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Risk of Cognitive Declines With Retirement: Who Declines and Why?

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Abstract

Retiring is associated with increased risk of cognitive decline (e.g., Bonsang et al., 2012; Wickrama et al., 2013). However, little is known about the moderating role of motivational and demographic factors that are implicated in adaptive development and the retirement transition process. We used data from the Midlife in the United States Study (n = 732, M age = 57, SD = 5.76, 50% female) to examine whether the association between retirement and cognitive decline depended on a key motivational factor (goal disengagement) in propensity score matched samples of older retirees and employees. We explored whether these effects were further moderated by gender. Results showed that those who retired (vs. remained employed) experienced steeper nine-year declines in episodic memory ($b = -.41$, $p = .001$) only if they were high in goal disengagement and female. Findings are consistent with theories of lifespan development and cognitive aging and provide initial evidence that retirement may be associated with increased cognitive declines for only certain individuals prone to disengage from highly challenging activities and goal pursuits.

Keywords

motivation; goal disengagement; cognitive functioning; aging; life course transitions

Research shows that cognitive functioning declines as people age (Hughes et al., 2018; Salthouse, 2012). However, there is substantial variability in rates of cognitive decline, which has been linked to individual differences and environmental factors (Hultsch et al., 1999; Salthouse, 1991, 2006). Increasing evidence suggests the work-to-retirement transition

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involves significant changes in exposure to simulating environments and that those who retire are at risk of steeper cognitive declines (Bonsang et al., 2012; Clouston & Denier, 2017; Wickrama et al., 2013).

Consistent with theories of cognitive aging and the use-it-or-lose it hypothesis (Hultsch et al., 1999), this implies that some individuals struggle to replace mentally stimulating work activities once they retire. However, risk of decline likely depends on previously unexamined motivational factors implicated in adaptive development and the retirement transition process. For instance, goal disengagement involves individual differences in people's tendencies to reduce goal-directed effort, lower aspirations, and decrease commitment to personal objectives (Heckhausen et al., 2010; Wrosch et al., 2002). Trait-like goal disengagement may play an important moderating role to the extent it undermines the motivation needed to replace former work tasks with new cognitively stimulating activities in retirement (Hamm et al., 2019; Wrosch et al., 2000). Gender may further moderate this relationship considering that retirement transition experiences, levels of cognitive functioning, and the associations between lifestyle activities and cognitive aging has been shown to differ for men and women (Hassing, 2020; Kim & Moen, 2001; Lachman et al., 2014).

The present study used data from the Midlife in the United States Study (MIDUS) to examine moderated associations between retirement status and nine-year cognitive functioning. To do so, we propensity score matched retirees with similar others who remained employed and tested whether the effects of retirement status depended on goal disengagement and gender.

Adaptive Development and Cognitive Functioning During the Retirement Transition

Our study was informed by theoretical frameworks that pertain to the retirement transition process and address individual differences in lifespan development and cognitive aging. The motivational theory of lifespan development (MTD) provided a developmental framework relevant to the work-to-retirement transition. Briefly, the MTD focuses on how individual differences in agency and motivation shape adaptive development (Heckhausen et al., 2010, 2019). Adaptive development depends on regulating motivation in response to changing opportunities and constraints that are affected by factors such as age, societal scaffolding, and major life course transitions. The MTD proposes that developmental regulation is a joint function of external scaffolding involving structured opportunities and individual differences in motivation (Heckhausen, 1999; Heckhausen & Buchmann, 2019).

For periods in the life course that offer limited external scaffolding (e.g., retirement) and thus require strong and autonomous motivation, MTD theory suggests that individuals with a trait-like tendency to disengage from difficult tasks and goals may be vulnerable to maladaptive developmental outcomes such as early cognitive declines (Hamm et al., 2019; Heckhausen et al., 2017; Heckhausen & Buchmann, 2019). The case in point within the context of the retirement transition is that, while employed, individuals are externally scaffolded to remain cognitively engaged as a function of their work activity. MTD theory implies that when these external scaffolds are eliminated with retirement, individual differences in goal disengagement may play an important role in moderating developmental trajectories of cognitive decline.[1]

Our study also drew from theoretical perspectives of cognitive aging that address cognitive enrichment and the use-it-or-lose-it hypothesis (Hertzog et al., 2008; Hultsch et al., 1999; Salthouse, 2006). The use-it-or-lose it hypothesis is pertinent to the retirement transition in that it suggests current mental activities should influence changes in cognitive functioning over time. Frequent exposure to stimulating activities and environments are theorized to slow rates of age-related decline (Hultsch et al., 1999). This implies that some individuals may be at increased risk of decline during work-to-retirement transitions that engender major changes in day-to-day cognitive activities.

