

Is Working Later in Life Good or Bad for Health? An Investigation of Multiple Health Outcomes

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Objectives. To examine the mutual influences between changes in work status and multiple dimensions of health outcomes (immediate memory, physical disability, and depressive symptoms) over later years.

Methods. We used a subsample of 8,524 older adults who participated in the Health and Retirement Study from 1998 to 2008 and were 62 years or older in 1998 to examine work status and health outcomes after controlling for age and background characteristics.

Results. We present results of cross-lagged auto-regressive models. Work status (level of work) predicted subsequent residual changes in immediate memory over time, whereas immediate memory predicted subsequent residual changes in work status over time, even after controlling for physical disability and depressive symptoms. Similar results were indicated for the associations between work status and physical disability and depressive symptoms over time.

Discussion. Consistent with social causation and social selection traditions, the findings support bi-directional associations among changes in work status (the level of work), immediate memory, physical disability, and depressive symptoms in later years. Practical implications are discussed.

Key Words: Depressive symptoms—Memory—Physical disability—Retirement—Work.

ALTHOUGH health declines with advancing age are anormative across a broad variety of domains including cognition, physical capabilities, and mental health, this deterioration is not homogeneous across all individuals. Some individuals maintain cognitive capabilities and physical and mental health even into their older years (Bonsang, Adam, & Perelman, 2009; Silver, Jilinskaia, & Perls, 2001). One factor associated with health outcomes during later life is work status. Recent studies increasingly demonstrate that working in later years is beneficial for maintaining cognitive functioning including memory (Park & Reuter-Lorenz, 2009; Rohwedder & Willis, 2010), mental health (Hinterlong, Morrow-Howell & Rozario, 2007; Schwingel, Niti, Tang, & Ng, 2009), and physical functioning (Hinterlong et al., 2007). Other studies suggest that working in later years has adverse health consequences, particularly for mental and physical health (Westerlund et al., 2009, 2010). Mixed findings about the directional association between working status and health outcomes in later years may be attributed to several methodological reasons including investigations limited to a single health outcome over a short duration.

The current economic recession seems to have reversed a century-long trend toward early retirement with many individuals now postponing retirement past age 65 years (Pynoos & Liebig, 2009). Thus, further examination and the extension of recent findings about the directional associations between changes in work status and health in later years are important for the formulation and implementation

of public health programs and policies for the rapidly increasing older American population. Such an investigation should take important methodological issues into consideration, including the (a) time-varying nature of work status and health, (b) potential reciprocity between work status and health outcomes, (c) multiple health outcomes, and (d) long-term work-health processes over later years.

Using data from the nationally representative Health and Retirement Study (HRS), we will investigate the influence of work status on subsequent changes in cognitive functioning, physical capabilities, and mental health as well as influences of cognitive functioning, physical capabilities, and mental health on subsequent changes in the work status of older adults (past 62 years—the average retirement age in the United States; Bureau of Labor Statistics, 2007) over a period of ten years after controlling for age, education, gender, and race/ethnicity. In this study, we will focus specifically on the immediate memory dimension of cognitive functioning because it is among the first cognitive abilities to show a decline with age and retirement (Adam, Bonsang, Germain, & Perelman, 2007).

Working in Later Years and Memory

Although some memory deterioration with advancing age is normative, declining memory with advancing age may be an early indicator of more severe cognitive impairments, including dementia, as well as mental and physical health problems (Chodosh, Reuben, Albert, & Seeman, 2002; von Gunten, Giannakopoulos, & Duc, 2005). Several work

socialization studies have shown that performing complex work has a positive influence on the cognitive abilities of working individuals, such as intellectual flexibility, self-directiveness, and mastery, particularly among older workers (Kohn & Schooler, 1982; O'Neal, Wickrama, & Bryant, 2012; Schooler, Mulatu, & Oates, 1999; Wickrama, Surjadi, Lorenz, & Elder, 2008). More importantly, recent studies of individuals in their later years suggest that working in old age has significant compensatory responses to declining cognitive functioning with aging even for those performing less complex work. Rohwedder and Willis (2010) proposed two mechanisms through which this compensatory effect may operate. First, because a work environment generally provides more cognitively challenging and stimulating environments than a nonwork environment, workers engage in more mental exercise than retirees. Second, the likelihood of, and need for, workers to engage in mental exercises related to their employment is very sensitive to the length of the remaining working life. If the remaining period is substantial, older adults may enthusiastically continue to engage in mental exercises that are important for work.

According to the scaffolding theory of aging and cognition (Park & Reuter-Lorenz, 2009), "scaffolding is a process that results in changes in brain function through strengthening of existing connections, formation of new connections, and disuse of connections that have become weak or faulty" (p. 175). Thus, scaffolding can help to protect cognitive functioning in older adults. More importantly, because scaffolding is strengthened by cognitive engagement and mental exercises, even a relatively routine job demands cognitive processes that require scaffolding and may stimulate one's cognitive functioning (Park & Reuter-Lorenz). For this reason, in this study, we focus on work status, or level of work, rather than work characteristics, such as complexity, and subsequent memory functioning.

Working in Later Years and Mental Health

According to role theory, role engagement, particularly the work role, affords the individual access to important resources, such as social support, which operate as a buffer to minimize the effects of stressful circumstances (Thoits, 2011). In addition, the work role enhances core psychological mechanisms and beliefs about the self including self-worth and sense of control (Hayward, Friedman, & Chen, 1998; Wickrama, Lorenz, Conger, Matthews, & Elder, 1997). Activity theory also suggests that older adults' engagement in activities enhances positive beliefs about the self and psychological well-being because it can be a fulfilling experience that bolsters meaning in later life (Hao, 2008; Wethington, Moen, Glasgow, & Pillmer, 2000). A large volume of research has revealed that positive psychological resources contribute to physical and mental health outcomes in adult years (Ross & Wu, 1996; Wickrama et al., 1997, 2008).

