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Original article

Rewarding Work and Memory Perceptions: Evidence Among Older Workers in the Health and Retirement Study

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ABSTRACT

Background: The projected expansion of an aging United States (US) workforce prompts further evaluation of the potential impact of work on cognitive health. This study aimed to investigate longitudinal associations of reward and effort at work with subjective memory among US older workers.
Methods: Data were obtained from the population-based Health and Retirement Study. At the 2006–2008 baseline, effort and reward were measured using hypotheses based on the effort-reward imbalance (ERI) model. A subjective memory summary score that was composed of two items, in which higher scores indicated better subjective memory, was assessed biennially between the baseline and 2018. Generalized estimating equations analyzed longitudinal associations of effort and reward categories with changes in subjective memory between the baseline and follow-ups. Demographic, socioeconomic, lifestyle, health, and work covariates were adjusted for in linear regression models. Supplementary analyses explored the associations of ERI components with each of the two items that formed the subjective memory summary score.
Results: Among 3,497 workers aged 50 years and older, after covariate adjustments, high reward was significantly associated with better subjective memory (regression coefficient: 0.15 [95% confidence interval: 0.07, 0.23], $p < 0.001$). Compared to the combination of "low effort and low reward," other effort-reward combinations were also associated with increased subjective memory ($p < 0.05$). Supplementary analyses demonstrated significant positive associations with independent high reward and ERI combinations. High effort was positively related to subjective memory, although the association was not significant after adjustments.
Conclusion: Work-related reward, independently and in combination with effort, may contribute to improved subjective memory among US older workers.

1. Introduction

Perceived declines in cognition have been related to increased risks of mild cognitive impairment and dementia [1], and perceived memory issues have been associated with objective memory decline [2] and Alzheimer's disease biomarkers [3]. Among United States (US) adults aged 45 years and older, about 10 % have reported perceived cognitive decline [4], and among US older adults, a future diagnosis of dementia was identified as a psychologically distressing concern [5]. US adults in these age groups also represent a substantial proportion of the US workforce, with those aged 55 years and up representing almost one-

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fourth of the workforce, with a projected 7.3% increase between 2023 and 2033 [6]. Although modifiable risk factors for dementia across midlife and older age have been identified, work-related factors are absent despite the acknowledgement that occupational complexity has been related to reduced dementia risk [7]. Further research is needed to clarify the work and cognition relationship, especially as people continue to work in older age.

Psychosocial work, particularly focusing on workers' perception of tasks, has been positively associated with favorable objective cognitive outcomes [8,9]. However, fewer studies have explored cognitive health in the context of theoretical concepts of a health-related psychosocial work environment, such as the Job Demand-Control model [10–13]. Effort-reward imbalance (ERI) is a complementary model focusing on perceived reciprocity between provided work-related efforts and rewards received in return [14]. This model assumes that the imbalance between high effort and low reward matters most for the risk of developing stress-related disorders [15], Yet, it also claims that its single components can predict positive and negative health outcomes [16]. In this study, we examine the single components of this model as well as their constellations in relation to longitudinal changes in subjective memory measures among a US cohort of workers. This approach is based on previous evidence indicating that high reward acts as a protective factor of objective cognitive functioning [17,18]. Moreover, it posits that high effort at work, rather than being a risk factor, may strengthen cognition through recurrent stimulation, particularly in combination with high reward. This combination was longitudinally associated with increased episodic memory in an earlier study among US workers [18]. Therefore, in this study, we analyze the role of components and constellations of the ERI model in predicting changes of subjective memory over time. Our focus on subjective memory is justified by the fact that memory complaints were associated with faster cognitive decline [19] and greater altered brain structure among older adults [20]. These complaints are already experienced in midlife to the extent of some 10 %, according to recent US data on adults aged 45 years and beyond [21].

