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## Examining gender differentials in the association of low control work with cognitive performance in older workers

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**Background:** Limited workplace control, an important dimension of job strain, can reduce occupational opportunities for problem solving and learning. Women may have fewer professional resources to mitigate effects of low control, while conversely, gender-role norms may moderate the influence of occupational psychosocial risk factors. We therefore examined whether the links between control and cognitive function were similarly gendered. **Methods:** This observational, longitudinal study included respondents of the Survey of Health, Ageing and Retirement in Europe who were aged 50–64 years at entry, employed and provided at least two measurements of control and cognition ( $n = 6697$ ). Relationships between control and cognition, quantified with standardized scores from verbal fluency, immediate and delayed word recall tests, were explored using linear fixed-effect and random-effect models with gender interactions. **Results:** Consistent trends of improved verbal fluency performance with high control were evident across analyses, equal to producing around three-quarters of a word more under high control conditions, with an effect size  $\sim 0.1$  SD units (fully adjusted models, range 0.077–0.104 SD), although associations with recall tests were inconsistent. We did not find evidence of clear gender differences in control–cognition relationships for any of the cognitive domains. **Conclusions:** The cognitive health of older European workers may benefit from improved workplace control irrespective of gender. Possible sources of bias that could explain the lack of gender differences are discussed, particularly gender differences in labour force participation, response behaviour in job control ratings and implications of gender-role norms on the importance of occupational risk factors.

### Introduction

People's working lives offer a prime area for optimizing cognitive health through opportunities for continued learning. The concept of cognitive reserve points to the importance of socio-cultural factors in influencing individuals' prospects for cognitively enriching experiences, such as those provided at work.<sup>1</sup> Cognitive reserve is actively developed through cognitive stimulation and is thought to compensate—to a certain extent—for the effects of brain pathology due to more efficient processing and optimized neuronal networks.<sup>1</sup> The concept has been used for conceptualizing the relationships between cognitively stimulating exposures, such as education or occupational conditions, and their consequences on cognitive functioning.<sup>2</sup> Occupational complexity has been shown to be related to higher cognitive functioning<sup>3</sup> and also to steeper cognitive decline.<sup>4,5</sup> Extending the concept of cognitive reserve to psychosocial occupational conditions, two recent systematic reviews showed that more favourable work conditions and particularly high-control jobs were predictive of higher cognitive functioning,<sup>6,7</sup> but there was insufficient evidence for delayed cognitive decline.<sup>7</sup> Theorell and Karasek's<sup>8,9</sup> job strain theory posits that demanding work with little control or decisional authority over managing those demands creates high job strain, which in turn limits learning processes and problem-solving skills that could be beneficial for cognitive reserve.

Although Karasek and Theorell had hypothesized that high demand in combination with low control may be associated with lower cognition,<sup>8</sup> there is little empirical evidence on this interaction, as job demands do not significantly contribute to cognitive performance<sup>6</sup> nor dementia risk in both men and women.<sup>10</sup> This is also consistent for cardiovascular disease outcomes.<sup>11</sup> Theoretical reasoning suggests that, in both high and low demand jobs, the internal capacities to deal with these demands would be the driving force explaining differences in health outcomes.<sup>6</sup>

Job control has been found to be an important predictor of lower cognitive functioning and accelerated cognitive decline in several longitudinal studies.<sup>12,13</sup> In the Baltimore Epidemiologic Catchment Area follow-up study, decreases in cognitive performance were equivalent to being roughly 4 years and 6 months older in adults over 55 years with passive or high strain jobs—both low-control work profiles.<sup>14</sup> Although these studies generally support a connection between low control and some aspect of cognitive performance, little consideration has been given to gender differences of this psychosocial occupational risk factor. Recent studies, however, confirm the relevance of gender considerations, as similar work conditions play out differently for men and women in terms of cognitive benefits.<sup>3,10</sup>