An increasing number of empirical studies have provided evidence for the protective role of working in later years

against the decline of older adults' mental health. For example, using a subsample of HRS respondents aged 55 years and older, Hao (2008) showed that full-time employment has an independent influence on the level of depressive symptoms experienced with employed individuals experiencing fewer symptoms. Schwingel et al. (2009) showed that, regardless of physical health status, working older adults have fewer depressive symptoms and higher life satisfaction. On the other hand, age discrimination, difficulty in performing technology-based work due to lack of skills, and job insecurity may increase the mental health problems of older working adults (Gallo, Bradley, Siegel, & Kasl, 2000; Roscigno, 2010).

However, these findings do not completely defy social selection or the presence of the "healthy worker" effect. That is, better physical health, mental health, and cognitive functioning may result in the increased likelihood of continued working in later years (Li & Sung, 1999). Conversely, poor mental and physical health of older adults may be a contributing factor in their exit from the workforce (Raymo, Liang, Kobayashi, Sugihara, & Fukaya, 2009; Rice, Lang, Henley, & Melzer, 2011). Thus, declining memory, poor mental health, and physical disability may also exert an effect on older individuals' decision to remain in the workforce (Alavinia & Burdorf, 2008; Olesen, Butterworth, & Rodgers, 2012).

Working in Later Years and Physical Disability

Both role theory (Moen, Dempster-McClain, & Williams, 1992; Sieber, 1974) and activity theory (Herzog & House, 1991) posit that engagement in a work role or other productive activity has positive health consequences. For instance, studies have documented that working in later life has a positive influence on the physical functioning of older adults. Hinterlong et al. (2007) showed that being a paid worker is associated with better self-rated health and less functional impairment in adults older than 60 years, controlling for socioeconomic characteristics. Furthermore, Luoh and Herzog (2002) showed that paid work has independent and significant protective effects against older adults' subsequent declines in physical health (self-rated health and functional limitations) and death. Working may minimize physical disability through several pathways (Behncke, 2009). Some research suggests that workers are more likely to value their health and, consequently, invest more resources (financial and otherwise) into maintaining their health (Dave, Rashad, & Spasojevic, 2006). Furthermore, retirement as a stressful life transition may lead to risky health habits that are often a product of stress, such as smoking, drinking, as well as weakened immune, endocrine, and cardiovascular systems (Ader, Felten, & Cohen, 1991).

Memory, Physical Disability, and Mental Health

Although there is some research regarding the directional associations between work status and individual aspects of

health, few studies have taken multiple health dimensions into account simultaneously. In this study, the associations between memory, physical disability, and depressive symptoms are controlled based on existing research. For example, Christensen, Holm, McGue, Corder, and Vaupel (1999) found that greater than expected decline in cognitive functioning was related to disability. This influence may operate through various mechanisms including: (a) damaged specific regions of brain, (b) neurological damages, (c) reduced general cognitive performance, such as attention difficulties, and (d) decline in somatic control, which is associated with memory loss (Dodge, Du, Saxton, & Ganguli, 2006; Salthouse & Ferrer-Caja, 2003). In contrast, numerous studies have demonstrated that physical health influences cognitive functioning, including memory loss. For instance, using a Swedish sample, Reynolds, Gatz, and Pedersen (2002) identified a number of health-related traits that were associated with declines in cognitive functioning including self-rated health and the number of illnesses.

Similarly, previous studies have indicated that individuals with poor mental health often show cognitive impairments, such as attention difficulties, psychomotor slowing, motivational impairment, and memory decline (Baune, Suslow, Engelien, Arolt, & Berger, 2006; Reynolds et al., 2002). Specifically, a number of studies have shown that depression is often a predecessor of later memory decline (Butters et al., 2000; Byers & Yaffe, 2011; Panza et al., 2010). Conversely, other studies have demonstrated that poor cognitive functioning is related to a subsequent escalation of depressive symptoms (Perrino, Mason, Brown, Spokane, & Szapocznik, 2008).

In sum, consistent with the “social causation tradition,” the level of work appears to influence health in older years. That is, we expect a decrease in the level of work initiates deteriorating cognitive and health processes over later years through various psychosocial losses including a cognitively active environment, role occupancy, social relations, economic and material resources, and health benefits. Furthermore, consistent with the “social selection tradition,” poor memory and poor health may select older adults into further work-exiting circumstances. Consequently, we expect level of work and health reciprocally influence each other over the later life course because of both social causation and social selection. Thus, in this study, we will investigate the bi-directional associations between the level of works and each of three health dimensions over later years after controlling for the other two health dimensions.

Demographic Characteristics as Control Variables

Several studies have shown that racial/ethnic minorities, women, and individuals with less education possess relatively lower levels of cognitive performance (Black & Rush, 2002; Karlamangla, Singer, McEwen, Rowe, & Seeman, 2002). Examining the cognitive trajectories of older individuals over time, Karlamangla et al. (2002) found that the

cognitive functioning, including memory, of older individuals compared with younger individuals and women compared with men declined faster. The cognitive functioning of African Americans also showed a slower decline compared with Whites. Furthermore, Reynolds et al. (2002) found that older adults with less education showed faster rates of decline in cognitive performance compared with their counterparts. Similarly, evidence also suggests that the prevalence of other health dimensions examined in these analyses (physical disability and depressive symptoms) vary across demographic groupings, including age, education, gender, and race/ethnicity (Chiu & Wray, 2011; Steffens, Fisher, Langa, Potter, & Plassman, 2009). Thus, in this study, we will examine the associations between work status and three health outcomes (immediate memory, physical disability, and depressive symptoms) after controlling for respondents’ age, education, gender, and race/ethnicity.

Specific Study Hypotheses

We will test the following hypotheses within a cross-lagged modeling framework after controlling for age, education, gender, and race/ethnicity as well as the other two dimensions of health examined (e.g., our analysis of immediate memory controlled for contemporaneous levels of physical disability and depressive symptoms).