2. Materials and methods

2.1. Data and sample

This study used data from the US Health and Retirement Study (HRS), a population-based study of adults aged 50 years and older [22]. While subjective memory was assessed biennially in the core HRS survey in all HRS participants [23], ERI data were available from the specific Psychosocial and Lifestyle Self-Administered or "Leave-Behind" Questionnaire, which was administered to rotating half samples [24]. This study combined the 2006 and 2008 half samples to form the baseline sample and utilized corresponding subjective memory data at the baseline and follow-ups biennially through 2018. This current study was exempt from review by the University of California, Los Angeles Institutional Review Board (IRB#24-001361), and followed the Declaration of Helsinki and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

Sample size was determined by inclusion criteria that were applied to this nationally representative HRS sample. Inclusion criteria were participants that: (1) were working and working full-time or part-time for pay in HRS 2006-2008, (2) were aged ≥50, (3) had complete baseline data of ERI, covariates, and subjective memory, (4) denied memory-related disease diagnosis or were identified as cognitively normal based on Langa–Weir classifications [25], and (5) had at least one follow-up of subjective memory data. The final analytic sample was 3,497 workers (Fig. 1).

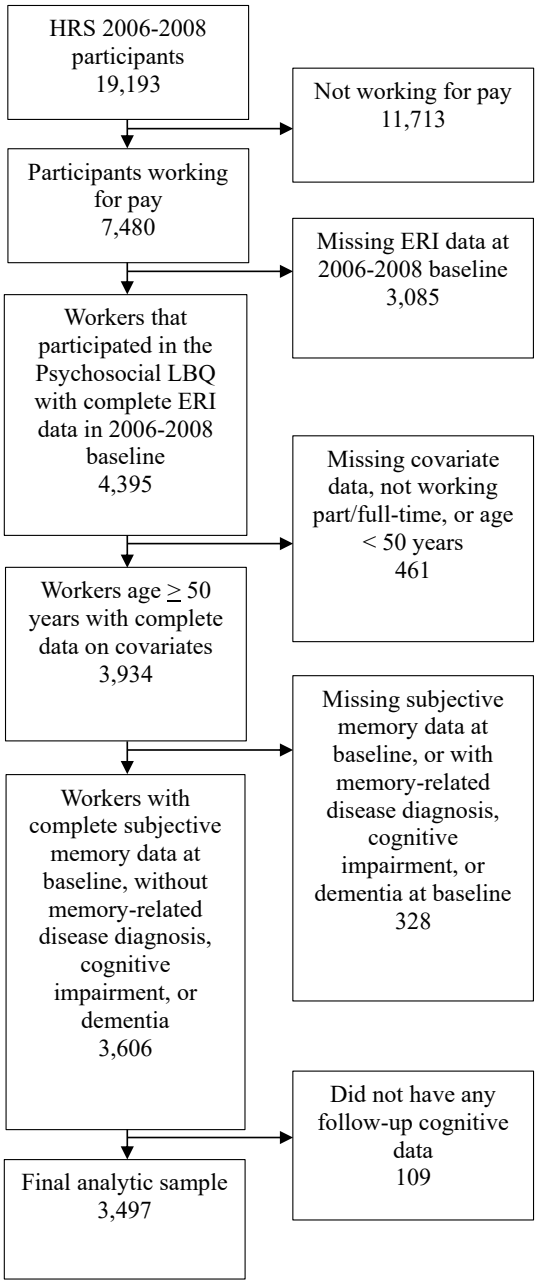

Fig. 1. Sample flowchart of HRS 2006–2008 participants. HRS, Health and Retirement Study.

2.2. Measures

2.2.1. Effort-reward imbalance

ERI was assessed with a proxy measure of the original scales [26], based on psychometric validation. Effort was assessed using three items on work pace, workload, and conflicting demands. Reward was measured using five items on salary, recognition, job security, job promotion, and support [27]. A four-level response option from 1 (strongly disagree) to 4 (strongly agree) was applied, and sum scores were calculated for the effort scale (range: 3–12) and reward scale (range: 5-20), respectively. Both scales were then dichotomized according to the median points (7 for effort and 14 for reward) to form "low" and "high" independent effort and reward groups, and additionally the joint combinations of: (1) "low effort and low reward," (2) "high effort and low reward," (3)

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"low effort and high reward," and (4) "high effort and high reward." Cronbach α coefficients were 0.59 for the effort scale and 0.70 for the reward scale. As argued in the introduction, this exploratory approach was preferred to the established procedure of introducing an investigator-based algorithm quantifying the (im)balance between effort and reward [28].

