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Life course exposure to work strain and cognitive disparities by race and ethnicity

Mara Getz Sheftel [a,*], Noreen Goldman [b], Anne R. Pebley [c], Boriana Pratt [d], Sung S. Park [e]

[a] Institute for Health, Health Care Policy and Aging and School of Public Health, Rutgers University, New Brunswick, NJ, USA
[b] Princeton School of Public and International Affairs and the Office of Population Research, Princeton University, Princeton, NJ, USA
[c] California Center for Population Research and Fielding School of Public Health, UCLA, Los Angeles, CA, USA
[d] Office of Population Research, Princeton University, Princeton, NJ, USA
[e] Department of Gerontology, University of Massachusetts Boston, Boston, MA, USA

A B S T R A C T

There is a well-documented association between exposure to occupational strain and adverse older adult cognition. However, limited research examines differences in this association by race and ethnicity despite considerable disparities in older adult cognition and occupational segregation in the U.S. Using work history data from the U.S. Health and Retirement Study (HRS), we construct comprehensive measures of exposure to occupational strain over working ages and assess differential exposure to cumulative strain, and variation in the association between strain and cognition by race and ethnicity. We find that Black and Latino workers in the U.S. have more exposure to high strain jobs across working ages, and that this type of work history is associated with lower cognitive functioning at older ages. This analysis suggests that occupational segregation and unequal exposure to psychosocial work characteristics are critical social determinants of cognitive health disparities in older adulthood.

1. Introduction

There are sizeable racial/ethnic disparities in older adult cognition in the United States. Non-Hispanic Black (hereafter: Black) and Latino older adults are more likely to report cognitive impairment and to spend a greater portion of their lives cognitively impaired or with dementia than non-Hispanic Whites (hereafter: White) in the same age cohort (Garcia et al., 2019; H. Luo et al., 2018). These cognitive health disparities are robust to multiple measures of cognition and persist into advanced older ages in longitudinal analysis (Sloan & Wang, 2005, pp. P242–P250).

Growing evidence shows that chronic exposure to psychosocial stressors is adversely associated with older adult cognitive health (J. Luo et al., 2023; Pearlin et al., 2005). Recent research has examined exposure to various domains of stressors by race and ethnicity as a driver of racial/ethnic older adult cognitive health disparities (Chen et al., 2022; Forrester et al., 2019; Zahodne et al., 2017; Zuelsdorff et al., 2020). However, despite a highly segregated U.S. labor market (King, 1992; Tomaskovic-Devey, 1993; Weeden et al., 2018) indicating potential differential exposure to strain by race and ethnicity, and the possibility that minoritized individuals may be differentially vulnerable to work strain (Diderichsen et al., 2019; Ulbrich et al., 1989), there is limited research on whether the association between psychosocial work stressors and cognition varies by race and ethnicity.

This paper uses a life course perspective to understand the association between racial and ethnic disparities in older adult cognition and differential exposure to work stressors. To assess exposure to workplace stressors, we adopt the Job-Demand Control (JDC) model of occupational strain and measure strain exposure longitudinally by using work history data from a nationally representative sample of older adults in the United States. This approach allows us to address cumulative exposure to work strain over time (Boen, 2016; Geronimus, 2023; Jackson et al., 2011). Our analysis answers three questions: First, how does longitudinal exposure to occupational strain differ by race and ethnicity? Second, is exposure to strain associated with cognitive functioning at older ages? Third, does the association between exposure to occupational strain and cognitive functioning differ by race and ethnicity? In answering these questions, we highlight an important source of stressful exposure across the life course that may have long-term implications for older adult cognitive well-being: cumulative work exposures to strain.

* Corresponding author.
E-mail address: mara.sheftel@rutgers.edu (M.G. Sheftel).

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2. Background

2.1. Socially patterned exposure to stressors and health disparities

The Stress Process Model (Pearlin et al., 1981) provides an overarching theoretical framework to understand the long-documented association between elevated stressful exposure and adverse health (Cohen et al., 2007; Schneiderman et al., 2005; Slavich, 2016). This model, which provides the underpinning for the sociological study of stress, points to stratification within social structures as patterning exposure to stressors, mediators, and outcomes (Pearlin, 1989). The Stress Process Model has been employed to explain health disparities, in which the unequal distribution of exposure to stressors by race and ethnicity contributes to adverse health in adulthood (Pearlin et al., 2005). Empirical research in this area looks at how differential exposure to stressors in the form of structural racism, discrimination, education quality, economic adversity, and social context contributes to a wide range of racial and ethnic health disparities (Boardman, 2004; L. L. Brown et al., 2020; T. H. Brown et al., 2023; DeAngelis, 2022; Sternthal et al., 2011; Turner & Avison, 2003; Williams & Mohammed, 2013; Zahodne et al., 2017).

The link between differential exposure to stressors and cognitive health disparities is an active area of research. Forrester et al. (2017; 2019) investigate the biopsychosocial pathways through which increased exposure to psychosocial stressors across the life course for minoritized individuals impact physiological regulation, which, in turn, may lead to worse cognitive impairment in older adulthood. Likewise, Chen et al. (2022) analyze multiple domains of stressors and find that overall exposure to stressors partially accounts for worse cognitive function among Black middle-age and older adults compared to their White counterparts. Examining stressful life events generally, Zuelsdorff et al. (2020) find that greater exposure to stressors partially explains lower scores in cognitive speed and flexibility for Black individuals compared to Whites. Further, for Black adults, exposure to stressful life events is associated with age-patterned declines in verbal learning and memory (Zuelsdorff et al., 2020).

Beyond *differential exposure* to stressors by race and ethnicity, there may also be variation in the relationship between strain and cognition among minoritized individuals. Drawing on the concept of *differential vulnerability* (Diderichsen et al., 2019; George & Lynch, 2003; Ulbrich et al., 1989; Vanroelen et al., 2010), the impact of occupational strain may differ for minoritized individuals for several reasons: experiences of and reactions to job characteristics may be impacted by previous experience of stressors, determination of occupational demand and control can be a result of micro-aggression or discrimination, and access to health resources to manage occupational strain may vary by race and ethnicity.

2.2. Occupational strain and cognition

Work-related stressors are a critical domain of stress exposure to consider in understanding cognitive health disparities because individuals spend a considerable portion of their adult years working. Additionally, the U.S. labor market is highly stratified by race and ethnicity, and there is evidence that Black and Latino workers are exposed to more work stressors than White workers across the life course (Sheftel et al., 2024).