- a. Level of work will positively predict the subsequent level of immediate memory after controlling for the lagged level of immediate memory, and the level of immediate memory will positively predict the subsequent level of work after controlling for the lagged level of work in later years.
- b. Level of work will negatively predict the subsequent level of physical disability after controlling for the lagged level of physical disability, and the level of physical disability will negatively predict the subsequent level of work after controlling for the lagged level of work in later years.
- c. Level of work will negatively predict the subsequent level of depressive symptoms after controlling for the lagged level of depressive symptoms, and the level depressive symptoms will negatively predict the subsequent level of work after controlling for the lagged level of work in later years.

METHOD

Sample

This study assesses data from the HRS collected in 1998, 2000, 2002, 2004, 2006, and 2008. These waves of data were selected for analyses in order to obtain a large sample of older individuals (62 years or older in 1998). The HRS sample is nationally representative. African Americans and

Hispanic Americans were oversampled. Further details regarding the sample are available at <http://hrsonline.isr.umich.edu/data/index.html>.

The overall response rate for each of the follow-up waves was higher than 80%. Of nearly 20,000 respondents in 1998 who were aged 50 years and older, just over 14,000 respondents participated in the follow-up interview conducted in 2006. Our analyses are based on HRS respondents who were 62 years or older in 1998 and provided complete information for our work status classification ($n = 8,524$). The percentage of missing data from our sample was 15% from 1998 to 2008.

A total of 58% of the older adults in this sample were females and 42% were males. The mean age in 1998 was 69.18 years ($SD = 7.08$). Approximately, 78% of older adults in this sample were White, 12.8% were African American, and 7.2% were Hispanics. Just less than 71% of the respondents were married in 1998. Respondents reported an average of 11.93 ($SD = 3.35$) years of education. The mean yearly household income was \$34,000 ($SD = \$15,770$). Descriptive statistics for study variables are provided in Tables 1 and 2.

Table 1. Descriptive Statistics of Study Variables by Year

	Mean	Standard deviation	Range
1998 ($n = 8,524$)			
Age	69.18	7.07	60–97
Work status	.53	.80	0–2
Immediate memory	5.69	1.74	0–10
Physical disability (ADL)	.40	.99	0–6
Depressive symptoms (CES-D)	1.47	1.84	0–8
2000 ($n = 8,270$)			
Work status	.41	.73	0–2
Immediate memory	5.40	1.73	0–10
Physical disability (ADL)	.42	1.00	0–6
Depressive symptoms (CES-D)	1.43	1.82	0–8
2002 ($n = 8,178$)			
Work status	.34	.67	0–2
Immediate memory	5.31	1.67	0–10
Physical disability (ADL)	.42	1.02	0–6
Depressive symptoms (CES-D)	1.44	1.89	0–8
2004 ($n = 8,164$)			
Work status	.28	.60	0–2
Immediate memory	5.04	1.65	0–10
Physical disability (ADL)	.52	1.20	0–6
Depressive symptoms (CES-D)	1.43	1.87	0–8
2006 ($n = 8,319$)			
Work status	.22	.54	0–2
Immediate memory	4.87	1.71	0–10
Physical disability (ADL)	.75	1.47	0–6
Depressive symptoms (CES-D)	1.49	1.91	0–8
2008 ($n = 8,206$)			
Work status	.20	.51	0–2
Immediate memory	4.84	1.68	0–10
Physical disability (ADL)	.84	1.57	0–6
Depressive symptoms (CES-D)	1.45	1.90	0–8

Note. ADL = Activities of Daily Living scale; CES-D = Center for Epidemiologic Studies-Depression scale.

Table 2. Descriptive Statistics of Study Variables by Work Status in 1998

	Mean	Standard deviation
Full-time work		
Age	66.97	5.71
Immediate memory	6.02	1.62
Physical disability (ADL)	.16	.50
Depressive symptoms (CES-D)	1.01	1.47
Part-time work		
Age	64.90	4.79
Immediate memory	6.08	1.68
Physical disability (ADL)	.18	.56
Depressive symptoms (CES-D)	1.22	1.69
Retired		
Age	70.32	6.50
Immediate memory	5.59	1.71
Physical disability (ADL)	.44	1.03
Depressive symptoms (CES-D)	1.59	1.91

Note. ADL = Activities of Daily Living scale; CES-D = Center for Epidemiologic Studies-Depression scale.

Measures

Work status.—Using prospective reports from respondents in 1998, 2000, 2002, 2004, 2006, and 2008 who were 62 years of age or older in 1998, we created an ordinal measure of respondents' self-reported work status (2 = working full-time, 1 = working part-time, and 0 = fully retired) for each wave of data. Individuals who were unemployed (i.e., those who were not currently working full or part-time but did not consider themselves retired) were not included in the analyses as they are similar to both groups in some ways. The percentages of individuals who were working full-time, working part-time, and fully retired in 1998 were 19.4, 12.5, and 65.7, respectively.

Immediate memory.—To assess immediate memory, respondents were asked to recall as many items as they could from a 10-word list. One of four word lists was randomly assigned to be read to the respondent. The assignment was also made so that two respondents in the same household (i.e., spouses or partners of one another) were not assigned the same set of words in the same or adjacent waves. Only non-imputed data were used. The summed free recall scores assess immediate memory. High scores on this scale indicate high levels of immediate memory. More information on the development and validation of the recall tests are available at <http://hrsonline.isr.umich.edu/docs/userg/dr-006.pdf>.

Depressive symptoms.—The short version of Center for Epidemiologic Studies-Depression scale (Radloff, 1977) was used to assess depressive symptoms. Respondents were asked whether (1) they felt that everything they did was an effort, (2) their sleep was restless, (3) they were happy, (4) they felt lonely, (5) they enjoyed life, (6) they felt sad, (7) they could not get going, and (8) they had a lot of energy

during the past week. The depressive symptom scale was computed by summing the presence of these eight symptoms after reverse-coding positively worded items. Scores ranged from 0 (*no symptoms*) to 8 (*eight symptoms*) with high scores indicating high levels of depressive symptoms. The measure demonstrated adequate internal consistency (α of at least .76 for all waves).