Theorell and Karasek<sup>9</sup> point out that, in occupational health research, it is important to take into account not only occupational

status but also domestic situations, particularly of women. When considering the domestic duties commonly ascribed to women, they are generally part of fixed day-to-day routines—such as meal preparation, cleaning and childcare, whereas typically masculine domestic duties are not under the same time constraints.<sup>15</sup> These ascribed domestic duties based on gender norms may play an important role in identity formation, and moreover, suggest a mechanism by which low-control work could impact women differently than men. Family commitments have generally required a greater devotion of time from women, thereby facilitating their family identities while potentially limiting their work identities.<sup>16</sup> Conversely, men's work identities have generally had less conflict with their family identities, due in part to fewer household commitments and shared responsibilities between the two roles, that is 'breadwinner father'.<sup>16</sup>

Lower identification with and time for work roles in women may potentially weaken the impact of work conditions on women's health. Two studies support this hypothesis, one of which showed that high job strain was independently associated with higher odds of myocardial infarction after full adjustment in men, but not in women.<sup>17</sup> On the contrary, an exploration of control at home and the incidence of coronary heart disease found that women, but not men, who reported low control at home had markedly increased likelihoods of developing heart disease.<sup>18</sup>

Distributional differences in work conditions, as well as the resources that could moderate the impacts of those conditions, may provide a different pathway through which low control could impact women differently than men, though in a different direction. Low-control jobs are typically not evenly distributed by social strata and gender, often reflecting underlying hierarchies such that women and the socio-economically disadvantaged generally have less autonomy.<sup>8,9,19</sup> Within similar work sectors, European data suggest that women in blue-collar work are less likely to report that their positions are based on complex tasks, problem-solving skills and learning skills, than men in blue-collar work.<sup>20</sup> Beyond the distribution of low control and task complexity, women are more likely to have limited access to power networks, organizational influence and pay equity which could increase the detrimental impact of low-control work.<sup>19</sup>

There is evidence for gender differences in cognitive deterioration and the distribution of dementia incidences. In studies of European data, older adult women had higher incidence rates of Alzheimer's disease<sup>21</sup>, while lifetime risk estimates for dementia place adult women's risk at 31% vs. 19% for men.<sup>22</sup> Furthermore, gender bias in occupational health research has persisted with insufficient justification for lack of gender considerations in study design and inadequate treatment of gender in analyses.<sup>23</sup> Earlier research on gender differences in the relationship between occupational conditions and cognitive outcomes is inconsistent. In two studies, men seemed to benefit more from more favourable working conditions, such as occupational complexity<sup>3</sup> or high job control.<sup>10</sup> Another study found no gender-specific effects on cognition two decades later in a cohort of Sweden's oldest old after full adjustment<sup>24</sup>; while conversely, one study found that women with low-control jobs had increased odds of a dementia diagnosis.<sup>25</sup> Building on this evidence, the current study aims to further our understanding of how low-control work may have more immediate effects on cognitive performance at the end of working life, and if these effects play out differently in men and women. We employ fixed-effects methodology with panel data from 13 European countries and Israel.

## Methods

### Participants

Described in detail elsewhere,<sup>26</sup> the Survey of Health, Ageing and Retirement in Europe (SHARE) is a pan-European, population-based, longitudinal study of the health, social, behavioural and economic characteristics of individuals aged 50 or older beginning in

2004. Our sample is derived from the 14 countries present in waves 1 and 2 and participating at least twice in SHARE (Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Greece, Israel, Italy, Netherlands, Sweden, Poland, and Czech Republic). SHARE's design and data collection procedures were reviewed by the University of Mannheim and the Ethics Council of the Max Planck Society, along with other country-level reviews.