2.2.2. Subjective memory

The subjective memory outcome was a summary score that incorporated two items. One item assessed current memory perceptions, with the prompt, "How would you rate your memory at the present time? "Would you say it is excellent, very good, good, fair, or poor?" [23]. The second item evaluated perception of memory in comparison to the past two years, with the prompt, "Compared to two years ago, would you say your memory is better now, about the same, or worse now than it was then?" [23]. Both items were reverse scored so that higher scores indicate better subjective memory, the latter item was rescaled using linear transformation and then both items were added together to form a summary score composite of self-rated present and relative memory [29].

2.2.3. Covariates

Covariates at the baseline were categorical and continuous variables for demographic, socioeconomic, lifestyle, health, and work characteristics, several of which have been identified as dementia risk factors [7]. These covariates were age, sex, marital status, race, educational attainment, household income in US dollars (USD), smoking status, alcohol consumption, physical exercise, perceived social support outside of work, cardiovascular disease, depression, and the psychosocial work factor of job control from the Job Demand-Control model [10]. The non–work-related social support and job-related control were derived from the Psychosocial and Lifestyle Leave-Behind Questionnaire [24]. A time-varying covariate across the baseline and follow-up survey waves was employment status.

2.3. Data analysis

For study sample characteristics, descriptive statistics were frequencies, means, and standard deviations. Generalized estimating equations [GEEs; [30]] linear regression evaluated the associations of components of the ERI model with subjective memory through multistep, multivariable models adjusting for covariates (Models 0 through VII). Outputs were regression coefficients that represented increased subjective memory if positive, with 95% confidence intervals, and p values. Reference groups were "low effort," "low reward," and "low effort and low reward," for consistency with previous ERI and objective cognition studies that determined positive associations of high effort and high reward categories with cognitive function [17,18]. Supplementary analyses examined the associations of ERI with the separate items of the present time and the two-year comparison subjective memory as sensitivity analyses. SAS Analytics Software version 9.4 (SAS Institute, Cary, NC, USA) performed the analyses.

3. Results

Baseline sample characteristics of demographic, socioeconomic, lifestyle, health, work, ERI, and subjective memory data are summarized in Table 1. Among the sample of 3,497 participants, the mean age was 61.03 years (standard deviation = 6.88, range: 50–87), 54.70% were female participants, and more than half were full-time workers (67.29%). For independent ERI group characteristics, 54.90% had high effort, 53.19% had low reward, while for joint ERI group characteristics, 34.74% had "high effort and low reward," 26.65% had "low effort and high reward," and 20.16% had "high effort and high reward." The mean subjective memory summary score was 5.98 (standard deviation = 5.98; range = 2-10).