Physical disability.—Physical disability was assessed using the Activities of Daily Living scale (ADL; Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963). Respondents were asked whether because of a health or memory problem they had any difficulty with (1) dressing, including putting on shoes and socks, (2) walking across a room, (3) bathing or showering, (4) eating, including cutting up food, (5) getting in or out of bed, and (6) using the toilet, including getting up and down. Scores ranged from 0 (*no difficulty*) to 6 (*can't do/don't do these activities or high difficulty with these activities of daily living*). For this sample, the measure exhibited adequate internal consistency ($\alpha > .77$ for all the waves).

Demographic control variables.—Respondents' education level, age, gender, and race/ethnicity were also included as control variables. Education was indicated using six categories ranging from (0) no formal education to (5) post-college educational training. Using respondents' reports of the year they were born, age was assessed as a continuous variable. Gender was coded as male or female. Respondents indicated their primary race/ethnicity. Dichotomous variables were created to assess African American, Hispanic, and White racial/ethnic status. The dichotomous variables for each of the minority statuses were included as independent variables resulting in regression coefficients that can be interpreted with reference to Whites.

Statistical Analyses

Estimation of cross-lagged auto-regressive models was conducted using maximum likelihood procedures in the Mplus (version 6) software program (Muthén & Muthén, 2007) with individual sample weights. Because respondents' level of working was an ordinal measure, we used the weighted least squares mean adjusted (Type 5) estimation procedure available in Mplus, which uses polychoric correlations for parameter estimation. Full Information Maximum Likelihood (FIML) procedures were used to account for missing data. FIML allowed individuals to be included in the analysis even if they dropped out of the sample (e.g., death). FIML does not impute missing values; instead, it estimates model parameters and standard errors directly from all available data. This procedure helped minimize potential survival bias that would have influenced the results (Taylor, 2008). Sample weights in 1998 were used in the analysis to account for oversampling of certain population groups.

We used the Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) to evaluate the fit of the structural equation models because these indices are not directly related to the sample size. The CFI should be close to or greater than .95, and the RMSEA should be close to or less than .06 to indicate that the model fits the data well (Hu & Bentler, 1999).

RESULTS

We began our analyses by fitting a six-wave two-variable auto-regressive structural equation model to the data to examine the associations between the level of working and immediate memory over time. Then, similar auto-regressive cross-lagged models were fit to examine the relationship among work status and two additional dimensions of health (depressive symptoms and physical disability). We controlled for the influence of respondents' initial age on all of the constructs in the models. The standardized path coefficients and fit-indices for each cross-lagged model are presented. Due to the similarity of coefficients indicating within-construct change over time (e.g., immediate memory from 1998 to 2000) and high stability, equality constraints were imposed for each construct over time (e.g., immediate memory in 1998, 2000, 2002, 2004, 2006, and 2008).

As shown in Figure 1, work status showed more stability over time than did immediate memory, suggesting immediate memory is more sensitive to the aging process than the level of working. The results showed that, over three time intervals (1998–2000, 2002–2004, and 2004–2006), the level of working at one point in time predicted subsequent changes (i.e., residual change) in immediate memory ($\beta = .04, .06, \text{ and } .07$). Also, over two time intervals (1998–2000 and 2004–2006), the level of immediate memory at one point in time predicted subsequent changes (i.e., residual change) in work status ($\beta = .06 \text{ and } .05$). These mutual longitudinal influences were not present during the last time period examined, when most of individuals were aged 70 years and older. In summary, results provided evidence supporting the reciprocal associations between work status and immediate memory over time.

Although not shown in Figure 1, age, education, gender, and race/ethnicity were included as control variables for all of the paths in the cross-lagged auto-regressive model. Age of respondents significantly and negatively influenced work status in 1998, 2000, and 2002 ($\beta = -.35, -.21, \text{ and } -.08$, respectively; $p < .001$) and immediate memory in 1998, 2000, 2002, 2004, 2006, and 2008 ($\beta = -.26, -.13, -.17, -.17, -.19, \text{ and } -.22$, respectively; $p < .001$). Respondents' education level significantly and positively influenced work status in 1998 and 2000 ($\beta = .05 \text{ and } .04$, respectively; $p < .01$) and immediate memory in 1998, 2000, 2002, 2004, 2006, and 2008 ($\beta = -.08, -.04, -.05, -.05, -.06, \text{ and } -.06$, respectively; $p < .001$). Respondents' gender (female) significantly and negatively influenced work status in 1998,

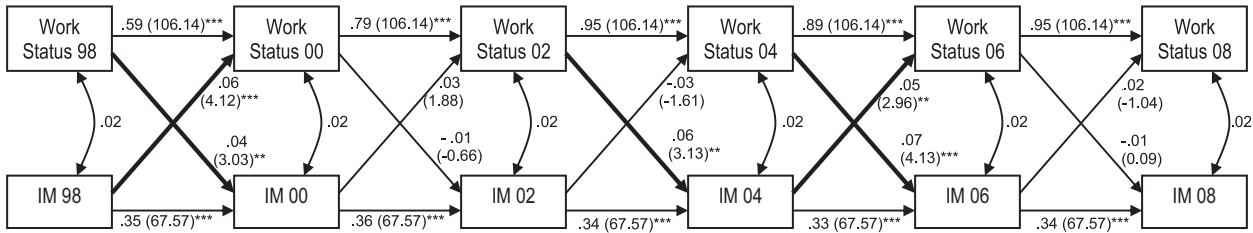


Figure 1. Cross-lagged auto-regressive structural equation model for work status and immediate memory (standardized coefficients with *t*-values in parentheses). Notes. Statistically significant cross-lags are shown in bold. Changes in work status and immediate memory over time were constrained to be equal. **p* < .05. ***p* < .01. ****p* < .001. $\chi^2(df) = 1358.49(237)$; Comparative Fit Index = .98; Root Mean Square Error of Approximation = .03.