For the purposes of these analyses, participants eligible for inclusion were those entering SHARE in either Wave 1 (2004–05) or Wave 2 (2006–07), who reported being in work, and between the ages of 50–64 years ( $n = 11\,678$ ). Available follow-up measurements from Wave 2, Wave 4 (2011–12), Wave 5 (2013) and Wave 6 (2015) were included.<sup>26</sup> Participants were excluded if they had reported a stroke at entry, Parkinson's disease or brain cancer in any wave, or an Alzheimer's disease diagnosis at Wave 2 when the question was first introduced ( $n = 166$ ). We further excluded those with less than two cognitive testing occasions ( $n = 2798$ ), those with less than two reports of workplace control information ( $n = 2005$ ) and no workplace control information in their first wave ( $n = 12$ ).

The core sample included 6697 participants, of which 46% were women. Participants were followed for a mean of 5.7 years. Figure 1 maps workplace control reports over the waves in a Sankey diagram. Greece and Israel did not participate in Wave 4, Greece and Poland in Wave 5 and the Netherlands in Wave 6, which contributes to missing values in these waves.<sup>27</sup> Those eligible for inclusion but excluded from the core sample were older (56 vs. 54 years,  $P < 0.001$ ) and less likely to report high control at work (49% vs. 43%,  $P < 0.001$ ), but gender proportions were similar ( $P = 0.167$ ).

### Work control measure

Our main independent variable was derived from two 4-point scale questions available in SHARE: 'opportunity to develop new skills' and the reverse coding of 'little freedom to decide how I do my work'. The two questions come from the Job Content Questionnaire<sup>8,28</sup> as they assess the core concept, and they were selected based on psychometric properties.<sup>29</sup> The questions were specifically designed to obtain assessments, rather than evaluative reflections, of workplace conditions.<sup>8</sup> Responses were summed to give a control score, with higher scores denoting lower control. Scores were then categorized by country-specific tertiles in line with previous work on low control with SHARE data.<sup>30</sup> Moderate control was chosen as the reference category.

