

Long working hours and symptoms of anxiety and depression: a 5-year follow-up of the Whitehall II study

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Background. Although long working hours are common in working populations, little is known about the effect of long working hours on mental health.

Method. We examined the association between long working hours and the onset of depressive and anxiety symptoms in middle-aged employees. Participants were 2960 full-time employees aged 44 to 66 years (2248 men, 712 women) from the prospective Whitehall II cohort study of British civil servants. Working hours, anxiety and depressive symptoms, and covariates were measured at baseline (1997–1999) followed by two subsequent measurements of depressive and anxiety symptoms (2001 and 2002–2004).

Results. In a prospective analysis of participants with no depressive ($n=2549$) or anxiety symptoms ($n=2618$) at baseline, Cox proportional hazard analysis adjusted for baseline covariates showed a 1.66-fold [95% confidence interval (CI) 1.06–2.61] risk of depressive symptoms and a 1.74-fold (95% CI 1.15–2.61) risk of anxiety symptoms among employees working more than 55 h/week compared with employees working 35–40 h/week. Sex-stratified analysis showed an excess risk of depression and anxiety associated with long working hours among women [hazard ratios (HRs) 2.67 (95% CI 1.07–6.68) and 2.84 (95% CI 1.27–6.34) respectively] but not men [1.30 (0.77–2.19) and 1.43 (0.89–2.30)].

Conclusions. Working long hours is a risk factor for the development of depressive and anxiety symptoms in women.

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Introduction

Common mental disorders, such as depression and anxiety disorders, are a growing cause of work disability and impaired quality of life among working-age populations (Thomas & Morris, 2003; Ormel *et al.* 2004; Mathers & Loncar, 2006). The number of employees who work long hours is substantial (Vaguer & Van Bastelaer, 2004) and it has been hypothesized that this might contribute to symptoms of anxiety

and depression among employees (Sparks *et al.* 1997; Spurgeon *et al.* 1997; Shields, 1999; Park *et al.* 2001; Bildt & Michelsen, 2002; Michelsen & Bildt, 2003; van der Hulst, 2003; Caruso *et al.* 2004; Fujino *et al.* 2006; Yamazaki *et al.* 2007; Kleppa *et al.* 2008).

To date, several cross-sectional studies have shown an association between long working hours and mental ill health and fatigue symptoms, but prospective evidence is scarce and inconsistent (Steptoe *et al.* 1998; Shields, 1999; Bildt & Michelsen, 2002; Michelsen & Bildt, 2003). One longitudinal study reported no association between long working hours and depression (Bildt & Michelsen, 2002; Michelsen & Bildt, 2003) whereas another reported an association only for women (Shields, 1999). In one study (Steptoe *et al.*

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1998), 71 participants were followed for 6 months and a within-subjects analysis of four assessments showed no change in psychological distress in relation to overtime work periods. Another experimental field study of 16 subjects found that overtime work was associated with increased exhaustion and irritation (Dahlgren *et al.* 2006). Studies from Japan using the 12-item General Health Questionnaire (GHQ-12) score (Suwazono *et al.* 2003) and records of diagnosed mental disorders from the employees' insurance company (Tarumi *et al.* 2003) found no association between long working hours and mental disorders. None of the earlier prospective studies examined anxiety as an outcome.

Several factors may have contributed to the mixed findings on the relationship between long working hours and mental health, including heterogeneity in the assessment of exposure, outcome and potential confounding factors; the small sample size in some studies; and insufficient control for bias. For example, the thresholds selected for long working hours have ranged from 41 h/week to as high as 70 h/week, and, in some studies, part-time employees have been included in the reference group. However, this creates a potential source of reverse causation bias because part-time work may be a response to health problems rather than a risk factor. Indeed, part-time work has been found to be associated with morbidity and mortality (Sokejima & Kagamimori, 1998; Nylen *et al.* 2001), and psychological distress in one study predicted a shift from ≥ 36 to < 36 h/week (De Raeve *et al.* 2009). In addition, given that mental health problems tend to fluctuate over time, the predictive value of working hours for mental health may have been underestimated in these studies as they were based on only one assessment of symptoms at follow-up.