2000, and 2002 ($\beta = -.08, -.06, \text{ and } -.05; p < .05$) but positively influenced immediate memory in 1998, 2000, 2002, 2004, 2006, and 2008 ($\beta = .15, .12, .11, .10, .09, \text{ and } .12$, respectively; $p < .001$). African American race/ethnicity status negatively influenced immediate memory in 2002 and 2008 ($\beta = -.05 \text{ and } -.08$, respectively; $p < .05$). Hispanic race/ethnicity status negatively influenced work status in 1998, 2000, 2006, and 2008 ($\beta = -.05, -.07, -.08, \text{ and } -.07$, respectively; $p < .05$) and immediate memory in 1998 and 2002 ($\beta = -.07 \text{ and } -.07$, respectively; $p < .01$).

As shown in Figure 2, we examined the inter-relationships between work status and physical disability (i.e., ADL) after controlling for immediate memory and depressive symptoms. Compared with the model shown in Figure 1, physical disability showed stronger stability than did immediate memory over later years. The results showed that paths from earlier work levels to later physical disability were statistically significant for three time periods ($\beta = -.05, -.09, \text{ and } -.12$, respectively, for 2002–2004, 2004–2006, and

2006–2008). Also, the paths from earlier physical disability to later work status were statistically significant for four time periods ($\beta = -.06, -.06, -.10, \text{ and } -.15$, respectively, for 1998–2000, 2002–2004, 2004–2006, and 2006–2008). In summary, results provided evidence supporting the reciprocal associations between work status and physical disability over time.

In Figure 3, we examined the inter-relationships between work status and depressive symptoms after controlling for immediate memory and physical disability. Compared with the model shown in Figure 1, depressive symptoms showed stronger stability than did immediate memory over later years. The results showed that paths from earlier work status to later depressive symptoms were significant for three time periods ($\beta = -.03, -.03, \text{ and } -.04$, respectively, for 1998–2000, 2000–2002, and 2004–2006). The effect of earlier depressive symptoms on later work status was significant for four time periods ($\beta = -.03, -.04, -.05, \text{ and } -.06$, respectively, for 1998–2000, 2000–2002, 2004–2006, and

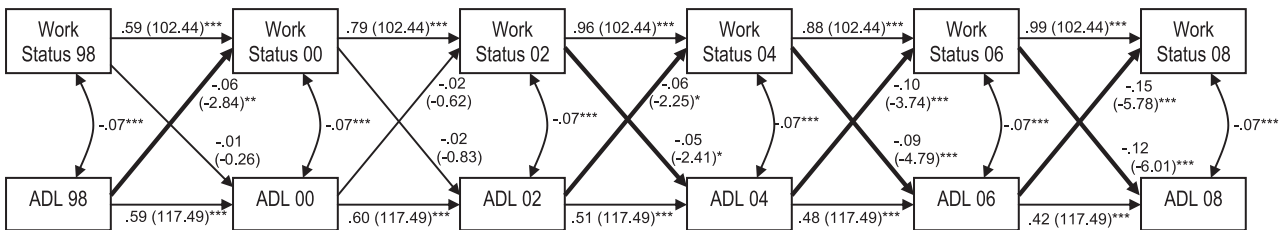


Figure 2. Cross-lagged auto-regressive structural equation model for work status and physical disability (standardized coefficients with *t*-values in parentheses). Notes. Statistically significant cross-lags are shown in bold. Changes in work status and physical disability over time were constrained to be equal. **p* < .05. ***p* < .01. ****p* < .001. $\chi^2(df) = 4511.98(243)$; Comparative Fit Index = .93; Root Mean Square Error of Approximation = .05.

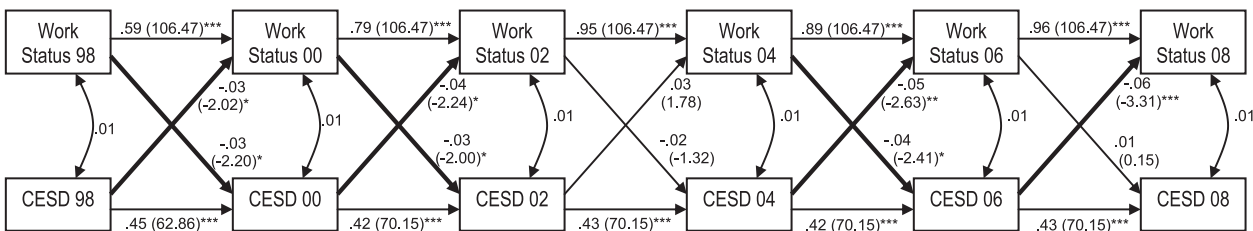


Figure 3. Cross-lagged auto-regressive structural equation model for work status and depressive symptoms (standardized coefficients with *t*-values in parentheses). Notes. Statistically significant cross-lags are shown in bold. Changes in work status and physical disability over time were constrained to be equal. **p* < .05. ***p* < .01. ****p* < .001. $\chi^2(df) = 4482.44(232)$; Comparative Fit Index = .93; Root Mean Square Error of Approximation = .05.

2006–2008. In summary, results provided evidence supporting the reciprocal associations between work status and depressive symptoms over time.

DISCUSSION

In this study, we used six waves of prospective data to investigate the relationship between older adults' work status (the level of working) and three dimensions of health over a ten-year period after controlling for lagged effects as well as for respondents' age, education, gender, and race/ethnicity. Our results indicate bi-directional, unique associations between work status (the level of working) and three dimensions of health in later years: immediate memory, physical disability, and depressive symptoms. That is, in these models, early levels of work predicted subsequent change in health over time and vice versa.