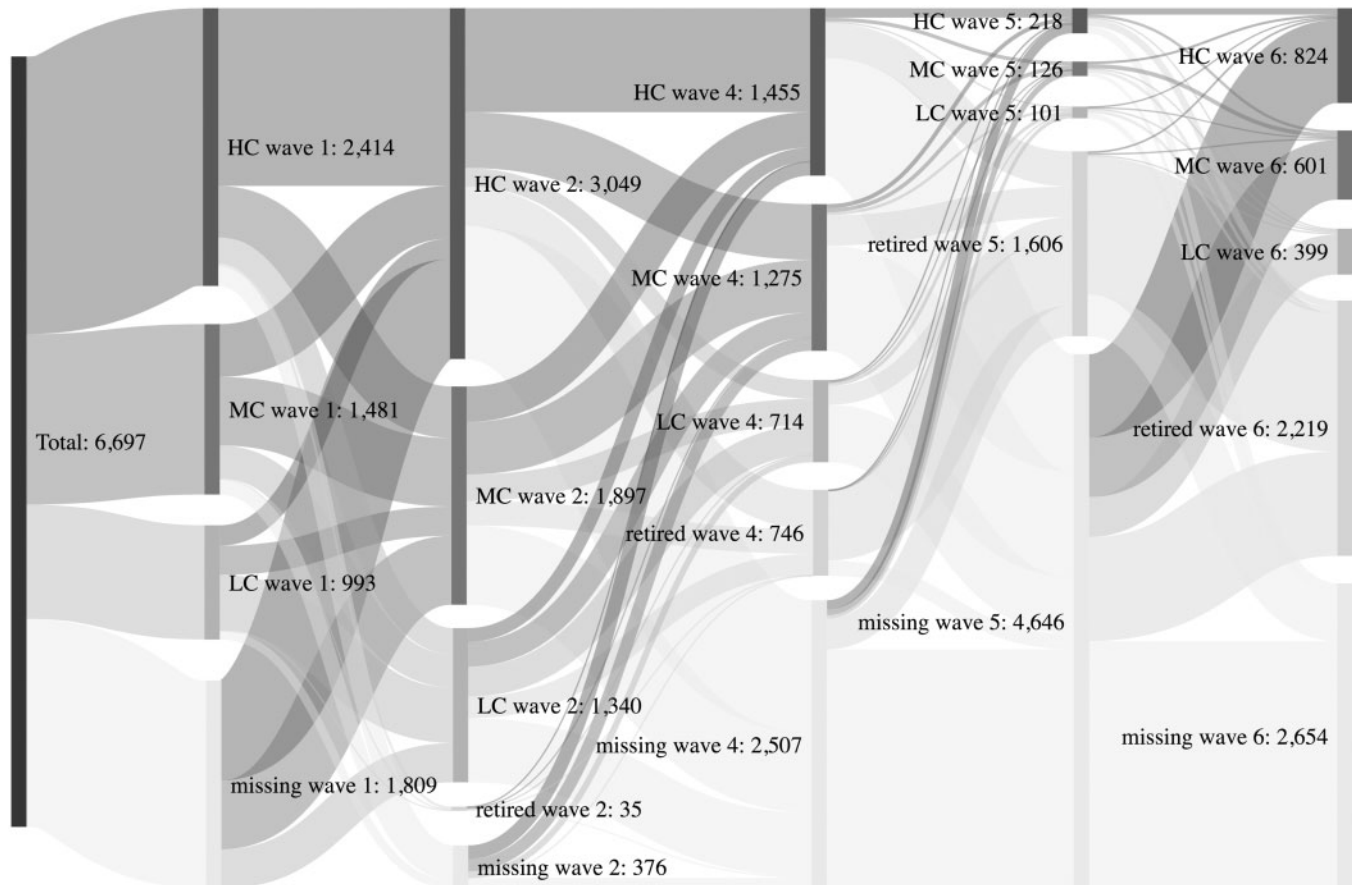
### Cognitive function measures

SHARE has three measures of cognitive functioning in all the regular panel waves included in this study. The animal naming test, where subjects are asked to name as many animals as possible in one minute, was used to assess verbal fluency. Memory was assessed by an immediate 10-word list recall and a delayed 10-word list recall. We computed standardized scores on the baseline means and standard deviation (SD) for each of the three tests. Only those with two or more scores for a given cognitive test were included in the test-specific analyses as some participants did not complete all three tests at each testing occasion.

### Study confounders

We used standard demographic variables as confounders, which included: age, cohort, country and education category (primary, secondary or post-secondary/tertiary using the International Standard Classification of Education 1997).

Work characteristics included: work demands, job security, work sector (private, public or self-employed), work schedules and household income (adjusted for household size, in country specific quintiles). Work demands were categorized in the same way as work control. Work schedules are derived from a recoding of work hours into part time (<30 h/week), full time (30–54 h/week) and overtime



**Figure 1** Transitions between control levels and loss to follow-up for the sample over the waves of the Survey for Health, Ageing and Retirement in Europe. The Sankey diagram illustrates the job control ratings (LC, low control; MC, moderate control; HC, high control) of the initial sample of 6697 workers aged 50–64 years, and the transitions to other levels of control or loss to follow-up, in absolute numbers and size of paths, over the five standard SHARE waves. Loss to follow-up could occur due to *retirement* in the sense of withdrawal from the work environment over time or due to non-response at follow-up wave, mentioned here as *missing*.

( $\geq 55$  h/week). Working  $>55$  h/week has been shown to correlate with lower performance in some cognitive domains.<sup>31</sup> Household size was missing in Wave 1 for Israel's respondents, therefore, their Wave 2 household size was used in lieu for income quintile calculations.