These changes create new opportunities (gains) and constraints (losses) for cognitive engagement in retirement. Retirement involves losses in the form of discontinued work activities that provided daily opportunities for cognitive engagement (Fisher et al., 2014; Wickrama et al., 2013), and gains in the form of increased autonomy and opportunities to engage with new goals that can provide mental stimulation (Lachman, 1986; Kim & Moen, 2001). This pattern of losses and gains implies strong motivation is needed to replace work activities with new cognitively stimulating activities. Research documenting cognitive declines during the retirement transition suggests this is a challenging task (Bonsang et al., 2012; Clouston & Denier, 2017; see the OSM for details).

However, little is known about factors that moderate the association between retirement status and cognitive decline, despite substantial variability in this association (Hülür et al., 2019; Oltmanns et al., 2017). Research examining the issue has largely focused on mental demands or task complexity at work (Fisher et al., 2014; Kajitani et al., 2017; Mazzonna & Peracchi, 2012), but has yet to consider individual differences in broader motivation factors implicated in adaptive development and the retirement transition. The MTD points to goal disengagement as an important motivation factor that may moderate the influence of retirement on developmental changes in cognitive functioning (Heckhausen et al., 2019; Shane & Heckhausen, 2019). Individual differences in goal disengagement may affect whether people seek out versus avoid cognitive challenges once external prompts have fallen away with retirement.

For those prone to goal disengagement, retiring eliminates an important source of structured opportunities for cognitive engagement inherent to daily work tasks (Wickrama et al., 2013). Work environments commonly require individuals to engage in executive functioning tasks and necessitate the frequent use of episodic memory for deadlines, appointments, and social interactions. The use-it-or-lose-it hypothesis (Hertzog et al., 2008) suggests finding substitutes for these mentally stimulating work activities represents an important task for retirees. Individuals prone to goal disengagement may have difficulty replacing structured work activities with new mentally stimulating activities that must be self-initiated and autonomously maintained (Hamm et al., 2019). Retirement may thus primarily be associated

[1]See the Online Supplemental Materials [OSM] for a discussion of more transient aspects of goal disengagement and the MTD.

with cognitive declines for individuals high in trait-like goal disengagement, who may not capitalize on increased opportunities for engagement in retirement (Kim & Moen, 2001; Wrosch et al., 2000).

A potential demographic moderator that has received little attention in the literature is gender. There are well-established gender differences on central measures of cognitive functioning: Women score better on episodic memory, whereas men score better on executive functioning (Asperholm et al., in press; Lachman et al., 2014; Hughes et al., 2018). Research suggests men and women also report differential retirement transition experiences and activities that may affect post-retirement declines in cognition. A review by Kim and Moen (2001) found that women, who typically enter retirement with fewer socioeconomic resources than men (Wang & Shi, 2014), report more negative attitudes towards retirement, prepare for it less, and experience more depressive symptoms during this transition (see also Moen et al., 2006). Gender differences in retirement leisure activities have also been observed, with women less likely to actively pursue concrete goals (Wang & Shi, 2014) and men less likely to engage in social activities (Kubicek et al., 2011; Scherger et al., 2011). Recent evidence suggests such leisure activities exhibit gender-dependent associations with cognitive declines in old age, prompting recommendations to examine differences between men and women in cognitive aging research (Hassing, 2020). Our study thus explored whether gender further moderated the association between retirement and cognitive decline. However, we did not make predictions concerning the direction of this moderated effect because it remains unclear whether men or women's cognitive functioning should be more affected by the retirement transition.[2]

The Present Study

The present study used nine-year (two-occasion) data from MIDUS to examine whether goal disengagement moderated previously observed differences in longitudinal cognitive functioning between those who retire and those who remain employed. We expected retiring would predict increased cognitive declines for only individuals prone to goal disengagement who may lack the motivational resources needed to replace work tasks with new cognitively stimulating activities (Hamm et al., 2019; Wrosch et al., 2000). We explored whether gender further moderated these effects based on the cognitive functioning and retirement literatures, which have documented differences between men and women in cognition, socioeconomic resources, and the retirement transition experience (Hughes et al., 2018; Wang & Shi, 2014).