In other research noting associations between work status and memory changes, these findings may be spurious due to common variance shared with other dimensions of health, specifically poor physical and mental health. That is, physically impaired and mentally distressed individuals are unable to work and may also experience memory decline over time because of their long-term health problems including neurological deteriorations. However, in this study, the possibility of spurious associations was minimized by controlling both work status and immediate memory for physical and mental health problems (more specifically, physical disability and psychological distress) within the same analytical framework. Similarly, the same methodological concern may be applied to the associations between work status and physical disability and depressive symptoms because these associations can be spurious due to deteriorating memory. Thus, each cross-lagged model that examined the association between work status and a health dimension controlled for the remaining two health dimensions.

Although the biological mechanisms were not observed in this study, the scaffolding theory of aging and cognition (Park & Reuter-Lorenz, 2009) explains the neurological mechanisms that may be involved in this effect for memory. According to the scaffolding theory, working in later years likely strengthens the development of complementary, alternative neural circuits that help maintain task performance, thus protecting cognitive function in the aging brain. Even the cognitive demands of a relatively routine job may stimulate one's cognitive functioning. Consistent with Rohwedder and Willis (2010), working in later years may stimulate and strengthen the scaffolding process because work environments generally provide more cognitively challenging and stimulating environments than do nonwork environments.

Engaging in the work role and its activities appears to also protect against the deterioration of physical functioning and mental health of older adults. Role theory and activity theory posit that this association exists because work provides

psychosocial health resources including self-esteem, self-control, life satisfaction, and social support, which positively contribute to health (Herzog & House, 1991; Moen et al., 1992). More importantly, paid work generates income and other economic benefits, including health insurance, necessary for the maintenance of health.

The findings provide evidence for both social causation and social selection traditions. Following Thoits and Hewitt (2001) findings of reciprocity between behavior and well-being, these results indicate the existence of reciprocity between work status and cognition as well as physical and mental health. Consistent with the social causation tradition, our findings showed that lower levels of working adversely influence memory, physical disability, and depressive symptoms of older adults. It appears a decrease in work initiates deteriorating health processes over later years. The cycle continues as poor memory and health *select* older adults into further work-exiting circumstances. That is, older adults who experience a decrease in the level of working may be trapped in a self-perpetuating cycle of adverse changes in work and health across the later years involving social causation, social selection, and the progression of health problems.

Interestingly, there were notable variations in the cross-wave comparisons over time. More specifically, reciprocal relationships were evident for memory and work status at most time periods. Similarly, the reciprocal relationships for depressive symptoms were also evident for most of the cross-lags from 1998 to 2008. However, for physical disability, the reciprocal relationships existed primarily during the last three time intervals, when respondents were in their older ages. Moreover, it appears that reciprocity is more consistent between work level and depressive symptoms and work level and physical disability than between work level and immediate memory. Future research should further investigate these age variations using age-based statistical analyses.

Although findings from this study are generally consistent with our expectations, several factors potentially limit the scope and generalizability of the results. First, observed bi-directional associations between the level of work and health outcomes may be spurious due to omitted common factors. For example, marital relationship quality and parent-child relationship quality may influence both the work level and health outcomes. More importantly, observed associations may be spurious due to individual genetic make-up. Now that genetic data are available in the HRS, future genetically informed studies should examine this possibility.

Second, this study largely used self-reported measures. Replication using clinical health measures would alleviate concerns regarding potential self-report biases related to the measures used in this study. Third, this study focused on the level of working (i.e., retired, part-time, and full-time work) regardless of work characteristics, including work

complexity. Particularly, adults whose job entails more complex work may have a “cognitive reserve” upon entering older age (Andel, Kareholt, Parker, Thorslund, & Gatz, 2007). Furthermore, part-time work can include a wide range of hours worked, but the available data did not allow for a more detailed examination of specific hours worked. Fourth, this study did not investigate family characteristics (e.g., marital status) that may moderate observed associations. Supplementary analyses revealed no systematic evidence of gender moderation, but such an examination of other work and family characteristics would strengthen these findings regarding the consequences of working late in life. Fifth, the progression of health problems operates not only through intra-health domain continuities but also through the proliferation of health problems across domains. However, this study did not investigate such cross-domain health problems proliferation over time. Finally, the results may have been influenced by unique cohort characteristics. Study cohort members, who were more than 62 years of age in 1998, may have experienced unique work characteristics compared with younger and older cohorts. Thus, this cohort of older adults may experience unique health consequences of work status.

Using a nationally representative sample and prospective longitudinal data, this study demonstrates subsequent long-term health consequences, including immediate memory, of work status in later years. Thus, policies and programs geared toward promoting the health of an increasingly older population should recognize the health consequences of change in work status and the need for flexible employment options for older adults, such as phased-out retirement and bridge-employment. In addition, our findings elaborate on the progression of related health processes involving the proliferation across different types of health problems during later years. A better understanding of these processes may aid in the formation of not only flexible employment options but also effective implementation of cognitive, mental, and physical health promotion programs for older individuals.

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AUTHOR CONTRIBUTIONS

K. A. S. Wickrama conceptualized and wrote the manuscript and performed all statistical analyses. C. W. O’Neal contributed to writing and revising the manuscript. K. H. Kwag prepared the data files and performed preliminary data analyses. T. K. Lee assisted with the preparation of figures and tables.

REFERENCES

Adam, S., Bonsang, E., Germain, S., & Perelman, S. (2007). *Retirement and cognitive reserve: A stochastic frontier approach to survey data*. CREPP Working Paper 2007/04, Centre de Recherche on Economie et de la Population, Liege, Belgium.