Known risk factors for dementia included: smoking status (never, former and current), body mass index (BMI) category, chronic conditions (diabetes and/or hypertension), depression, physical inactivity, hearing loss (use of hearing aid or rating hearing as poor) and social isolation (married or cohabitating was used as a proxy measure).<sup>32</sup> The underweight BMI category was regrouped with the normal weight category as  $<1\%$  of observations were categorized as underweight.

### Statistical procedures

Descriptive statistics, including Pearson  $\chi^2$  tests and  $t$ -tests, were used to tabulate baseline characteristics of our sample. To test our hypothesis of gender differences in control–cognition relationships, models with both pooled data with gender interaction terms and stratified data for each of the three cognitive tests were run.

Fixed-effects models use time-varying information on the exposure, job control and the three cognitive outcomes to detect to which extent an increase or decrease in job control is mirrored in an increase or decrease in cognition. Using a sequential approach, we first ran a base model of control level and age (model I), followed by a model that included work characteristics (model II) and a full model with work characteristics and known risk factors (model III) as fixed-effect models.

In a second set of analyses, the fully adjusted models were then run as random-effect models and included the time-constant demographic confounders. Fixed-effect models account for all observed and unobserved time-constant confounders, but are dependent on sufficient within-unit variation over time.<sup>33</sup> Hausman tests were performed to determine if unobserved time-constant confounders biased the random-effect estimates.<sup>33</sup>

Confidence intervals and conventional  $P$ -values of  $<0.05$  were used to guide interpretations. All procedures were performed using Stata version 13.1 (College Station, TX, USA).

### Results

Similar to other literature that suggests women experience lower levels of control at work,<sup>8,19</sup> women in our sample were less likely to be in the high-control group (46% vs. 51% of men;  $P < 0.001$ ). Gender difference was also notable in work schedules, work sector, smoking status, BMI categories and depression (table 1). Those in low-control work at survey entry did not differ significantly in age from those in moderate ( $P = 0.167$ ) or high ( $P = 0.115$ ) control work.

Hausman tests indicated that fixed-effect models should be preferred to account for time-constant confounding (all  $P$ s  $< 0.001$ ). The fixed-effect models suggested that with improvements in level of control (high vs. moderate) and across all levels of adjustment, both men and women had increases in verbal fluency scores (table 2). Low-control work appeared detrimental for both genders in terms of their delayed recall scores in the base model. This association disappeared with further adjustment for work and health variables

**Table 1** Characteristics of sample at study entry (Wave 1 or 2 of the Survey for Health, Ageing and Retirement in Europe)

	Men (N = 3649)		Women (N = 3048)		P-value
	n	%	N	%	
Control	3649		3048		0.000
Moderate		30		33	
High		51		46	
Demand	3647		3046		0.001
Moderate		47		44	
High		18		17	
Job security	3589	77	3014	81	0.000
Sector	3648		3046		0.000
Private		61		71	
Public		15		16	
Self-employed		24		13	
Work schedule	3649		3048		0.000
Part time		10		30	
Full time		71		64	
Overtime		19		6	
Education	3640		3040		0.002
Secondary		50		49	
Tertiary		37		40	
Smoker	3646		3047		0.000
Former		35		25	
Current		28		23	
Body mass index	3637		3008		0.000
<25		33		55	
25–29.9		52		32	
≥30		15		13	
Chronic conditions	3648	20	3047	20	0.809
Depression	3625	11	3030	24	0.000
Inactive	3647	3	3045	3	0.031
Hearing loss	3649	3	3047	2	0.003
Married/partnered	3645	84	3045	74	0.000
Mean age (years) (SD)	3649	54.6 (3.5)	3048	54.2 (3.4)	0.000
Mean verbal fluency score (SD)	3630	21.9 (7.3)	3035	22.8 (7.0)	0.000
Mean immediate recall score (SD)	3639	5.5 (1.5)	3038	5.9 (1.6)	0.000
Mean delayed recall score (SD)	3641	4.0 (1.7)	3038	4.6 (1.9)	0.000

SD, standard deviation.