Few studies have examined gender as a moderator of the association between retirement and cognition, and it is unknown whether retiring might be more detrimental for men or women prone to goal disengagement. On the one hand, retiring could be more maladaptive for men high in goal disengagement who pursue fewer post-retirement cultural or social activities, which could undermine cognitive functioning (Kubicek et al., 2011; Scherger et al., 2011). On the other hand, retiring could be most detrimental for women prone to goal

[2]Although men and women have different levels of episodic memory and executive functioning, the pattern concerning which gender is disadvantaged differs (Hughes et al., 2018). Similarly, retired women are disadvantaged on some factors that could protect against cognitive declines (e.g., fewer retirement goals, lower SES; Wang & Shi, 2014), but retired men are disadvantaged on other factors (e.g., fewer social activities; Kubicek et al., 2011).

disengagement. Female retirees high in goal disengagement may find it difficult to adopt and maintain new goals for active engagement in retirement (Wang & Shi, 2014), and may thus be less likely to seek out and persist with mentally stimulating activities that can sustain cognitive functioning (Lachman et al., 2010). Accelerated declines could occur under these circumstances for women who commonly enter retirement with fewer socioeconomic resources that can buffer against losses in cognition (Hughes et al., 2014; Wickrama et al., 2013).

Method

Participants and Procedures

We examined our research questions using data from the Midlife in the United States Study (MIDUS; see Brim et al., 2004; Ryff et al., 2017). Briefly, MIDUS is a national study of American adults who were initially assessed in 1995 (n = 7,108) and who were reassessed in 2004 (MIDUS 2) and 2013 (MIDUS 3). Our study focused on participants from MIDUS 2 and 3 because cognitive functioning was not assessed at MIDUS 1. Inclusion criteria for the present study were that participants (a) were 50+ years old at MIDUS 2, (b) reported they were working or self-employed at MIDUS 2, (c) indicated they were working, self-employed, or retired at MIDUS 3, (d) had data on the MIDUS 2 matching variables that included age, gender, education, income, occupation, and self-reported health, and (e) provided data on our outcome measures of episodic memory and/or executive functioning at MIDUS 3.

These criteria allowed us to examine nine-year differences in cognitive functioning between matched samples of middle-aged and older adults who retired versus their peers who stayed employed. At MIDUS 2, the retained sample (n = 732) was working or self-employed, had a mean age of 57 (range = 50–77), was 50% female and 94% White, had an average household income of $88,507, and 76% had some postsecondary education. See the OSM for precautions taken to ensure the comparability of our retiree and employee samples as well as differences between the analyzed sample and the full MIDUS sample. MIDUS data collection was approved by the Education and Social/Behavioral Sciences and the Health Sciences Institutional Review Boards at the University of Wisconsin-Madison.

Matching and Predictor Variables (see Table 1)

Demographic matching variables.—Matching variables were assessed at MIDUS 2 and included age (in years), gender (1 = *male*, 2 = *female*), education, household income, occupation, and self-reported health status. Education was assessed using a 12-point scale and recoded to reflect whether participants had completed some post-secondary education (0 = *no postsecondary education*, 1 = *1+ year of postsecondary education*). Occupation was self-reported and coded to reflect whether participants were in managerial or professional positions (0 = *no*, 1 = *yes*). Current health status was reported on an 11-point scale (0 = *worst possible health,* 10 = *best possible health*).

Retirement status.—Retirement status was dummy coded to reflect whether participants were working at MIDUS 2 and 3 or were working at MIDUS 2 and retired by MIDUS 3 (0 =

remained employed [n = 419], 1 = *retired* [n = 313]). Although retirement does not always reflect a discrete process, 98% of our retired participants reported being exclusively retired (not being in any other work category). See the OSM for further details on our operationalization.

Goal disengagement.—Individual differences in goal disengagement were assessed at MIDUS 2 using a preexisting three-item scale that measured disengagement from attainable and unattainable goals. Items assessed participants' general tendencies to lower aspirations and withdraw commitment from personal tasks and goals ("When my expectations are not being met, I lower my expectations", "To avoid disappointments, I don't set my goals too high", "I feel relieved when I let go of some of my responsibilities"). Participants responded to each item on a four-point scale (1 = *not at all*, 4 = *a lot*; M = 2.12, SD = 0.62, range = 1–4, Skewness = 0.22, Kurtosis = −0.33, α = .51). See the OSM for details on scale items, reliability, and validity.