Table 1
Characteristics of study sample at HRS 2006–2008 baseline, n = 3,497

Variable	Category/measure	Value
Age group	50-64	2476 (70.80%)
	65-74	864 (24.71%)
	75 and up	157 (4.49%)
Sex	Male	1584 (45.30%)
	Female	1913 (54.70%)
Marital status	Married	2544 (72.75%)
	Never married	105 (3.00%)
	Other (e.g., divorced, widowed)	848 (24.25%)
Race	White	2962 (84.70%)
	Black	339 (9.69%)
	Other	196 (5.60%)
Education	High school or less	2093 (59.85%)
	Some college	260 (7.43%)
	University or more	1144 (32.71%)
Income (US dollar)	>99,999	1089 (31.14%)
	45,000–99,999	1357 (38.80%)
	<45,000	1051 (30.05%)
Smoking	Yes	485 (13.87%)
	No	3012 (86.13%)
Alcohol	None/moderate	3376 (96.54%)
	Heavy	121 (3.46%)
Physical exercise	High	2005 (57.33%)
	Moderate	412 (11.78%)
	Low	1080 (30.88%)
Cardiovascular disease	No	2957 (84.56%)
	Yes	540 (15.44%)
Depression	No	3197 (91.42%)
	Yes	300 (8.58%)
Employment status	Full-time	2353 (67.29%)
	Part-time or partly retired	1144 (32.71%)
Continuous measures *	Social support (non-work)	3.15 ± 0.51 (range 1-4)
	Job control	9.25 ± 1.70 (range 3-12)
	Subjective memory score	5.98 ± 1.39 (range 2-10)
Effort-reward scores *	Effort	6.83 ± 1.89 (range 3-12)
	Reward	14.32 ± 2.76 (range 5-20)
Effort-reward groups	Low Effort	1577 (45.10%)
	High Effort	1920 (54.90%)
	Low Reward	1860 (53.19%)
	High Reward	1637 (46.81%)
	Low Effort + Low Reward	645 (18.44%)
	High Effort + Low Reward	1215 (34.74%)
	Low Effort + High Reward	932 (26.65%)
	High Effort + High Reward	705 (20.16%)

* Higher scores reflecting greater values of measured variables.

Table 2 exhibits the regression results of components of the ERI model with subjective memory summary scores. In the fully adjusted results, compared to low effort, high effort was related to increased subjective memory scores but the association was not statistically significant (Table 2; Model VII: regression coefficient: 0.01 [95% confidence interval: -0.07, 0.08], $p = 0.824$). Compared to low reward, high reward was associated with increases in subjective memory (Table 2; Model VII: 0.15 [0.07, 0.23], $p < 0.001$). For joint combinations, in comparison to "low effort and low reward," all three combinations were significantly associated with increased subjective memory summary scores (Table 2; Model VII). Similar patterns occurred in sensitivity analyses on the subjective memory components of the present time and two-year comparison perceptions and demonstrated consistent findings for high reward and "low effort and high reward" (Supplemental Tables 1 and 2).

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Table 2
Independent and joint associations of effort and reward at the baseline with changes in subjective memory summary scores between the baseline and follow-ups, n = 3,497

	Subjective memory – summary scores							
	Model 0	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII
Low effort	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High effort	0.06 (-0.01, 0.14)	0.00 (-0.08, 0.07)	0.00 (-0.08, 0.07)	-0.02 (-0.09, 0.06)	-0.01 (-0.09, 0.06)	0.00 (-0.07, 0.08)	0.02 (-0.06, 0.09)	0.01 (-0.07, 0.08)
Low reward	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High reward	0.25*** (0.18, 0.33)	0.27*** (0.19, 0.34)	0.27*** (0.20, 0.34)	0.24*** (0.17, 0.31)	0.21*** (0.14, 0.29)	0.19*** (0.12, 0.26)	0.15*** (0.07, 0.23)	0.15*** (0.07, 0.23)
Low effort + low reward	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High effort + low reward	0.15** (0.04, 0.25)	0.08 (-0.02, 0.18)	0.08 (-0.03, 0.18)	0.08 (-0.03, 0.18)	0.08 (-0.02, 0.18)	0.10 (-0.01, 0.20)	0.11* (0.01, 0.22)	0.11* (0.00, 0.21)
Low effort + high reward	0.34*** (0.24, 0.45)	0.36*** (0.25, 0.46)	0.36*** (0.25, 0.46)	0.34*** (0.24, 0.45)	0.31*** (0.21, 0.42)	0.29*** (0.19, 0.40)	0.26*** (0.15, 0.37)	0.26*** (0.15, 0.37)
High effort + high reward	0.32*** (0.21, 0.44)	0.27*** (0.15, 0.39)	0.27*** (0.15, 0.38)	0.22*** (0.11, 0.34)	0.21*** (0.09, 0.32)	0.20*** (0.08, 0.31)	0.17** (0.06, 0.29)	0.16** (0.05, 0.28)

