

Neuberg SL, Newsom JT. Personal need for structure: Individual differences in the desire for simpler structure. Journal of Personality and Social Psychology. 1993; 65:113–131.

Rousseau E, Pushkar D, Reis M. Dimensions and predictors of activity engagement: A short-term longitudinal study. Activities, Adaptation & Aging. 2005; 29:11–33. DOI: 10.1300/J016v29n02

Salthouse TA, Berish DE, Miles JD. The role of cognitive stimulation on the relations between age and cognitive functioning. Psychology and Aging. 2002; 17:548–557. DOI: 10.1037/0882-7974.17.4.548 [PubMed: 12507353]

Schooler C, Mulatu MS. The reciprocal effects of leisure time activities and intellectual functioning in older people: a longitudinal analysis. Psychology and Aging. 2001; 16:466–482. DOI: 10.1037/0882-7974.16.3.466 [PubMed: 11554524]

Smith, J., Fisher, G., Ryan, L., Clark, P., House, J., Weir, DR. Psychosocial Lifestyle Questionnaire 2006-2010: Documentation Report. 2013. Retrieved from: http://hrsonline.isr.umich.edu/index.php?p=userg

Tun PA, McCoy S, Wingfield A. Aging, hearing acuity, and the attentional costs of effortful listening. Psychology and Aging. 2009; 24:761–766. DOI: 10.1037/a0014802 [PubMed: 19739934]

von Stumm S. Investment traits and intelligence in adulthood: Assessment and associations. Journal of Individual Differences. 2013; 34:82–89. DOI: 10.1027/1614-0001/a000101

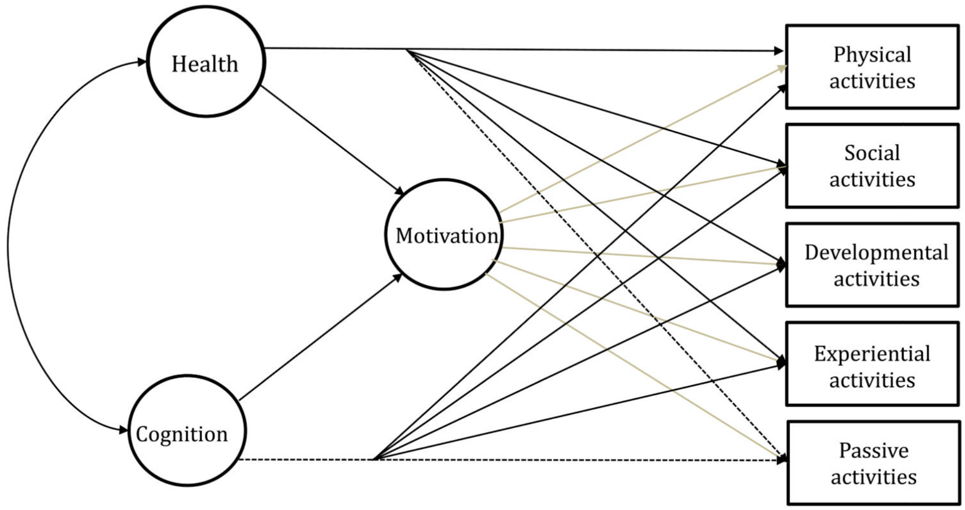

Figure 1.

Conceptual model depicted proposed relationships between resources (health, cognition, and motivation) and activity engagement. Black solid single and double-headed arrows indicate proposed positive relationships. Dashed arrows indicate proposed negative relationships. Gray arrows indicate proposed indirect effects.