Outcome Variables

MIDUS cognitive battery.—The Brief Test of Adult Cognition by Telephone (BTACT) was used to assess episodic memory and executive functioning at MIDUS 2 and 3 (Lachman & Tun, 2008; Tun & Lachman, 2006). Previous research has shown the BTACT is a reliable and valid measure of central dimensions of cognition involving episodic memory and executive functioning (see Hughes et al., 2018; Lachman et al., 2010, 2014; Tun & Lachman, 2006). Episodic memory was assessed using immediate and delayed recall tasks (free recall of 15 words). Executive functioning was assessed using measures of inductive reasoning, category verbal fluency, working memory span, processing speed, and attention switching and inhibitory control. Episodic memory and executive functioning were calculated by averaging the standardized values of their respective subtests. See the OSM for further details on the BTACT.

Results

Preliminary Gender Analyses

Correlation coefficients revealed gender differences in cognitive functioning, socioeconomic resources, and goal disengagement (see Table 1). Consistent with previous research, men scored higher in executive functioning, whereas women scored higher in episodic memory (Hughes et al., 2018). Small but consistent gender associations with the socioeconomic variables indicated that women reported less education, income, and lower occupational prestige than their male counterparts. Women were also higher in trait-like goal disengagement than men.

Data Preparation and Rationale for Analyses

We employed propensity score matching to equate those who were working at MIDUS 2 and retired at MIDUS 3 (n = 313) with their peers who remained employed (n = 419) on relevant background variables (Austin, 2011). Specifically, for each retired participant, a "twin" who remained employed was identified who was the same or as similar as possible on covariates related to both the predictor (retirement status) and the outcome (cognitive functioning): age, gender, education, income, occupation, and self-reported health (see the OSM for a detailed rationale). Propensity score models were estimated using the MatchIt package for R (Ho et al., 2011). Our logistic regression matching algorithm employed 1:1 nearest neighbor matching with a caliper of ≤ .20 (maximum allowable distance between matched participants; Lee & Little, 2017). Suitable neighbors who remained employed were identified for 268 participants who retired. The matching algorithm successfully equated the two groups on the matching variables (see Figure 1). The propensity score matched samples also did not differ on baseline episodic memory, executive functioning, or an array of demographic, psychosocial, or health-related variables (*p*s > .05; see Figure S2).

Hierarchical OLS regression analyses assessed differences in nine-year cognitive functioning between the matched samples. Model 1 examined whether retirement status predicted differential change in cognitive functioning for the matched samples (main effect models). Model 2 incorporated goal disengagement as a moderator of retirement status effects (two-way interaction models). Model 3 examined whether gender further moderated retirement status effects (three-way interaction models). All regression models controlled for baseline cognitive functioning (autoregressive effects) which permitted a test of differential changes in cognitive functioning between the matched samples (Cohen, Cohen, West, & Aiken, 2003).

Model Equations

OLS regression equations were specified as follows for Models 1–3. Note that RS = retirement status and GD = goal disengagement.

$$\hat{Y} = b_0 + b_1 Baseline + b_2 RS + b_3 GD + b_4 Gender \quad \text{Model 1.}$$

$$\hat{Y} = b_0 + b_1 Baseline + b_2 RS + b_3 GD + b_4 Gender + b_5 RS \times GD \quad \text{Model 2.}$$

$$\begin{aligned}\hat{Y} = b_0 + b_1 Baseline + b_2 RS + b_3 GD + b_4 Gender + b_5 RS \times GD \\ + b_6 RS \times Gender + b_7 GD \times Gender + b_8 RS \times GD \times Gender\end{aligned} \quad \text{Model 3.}$$

Moderated Differences in Cognitive Functioning Between the Matched Samples

Table 2 presents a summary of results for all models. Model 1 (main effects) results showed those who retired did not significantly differ from those who remained employed in rates of nine-year decline for episodic memory or executive functioning.

Model 2 (two-way interactions) results indicated the Retirement Status x Goal Disengagement interaction for episodic memory was not significant at $p < .05$ ($b = -.19$, $SE = .113$, $p = .085$). Exploratory simple slope analyses probed the interaction by assessing retirement status effects at low (−1 SD) and high (+1 SD) values of goal disengagement (Hayes, 2013). Results showed retiring (vs. remaining employed) predicted steeper declines in episodic memory for only those who were high in goal disengagement ($b = -.20$, $SE = .100$, $p = .046$). No two-way interaction emerged for executive functioning.