- Ader, R., Felton, D. L., & Cohen, N. (Eds.). (1991). *Psychoneuroimmunology* (2nd ed.). San Diego, CA: Academic Press.
- Alavinia, S. M., & Burdorf, A. (2008). Unemployment and retirement and ill-health: A cross-sectional analysis across European countries. *International Archives of Occupational and Environmental Health*, 82, 39–45. doi:10.1007/s00420-008-0304-6
- Andel, R., Kareholt, I., Parker, M. G., Thorslund, M., & Gatz, M. (2007). Complexity of primary lifetime occupation and cognition in advanced old age. *Journal of Aging and Health*, 19, 397–415. doi:10.1037/a0015511
- Baune, B. T., Suslow, T., Engelen, A., Arolt, V., & Berger, K. (2006). The association between depressive mood and cognitive performance in an elderly general population - the MEMO study. *Dementia and Geriatric Cognitive Disorders*, 22, 142–149. doi:10.1159/000093745
- Behncke, S. (2009). *How does retirement affect health?* IZA Discussion Papers 4253, Institute for the Study of Labor, Bonn, Germany.
- Black, S. A., & Rush, R. D. (2002). Cognitive and functional decline in adults aged 75 and older. *Journal of the American Geriatrics Society*, 50, 1978–1986. doi:10.1046/j.1532-5415.2002.50609.x
- Bonsang, E., Adam, S., & Perelman, S. (2009). *Does retirement affect cognitive performance?* Paper presented at SHARE Users Conference, Mainz, Germany.
- Bureau of Labor Statistics. (2007). The U.S. economy to 2016: Slower growth as boomers begin to retire. *Monthly Labor Review*, 130, 13–32.
- Butters, M. A., Becker, J. T., Nebes, R. D., Zmuda, M. D., Mulsant, B. H., Pollock, B. G., & Reynolds, C. F. III. (2000). Changes in cognitive functioning following treatment of late-life depression. *The American Journal of Psychiatry*, 157, 1949–1954. doi:10.1176/appi.ajp.157.12.1949
- Byers, A. L., & Yaffe, K. (2011). Depression and risk of developing dementia. *Nature Reviews Neurology*, 7, 323–331. doi:10.1038/nrneuro.2011.60
- Chiu, C. J., & Wray, L. A. (2011). Physical disability trajectories in older Americans with and without diabetes: The role of age, gender, race or ethnicity, and education. *The Gerontologist*, 51, 51–63. doi:10.1093/geront/gnq069
- Chodosh, J., Reuben, D. B., Albert, M. S., & Seeman, T. E. (2002). Predicting cognitive impairment in high-functioning community-dwelling older persons: MacArthur Studies of Successful Aging. *Journal of the American Geriatrics Society*, 50, 1051–1060. doi:10.1046/j.1532-5415.2002.50260.x
- Christensen, K., Holm, N. V., McGue, M., Corder, L., & Vaupel, J. W. (1999). A Danish population-based twin study on general health in the elderly. *Journal of Aging and Health*, 11, 49–64. doi:10.1177/089826439901100103
- Dave, D., Rashad, I., & Spasojevic, J. (2006). *The effects of retirement on physical and mental health outcomes*. NBER Working Paper Series, Working Paper, 12123. Retrieved from <http://www.nber.org/papers/w12123>
- Dodge, H. H., Du, Y., Saxton, J. A., & Ganguli, M. (2006). Cognitive domains and trajectories of functional independence in nondemented elderly persons. *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences*, 61, 1330–1337. doi:10.1093/geronol/61.12.1330
- Gallo, W. T., Bradley, E. H., Siegel, M., & Kasl, S. V. (2000). Health effects of involuntary job loss among older workers: Findings from the health and retirement survey. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 55, 131–140. doi:10.1093/geronb/55.3.S131
- Hao, Y. (2008). Productive activities and psychological well-being among older adults. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 63, 64–72. doi:10.1093/geronb/63.2.S64
- Hayward, M. D., Friedman, S., & Chen, H. (1998). Career trajectories and older men’s retirement. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 53, 91–103. doi:10.1093/geronb/53B.2.S91