Further issues relate to controlling for relevant confounders and mediators. The mechanisms for the associations between long working hours and mental ill health may be related to unhealthy lifestyles and stress-related physical diseases, such as cardiovascular disease (Sparks *et al.* 1997; Caruso *et al.* 2006; Virtanen *et al.* 2010). It is therefore important to take into account these factors in the analysis, alongside more conventional risk factors such as age, sex, socioeconomic position and marital status. Furthermore, the association may be sex specific, as women who are employed full time may be at higher risk of work-related health problems than men because of the combined load from paid and unpaid work (Alfredsson *et al.* 1985; Gjerdingen *et al.* 2000; Lundberg & Parr, 2000; Artazcoz *et al.* 2001; Lundberg & Hellström, 2002; Matthews & Power, 2002).

In this study of British civil servants, we therefore examined the associations between working hours

and symptoms of anxiety and depression using a prospective study design with three repeat measurements of anxiety and depressive symptoms and controlling for important potential mediators and confounding factors. Our aim was to determine whether long working hours predict future symptoms of depression and anxiety in a cohort of middle-aged full-time employees without these symptoms at baseline. To take into account reverse causation, we also examined whether pre-existing depressive or anxiety symptoms predict a transfer from shorter to longer working hours or from longer to shorter working hours.

Method

Participants and study design

Recruitment to the Whitehall II study (phase 1) took place between late 1985 and early 1988 among all office staff, aged 35–55 years, from 20 London-based Civil Service departments (Marmot & Brunner, 2005). The response rate was 73% (6895 men and 3413 women) and, since recruitment, there have been seven further data collection phases. Informed consent was gained from all participants and the University College London Medical School Committee on the Ethics of Human Research approved the protocol.

Data for the exposure and outcome measures for the present study were drawn from three survey phases: phase 5, 1997–1999 (the baseline for these analyses), when working hours were measured comprehensively for the first time in the Whitehall II study. The assessment of depression and anxiety symptoms was repeated at two subsequent phases (phase 6, 2001 and phase 7, 2002–2004). Participants were followed up until phase 7, or if these data were missing, until phase 6. Those with missing data at phase 6 were excluded from all analyses. Covariates were assessed at baseline.

The number of participants who worked full time (≥ 35 h/week) with complete data on covariates at baseline was 3536 [2678 (76%) men, 858 (24%) women, mean age at time of survey 52.4 years, s.d. = 4.3]. Of those, 2960 (84%) responded to the first follow-up survey [2248 (76%) men, 712 (24%) women, mean age at time of survey 55.3 years, s.d. = 4.3]. Altogether, 2764 (78%) responded to both follow-up surveys [2096 (76%) men, 668 (24%) women, mean age at time of survey 57.7 years, s.d. = 4.3]. Of the study sample, 85% were employed at the time of the first follow-up, and 75% at the second follow-up. Participants with no depressive symptoms ($n = 2549$) and those free of anxiety symptoms ($n = 2618$) at baseline formed the analytic samples for the study.

Measures

Working hours were ascertained from the following two questions: 'How many hours do you work in an average week in your main job, including work brought home?' and 'How many hours do you work in an average week in your additional employment?' Response alternatives to these questions ranged from 0 to ≥ 100 and 0 to 99 respectively. As there is no consensus on the definition of long working hours, we chose to follow a definition used in two studies that reported an association between long working hours and poor sleep quality (Sekine *et al.* 2006), and myocardial infarction (Sokejima & Kagamimori, 1998). Based on the reported number of hours worked, the participants were divided into three groups: 1=35–40 h/week; 2=41–55 h/week; and 3=more than 55 h/week.

Depressive symptom score (Stansfeld *et al.* 1998) was drawn from the 30-item General Health Questionnaire (GHQ-30; Goldberg, 1972) and included the following four items: 'been thinking of yourself as a worthless person', 'felt that life is entirely hopeless', 'felt that life isn't worth living', and 'found at times you couldn't do anything because your nerves were too bad' (Cronbach's $\alpha=0.88$). These four items, assessed on a four-point Likert scale, range 0–3, are a subset of the seven items in the depression subscale of the GHQ-28 (Goldberg, 1972). A sum score was calculated and, as previously, a total score of 4 or more was used to define the presence of depressive symptoms (Stansfeld *et al.* 2003; Stafford *et al.* 2007; Hamer *et al.* 2010; Singh-Manoux *et al.* 2010).

A five-item anxiety symptom score ('lost much sleep over worry', 'felt constantly under strain', 'been getting scared or panicky for no good reason', 'found everything getting on top of you', 'been feeling nervous and strung up all the time'; Cronbach's $\alpha=0.86$) was also drawn from the GHQ. These five items, which are a subset of the seven items of the GHQ-28 anxiety scale, were rated on a four-point scale (range 0–3) and scores in the top decile (8 or more points of the total of 15 points) used to define anxiety cases (Virtanen *et al.* 2009); this classification leads to a prevalence rate that closely matches that of anxiety disorders in the general UK population (Jenkins *et al.* 1997).