Karasek and colleagues (Karasek, 1979; Karasek & Theorell, 1990) provide the most widely used conceptualization of psychosocial occupational stressors through their Job Demand-Control (JDC) model. The JDC model holds that occupational strain – the term the JDC literature uses – is an interaction between the level of demand required for a job and the level of control an individual has over their position to meet these demands. Fig. 1 presents the four potential quadrants of the JDC model, combining high/low demand and high/low control.

This model suggests that high-strain jobs (high demand/low control) are most likely associated with adverse health. Empirical evidence over the four decades since the model was introduced supports this conclusion (Burgard & Lin, 2013) across many domains of health, including cardiovascular disease and hypertension (Babu et al., 2014; Belkic et al., 2004; Burns et al., 2016; Gilbert-Ouimet et al., 2014; Landsbergis et al., 2015; Nilsen et al., 2019; Slopen et al., 2012).

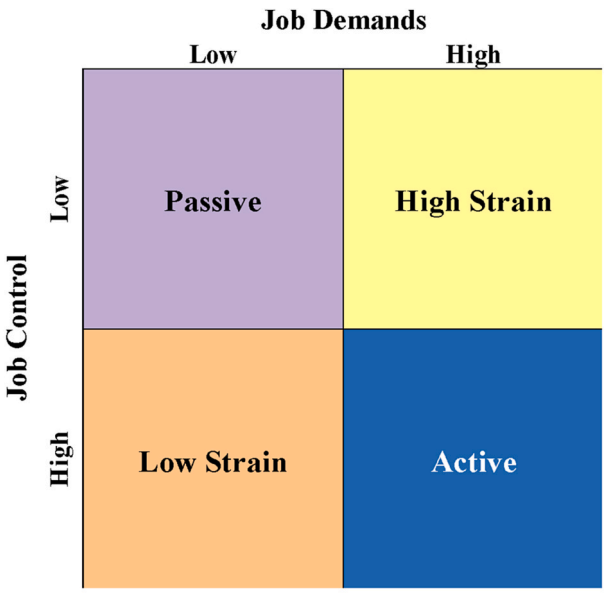

Fig. 1. Four Job Demand-Control (JDC) Profiles, adapted from Karasek (1979) Job Strain Model
Note: Adapted from Karasek (1979) Job Strain Model.

Research also points to a link between job strain and cognition. For example, high job strain is associated with declines in verbal learning, memory, and word recognition (Agbenyikey et al., 2015) and higher risks of vascular dementia (Andel et al., 2012). Greater exposure to occupational strain during midlife is also associated with higher risk of mild cognitive impairment, dementia, and Alzheimer's disease in older adulthood (Sindi et al., 2017). At retirement, high job strain is associated with poor episodic memory, cognitive speed, and spatial and overall cognitive ability (Andel et al., 2015; Nilsen et al., 2021). There is limited research on the relationship between exposure to the other three JDC categories and cognition: Agbenyikey et al. (2015) find evidence of a decline in cognitive functioning over time for adults working in passive jobs (low demand/low control), and Andel et al. (2011) find that active jobs (high demand/high control) may be associated with better cognition compared to jobs with all other levels of strain.

2.3. Contribution

There is ample evidence that exposure to occupational strain is a risk factor for adverse cognitive health in older adulthood (Agbenyikey et al., 2015; Andel et al., 2011, 2012, 2015; Nilsen et al., 2021; Sindi et al., 2017) and that strain exposure is socially patterned with Black and Latino workers exposed to more strain during their working lives than Whites (Sheftel et al., 2024). However, there is limited research connecting these two threads: how is differential exposure to occupational strain across the life course related to cognitive disparities by race and ethnicity in older adulthood? Adopting a global measure of cognitive functioning (Yang et al., 2024; Zheng, 2021) which includes episodic memory, mental status, and vocabulary (McArdle et al., 2007; McCammon et al., 2023), we address the association between exposure to occupational strain and cognition.

We also advance the overall understanding of the occupational

strain-cognition relationship by measuring longitudinal exposure to work strain. Existing research on occupational strain and cognition predominantly uses measures of strain exposure from a single job (current or longest held). These cross-sectional measures assume a single level of occupational strain over one's working life, which is inconsistent with contemporary career mobility (Johnson & Stewart, 1993). Static measures of strain exposure also do not consider the cumulative impact of strain across the life course, which is particularly important in the context of racial and ethnic health disparities (Boen, 2016; Geronimus, 2023; Hummer, 2023; Jackson et al., 2011).

To address the gaps in previous research, we use nationally representative work history data to assess the relationship between longitudinal exposure to work strain and cognitive disparities among White, Black, and Latino older adults. Drawing on existing research, we hypothesize that Black and Latino workers are exposed to more occupational strain across the life course than Whites. We also hypothesize that increased longitudinal exposure to high strain and passive JDC profiles are associated with lower cognitive functioning compared to exposure to active and low strain jobs, net of other factors impacting cognition. Finally, we hypothesize that high strain jobs have a stronger association with cognitive functioning for Black and Latino older adults compared to White older adults due to differential vulnerability and the racialized nature of strain exposure.

3. Material and methods

3.1. Data sources & analytic sample

We use data from the U.S. Health and Retirement Study (HRS) to understand the life course trajectory of occupational strain by race and ethnicity and to assess the association between longitudinal exposure to job strain and cognitive functioning. HRS is a nationally representative longitudinal panel study of U.S. residents over age 50 that began in 1992 with waves every two years. To construct work histories and measure exposure to occupational strain, we combined data from restricted HRS Core files 2002–2016, which include detailed Census Occupation Codes (Nolte et al., 2016) for jobs held at the time of each interview or the most recent job (for those unemployed at the time of interview), with retrospective work history data from the restricted 2017 Life History Mail Survey (LHMS), which include detailed Census Occupation Codes for jobs held for at least one year after completing full-time education. This process produced detailed work histories for all HRS respondents in the 2017 LHMS who were employed at any time from completion of full-time education through exit from the labor force or end of observation. For details on the collection of LHMS life history data, see Smith et al. (2022), and for a description of the construction of work histories combining the HRS Core data with LHMS data, see Park et al. (2022).