- Herzog, R. A., & House, J. (1991). Productive activities and aging well. *Generations, 15*, 49–54.
- Hinterlong, J. E., Morrow-Howell, N., & Rozario, P. A. (2007). Productive engagement and late life physical and mental health findings from a nationally representative panel study. *Research on Aging, 29*, 348–370. doi:10.1177/0164027507300806
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. doi:10.1080/10705519909540118
- Karlamangla, A. S., Singer, B. H., McEwen, B. S., Rowe, J. W., & Seeman, T. E. (2002). Allostatic load as a predictor of functional decline. MacArthur studies of successful aging. *Journal of Clinical Epidemiology, 55*, 696–710. doi:10.1016/S0895-4356(02)00399-2
- Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. (1963). Studies of illness in the aged. The index of adl: A standardized measure of biological and psychosocial function. *JAMA, 185*, 914–919. doi:10.1001/jama.1963.03060120024016
- Kohn, M. L., & Schooler, C. (1982). Job conditions and personality: A longitudinal assessment of their reciprocal effects. *American Journal of Sociology, 87*, 1257–1286.
- Li, C. Y., & Sung, F. C. (1999). A review of the healthy worker effect in occupational epidemiology. *Occupational Medicine, 49*, 225–229. doi:10.1093/occmed/49.4.225
- Luoh, M. C., & Herzog, A. R. (2002). Individual consequences of volunteer and paid work in old age: Health and mortality. *Journal of Health and Social Behavior, 43*, 490–509. doi:10.2307/3090239
- Moen, P., Dempster-McClain, D., & Williams, R. M. (1992). Successful aging: A life course perspective on women's multiple roles and health. *American Journal of Sociology, 97*, 1612–1638. doi:10.2307/2781550
- Muthén, L. K., & Muthén, B. O. (2007). Mplus (Version 6) [Computer software]. Los Angeles, CA.
- O'Neal, C. W., Wickrama, K. A. S., & Bryant, C. M. (2012). Control over work, positive self, and health in African American husbands and wives. *Journal of Family Issues, 33*, 1246–1263. doi:10.1177/0192513X12468435
- Olesen, S. C., Butterworth, P., & Rodgers, B. (2012). Is poor mental health a risk factor for retirement? Findings from a longitudinal population survey. *Social Psychiatry and Psychiatric Epidemiology, 47*, 735–744. doi:10.1007/s00127-011-0375-7
- Panza, F., Frisardi, V., Capurso, C., D'Introno, A., Colacicco, A., Imbimbo, B. P., . . . Solfrizzi, V. (2010). Late-life depression, mild cognitive impairment, and dementia: Possible continuum? *The American Journal of Geriatric Psychiatry, 18*, 98–116. doi:10.1097/JGP.0b013e3181b0fa13
- Park, D. C., & Reuter-Lorenz, P. (2009). The adaptive brain: Aging and neurocognitive scaffolding. *Annual Review of Psychology, 60*, 173–196. doi:10.1146/annurev.psych.59.103006.093656
- Perrino, T., Mason, C. A., Brown, S. C., Spokane, A., & Szapocznik, J. (2008). Longitudinal relationships between cognitive functioning and depressive symptoms among Hispanic older adults. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences, 63*, 309–317. doi:10.1093/geronb/63.5.P309
- Pynoos, J., & Liebig, P. (2009). Changing work, retirement, and housing patterns. *Generations, 33*, 20–26.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385–401. doi:10.1177/014662167700100306
- Raymo, J. M., Liang, J., Kobayashi, E., Sugihara, Y., & Fukaya, T. (2009). Work, health, and family at older ages in Japan. *Research on Aging, 31*, 180–206. doi:10.1177/0164027508328309
- Reynolds, C. A., Gatz, M., & Pedersen, N. L. (2002). Individual variation for cognitive decline: Quantitative methods for describing patterns of change. *Psychology and Aging, 17*, 271–287. doi:10.1037/0882-7974.17.2.271
- Rice, N. E., Lang, I. A., Henley, W., & Melzer, D. (2011). Common health predictors of early retirement: Findings from the English Longitudinal Study of Ageing. *Age and Ageing, 40*, 54–61. doi:10.1093/ageing/afq153
- Rohwedder, S., & Willis, R. J. (2010). Mental retirement. *The Journal of Economic Perspectives, 24*, 119–138. doi:10.1257/jep.24.1.119
- Roscigno, V. J. (2010). Ageism in the American workplace. *Contexts, 9*, 16–21. doi:10.1525/ctx.2010.9.1.16
- Ross, C. E., & Wu, C. L. (1996). Education, age, and the cumulative advantage in health. *Journal of Health and Social Behavior, 37*, 104–120. doi:10.1007/BF02681006
- Salthouse, T. A., & Ferrer-Caja, E. (2003). What needs to be explained to account for age-related effects on multiple cognitive variables? *Psychology and Aging, 18*, 91–110. doi:10.1037/0882-7974.18.1.91
- Schooler, C., Mulatu, M. S., & Oates, G. (1999). The continuing effects of substantively complex work on the intellectual functioning of older workers. *Psychology and Aging, 14*, 483–506. doi:10.1037/0882-7974.14.3.483
- Schwengel, A., Niti, M. M., Tang, C., & Ng, T. P. (2009). Continued work employment and volunteerism and mental well-being of older adults: Singapore longitudinal ageing studies. *Age and Ageing, 38*, 531–537. doi:10.1093/ageing/afp089
- Siebert, S. D. (1974). Toward a theory of role accumulation. *American Sociological Review, 39*, 567–578. doi:10.2307/2094422
- Silver, M. H., Jilinskaia, E., & Perls, T. T. (2001). Cognitive functional status of age-confirmed centenarians in a population-based study. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences, 56*, P134–P140. doi:10.1093/geronb/56.3.P134
- Steffens, D. C., Fisher, G. G., Langa, K. M., Potter, G. G., & Plassman, B. L. (2009). Prevalence of depression among older Americans: The Aging, Demographics and Memory Study. *International Psychogeriatrics, 21*, 879–888. doi:10.1017/S1041610209990044
- Taylor, M. G. (2008). Timing, accumulation, and the Black/White disability gap in later life: A test of weathering. *Research on Aging, 30*, 226–250. doi:10.1177/0164027507311838
- Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior, 52*, 145–161. doi:10.1177/0022146510395592
- Thoits, P. A., & Hewitt, L. N. (2001). Volunteer work and well-being. *Journal of Health and Social Behavior, 42*, 115–131. doi:10.2307/3090173
- von Gunten, A., Giannakopoulos, P., & Duc, R. (2005). Cognitive and demographic determinants of dementia in depressed patients with subjective memory complaints. *European Neurology, 54*, 154–158. doi:10.1159/000090104
- Westerlund, H., Kivimäki, M., Singh-Manoux, A., Melchior, M., Ferrie, J. E., Pentti, J., . . . Vahtera, J. (2009). Self-rated health before and after retirement in France (GAZEL): A cohort study. *Lancet, 374*, 1889–1896. doi:10.1016/S0140-6736(09)61570-1
- Westerlund, H., Vahtera, J., Ferrie, J. E., Singh-Manoux, A., Pentti, J., Melchior, M., . . . Kivimäki, M. (2010). Effect of retirement on major chronic conditions and fatigue: French GAZEL occupational cohort study. *BMJ, 341*, c6149. doi:10.1136/bmj.c6149
- Wethington, E., Moen, P., Glasgow, N., & Pillemer, K. (2000). Multiple roles, social integration, and health. In K. Pillemer & N. Glasgow (Eds.), *Social integration in the second half of life*. Baltimore, MD: Johns Hopkins University. 48–74.
- Wickrama, K. A., Lorenz, F. O., Conger, R. D., Matthews, L., & Elder, G. H. Jr. (1997). Linking occupational conditions to physical health through marital, social, and intrapersonal processes. *Journal of Health and Social Behavior, 38*, 363–375. doi:10.2307/2955431
- Wickrama, K. A., Surjadi, F. F., Lorenz, F. O., & Elder, G. H. Jr. (2008). The influence of work control trajectories on men's mental and physical health during the middle years: Mediation role of personal control. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences, 63*, 135–145. doi:10.1093/geronb/63.3.S135