Data on sociodemographic factors, health-related behaviours and physical health at baseline were used as covariates in the analyses. Sociodemographic factors included sex, age, marital status (married/cohabiting *versus* not married/not cohabiting) and occupational grade which was grouped into six levels. Alcohol consumption was classified as 0, 1–14 and >14 units/week for women and 0, 1–21 and >21

units/week for men (the last category for each sex representing alcohol consumption over the recommended limit) (White *et al.* 2004). Smoking was assessed by a single question on whether the respondent was a current smoker. Chronic disease was indicated by the presence of at least one of the following conditions: (1) report of long-standing illness, disease, or medical condition for which the participant had sought treatment in the 12 months before the survey; (2) presence of coronary heart disease (CHD), as defined previously (Kivimaki *et al.* 2007), at phase 5. Employment status at follow-up (employed *versus* not employed) was derived from the last follow-up questionnaire.

To examine whether individuals with anxiety or depressive symptoms are more likely to be selected for, or remain in, jobs with long working hours (i.e. reverse causality), we ran additional analyses among participants who responded to the questionnaire at phase 3 in addition to phase 5 ($n=3416$). Assessment of working hours at phase 3 was not as accurate as at phase 5 including hours worked only on an average weekday. However, using these data we examined whether depressive and anxiety symptoms predicted a shift from shorter to longer working hours or from longer to shorter working hours. We used three different definitions for change in working hours as follows: increased working hours (shift from 7–8 h/day to >40 h/week; shift from 7–8 h/day to >55 h/week; shift from 7–10 h/day to >55 h/week) and decreased working hours (shift from >8 h/day to <40 h/week; shift from ≥ 11 h/day to <40 h/week; and shift from ≥ 11 h/day to 35–54 h/week). The reference group in all analyses comprised those who stayed in the baseline category in question.

Statistical analysis

For dichotomous measures, we tested for a trend in the prevalence of the baseline characteristic across the working hours categories using a χ^2 test. We used Cox proportional hazard models with follow-up period as the time scale to examine the relationship between working hours and incident depressive and anxiety symptoms among participants free from symptoms at baseline. Those working 35–40 h/week formed the reference category against which the hazard ratio (HR) was calculated. To examine the linear trend in the association between working hours and new-onset depressive or anxiety symptoms, we repeated the analysis treating working hours as a continuous variable and expressed as the effect per 10-h increase in weekly working hours.

The models were serially adjusted for covariates (sociodemographic factors and health and health

Table 1. Characteristics of the participants by working hours at baseline

Characteristic	Weekly working hours				p value for trend
	All	35–40	41–55	>55	
Age (years), mean (s.d.)	52.3 (4.3)	52.7 (4.5)	51.9 (4.0)	52.9 (4.4)	<0.001 ^a
Sex					<0.001
Male	2248 (76)	824 (70)	1209 (79)	215 (81)	
Female	712 (24)	345 (30)	316 (21)	51 (19)	
Marital status					<0.001
Married/cohabiting	2323 (78)	860 (74)	1242 (81)	221 (83)	
Non-married/non-cohabiting	637 (22)	309 (26)	283 (19)	45 (17)	
Occupational grade					<0.001
1 (highest)	653 (22)	103 (9)	424 (28)	126 (47)	
2	731 (25)	214 (18)	451 (30)	66 (25)	
3	440 (15)	199 (17)	213 (14)	28 (11)	
4	515 (17)	289 (25)	207 (14)	19 (7)	
5	330 (11)	179 (15)	134 (9)	17 (6)	
6 (lowest)	291 (10)	185 (16)	96 (6)	10 (4)	
Chronic disease					0.185
No	1549 (52)	596 (51)	807 (53)	146 (55)	
Yes	1411 (48)	573 (49)	718 (47)	120 (45)	
Alcohol use					<0.001
No	376 (13)	182 (16)	174 (11)	20 (8)	
>0–14 women, >0–21 men	1824 (62)	737 (63)	921 (60)	166 (62)	
Above recommended limits	760 (26)	250 (21)	430 (28)	80 (30)	
Smoking					0.014
No	2668 (90)	1036 (89)	1385 (91)	247 (93)	
Yes	292 (10)	133 (11)	140 (9)	19 (7)	

All values given as *n* (%) unless stated otherwise.