Using constructed work histories, we matched detailed Census Occupation Codes for each job held by an individual with occupational characteristics from the Occupational Information Network (O*NET). O*NET is collected by the Employment and Training Administration of the U.S. Department of Labor (USDOL/ETA), which randomly samples incumbents (workers) employed in 1000 occupations from a national sampling frame of establishments. Incumbents answer surveys about occupation-specific tasks, knowledge, education and training, work styles, work activities, and work context. For a minority of occupations, where it is difficult to sample workers, occupational analysts answer surveys instead of incumbents. Data collection for O*NET occurs on a rolling basis, survey responses are aggregated at the occupation level, and summary scores and standard error estimates are annually released so that measures reflect accurate information about occupations as they evolve over time. We use data from O*NET Versions 5 (2003), 13 (2008), 18 (2013), and 23 (2018), which are temporally comparable to the Health and Retirement Study (HRS) data.

We restrict our analytic sample to US-born White, Black, and Latino respondents who participated in the 2017 HRS LHMS and have a measure of cognitive functioning between the ages of 65 and 75. We exclude respondents from other race and ethnicity groups due to small sample sizes. Foreign-born respondents are excluded because it appears that work outside the U.S. was under-reported. For the work history data, we include all respondent person-years from age 25 until age 59. We restrict the work history data to these ages so that the majority of the sample has finished full-time education by the time the work histories begin, and so that we end work histories before the typical retirement age. The restriction to person-years 59 and younger is also because of low labor force participation rates at age 60 and older in our empirical sample and nationally (U.S. Bureau of Labor Statistics, 2023). Our final analytic sample includes 6653 respondents (2658 men and 3995 women).

3.2. Measures

Cognitive Functioning. All HRS respondents ages 65 and older (except those interviewed by proxy) complete a cognitive assessment with questions based on the modified version of the Telephone Interview for Cognitive Status (TICS-M) and the Mini-Mental State Examination (MMSE) (Brandt et al., 1988; Ofstedal et al., 2005). The HRS assessment includes measures of immediate and delayed word recall, orientation, repetition, naming, and calculations, which assess attention and processing speed. We follow previous research using the sum of these measures as a measure of cognitive functioning (Yang et al., 2024; Zheng, 2021). The maximum score is 35, with a higher score indicating better cognitive functioning. We use the first cognitive assessment completed in the HRS between ages 65 and 75 and transform raw scores to z-scores for interpretability.

Occupational Strain. The JDC conceptualization of occupational strain (demand/control) is the key predictor in this analysis. We adopt the same operationalization of demand and control as previous research using O*NET data (Andel et al., 2015; Cifuentes et al., 2007). Demand is the average required level of (1) selective attention, (2) time sharing (shifting between two or more tasks), (3) consequence of error, and (4) importance of being exact/accurate for each detailed occupational category. Control is the average required level of (1) independence, (2) decision making freedom, (3) decision making frequency, (4) impact of decisions on coworkers/company results, and (5) skill discretion for each detailed occupational category. We rescale O*NET measures to range from 0 to 100.

Fig. 1 presents the four job profiles from the JDC Model: (1) passive (low demand/low control), (2) low strain (low demand/high control), (3) high strain (high demand/low control), and (4) active (high demand/high control) (Karasek, 1979; Karasek & Theorell, 1990). We follow previous research operationalizing the JDC model, using national data to establish median thresholds of demand and control (Bennett et al., 2006; Hammar et al., 1998; Karasek, 1979). Based on all jobs in O*NET Version 23 (2018), the national median of demand is 54.3 and control is 66.9. We then categorize each job reported in HRS based on these thresholds into the four JDC job profiles.

Race, Ethnicity and Gender. HRS respondents self-classify as White, Black, or Other (there is no multi-racial category) and as Hispanic or not Hispanic. Combining race and ethnicity, we create three mutually exclusive race-ethnicity groups: White, Black, and Latino (of any race). Respondents also self-classify as male or female.

Covariates. We include control variables informed by prior research about racial and ethnic cognitive disparities. These controls allow us to investigate the association between occupational strain and cognitive functioning net of previously identified factors. First, all models include a control for single year of age to account for differences in cognitive functioning across the 10-year age span (65–75) of cognitive assessment. Second, following Zhang et al. (2016), we include three indicators of childhood conditions: childhood health (fair/poor vs. good/very good/excellent), birth region (South vs. other), and childhood socioeconomic status. Childhood socioeconomic status is an index

constructed by Zhang et al. (2016) from four binary variables: father's education less than eight years, mother's education less than eight years, father worked in a blue-collar occupation, and self-report of family's financial situation as poor. This index of childhood adversity ranges from least adverse (0) to most adverse (4).

Third, we include controls for two adult characteristics associated with cognitive functioning at older ages: educational attainment (Q. Liu et al., 2019; Zhang et al., 2016) and marital status (H. Liu et al., 2020; Sundström et al., 2016). These variables are dichotomous: less than high school vs. high school or more and never married vs. ever married. Table 1 presents descriptive statistics for all measures by race and ethnicity.

3.3. Analytic strategy

We convert the constructed work history file to a person-year file for every year from age 25 to 59. For person-years with no employment reported, demand and control are both assigned 0. When multiple jobs are reported for a single person-year, we calculate the average demand and average control scores across all jobs reported for that person-year. We classify each person-year as high/low demand/control using the median split approach described in Section 3.2 and adopted from previous research operationalizing JDC profiles (Bennett et al., 2006; Hammar et al., 1998; Karasek, 1979). Then, each person-year is categorized as either not working or in one of the four JDC profiles: passive (low demand/low control), low strain (low demand/high control), high strain (high demand/low control), and active (high demand/high control). Each respondent has up to 35 JDC profile measurements across working ages (fewer if they exited the survey earlier).

Table 1
Sample characteristics by race & ethnicity (mean/SE).