(table 2). However, there was no effect modification of control-cognition associations by gender (table 2).

The stratified models supported the association between high-control work and verbal fluency performance for both genders, though low-control work was also associated with better verbal fluency performance in women compared with moderate-control work. The base model association between low control and delayed recall performance appeared to be driven by the male sample when considering the stratified results (table 3).

We report the results of the random-effect models in Supplemental material. Random-effect models mostly confirmed the findings, specifically, the beneficial effect of high-control work on verbal fluency for both men and women and the lack of associations of high or low-control work with delayed recall (Supplementary table S1).

## Discussion

### Main findings, comparisons with current evidence and future directions

Our main finding was the association of high-control work with better performance on verbal fluency tests for both older male and female workers, answering with roughly three-quarters of a word more ( $\beta \times$  pooled SD for verbal fluency =  $0.1 \times 7.2$ ) than those with moderate control across all levels of adjustment. Low-control

work may have some detrimental effect on delayed word recall performance although the evidence from this study is not conclusive. Low-control work, compared with moderate-control work, was associated with better verbal fluency performance in women.

Our results suggest there are likely few significant gender-specific effects of control levels on concurrent cognitive functioning in different domains at the end of working life. This is consistent with a study that included gender-interactions in their analysis of low control and cognitive impairment.<sup>24</sup> The fact that low-control work was associated with better verbal fluency performance in women could be due to job characteristics of low-control work, such as a high level of social interactions, particularly in female-dominated care professions, which may help to maintain verbal fluency performance. Studies with fine-grained information on job characteristics are necessary to validate this interpretation.

Studies based on national samples with dementia as outcome found that low-control work was associated with an increased risk of dementia in women,<sup>25</sup> and high-control work was associated with lower risk of dementia in men, respectively.<sup>10</sup> Both studies derived their low control measure from Job Exposure Matrices (JEM) attached to International Standard Classification of Occupation codes that rate occupations separately for men and women.<sup>10,25</sup> JEM offer the advantage of more objective ratings that are free of individual reporting differences. However, JEM have limited generalizability across countries and are not validated in contexts beyond those in which they were developed, with few exceptions.<sup>34</sup> Methodological differences between these studies and ours could be a potential explanation for seemingly incoherent results, though it is also possible that women may be at an increased risk for dementia due to other factors related to gender (social) or sex (biological) that interact with control.

In the context of our sample population who were mostly born in the 1940s and 1950s, some evidence suggests that women—particularly older women—rate their objectively worse working situations more positively than men given their historically poor access to good jobs<sup>35</sup>; gender differences in ratings constitute information (or measurement) bias in the exposure variable. Although employment opportunities expanded a great deal over the life-course of the women in our sample, their generation's expectations of working life were likely shaped to some degree by their mothers' generation, alongside notions of wives being secondary earners.<sup>36</sup> It is possible that women in our cohort may not have had the same expectations for their careers as subsequent cohorts. When countries modernize their welfare and labour regimes for the betterment of equal opportunities, men and women's job ratings seem to converge.<sup>37</sup> With better integration of women on the labour market, it could be expected that women may report less control if they use men as their reference group rather than other women, alongside potential consequences for psychosocial stress and cognitive outcomes.

### Study limitations

A common limitation to longitudinal studies of older adults is survival bias. Even if household response and attrition rates in SHARE are acceptable,<sup>27</sup> they may have influenced the findings. To be invited to participate in SHARE, individuals needed to be 50 years or older. Additionally, they needed to be working for selection into our sample. Previous research on the healthy worker effect has shown that poor quality work and poor health increases intentions to retire early.<sup>28</sup> It is conceivable that those with the least bearable levels of control are already retired or unable to work due to the health consequences, while differential selection into retirement based on gender may confer some additional selection bias. Effect sizes in both men and women could be underestimated if we are missing those who can no longer work because of low control or its impacts on health, including cognitive health; while with differential