GEE linear regression: beta coefficients with 95% confidence intervals (CIs) in parentheses. Model 0: mutual adjustment for effort and reward at baseline. Model I: Model 0 + additional adjustment for age (years) at baseline. Model II: Model I + additional adjustment for sex, marital status, and race at baseline. Model III: Model II + additional adjustment for education and income at baseline. Model IV: Model III + additional adjustment for smoking, alcohol use, exercise, and social support at baseline. Model V: Model IV + additional adjustment for cardiovascular disease and depression at baseline. Model VI: Model V + additional adjustment for job control at baseline. Model VII: Model VI + additional adjustment for employment at baseline and follow-ups.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.
More detailed results are displayed in Supplemental Table 3.

4. Discussion

In this longitudinal study among US older workers aged 50 years and older, high reward independently, and combinations of reward and effort, were associated with increases in subjective memory measures, after adjusting for demographic, socioeconomic, lifestyle, health, and work characteristics. These findings contribute to the existing literature of psychosocial work and cognition, additionally providing evidence that high levels of workplace reward, as well as different effort-reward combinations with either high effort or high reward, may positively influence perceptions of memory spanning up to six follow-up waves or 12 years. Results align with components of the ERI model and objective cognitive performance research, in which high work-related reward has been positively associated with different measures of objective cognitive function, including episodic memory, among US and European worker groups [17,18].

The general concept of reward has been linked with memory through reward motivation and reward processing in the brain [31], and functional connectivity demonstrated between reward and memory regions [32]. The study findings of longitudinal associations of high work-related reward with improved subjective memory suggest that exposure to reward and the brain processing of reward may positively influence self-perceptions. Reward processing has been positively associated with resilience and subjective well-being perceptions of life satisfaction and positive affect, and resilience was identified as a mediator in the reward processing and subjective well-being relationship [33]. Among older adult populations, resilience has been conceptualized as the conjunction of positive attitude and resource availability [34]. Considering these possible mechanisms and relationships, in this sample of US older workers, those with high work-related reward may have accumulated financial resources and social esteem, which activate reward processing and resilience development and thus may contribute to positive perceptions of memory ability.

The combinations of effort and reward, in comparison to "low effort and low reward," yielded positive associations with subjective memory summary scores. Notably, the combinations which contained high reward, "low effort and high reward," and "high effort and high reward" yielded relatively high positive coefficients. Although the positive association between effort and subjective memory was not obvious in this study, in previous respective research, high effort in combination with reward has been associated with positive cognitive outcomes [17,18], suggesting high effort may still contribute to improved cognitive outcomes when combined with reward. For instance, among German workers, compared to the "low effort and low reward" reference group, all other ERI combinations were significantly associated with increased perceptual speed test scores across six years [17]. Among US workers, "high effort and high reward" was longitudinally associated with increased episodic memory across nine years [18]. These patterns demonstrate distinct health effects when the two conceptual components, effort and reward, are considered jointly [14].

4.1. Limitations

Limitations of this study include, first, its inability to account for possible changes that may have occurred between survey waves. As this study used only a one-time baseline measure of ERI psychosocial work data, we were not able to explore changes of stressful work overtime. Second, ERI was assessed with a proxy measure of the original scales. Despite satisfactory psychometric criteria of an overall model fit, the internal consistency of the scale "effort" was relatively low. Third, both the prediction and the

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outcome variables were measured by self-report information. Therefore, we cannot rule out unmeasured effects of a subjective reporting bias. Future studies may use a more objective measure of psychosocial work environments based on job exposure matrix [35]. Finally, subjective memory measures were generalized and did not specify different memory subdomains [36].