	Full Sample	Non-Hispanic White	Non-Hispanic Black	Latino
Total Cognitive Score (Z-Score)	0.20 (0.012)	0.37 (0.012)	−0.39*** (0.032)	−0.32*** (0.062)
JDC Exposure Clusters				
Never worked	0.02 (0.002)	0.02 (0.002)	0.03* (0.005)	0.04* (0.011)
Limited work	0.21 (0.005)	0.20 (0.006)	0.21 (0.012)	0.31*† (0.026)
Mostly Passive (LD-LC)	0.19 (0.005)	0.17 (0.005)	0.29*** (0.013)	0.20††† (0.022)
Mostly Low Strain (LD-HC)	0.19 (0.005)	0.20 (0.006)	0.12*** (0.010)	0.11*** (0.017)
Mostly Active (HD-HC)	0.22 (0.005)	0.25 (0.006)	0.13*** (0.010)	0.14*** (0.020)
Mostly High Strain (HD-LC)	0.17 (0.005)	0.16 (0.005)	0.22*** (0.012)	0.19 (0.022)
Male	0.40 (0.006)	0.41 (0.007)	0.35*** (0.014)	0.42† (0.028)
Age	66.04 (0.020)	66.08 (0.023)	65.87*** (0.039)	65.93 (0.081)
Fair/Poor Childhood Health	0.06 (0.003)	0.05 (0.003)	0.08** (0.008)	0.08 (0.015)
Childhood Adversity	1.56 (0.013)	1.38 (0.014)	2.08*** (0.033)	2.60***††† (0.061)
Southern Born	0.36 (0.006)	0.27 (0.006)	0.76*** (0.013)	0.45***††† (0.028)
High School or more	0.88 (0.004)	0.92 (0.004)	0.77*** (0.012)	0.64***††† (0.027)
Never married	0.04 (0.003)	0.03 (0.002)	0.10*** (0.009)	0.08** (0.015)
N	6653	5189	1145	319

Notes.
*p < 0.05; **p < 0.01; ***p < 0.001 (compared to non-Hispanic White estimates using adjusted Wald test).
†p, 0.05, ††p < 0.01, †††p < 0.001 (compared to non-Hispanic Black estimates using adjusted Wald test).
Analytic sample restricted to US-born only.

We use sequence analysis (SA) to investigate the similarity in patterns of person-year JDC profiles from ages 25–59. Sequence analysis is an approach focused on the succession of states over time and treats longitudinal data on a discrete number of states (in this case, JDC profiles) as part of an entire trajectory (or sequence) (Abbott & Tsay, 2000). SA is well suited for work history data since it allows us to identify exposure patterns to JDC profiles over working ages and classify individuals into these patterns. SA proceeds in two steps (Abbott & Tsay, 2000; Liao et al., 2022). First, we use an optimal matching (OM) algorithm and, to do so, define a measure of dissimilarity. Dissimilarity between two sequences is measured as the minimum cost of edits (insertions, deletions, or substitutions) needed to transform from one sequence into another. As is standard, we set the cost of insertions and deletions (indel costs) to 1 and use the probability of transition from one sequence to another (transition rates) for the cost of substitutions (Gabadinho et al., 2011). Using the TraMineR package in R, the dissimilarity between each pair of sequences is calculated from a dissimilarity matrix (Gabadinho et al., 2011).

The second step of SA involves using a clustering procedure applied to the dissimilarity matrix to determine a few distinct groups, each made up of similar sequences. Here we use agglomerative hierarchical clustering (agnes function in R) (Gabadinho et al., 2011). We conduct the sequence analysis stratified by gender to account for gendered work histories (Moen, 2016) and gendered occupational segregation (England, 2005). We explored results for 2–7 clusters for both men and women. Informed by visual inspection of dendrograms (tree diagrams illustrating the division of sequences into clusters), cluster subsample size, and substantive knowledge and interpretability, we concluded that five clusters best capture the main longitudinal patterns of engagement in JDC profiles for both men and women.

Each respondent with a work history is assigned to one of the five gender-specific clusters. Fig. 2 presents the chronograms (density plots) of the five clusters for each gender, and as illustrated, clusters show relatively similar patterns by gender. We add an additional cluster – never worked – for men and women who report no work between ages 25–59 (and thus are not included in the sequence analysis). This cluster is assigned to individuals rather than being a product of the sequence analysis. For each gender, we refer to the set of six clusters as *JDC exposure clusters.*

To examine differential exposure to occupational strain over working years, we examine the race and ethnicity composition of each of the clusters. We assess statistical differences in distributions across race-ethnicity groups using an adjusted Wald test. Results are presented in Fig. 3.

To examine the association between longitudinal exposure to occupational strain and older adult cognitive functioning, we estimate z-score-transformed total cognitive assessment scores at ages 65–75 as a function of the six JDC exposure clusters, race and ethnicity, gender, age, childhood characteristics (childhood health, childhood adversity, born in the South), and adult characteristics (educational attainment, marital history). We also include interactions between the JDC exposure clusters and race-ethnicity groups to investigate whether the relationship between longitudinal occupational strain exposure and cognitive functioning in older adulthood varies by race and ethnicity. In preliminary analyses, an interaction between race-ethnicity groups and gender and an interaction between gender and JDC exposure clusters were included but neither was found jointly significant. For parsimony these additional interactions are not included in our final analysis.

4. Results

4.1. Exposure to job strain across working ages

Table 1 presents sample characteristics by race and ethnicity. Adjusted Wald tests compare Black and Latino sample means to White sample means (indicated by *) or Latino sample means to Black sample