^a Paired test of difference between 41–55 *v.* 35–40 h and >55 h significant ($p < 0.001$). Difference between 35–40 h and >55 h non-significant ($p = 0.508$).

behaviours) to examine the effect of covariates on the association. Interaction terms between sex and categories of working hours were used to assess whether the effect of working hours on mental health was dependent on sex. In a sensitivity analysis, we restricted the sample to those who were employed during the whole follow-up period and therefore were not misclassified in relation to working hours due to non-employment during the follow-up ($n = 1924$ for depression analysis; $n = 1988$ for anxiety analysis). We used binary logistic regression analysis to assess reverse causality (shift from shorter to longer hours and shift from longer to shorter hours). SAS version 9.2 (SAS Institute, USA) was used for all analyses.

Results

Participants in the first and second follow-up did not differ markedly from all 3536 baseline participants in terms of working hours: 40% of those who responded to the first follow-up survey only and 39% of those

who responded to both follow-up surveys *versus* 40% of all the respondents in the baseline survey worked 35–40 h/week at baseline. The proportion of employees working 41–55 h/week was 52% for both follow-up groups *versus* 51% at baseline, and for those working >55 h 9% at baseline and both follow-up groups. Thus, there were no major differences in drop-out between the groups defined by working hours.

Table 1 presents the association between working hours and covariates among the participants at baseline. Employees working long hours (>55 h/week) were more often men, married or cohabiting, were in higher occupational grades, more likely to drink over the recommended limit and less often current smokers. Employees working 41–55 h were slightly younger than the other two groups.

During the mean follow-up period of 5.3 (s.d. = 0.9) years, 274 new-onset depressive symptom cases were identified. The mean follow-up time for anxiety symptoms was 5.2 (s.d. = 0.9) years, during which 313 new-onset cases were recorded. Associations between

working hours at baseline and onset of depressive and anxiety symptoms at follow-up are presented in Table 2. In the model adjusted for sociodemographic factors, working more than 55 h/week was related to a 1.65-fold risk of symptoms of depression and a 1.68-fold risk of symptoms of anxiety in those without those symptoms at baseline. The HR for depressive symptoms for each 10-h increase in working hours was 1.18, and the HR for anxiety symptoms was 1.22. The HRs were all robust to further adjustment for baseline health and health behaviours.

We found a significant interaction between working hours and sex predicting onset of depressive and anxiety symptoms (p values for interaction <0.001 and 0.016 respectively). Therefore, the results are presented separately for women and men in Table 2. The fully adjusted HR for depressive symptoms in the group with the longest working hours was 2.67 among women and 1.30 (non-significant) among men. The corresponding HRs for each 10-h increase in working hours were 1.40 and 1.02 among women and men respectively. The HR for anxiety symptoms in the longest working hours group was 2.84 among women and 1.43 (non-significant) among men. The corresponding HRs for each 10-h increase in working hours predicting anxiety symptoms were 1.31 and 1.19 among women and men respectively.

Sensitivity analysis

In this analysis we restricted the sample to those who were employed during the whole follow-up period ($n=1924$ for depression analysis and $n=1988$ for anxiety analysis) and found an HR of 1.71 [95% confidence interval (CI) 1.03–2.84] for new-onset depressive symptoms among employees who worked >55 h at baseline (HR 1.20, 95% CI 1.01–1.43 for each 10-h increase), and an HR of 1.95 (95% CI 1.24–3.07) for new-onset anxiety symptoms (HR 1.30, 95% CI 1.11–1.52 for each 10-h increase). There was also a clear sex interaction in these subsamples ($p < 0.001$ for depression, $p = 0.003$ for anxiety). Sex-stratified analyses showed an HR of 2.13 (95% CI 0.66–6.91) for depression among women working >55 h and an HR of 1.48 (95% CI 0.84–2.61) among men. The middle group (41–55 h/week) among women had an HR of 2.66 (95% CI 1.45–4.85) for depression. The corresponding figures regarding depression for each 10-h increase among women and men were HR 1.35 (95% CI 1.04–1.75) and HR 1.10 (95% CI 0.87–1.39) respectively. Regarding anxiety, working >55 h compared to 35–40 h was related to an HR of 4.09 (95% CI 1.65–10.11) among women and an HR of 1.51 (95% CI 0.89–2.56) among men. The middle group (41–55 h/week) among women had an HR of 2.26

(95% CI 1.24–4.12) for anxiety. The corresponding figures for anxiety for each 10-h increase among women and men were HR 1.47 (95% CI 1.10–1.97) and HR 1.24 (95% CI 1.03–1.50) respectively.