**Table 2**  $\beta$ -Coefficients for the interactive association of gender and control on cognition using fixed-effect models

	Base model <sup>a</sup>		Work factors model <sup>b</sup>		Fully adjusted model <sup>c</sup>	
	<i>B</i>	95% CI	$\beta$	95% CI	<i>B</i>	95% CI
Verbal fluency						
High control	0.094***	0.047 to 0.141	0.084**	0.035 to 0.133	0.079**	0.030 to 0.129
Moderate control	0		0		0	
Low control	0.030	-0.028 to 0.088	0.020	-0.042 to 0.081	0.014	-0.047 to 0.076
High control $\times$ woman	-0.018	-0.086 to 0.050	-0.001	-0.072 to 0.070	0.000	-0.072 to 0.072
Moderate control $\times$ woman	0		0		0	
Low control $\times$ woman	0.034	-0.048 to 0.115	0.050	-0.037 to 0.136	0.061	-0.027 to 0.148
Immediate recall						
High control	-0.022	-0.078 to 0.033	-0.011	-0.069 to 0.048	-0.012	-0.071 to 0.046
Moderate control	0		0		0	
Low control	-0.063	-0.131 to 0.005	-0.042	-0.115 to 0.030	-0.032	-0.104 to 0.041
High control $\times$ woman	0.058	-0.023 to 0.138	0.055	-0.030 to 0.139	0.055	-0.030 to 0.140
Moderate control $\times$ woman	0		0		0	
Low control $\times$ woman	0.080	-0.017 to 0.176	0.062	-0.040 to 0.164	0.056	-0.047 to 0.159
Delayed recall						
High control	-0.037	-0.091 to 0.017	-0.021	-0.079 to 0.036	-0.019	-0.077 to 0.038
Moderate control	0		0		0	
Low control	-0.073*	-0.139 to -0.006	-0.060	-0.131 to 0.011	-0.051	-0.123 to 0.020
High control $\times$ woman	0.032	-0.047 to 0.111	0.017	-0.066 to 0.100	0.015	-0.069 to 0.098
Moderate control $\times$ woman	0		0		0	
Low control $\times$ woman	0.034	-0.061 to 0.129	0.019	-0.081 to 0.120	0.012	-0.090 to 0.113

CI, confidence interval.

a: Models adjusted for age only.

b: Models adjusted for age, demands, job security, work sector, work schedules and household income quintile.

c: Models adjusted for age, demands, job security, work sector, work schedules, household income quintile, smoking status, body mass index, chronic conditions, depression, physical inactivity, hearing loss and cohabitation.

\*:  $P < 0.05$ .

\*\* :  $P < 0.01$ .

\*\*\*:  $P < 0.001$ .

selection into retirement, effect sizes could be underestimated in women and mask potential gender differences.

Those with low control levels were also less likely to be included in our main sample, and those who were included may have had better social support, potentially mitigating the hypothesized negative effects of low control. Other research suggests that social support in and outside the workplace improves performance and job satisfaction of employees in high strain positions (low control and high demands) compared with those without similar support.<sup>38</sup> SHARE does not assess the full Job Content Questionnaire,<sup>8</sup> further dimensions of which, such as social support in the workplace, could also be relevant for cognitive functioning. However, as the fixed-effects methodology adjusts for time-constant confounding, these alternative pathways would only be relevant if substantial changes in support or conflict would have occurred between measurements.

The short timeframe of observation with our sample is another limitation, particularly with protracted periods of disease progression for dementia. Fixed-effect models fail to capture cumulative exposure to low control over the entire working life, insofar that we lack a cumulative score reflecting job history. Since a potentially long exposure to low-control work may have already started to decrease cognitive scores in this age group, it is possible that we have not captured previously accumulated effects. Thus, our effect sizes reflect a short window in the cognitive ageing process, but from a public health perspective, also a window of opportunity for

prevention before retirement, conditional on the cumulative effects being reversible.