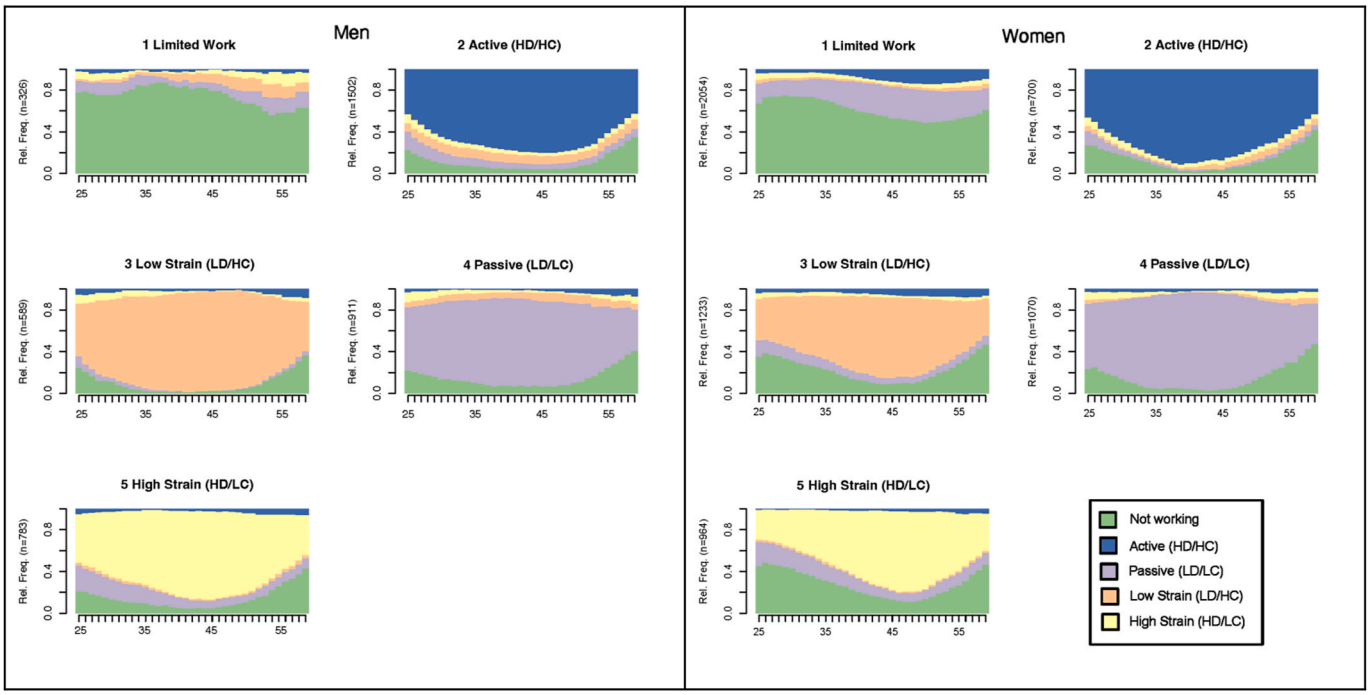

Fig. 2. Chronograms of job demand-control (JDC) exposure clusters resulting from sequence analysis.

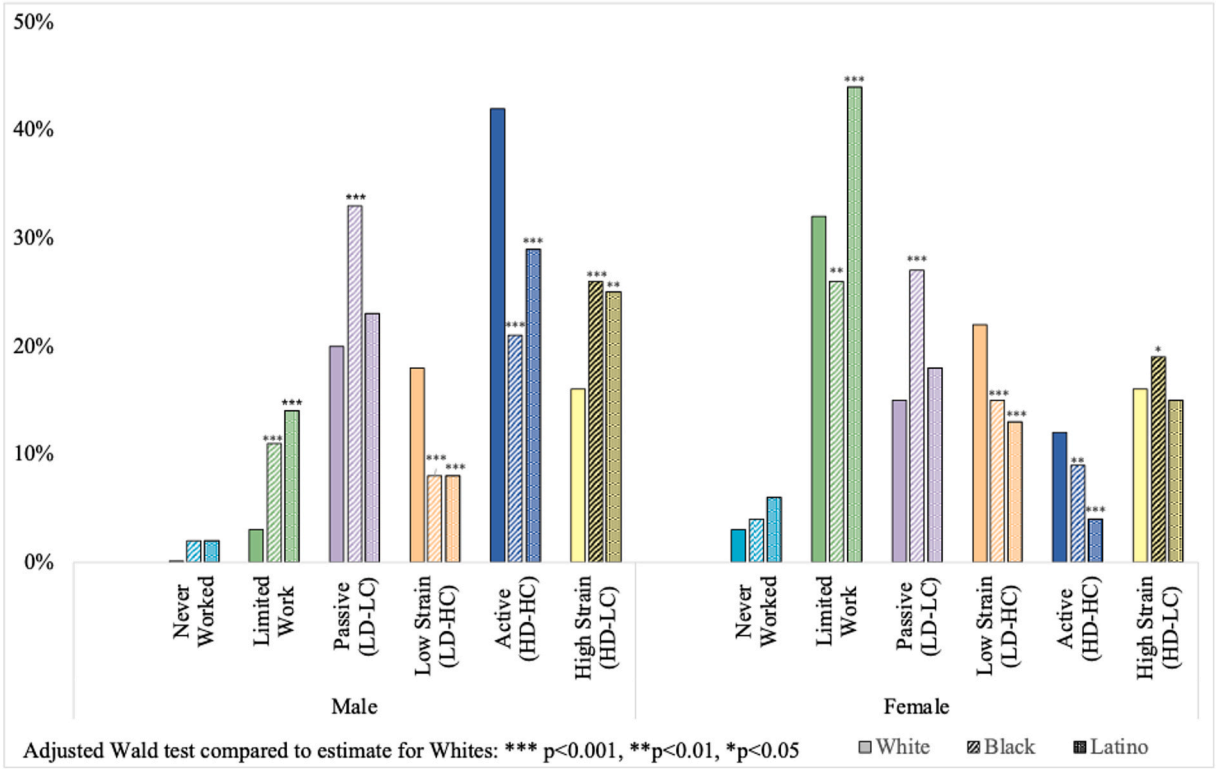

Fig. 3. Distribution of job demand-control (JDC) exposure clusters by race and ethnicity.

means (indicated by †). First, at ages 65–75, White older adults have a higher cognitive assessment score (z-score) than Black and Latino older adults. Table 1 also shows evidence of higher prevalence of certain risk factors for cognitive functioning for Black and Latino older adults compared to Whites. For example, compared to White older adults, a higher portion of Black older adults report fair/poor health in childhood, have a higher score on the childhood adversity measure, are more likely to be born in the South, have a lower portion who completed high school or more, and are more likely to have never been married. Latino older adults are also at a relative disadvantage in terms of correlates of cognitive functioning with evidence of significantly higher childhood adversity compared to both Black and White older adults, a higher portion born in the South, lower rates of having a high school degree or more, and a higher portion never married than Whites.

Fig. 2 presents the gender specific chronograms of the resulting five JDC exposure clusters from the sequence analysis (the sixth cluster, not pictured, captures those who report no work from ages 25 to 59). Men and women have similar clusters to one another. The first cluster for both men and women is characterized by a high proportion (men: 60–80%, women: 55–75%) of individuals not working at each age. For women, a considerable share of the remaining person-years pertains to work in passive (low demand/low control) jobs across the age range and a modest portion pertains to active (high demand/high control) jobs from ages 40 to 59. Men also have a considerable amount of the remaining portion of this cluster in passive jobs, but also have a small portion in low strain (low demand/high control) jobs and smaller portions in the other two JDC profiles. We term JDC exposure cluster 1 "limited work" for both men and women because more than half of the person-years of individuals in this cluster are spent not working.