4.2. Strengths

This study is among the first to evaluate components of the ERI model with perceived memory, utilizing independent and joint categories among a population-based sample of workers from a nationally representative cohort. Although the strategy of analysis deviates from an often-practiced procedure of testing a summary measure of this model, the effort-reward ratio, as the only outcome criterion, our data demonstrate that single components, as well as distinct combinations of "effort" and "reward", yield significant effects on perceived memory. In line with recommendations of the author of this model [16], we suggest making full use of all components of this theoretical model. As for further strengths, methodological merits include the longitudinal study design with subjective memory data up to six survey waves across a timespan of up to 12 years. In addition, GEE analysis with covariate adjustments provided outputs that may approximate those of the population [37]. Finally, sensitivity analyses supported the main findings of this study.

4.3. Implications

This study integrated occupational health and gerontological sciences, focusing on workers aged 50 years and older, and the associations of their psychosocial work perceptions at the baseline with their 12-year trajectory of subjective memory changes. As the quantity of older workers in the US workforce is projected to increase within less than a decade [6], workplace support is needed for their working conditions and cognitive health. However, current evidence does not justify a regular screening for subjective memory in otherwise healthy middle-aged and older working populations, despite some respective recommendation [29]. We suggest including one or two questions about recent subjective memory complaints in a general worksite health screening but to restrict further cognitive screening to individuals with reported complaints. More importantly, decision-makers, managers, and business leaders should be informed about the health benefits of providing rewarding working conditions and they should be motivated to promote rewarding work among employees. Different models of good practice are available to this end, e.g., measures to improve control over working time [38], to strengthen collaboration and appreciation [39], and to promote fair pay [40].

5. Conclusion

Reward, and combinations of effort and reward at work, may strengthen perceived memory over 12 years' time among US older adults working full-time and part-time at age 50 years and older. These findings may be translated into workplace practices that enhance financial and social esteem aspects of reward and clinical practices that incorporate assessments of subjective cognition to support the aging US workforce.

CRediT authorship contribution statement

Megan Guardiano: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation. **Johannes Siegrist:** Writing – review & editing, Methodology, Conceptualization. **Jian Li:** Writing – review & editing, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Data accessibility statement

HRS and RAND HRS datasets used in this study are publicly accessible. The RAND HRS Longitudinal file 2020 (V2) and the RAND HRS Fat Files 2006 (V4A) and 2008 (V3A) are available at: https://hrsdata.isr.umich.edu/data-products/rand. The HRS Cross-Wave Tracker File (Early 2022 V2.0) and the Langa–Weir Classification of Cognitive Function contributed dataset (1995-2020 V2.0) are available at https://hrsdata.isr.umich.edu/data-products/public-survey-data. Program code and scripts for statistical packages are available from the corresponding author upon request.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

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References

[1] Pike KE, Cavuoto MG, Li L, Wright BJ, Kinsella GJ. Subjective cognitive decline: level of risk for future dementia and mild cognitive impairment, a meta-analysis of longitudinal studies. Neuropsychol Rev 2022;32(4):703–35.
[2] Lee CD, Foster ER. Subjective memory complaints predict decline in memory, instrumental activities of daily living, and social participation in older adults: a fixed-effects model. Am J Occup Ther 2023;77(4).
[3] García de la Garza A, Nester C, Wang C, Mogle J, Roque N, Katz M, Derby CA, Lipton RB, Rabin L. Enhanced associations between subjective cognitive concerns and blood-based AD biomarkers using a novel EMA approach. Alzheimers Res Ther 2025;17(1):82.
[4] Wooten KG, McGuire LC, Olivari BS, Jackson EMJ, Croft JB. Racial and ethnic differences in subjective cognitive decline - United States, 2015-2020. MMWR Morb Mortal Wkly Rep 2023;72(10):249–55.