## Conclusion

Our findings suggest that high-control work was consistently associated with improved verbal fluency performance in a sample of SHARE participants born in the 1940s and 1950s. Gender differences did not seem apparent in this control-cognition relationship, however, several sources of bias may have contributed to this null finding. Extended working lives and strong increases in the rate of older adults in employment,<sup>39</sup> increasing divides between low-skilled and high-skilled work, and other labour market developments of the recent decade such as 'Uberization', may lead to stronger associations between perceived control and cognitive performance warranting further exploration in younger cohorts. Furthermore, evolving gender norms in occupational opportunities and domestic labour merit the continued incorporation of gender considerations in occupational health research.

## Supplementary data

Supplementary data are available at *EURPUB* online.

**Table 3**  $\beta$ -Coefficients for the association of control and cognition using stratified fixed-effect models

		Base model <sup>a</sup>		Work factors model <sup>b</sup>		Fully adjusted model <sup>c</sup>	
		$\beta$	95% CI	$\beta$	95% CI	$\beta$	95% CI
Men	Verbal fluency						
	High control	0.093***	0.045 to 0.141	0.085**	0.034 to 0.135	0.080**	0.029 to 0.131
	Moderate control	0		0		0	
Women	Low control	0.030	-0.029 to 0.089	0.019	-0.044 to 0.082	0.014	-0.049 to 0.078
	High control	0.077**	0.029 to 0.126	0.083**	0.033 to 0.133	0.079**	0.028 to 0.130
	Moderate control	0		0		0	
Men	Low control	0.063*	0.007 to 0.119	0.071*	0.012 to 0.130	0.076*	0.016 to 0.136
	Immediate recall						
	High control	-0.024	-0.079 to 0.032	-0.012	-0.071 to 0.046	-0.014	-0.072 to 0.045
Women	Moderate control	0		0		0	
	Low control	-0.063	-0.131 to 0.005	-0.039	-0.112 to 0.034	-0.027	-0.100 to 0.046
	High control	0.037	-0.022 to 0.096	0.044	-0.017 to 0.106	0.042	-0.020 to 0.104
Men	Moderate control	0		0		0	
	Low control	0.015	-0.053 to 0.084	0.016	-0.057 to 0.088	0.018	-0.056 to 0.091
	Delayed recall						
Women	High control	-0.041	-0.094 to 0.012	-0.026	-0.082 to 0.030	-0.023	-0.080 to 0.033
	Moderate control	0		0		0	
	Low control	-0.072*	-0.137 to -0.007	-0.057	-0.127 to 0.012	-0.048	-0.118 to 0.022
Men	High control	-0.001	-0.060 to 0.058	-0.001	-0.063 to 0.061	-0.002	-0.065 to 0.061
	Moderate control	0		0		0	
	Low control	-0.042	-0.111 to 0.027	-0.046	-0.119 to 0.028	-0.045	-0.120 to 0.029

CI, confidence interval.

a: Models adjusted for age only.

b: Models adjusted for age, demands, job security, work sector, work schedules and household income quintile.

c: Models adjusted for age, demands, job security, work sector, work schedules, household income quintile, smoking status, body mass index, chronic conditions, depression, physical inactivity, hearing loss and cohabitation.

\*:  $P < 0.05$ .

\*\* :  $P < 0.01$ .

\*\*\*:  $P < 0.001$ .

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## Key points

- The treatment of gender in occupation health research is often insufficiently implemented given notable differences in occupational experiences of men and women, thus we explored low job control and cognitive health with a gender perspective.
- There was no clear evidence of gender differences in control–cognition relationships in our population of older European workers, however, information and selection bias may have contributed to masking possible gender differences.
- High control was protective for cognitive performance in verbal fluency tests.
- Regardless of gender, high control at work may set up soon-to-be retirees with improved cognitive capacities.

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