JDC exposure clusters 2 through 5 for both men and women are each characterized by having most of the years from age 25 to 59 in one JDC profile. Each cluster is named after the dominant profile. Cluster 2 consists of individuals who spend the majority of their working years in active jobs (high demand/high control) with larger proportions not working or in other JDC categories at the beginning and end of the age range. Cluster 3 has a concentration of employment in low strain jobs (low demand/low control) and modest proportions of person-years at the beginning and end of the age range not working or working in other JDC categories. Similarly, Cluster 4 is characterized mainly by high strain jobs (high demand/low control) and Cluster 5 is characterized mainly by active jobs (high demand/high control).

To assess differential exposure to occupational strain by race and ethnicity, we estimated the distribution of race-ethnicity groups across the six JDC exposure clusters, presented in Fig. 3. Adjusted Wald tests assess differences in means compared to Whites (within gender). There are no differences in the portion of individuals who never work across race and ethnicity groups, with less than 2% never working in each race-ethnicity group for men and less than 6% never working in each race-ethnicity for women. Among men, both Black (11%) and Latino (14%) individuals have a higher portion classified in the limited work exposure cluster than White individuals (3%). Patterns differ for women, where a limited labor force engagement is more likely to be a product of domestic responsibilities than for men. Only 26% of Black women are classified into the limited work cluster, whereas 32% of White and 44% of Latina women are classified as such.

About a third of Black men and women are classified in the passive exposure cluster, as opposed to a fifth or less of White men and women. There are no significant differences in the distribution of exposure to mostly passive work between Latino and White individuals (both men and women). A similar pattern holds for the high strain exposure cluster where between about a quarter and a fifth of Black men and women are classified into this JDC exposure cluster compared to only 16% of both White men and women. Additionally, a quarter of Latino men are also classified into high strain jobs, but there is no significant difference in the proportion of Latina and White women in this cluster. The opposite pattern is evident for both the low strain and active clusters, where a greater portion of White men and women are classified into these two clusters than both Black and Latino men and women, respectively.

4.2. Job strain and cognitive functioning in older adulthood

To understand the relationship between longitudinal exposure to job strain and cognitive functioning in older adulthood, we use OLS regression to predict cognitive assessment z-scores as a function of JDC exposure cluster and race-ethnicity group and the interaction between them, controlling for gender, age, childhood characteristics, and adult characteristics (Appendix 1 presents unadjusted models). Regression results are presented in Table 2. The interactions between race-ethnicity groups and JDC exposure clusters are jointly significant ($p \simeq 0.0016$).

In order to facilitate interpretability of regression results and answer our second question – how is life course exposure to occupational strain associated with cognitive functioning in older adulthood? – we estimated the predicted z-score of cognitive assessment for each JDC exposure cluster at age 65 from the regression model (all variables other than age are at their observed values). Fig. 4 presents estimated cognitive assessment z-scores for each cluster with 95% confidence intervals. Results from pairwise comparisons assessing differences between each estimate and that for the high strain cluster are indicated with asterisks. It is evident that working mainly in low strain (0.39) or active jobs (0.39) is associated with a higher cognitive assessment score than working in high strain jobs (0.14). There is no statistically significant difference in predicted cognitive score for those with limited work or work in passive jobs, compared to work in high strain jobs. Never working is associated with a lower cognitive score than working in high strain jobs.

Table 2
OLS regression coefficients predicting Z-score of cognitive assessment at ages 65–75 (SE).

Race/Ethnicity (ref: NH White)	
NH Black	−0.481***
	(0.062)
Latino	−0.0929
	(0.111)
Male	−0.251***
	(0.023)
Age	−0.0160*
	(0.006)
JDC Profile (ref: High Strain (HD-LC))	
Never Worked	−0.156
	(0.090)
Limited work history	0.00145
	(0.040)
Mostly Passive (LD-LC)	0.0212
	(0.040)
Mostly Low Strain (LD-HC)	0.253***
	(0.039)
Mostly High Strain (HD-LC)	0.232***
	(0.038)
Race/Ethnicity X JDC Profile (ref: NHW, HD-LC)	
NH Black X Never Worked	−0.380*
	(0.170)
NH Black X Limited work history	−0.209*
	(0.085)
NH Black X Mostly Passive (LD-LC)	−0.0677
	(0.080)
NH Black X Mostly Low Strain (LD-HC)	0.0312
	(0.096)
NH Black X Mostly High Strain (HD-LC)	0.178
	(0.094)
Latino X Never Worked	−0.401
	(0.261)
Latino X Limited work history	−0.310*
	(0.141)
Latino X Mostly Passive (LD-LC)	−0.341*
	(0.154)
Latino X Mostly Low Strain (LD-HC)	−0.228
	(0.182)
Latino X Mostly High Strain (HD-LC)	−0.229
	(0.166)
Fair/Poor Childhood Health	−0.204***
	(0.045)
Childhood Adversity Score	−0.017
	(0.231)
Southern Born	−0.0855***
	(0.011)
High School or More	−0.0742**
	(0.024)
Never Married	0.628***
	(0.034)
Constant	−0.0874
	(0.050)
Observations	0.990*
R-squ	0.422

*p < 0.05; **p < 0.01; ***p < 0.001.

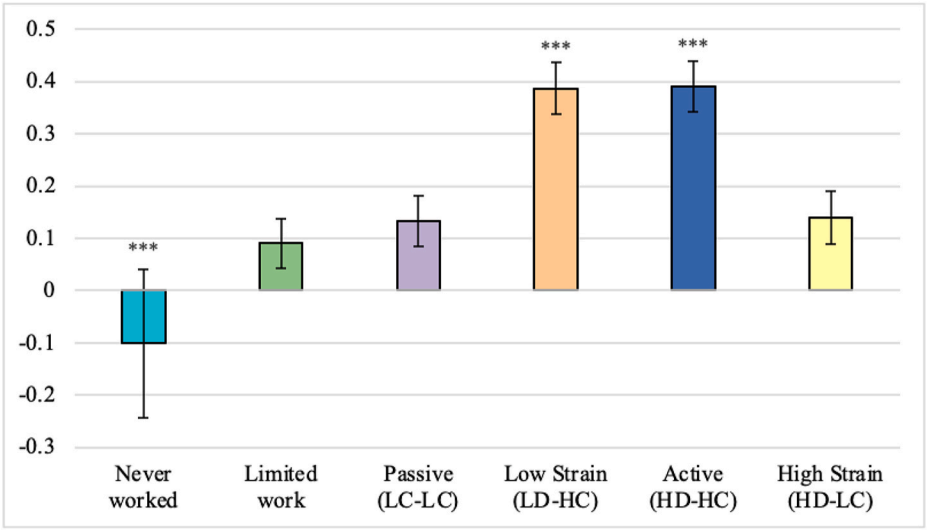

Fig. 4. Predicted HRS Cognitive Assessment Score (z-score) by Job Demand-Control (JDC) Exposure Clusters (with adjustments) - Estimated at Age 65 with All Other Variables at Observed Values
95% confidence intervals estimated from adjusted predictions
Comparisons to high strain cluster: *p < 0.05, **p < 0.01, ***p < 0.001
Predicted values estimated from models adjusting for: race/ethnicity, gender, age, childhood characteristics (childhood health, childhood adversity, born in the South), and adult characteristics (educational attainment, marital history), and interactions between the JDC exposure clusters and race-ethnicity groups.