Table 1

Means and Standard Deviations for the Primary Model Variables

	Middle-aged		Young-Old		Old-Old		Full sample	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Health								
Self-rated health	3.25	1.10	3.17	1.04	3.05	1.02	3.19	1.07
# chronic illnesses	1.74	1.45	2.53	1.41	2.74	1.32	2.19	1.48
# functional limitations	3.54	4.07	4.48	3.83	6.19	4.31	4.26	4.10
Cognitive functioning								
Serial 7s	3.98	1.28	3.98	1.25	3.88	1.24	3.97	1.26
Verbal fluency	19.54	7.33	16.19	6.65	13.53	5.83	17.41	7.21
Recall	10.58	3.06	9.38	3.19	7.21	3.22	9.66	3.32
Motivation								
Need for cognition: Enjoyment	3.50	1.00	3.31	1.02	3.15	1.03	3.38	1.02
Need for cognition: Effort	3.58	1.10	3.38	1.09	3.20	1.08	3.45	1.10
Openness to new experiences	2.97	.56	2.90	.57	2.78	.59	3.11	0.58
Activity engagement								
Social	1.28	0.92	1.21	0.92	0.90	.80	1.20	0.91
Physical	3.39	1.57	3.12	1.64	2.67	1.71	3.19	1.63
Passive	4.78	1.29	4.89	1.27	4.83	1.33	4.83	1.29
Developmental	2.14	1.17	1.81	1.24	1.59	1.121	1.94	1.22
Experiential	2.71	1.14	2.77	1.19	2.56	1.27	2.71	1.18

Table 2

Standardized Model Results

	B **(SE)**
Latent factor loadings	
Health	
Self-rated health	0.70 (0.01) **
# chronic illnesses	0.61 (0.01) **
# functional limitations	0.81 (0.01) **
Cognition	
Serial 7s	0.47 (0.01) **
Verbal fluency	0.57 (0.01) **
Recall	0.61 (0.01) **
Motivation	
NFC Enjoyment	0.66 (0.01) **
NFC Effort	0.56 (0.01) **
Openness to new experiences	0.67 (0.01) **
Path Coefficients	
Health → Motivation	0.14 (0.02) **
Cognition → Motivation	0.32 (0.02) **
Health → Social activities	0.14 (0.01) **
Health → Developmental activities	-0.03 (0.01) ǂ
Health → Passive activities	-0.05 (0.01) **
Health → Experiential activities	0.09 (0.01) **
Health → Physical activities	0.45 (0.01) **
Cognition → Social activities	0.11 (0.02) **
Cognition → Developmental activities	0.45 (0.02) **
Cognition → Passive activities	-0.02 (0.02)
Cognition → Experiential activities	0.16 (0.02) **
Cognition → Physical activities	-0.01 (0.01)
Motivation → Social activities	0.18 (0.01) **
Motivation → Developmental activities	0.23 (0.01) **
Motivation → Passive activities	0.02 (0.01)
Motivation → Experiential activities	0.19 (0.01) **
Motivation → Physical activities	0.15 (0.01) **

Note:

** $p < .001$;

* $p < .01$;

‡ $p < .05$

Table 3

Direct and Indirect Effects between Cognitive and Health Resources and Activities through Motivation: Men only

	Direct Effect			Indirect Effect			Total		
Activity	***B***	***p***	**95% CI**	***B***	***p***	**95% CI**	***B***	***p***	**95% CI**
Cognitive Resources									
Social	0.146	< .001	0.099 – 0.192	0.038	<.001	0.023 – 0.052	0.183	< .001	0.141 – 0.225
Developmental	0.460	< .001	0.418 – 0.503	0.079	< .001	0.063 – 0.094	0.539	< .001	0.498 – 0.579
Passive	-0.072	.003	-0.119 – -0.024	0.009	.204	-0.005 – 0.022	-0.063	.003	-0.106 – 0.021
Experiential	0.132	< .001	0.087 – 0.177	0.083	< .001	0.063 – 0.103	0.215	< .001	0.172 – 0.257
Physical	-0.004	.848	-0.048 – 0.039	0.036	< .001	0.022 – 0.051	0.032	.111	-0.007 – 0.071
Health Resources									
Social	0.095	< .001	0.057 – 0.132	0.018	< .001	0.010 – 0.026	0.112	< .001	0.074 – 0.150
Developmental	-0.026	.167	-0.062 – 0.11	0.037	< .001	0.024 – 0.050	0.011	.567	-0.027 – 0.050
Passive	-0.028	.163	-0.095 – -0.046	0.004	.201	-0.004 - 0.005	-0.024	.233	-0.095 - -0.046
Experiential	0.077	< .001	0.041 – 0.114	0.039	< .001	0.026 – 0.052	0.117	< .001	0.079 – 0.154
Physical	0.424	< .001	0.391 – 0.458	0.017	< .001	0.010 – 0.024	0.442	< .001	0.408 – 0.475