Model 3 (three-way interactions) yielded a significant Retirement Status x Goal Disengagement x Gender interaction for episodic memory. Simple slope analyses probed the interaction by assessing retirement status effects for males and females at low (−1 SD) and high (+1 SD) values of goal disengagement (see the OSM for results of a range-of-significance approach). Results showed that retiring (vs. remaining employed) predicted steeper declines in episodic memory for only females high in goal disengagement ($b = -.41$, $SE = .128$, $p = .001$; see Figure 2). Retiring did not predict greater declines in episodic memory for males high in goal disengagement ($b = .13$, $SE = .158$, $p = .420$).

The three-way interaction was not significant for executive functioning. We assessed exploratory simple slope analyses as a preliminary test of whether the pattern of results was consistent with those observed for episodic memory: Results of these exploratory analyses suggested retiring (vs. remaining employed) predicted steeper declines in executive functioning for only females high in goal disengagement ($b = -.14$, $SE = .066$, $p = .041$). Retiring did not predict greater declines in executive functioning for males high in goal disengagement ($b = .01$, $SE = .082$, $p = .906$).[3]

See the OSM for results of a series of supplemental analyses that tested doubly-robust models, separate models for each BTACT scale, latent variable models, and models assessing whether results differed for participants who held professional vs. non-professional positions.

Discussion

Our study examined the conditions under which transitioning to retirement predicted cognitive declines using data from MIDUS. Findings from our matched samples provide initial evidence that whether retirees are at risk of greater declines than their peers who remain employed may depend on goal disengagement and gender. Results are consistent with theories of lifespan development and cognitive aging and contribute to a better understanding of individual differences that moderate risk of cognitive decline during the retirement transition (Heckhausen et al., 2010, 2019; Hultsch et al., 1999).

Moderated Associations Between Retirement and Cognitive Decline

Our findings suggest that not all those who retire experience greater losses in cognitive functioning (see the OSM for a discussion of non-significant retirement main effects). Results showing the association between retirement and developmental changes in cognition depend on individual differences in goal disengagement are consistent with the MTD and the use-it-or-lose-it hypothesis (Heckhausen et al., 2019; Hertzog et al., 2008; Hultsch et al., 1999). These findings highlight the trade-off between individual agency and social context in regulating individuals’ development (Heckhausen et al., 1999, 2019). With the absence of structured work-based cognitive activity after retirement, the regulatory challenge to maintain cognitively demanding activities falls to the individual. This may be a significant challenge for those prone to disengage from difficult tasks and goals.

[3]Although the simple retirement slope on executive functioning was significant only for women high in goal disengagement, the absence of a significant interaction indicates the pattern of simple slopes did not significantly differ from one another (Hayes, 2013).

Goal disengagement tendencies may undermine the motivation needed to capitalize on new opportunities for active engagement during retirement transitions that remove previous societal scaffolds (Hamm et al., 2019). This would be maladaptive if individuals prone to goal disengagement fail to replace mentally stimulating work activities in retirement (Lachman et al., 2010). Our study supports this logic in showing that retirement was only associated with declines among those high in goal disengagement.

Gender further moderated these associations, such that retiring only predicted cognitive declines for women high in goal disengagement. Previous research points to several possible mechanisms that may underlie this effect. For instance, some evidence suggests women may have greater difficulty adapting to retirement (e.g., women report more negative attitudes toward retirement and exhibit more depressive symptoms; Kim & Moen, 2001). Women are also less likely to hold specific goals for active engagement in retirement and participate in fewer post-retirement hobbies (Moen et al., 2006; Wang & Shi, 2014). Female retirees high in goal disengagement may thus be less likely to seek out and maintain new mentally stimulating activities that can sustain cognitive functioning (Lachman et al., 2010). Accelerated declines could occur under these circumstances considering that women typically enter retirement with fewer socioeconomic resources that can buffer against losses in cognition (Hughes et al., 2014; Wickrama et al., 2013).

Our results indicate that male retirees (vs. employees) high in goal disengagement were not at greater risk of cognitive declines, which is in contrast to the differences observed among women. These divergent findings may be due to the higher socioeconomic status (education, income, occupation) of men in our study, which could have protected them from early declines. See the OSM for a more detailed discussion of gender differences as well as the differential effects of retirement on the two indicators of cognitive functioning.