[5] Maxfield M, Peckham A, James DL. "Terror is a better word": a qualitative analysis of dementia-related anxiety. Gerontologist 2024;64(5).
[6] U.S. Bureau of Labor Statistics. Employment projections: civilian labor force, by age, sex, race, and ethnicity [Internet]. Washington, DC: U.S. Bureau of Labor Statistics. 2024 [cited 2025 May 19]. Available from: https://www.bls.gov/emp/tables/civilian-labor-force-summary.htm.
[7] Livingston G, Huntley J, Liu KY, Costafreda SG, Selbaek G, Alladi S, Ames D, Banerjee S, Burns A, Brayne C, Fox NC, Ferri CP, Gitlin LN, Howard R, Kales HC, Kivimäki M, Larson EB, Nakasujja N, Rockwood K, Samus Q, Shirai K, Singh-Manoux A, Schneider LS, Walsh S, Yao Y, Sommerlad A, Mukadam N. Dementia prevention, intervention, and care: 2024 report of the Lancet standing Commission. Lancet 2024;404(10452):572–628.
[8] Parker SK, Ward MK, Fisher GG. Can high-quality jobs help workers learn new tricks? A multidisciplinary review of work design for cognition. Acad Manag Ann 2021;15(2):406–54.
[9] Huang L-Y, Hu H-Y, Wang Z-T, Ma Y-H, Dong Q, Tan L, Yu JT. Association of occupational factors and dementia or cognitive impairment: a systematic review and meta-analysis. J Alzheimers Dis 2020;78(1):217–27.
[10] Karasek RA. Job demands, job decision latitude, and mental strain: implications for job redesign. Admin Sci Quart 1979;24(2):285–308.
[11] Grzywacz JG, Segel-Karpas D, Lachman ME. Workplace exposures and cognitive function during adulthood: evidence from national survey of midlife development and the O*NET. J Occup Environ Med 2016;58(6):535–41.
[12] Rijs KJ, Van den Kommer TN, Comijs HC, Deeg DJH. Prevalence and incidence of memory complaints in employed compared to non-employed aged 55-64 years and the role of employment characteristics. Plos One 2015;10(3).
[13] Stenfors CUD, Hanson LM, Oxenstierna G, Theorell T, Nilsson LG. Psychosocial working conditions and cognitive complaints among Swedish employees. Plos One 2013;8(4).
[14] Siegrist J. Adverse health effects of high-effort/low-reward conditions. J Occup Health Psych 1996;1(1):27–41.
[15] Siegrist J, Li J. Effort-reward imbalance and occupational health. In: Theorell T, editor. Handbook of socioeconomic determinants of occupational health. Switzerland: Cham: Springer Nature International Publishing; 2020. p. 355–82.
[16] Siegrist J. A theoretical model in the context of economic globalization. In: Siegrist J, Wahrendorf M, editors. Work stress and health in a globalized economy. Switzerland: Cham: Springer Nature International Publishing; 2016. p. 3–19.
[17] Riedel N, Siegrist J, Wege N, Loerbroks A, Angerer P, Li J. Do effort and reward at work predict changes in cognitive function? First longitudinal results from the representative German Socio-Economic Panel. Int J Environ Res Public Health 2017;14(11).
[18] Guardiano M, Matthews TA, Liu S, Arah OA, Siegrist J, Li J. Longitudinal associations of effort and reward at work with changes in cognitive function: evidence from a national study of U.S. workers. Int Arch Occup Environ Health 2024;97(7):745–55.
[19] Lee CD, Foster ER. Subjective memory complaints predict decline in memory, instrumental activities of daily living, and social participation in older adults: a fixed-effects model. Am J Occup Ther 2023;77(4):7704205100.
[20] Dhana A, DeCarli C, Dhana K, Desai P, Krueger K, Evans DA, Rajan KB. Association of subjective memory complaints with white matter hyperintensities and cognitive decline among older adults in Chicago, Illinois. JAMA Netw Open 2022;5(4):e227512.
[21] Taylor CA, Bouldin ED, McGuire LC. Subjective cognitive decline among adults aged ≥45 Years - United States, 2015-2016. MMWR Morb Mortal Wkly Rep 2018;67(27):753–7.