To assess how the relationship between exposure to work strain and cognitive functioning may differ by race and ethnicity, our third question, we estimate the predicted z-score of cognitive assessment for each JDC exposure cluster at age 65 by race-ethnicity group from the regression model (keeping all variables besides age at their observed values). Results are presented in Fig. 5. Here it is evident that the pattern presented in Fig. 4 largely holds for White older adults, except that never working does not differ significantly from high strain. For Black older adults, similar to Whites and the overall patterns, exposure to high strain work is associated with lower cognitive scores than low strain and active jobs, never working is associated with lower cognitive scores than exposure to high strain jobs, and there is no statistically significant difference between exposure to passive jobs and high strain jobs. However, for Black older adults, limited work is also associated with lower cognitive scores than high strain jobs. Results for Latino older adults also differ from general patterns presented in Fig. 4. For Latino

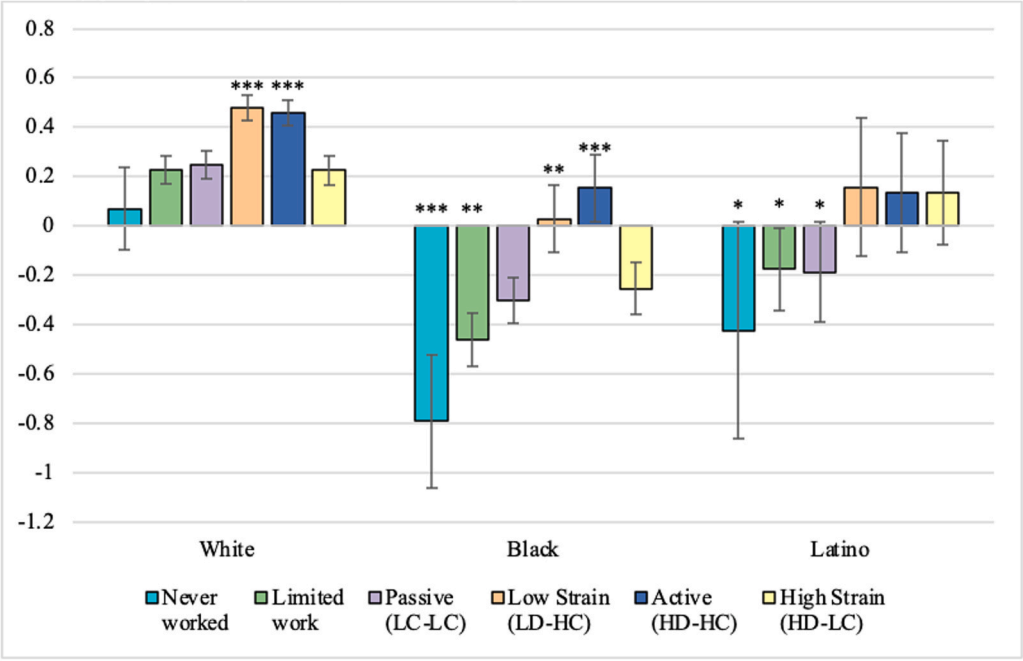

Fig. 5. Predicted HRS Cognitive Assessment Score (z-score) by Job Demand-Control (JDC) Exposure Cluster within Race-Ethnicity group (with adjustments) - Estimated at Age 65 with All Other Variables at Observed Values
95% confidence intervals estimated from adjusted predictions
Comparisons to high strain cluster within each race-ethnicity group: *p < 0.05, **p < 0.01, ***p < 0.001
Predicted values estimated from models adjusting for: race/ethnicity, gender, age, childhood characteristics (childhood health, childhood adversity, born in the South), and adult characteristics (educational attainment, marital history), and interactions between the JDC exposure clusters and race-ethnicity groups.

older adults there is no statistically significant difference in cognitive scores between exposure to low strain or active jobs and high strain jobs. Exposure to passive jobs, limited work, and not working are associated with lower cognitive scores than exposure to high strain jobs.

5. Discussion

The Alzheimer's Association (2021) estimates that older Black adults in the U.S. are twice as likely as older Whites to have Alzheimer's Disease (AD) or other types of dementia. In fact, since 2010 AD/dementia has been identified as a public health crisis among Black Americans (Alzheimer's Association, 2010). Older Latinos are also more likely than Whites – by a factor of 1.5 – to have AD/dementia (Alzheimer's Association, 2021) – with heterogeneity among Latino subgroups in the US by place of origin and nativity (Garcia et al., 2021). The adverse association between exposure to stressors and cognition is well-documented and theoretically supported by the Stress Process Model (Pearlin et al., 1981, 2005), as are the biopsychosocial pathways by which exposure to stressors may be associated with cognition for Black and Latino individuals (Forrester, 2017; Forrester et al., 2019). However, limited research looks specifically at the relationship between occupational psychosocial stressors and disparities in older adult cognitive functioning by race and ethnicity.

This analysis uses the Job-Demand Control (Karasek, 1979) model of work strain and unique work history data to measure longitudinal exposure to occupational strain across working ages by race and ethnicity. We contribute three important findings. First, we advance the understanding of exposure to work strain across working ages, showing that individuals spend most of their working years exposed to a consistent type of job strain (Fig. 2).

Second, we demonstrate that job strain exposure is racialized. We find that Black men and women are likely to spend more of their working life in high strain and passive jobs compared to White individuals (Fig. 3). Latino men are also more likely than White men to work in high strain jobs. The over-representation of Black and Latino workers in high strain jobs is likely partially attributable to structural racism operating across the life course, impacting educational attainment (Logan & Burdick-Will, 2016; Ryan & Bauman, 2016), hiring (Pager et al., 2009; Pager & Western, 2012), and work responsibilities, schedule and advancement (Greenhaus et al., 1990; Meyer, 2014; Presser, 2003) of Black and Latino individuals. These factors result in constrained job opportunities and advancement and subsequently in a higher proportion of minoritized individuals working in high strain occupations. These patterns have important implications for racial and ethnic cognitive disparities: our analysis using longitudinal measures of strain exposure advances previous cross-sectional evidence that exposure to high strain and passive jobs at younger ages is associated with worse cognitive functioning in older adulthood (Fig. 4).