Strengths, Limitations, and Future Directions

The present study has several strengths. First, our sample was drawn from MIDUS which contains longitudinal data from a national sample of middle-aged and older American adults. Second, our nine-year outcome variables were objectively assessed and comprised previously validated measures of episodic memory and executive functioning (Lachman et al., 2014). Third, our analytic approach ensured a region of common support that involved overlapping distributions on age, gender, education, income, occupation, and health status for our propensity score matched samples of retirees and employees (Lee & Little, 2017).

One caveat when interpreting our findings is that data on cognitive functioning were collected on only two occasions over a nine-year period. Future research should examine differential trajectories for those who retire (vs. remain employed) based on more frequent assessments of cognitive functioning across multiple domains (e.g., language, visuospatial processing). A second limitation is that the MTD also addresses within-person changes in more transient aspects of goal disengagement which were not measured in MIDUS. Future research is needed on the role of task-specific goal disengagement within different life domains such as work and leisure. A third limitation is the modest internal consistency of our goal disengagement measure. A final caveat is that a majority of MIDUS participants were White and had moderate to high socioeconomic statuses. It is unclear whether results would generalize to individuals from different backgrounds.

Future research should examine the role of individual differences in goal disengagement during other life course transitions that involve increasing (e.g., college entry) and decreasing autonomy (e.g., loss of functioning). According to MTD theory, goal disengagement should be detrimental in the former and beneficial in the latter (Heckhausen et al., 2010, 2019), but research is needed to test this supposition. Further, there is a growing literature on the adaptive role of trait-like goal disengagement in response to unattainable goals (Barlow et al., in press; Wrosch et al., 2003). However, less is known about the maladaptive implications of goal disengagement in response to challenging but still achievable goals. Our study provided some initial evidence for one set of developmental conditions under which goal disengagement can be dysfunctional, but further research is needed to address this issue.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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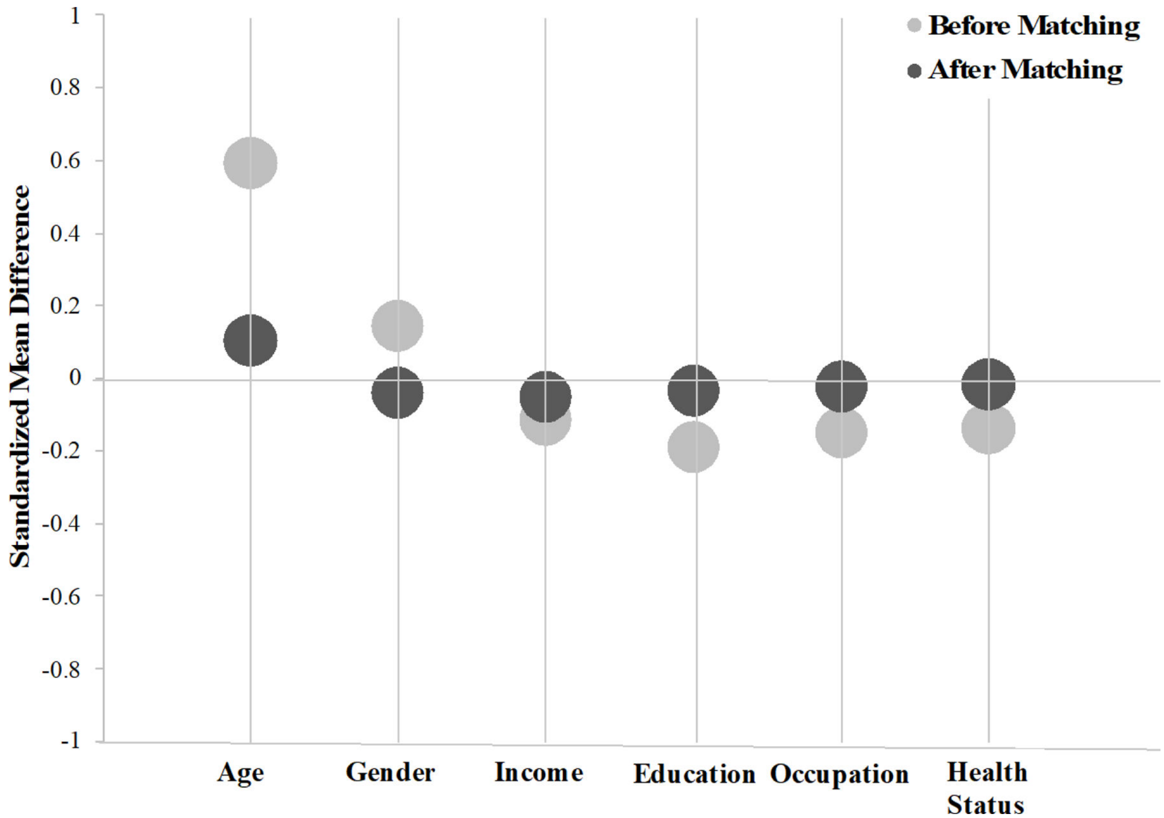