Table 4

Direct and Indirect Effects between Cognitive and Health Resources and Activities through Motivation: Women only

	Direct Effect			Indirect Effect			Total		
Activity	***B***	***p***	**95% CI**	***B***	***p***	**95% CI**	***B***	***p***	**95% CI**
Cognitive Resources									
Social	0.087	< .001	0.049 – 0.125	0.081	<.001	0.063 – 0.098	0.168	< .001	0.133 – 0.203
Developmental	0.408	< .001	0.373 – 0.442	0.090	< .001	0.074 – 0.106	0.498	< .001	0.465 – 0.531
Passive	-0.017	.410	-0.056 – 0.023	0.017	.010	0.005 – 0.030	0.001	.976	-0.035 – 0.036
Experiential	0.135	< .001	0.098 – 0.172	0.075	< .001	0.059 – 0.090	0.210	< .001	0.174 – 0.245
Physical	-0.001	0.953	-0.036 – 0.034	0.060	< .001	0.045 – 0.075	0.059	<.001	0.026 – 0.091
Health Resources									
Social	0.175	< .001	0.144 – 0.206	0.030	< .001	0.020 – 0.039	0.205	< .001	0.173 – 0.236
Developmental	0.008	.611	-0.022 – 0.038	0.033	< .001	0.022 – 0.044	0.041	.012	0.009 – 0.073
Passive	-0.033	.047	-0.066 – 0.000	0.006	.010	0.002 - 0.011	-0.027	.108	-0.060 – 0.006
Experiential	0.155	< .001	0.125 – 0.185	0.027	< .001	0.08 – 0.037	0.182	< .001	0.151 – 0.214
Physical	0.455	< .001	0.426 – 0.481	0.022	< .001	0.015 – 0.029	0.476	< .001	0.448 – 0.504

Table 5

Standardized Model Path Coefficients by Age Group: Men only

	Middle-aged	Young-old	Old-old
	B (SE)	**B (SE)**	**B (SE)**
Latent factor loadings			
Health			
Self-rated health	0.77 (0.01) **	0.70 (0.02) **	0.53(0.04) **
# chronic illnesses	0.63 (0.02) **	0.54 (0.02) **	0.39 (0.04) **
# functional limitations	0.77 (0.01) **	0.75 (0.02) **	0.82 (0.04) **
Cognition			
Serial 7s	0.53 (0.02) **	0.45 (0.02) **	0.43 (0.05) **
Verbal fluency	0.48 (0.02) **	0.53 (0.02) **	0.59 (0.04) **
Recall	0.88 (0.02) **	0.59 (0.02) **	0.63 (0.04) **
Motivation			
Need for cognition: enjoyment	0.74 (0.02) **	0.67 (0.02) **	0.66 (0.04) **
Need for cognition: effort	0.56 (0.02) **	0.70 (0.02) **	0.44 (0.04) **
Openness to new experiences	0.66 (0.02) **	0.70 (0.02) **	0.63 (0.04) **
Health → Motivation	0.17 (0.03) **	0.18 (0.03) **	0.14 (0.06) ǂ
Cognition → Motivation	0.30 (0.06) **	0.32 (0.06) **	0.29 (0.07) **
Health → Social activities	0.12 (0.02) **	0.09 (0.03) **	0.09 (0.05)
Health → Developmental activities	-0.01 (0.03)	-0.01 (0.03)	0.03 (0.05)
Health → Passive activities	0.04 (0.03)	-0.05 (0.03)	-0.03 (0.05)
Health → Experiential activities	0.05 (0.03)ǂ	0.09 (0.03) **	0.18 (0.05) **
Health → Physical activities	0.39 (0.02) **	0.45 (0.03) **	0.44 (0.04) **
Cognition → Social activities	0.06 (0.02)	0.17 (0.03) **	0.24 (0.06) **
Cognition → Developmental activities	0.39 (0.03) **	0.50 (0.03) **	0.41 (0.05) **
Cognition → Passive activities	-0.07 (0.03)ǂ	-0.10 (0.04) **	-0.05 (0.06)
Cognition → Experiential activities	0.12 (0.03) **	0.19 (0.03) **	0.18 (0.06) **
Cognition → Physical activities	-0.01 (0.03)	0.00 (0.03)	0.12 (0.05) **
Motivation → Social activities	0.15 (0.03) **	0.12 (0.03)ǂ	0.01 (0.04)
Motivation → Developmental activities	0.28 (0.03) **	0.22 (0.03) **	0.18 (0.04) **
Motivation → Pass activities	-0.01 (0.03)	0.06 (0.03)ǂ	-0.09(0.04)
Motivation → Experiential activities	0.31 (0.03) **	0.23 (0.03) **	0. 10 (0.04)
Motivation → Physical activities	0.14 (0.03) **	0.08 (0.03) **	0.10 (0.03)