Third, we provide evidence that the relationship between exposure to work strain and cognitive functioning varies by race and ethnicity. For White older adults, the predicted cognitive score at age 65 for those exposed to high strain jobs is not significantly different from the corresponding scores for those with limited work or those who never worked (Fig. 5). However, for Black older adults, exposure to high strain jobs is associated with a better cognitive score than exposure to limited or no work. Racialized social processes, like incarceration and employment discrimination, which often lead to limited or no work, are likely associated with adverse cognitive functioning in older adulthood (Cox & Wallace, 2022; Diette et al., 2018; London & Myers, 2006; Pedulla, 2018). These results highlight the importance of a life course perspective on older adult cognition by enabling longitudinal measurement of exposure to stressors. Results for Latino older adults also differ from those of White older adults, but these findings should be interpreted cautiously as they result from a relatively small sample of Latinos that excludes the foreign-born. We recommend that future research look at exposure to work strain and cognition in older adulthood using a larger, and more diverse, sample of Latinos. Our analysis makes preliminary conclusions about the associations between occupational strain and cognition by race and ethnicity. Although beyond the scope of this analysis, we recommend that future research adopt a causal framework to explore the contribution of differences in exposure to occupational strain by race and ethnicity to cognitive disparities.

5.1. Conclusion

Overall, we show that the U.S. labor market is stratified in terms of exposure to occupational strain over the life course and that this stratification has important implications for cognitive health disparities by race and ethnicity. Understanding relationships between specific stressors (e.g., work strain) and disparities in cognition is critical to designing targeted policy and public health interventions to reduce disparities. While analyses focused on a single domain of stress exposure, such as occupational strain, complement research on the broader stressor-cognitive disparity relationship using multiple interconnected domains of stressors and cognitive disparities (Chen et al., 2022; Forrester, 2017; Forrester et al., 2019), it is also important to acknowledge that work stressors are only one type of chronic psychosocial stressor. Multiple chronic and acute stressors often occur simultaneously, especially for racialized individuals, and can be cumulatively associated with physiological dysfunction and thereafter poorer cognition (Forrester et al., 2019). Modeling a single stressor may underestimate the stressor-cognition relationship (Mann et al., 2021).

Additionally, because O*NET collects a single estimate of job characteristics, with no variation within an occupation by race, ethnicity or gender, potential structural segregation within an occupation (e.g., systematically different job tasks by race, ethnicity and gender) is not considered in this analysis (Fujishiro & Koessler, 2020). Future research should compare O*NET external reports of strain by workers with other sources of occupational strain measures - e.g., survey-based self-reports and outside observers.

Moreover, this analysis uses a summary score of all cognitive assessments in HRS to assess overall cognitive functioning. The summary score facilitates an analysis of the association between occupational strain and global cognitive functioning and allows the evaluation of incremental differences in cognitive functioning. Additional research should consider the relationship between occupational strain and specific domains of cognition (e.g., memory, executive functioning, orientation) which may be differentially associated with various JDC exposure clusters. Although the type and breadth of cognitive assessments included in HRS facilitate the collection of data on cognition in a nationally representative sample, these survey-based assessments do not offer the precision of comprehensive cognitive and neuropsychiatric assessments conducted in clinical settings. Future research should consider life course exposure to work strain and disparities in cognitive function using clinical assessments of cognition and dementia diagnosis.

Nonetheless, our analysis highlights two important avenues to reduce the risk of poor cognitive health among Black and Latino individuals: policy changes aiming to decrease racial/ethnic labor market stratification and public health interventions for workers exposed to high strain and passive jobs. Our findings underscore the importance of acknowledging the role of labor market stratification in U.S. health disparities by race and ethnicity.

CRediT authorship contribution statement

Mara Getz Sheftel: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization. **Noreen Goldman:** Writing – review & editing, Supervision, Methodology. **Anne R. Pebley:** Writing – review & editing, Supervision, Methodology. **Boriana Pratt:** Writing – review & editing, Visualization, Methodology, Investigation, Formal analysis, Data curation. **Sung S. Park:** Writing – review & editing, Data curation.

Ethical statement

Life course exposure to work strain and cognitive disparities by race and ethnicity.

We have no conflicts of interest with suggested reviewers or editors of this journal. We confirm that this work is original, has not been published elsewhere, nor is it under consideration for publication elsewhere.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1. OLS Regression Coefficients Predicting Z-Score of Cognitive Assessment at Ages 65–75 (SE) (without covariates)

Race/Ethnicity (ref: NH White)	
NH Black	−0.647***
	(0.0627)
Latino	−0.298**
	(0.115)
Male	−0.260***
	(0.0239)
Age	−0.0264***
	(0.00658)
JDC Profile (ref: Mostly High Strain, HD-LC)	
Never Worked	−0.320***
	(0.0929)
Limited work	−0.0164
	(0.0412)
Mostly Passive (LD-LC)	0.00134
	(0.0418)
Mostly Low Strain (LD-HC)	0.326***
	(0.0403)
Mostly Active (HD-HC)	0.296***
	(0.0393)
Race/Ethnicity X JDC Profile (ref: NHW, HD-LC)	
NH Black X Never Worked	−0.666***
	(0.177)
NH Black X Limited work history	−0.269**
	(0.0882)
NH Black X Mostly Passive (LD-LC)	−0.11
	(0.0837)
NH Black X Mostly Low Strain (LD-HC)	0.0954
	(0.0995)
NH Black X Mostly Active (HD-HC)	0.222*
	(0.098)
Latino X Never Worked	−0.651*
	(0.272)
Latino X Limited work history	−0.518***
	(0.146)
Latino X Mostly Passive (LD-LC)	−0.374*
	(0.16)
Latino X Mostly Low Strain (LD-HC)	−0.229
	(0.189)
Latino X Mostly Active (HD-HC)	−0.212
	(0.173)
Constant	2.090***
	(0.436)
R-squ	0.166
N	6653

Data availability

The data that has been used is confidential. It is available through a data use agreement for restricted data access from the Health and Retirement Study (HRS).

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