Figure 1.

Standardized mean differences on the matching variables before and after propensity score matching.

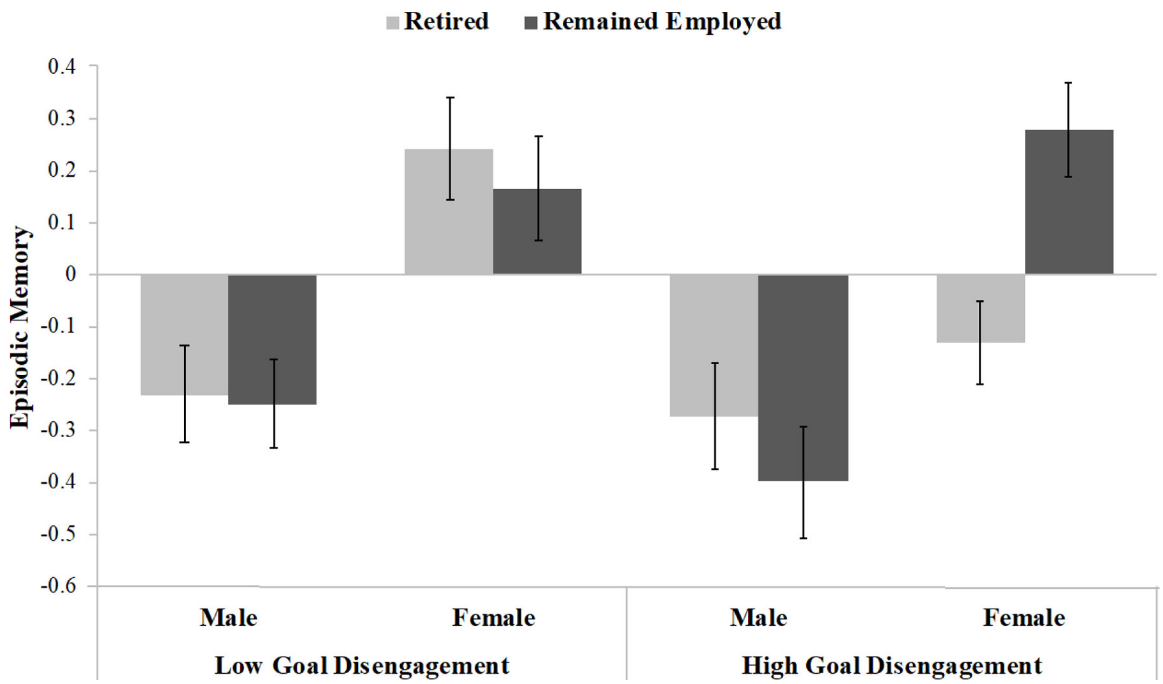

Figure 2.

Moderated differences in nine-year episodic memory for the matched samples of those who retired and their peers who remained employed. Simple slopes of retirement status are presented for males and females at low (−1 SD) and high (+1 SD) levels of goal disengagement. Episodic memory scores represent predicted regression values for each combination of retirement status, goal disengagement, and gender. Analyses controlled for autoregressive effects (baseline levels of episodic memory). Error bars represent ± 1 *SE*.