[22] Sonnega A, Faul JD, Ofstedal MB, Langa KM, Phillips JW, Weir DR. Cohort profile: the health and retirement study (HRS). Int J Epidemiol 2014;43(2):576–85.
[23] McCammon R,J, Fisher G,G, Halimah H, Faul J, Willard R, Weir D,R. Health and Retirement Study imputation of cognitive functioning measures: 1992-2020. Ann Arbor, Michigan: Survey Research Center, University of Michigan; 2023.
[24] Smith J, Lindsay HR, Larkina M, Amanda S, Weir DR. Psychosocial and lifestyle Questionnaire 2006-2022. Ann Arbor, MI: Survey Research Center, Institute for Social Research, University of Michigan; 2023.
[25] Langa KM, Weir DR, Kabeto M, Sonnega A. Langa-Weir classification of cognitive function (1995-2020). Survey Research Center, Institute for Social Research, University of Michigan; 2023.
[26] Leineweber C, Wege N, Westerlund H, Theorell T, Wahrendorf M, Siegrist J. How valid is a short measure of effort-reward imbalance at work? A replication study from Sweden. Occup Environ Med 2010;67(8):526–31.
[27] Mutambudzi M, Siegrist J, Meyer JD, Li J. Association between effort-reward imbalance and self-reported diabetes mellitus in older U.S. workers. J Psychosom Res 2018;104:61–4.
[28] Montano D, Li J, Siegrist J. The measurement of effort-reward imbalance (ERI) at work. In: Siegrist J, Wahrendorf M, editors. Work stress and health in a globalized economy. Switzerland: Cham: Springer Nature International Publishing; 2016. p. 21–42.
[29] Zhao Y, Inder B, Kim JS. Spousal bereavement and the cognitive health of older adults in the US: new insights on channels, single items, and subjective evidence. Econ Hum Biol 2021;43:101055.
[30] Liang KY, Zeger SL. Longitudinal data-analysis using generalized linear-models. Biometrika 1986;73(1):13–22.
[31] Weinstein AM. Reward, motivation and brain imaging in human healthy participants - a narrative review. Front Behav Neurosci 2023;17:1123733.
[32] Frank LE, Preston AR, Zeithamova D. Functional connectivity between memory and reward centers across task and rest track memory sensitivity to reward. Cogn Affect Behav Neurosci 2019;19(3):503–22.
[33] Oltean L-E, Șoflău R, Miu AC, Szentágotai-Tătar A. Unveiling subjective well-being: the role of reward processing and resilience. Curr Psychol 2025;44(3):1896–905.
[34] Lima GS, Figueira ALG, Carvalho EC, Kusumota L, Caldeira S. Resilience in older people: a concept analysis. Healthcare (Basel) 2023;11(18).
[35] Sorensen JK, Framke E, Pedersen J, Alexanderson K, Bonde JP, Farrants K, Flachs EM, Magnusson Hanson LL, Nyberg ST, Kivimäki M, Madsen IEH, Rugulies R. Work stress and loss of years lived without chronic disease: an 18-year follow-up of 1.5 million employees in Denmark. Eur J Epidemiol 2022;37(4):389–400.
[36] Rickenbach EH, Agrigoroaei S, Lachman ME. Awareness of memory ability and change: (In)Accuracy of memory self-assessments in relation to performance. J Popul Ageing 2015;8(1–2):71–99.
[37] Pekár S, Brabec M, Bshary R. Generalized estimating equations: a pragmatic and flexible approach to the marginal GLM modelling of correlated data in the behavioural sciences. Ethology 2017;124(2):86–93.
[38] Voglino G, Savatteri A, Gualano MR, Catozzi D, Rousset S, Boietti E, Bert F, Siliquini R. How the reduction of working hours could influence health outcomes: a systematic review of published studies. BMJ Open 2022;12(4):e051131.
[39] Fox KE, Johnson ST, Berkman LF, Sianoja M, Soh Y, Kubzansky LD, Kelly EL. Organisational-and group-level workplace interventions and their effect on multiple domains of worker well-being: a systematic review. Work Stress 2021;36(1):30–59.
[40] Falk A, Kosse F, Menrath I, Verde PE, Siegrist J. Unfair pay and health. Manag Sci 2018;64(4):1477–88.

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