Note:

** $p < .001$;

* p . 01;

‡ $p < .05$

Author Manuscript
Author Manuscript
Author Manuscript

Table 6
Standardized Model Path Coefficients by Age Group: Women only

	Middle-aged	Young-old	Old-old
	B (SE)	B (SE)	B (SE)
Latent factor loadings			
Health			
Self-rated health	0.77 (0.01)**	0.75 (0.01)**	0.59 (0.03)**
# chronic illnesses	0.60 (0.01)**	0.60 (0.01)**	0.40 (0.03)**
# functional limitations	0.80 (0.01)**	0.79 (0.01)**	0.82 (0.03)**
Cognition			
Serial 7s	0.55 (0.02)**	0.52 (0.02)**	0.44 (0.04)**
Verbal fluency	0.49 (0.02)**	0.56 (0.02)**	0.56 (0.03)**
Recall	0.57 (0.02)**	0.57 (0.02)**	0.64 (0.03)**
Motivation			
Need for cognition: enjoyment	0.64 (0.01)**	0.63 (0.02)**	0.58 (0.03)**
Need for cognition: effort	0.54 (0.02)**	0.55 (0.02)**	0.43 (0.03)**
Openness to new experiences	0.65 (0.02)**	0.69 (0.02)**	0.75 (0.03)**
Health → Motivation	0.17 (0.03)**	0.12 (0.03)**	0.11 (0.05)ⱡ
Cognition → Motivation	0.39 (0.06)**	0.35 (0.05)**	0.25 (0.07)**
Health → Social activities	0.17 (0.02)**	0.20 (0.02)**	0.21 (0.04)**
Health → Developmental activities	-0.02 (0.02)	0.04 (0.02)	0.10 (0.04)ⱡ
Health → Passive activities	-0.07 (0.02)*	0.04 (0.03)	0.01 (0.04)
Health → Experiential activities	0.14 (0.02)**	0.19 (0.02)**	0.22 (0.04)**
Health → Physical activities	0.45 (0.02)**	0.43 (0.02)**	0.44 (0.04)**
Cognition → Social activities	-0.04 (0.03)	0.14 (0.03)**	0.20 (0.05)**
Cognition → Developmental activities	0.33 (0.02)**	0.44 (0.03)**	0.37 (0.04)**
Cognition → Passive activities	-0.04 (0.03)	-0.03 (0.03)	0.02 (0.05)
Cognition → Experiential activities	0.12 (0.03)**	0.17 (0.03)**	0.17 (0.05)**
Cognition → Physical activities	-0.03 (0.02)	0.01 (0.03)	0.03 (0.05)
Motivation → Social activities	0.24 (0.02)**	0.21 (0.02)**	0.22 (0.04)**
Motivation → Developmental activities	0.32 (0.02)**	0.21 (0.02)**	0.18 (0.04)**
Motivation → Passive activities	0.08 (0.02)**	0.03 (0.03)	0.04 (0.04)
Motivation → Experiential activities	0.24 (0.02)**	0.19 (0.02)**	0.21 (0.04)**
Motivation → Physical activities	0.17 (0.02)**	0.14 (0.02)**	0.18 (0.04)**

Note:

** $p < .001$;

* $p < .01$;

‡ $p < .05$

Author Manuscript
Author Manuscript
Author Manuscript