Table 1

Descriptive Statistics and Interitem Correlations for the Pre-Matched (Below Diagonal) and Post-Matched Samples (Above Diagonal)

	1	2	3	4	5	6	7	8	9	10	11	12
1. M2 Age	–	−.07	.02	−.09	.00	.12	.05	−.02	−.11	−.11	−.26	−.21
2. M2 Gender (female)	.00	–	−.10	−.15	−.09	.03	−.02	.19	.29	−.11	.32	−.12
3. M2 Education	−.05	−.11	–	.23	.36	.09	−.02	−.18	.18	.27	.11	.26
4. M2 Income	−.09	−.16	.22	–	.31	.02	−.02	−.07	.04	.24	.09	.21
5. M2 Occupation	−.04	−.09	.34	.31	–	.00	−.01	−.17	.10	.31	.05	.28
6. M2 Health status	.05	−.01	.12	.03	−.02	–	−.01	.00	.08	.02	.04	.00
7. M2-M3 Retirement status	.29	.07	−.10	−.06	−.07	−.07	–	.05	−.05	−.07	−.07	−.08
8. M2 Goal disengagement	−.02	.17	−.13	−.06	−.10	−.05	.04	–	.01	−.09	−.03	−.10
9. M2 Episodic memory	−.13	.23	.15	.02	.09	.05	−.07	.03	–	.31	.48	.23
10. M2 Executive functioning	−.19	−.14	.30	.23	.28	.06	−.17	−.07	.32	–	.24	.76
11. M3 Episodic memory	−.26	.29	.12	.09	.08	.04	−.11	.00	.49	.27	–	.32
12. M3 Executive functioning	−.27	−.15	.28	.20	.28	.03	−.18	−.07	.24	.75	.33	–
M (total)	57.36	1.50	0.76	88507	0.49	7.74	0.43	2.12	0.12	0.14	−.02	−.10
SD (total)	5.76	–	–	66590	–	1.30	–	0.62	0.91	0.60	0.91	0.65
M (female)	57.37	–	0.71	77680	0.45	7.72	0.46	2.23	0.34	0.06	0.25	−0.20
SD (female)	5.77	–	–	60609	–	1.34	–	0.62	0.95	0.60	0.96	0.64
M (male)	57.35	–	0.81	99394	0.54	7.75	0.39	2.02	−0.09	0.23	−0.28	0.00
SD (male)	5.76	–	–	70529	–	1.27	–	0.60	0.81	0.59	0.78	0.63

Note. M2 = MIDUS 2. M3 = MIDUS 3. M2-M3 Retirement status (0 = *working at MIDUS 2 and 3*, 1 = *working at MIDUS 2 and retired at MIDUS 3*). All correlations above |.09| are significant at $p < .05$ (two-tailed tests). Correlations below the diagonal are based on the pre-matched sample ($n = 732$), and correlations above the diagonal are based on the post-matched sample ($n = 536$).

Table 2

Regression Coefficients for 9-Year Cognitive Functioning in the Matched Samples

	Episodic Memory		Executive Functioning	
Predictor Variable	***b***	***SE***	***b***	***SE***
Model 1				
Baseline	.42**	(.040)	.77**	(.031)
Retirement Status (RS)	−.08	(.070)	−.03	(.036)
Goal Disengagement (GD)	−.10†	(.057)	−.02	(.029)
Gender (female)	.42**	(.074)	−.06†	(.037)
R^2	.27		.58	
Model 2				
Baseline	.42**	(.040)	.77**	(.031)
Retirement Status (RS)	−.08	(.070)	−.03	(.036)
Goal Disengagement (GD)	−.10†	(.057)	−.02	(.029)
Gender (female)	.42**	(.074)	−.06†	(.037)
RS x GD	−.19†	(.113)	−.07	(.057)
R^2	.28		.58	
Model 3				
Baseline	.42**	(.040)	.77**	(.031)
Retirement Status (RS)	−.05	(.071)	−.02	(.037)
Goal Disengagement (GD)	−.09	(.057)	−.01	(.030)
Gender (female)	.42**	(.074)	−.06	(.037)
RS x GD	−.16	(.114)	−.07	(.059)
RS x Gender	−.24†	(.142)	−.03	(.074)
GD x Gender	−.03	(.114)	−.01	(.059)
RS x GD x Gender	−.48*	(.229)	−.18	(.118)
R^2	.29		.59	

Note. Retirement status (0 = *working at MIDUS 2 and 3*, 1 = *working at MIDUS 2 and retired at MIDUS 3*). Unstandardized beta estimates are presented. Episodic memory $n = 513$. Executive functioning $n = 473$. Predictor variables were mean centered to facilitate interpretation (Hayes, 2013).

† $p < .10$,

* $p < .05$,

** $p < .01$