Test of reverse causality

To examine whether individuals with anxiety or depressive symptoms are more likely to change their working hours, we ran additional analyses among participants ($n=3416$) who responded to questionnaires at phase 3 (1991–1994) and phase 5 (1997–1999). We examined whether depressive and anxiety symptoms at phase 3 predicted selection into, or reduced selection out of, jobs with long working hours between phases 3 and 5. We used three definitions of change in working hours and adjusted the analyses for sex, age, marital status and occupational grade. Among the 12 tests performed, the only association that was close to statistical significance was a decreased, although non-significant, probability for employees with anxiety symptoms to reduce their working hours from more than 10 h/day to less than 55 h/week (OR 0.53, 95% CI 0.27–1.05).

Discussion

We examined long working hours as a predictor of depressive and anxiety symptoms in a sample of middle-aged British civil servants. Among participants free from such symptoms at baseline followed up over 5 years, working more than 55 h/week predicted subsequent depressive and anxiety symptoms. In the fully adjusted models, each 10-h increase was related to a 17% and 22% increase in risk of depressive and anxiety symptoms respectively. Sex-stratified analyses revealed that, in women, working more than 55 h/week was related to a 2.67-fold risk of depression and a 2.84-fold risk of anxiety, and each 10-h increase in working hours was associated with 40% and 31% increase in risk of depression and anxiety respectively. Among men, the associations were weaker and the only significant association we found was a linear association between each 10-h increase in working hours and the onset of anxiety symptoms. By contrast, among women, even moderate overtime work (41–55 h/week) seemed to increase the probability of mental health problems. Our findings are in line with those of an earlier cross-sectional study showing a relationship between overtime work and anxiety symptoms (Kleppa *et al.* 2008), and a prospective study showing overtime work to be a risk factor for new-onset depressive disorder among women but not among men whose weekly working hours exceeded 40 h (Shields, 1999).

Table 2. Association between working hours at baseline and incident anxiety and depressive symptoms at follow-up

Weekly working hours at baseline	Depressive symptoms					Anxiety symptoms				
	Events	Person-years (py)	Rate/100 py	HR (95% CI) ^a	HR (95% CI) ^b	Events	Person-years (py)	Rate/100 py	HR (95% CI) ^a	HR (95% CI) ^b
All participants										
All	274	13 429	2.0			313	13 723	2.3		
35–40	105	5202	2.0	1.00	1.00	119	5399	2.2	1.00	1.00
41–55	141	7076	2.0	1.03 (0.79–1.35)	1.02 (0.78–1.34)	158	7119	2.2	1.01 (0.78–1.31)	1.02 (0.79–1.32)
>55	28	1152	2.4	1.65 (1.05–2.59)	1.66 (1.06–2.61)	36	1206	3.0	1.68 (1.12–2.52)	1.74 (1.15–2.61)
Per 10-h increase				1.18 (1.02–1.36)	1.17 (1.01–1.35)				1.22 (1.08–1.38)	1.22 (1.08–1.39)
Women										
All	77	3102	2.5			88	3036	2.9		
35–40	27	1507	1.8	1.00	1.00	36	1546	2.3	1.00	1.00
41–55	43	1378	3.1	2.15 (1.28–3.59)	2.15 (1.28–3.60)	42	1303	3.2	1.63 (0.99–2.71)	1.69 (1.02–2.81)
>55	7	216	3.2	2.80 (1.13–6.96)	2.67 (1.07–6.68)	10	187	5.3	2.81 (1.28–6.17)	2.84 (1.27–6.34)
Per 10-h increase				1.43 (1.16–1.77)	1.40 (1.14–1.73)				1.31 (1.03–1.67)	1.31 (1.03–1.67)
Men										
All	197	10 328	1.9			225	10 687	2.1		
35–40	78	3695	2.1	1.00	1.00	83	3852	2.2	1.00	1.00
41–55	98	5697	1.7	0.75 (0.55–1.02)	0.73 (0.53–1.00)	116	5816	2.0	0.87 (0.64–1.17)	0.86 (0.64–1.17)
>55	21	936	2.2	1.30 (0.77–2.20)	1.30 (0.77–2.19)	26	1019	2.6	1.39 (0.87–2.24)	1.43 (0.89–2.30)
Per 10-h increase				1.03 (0.85–1.26)	1.02 (0.83–1.25)				1.19 (1.03–1.39)	1.19 (1.03–1.38)

HR, Hazard ratio; CI, confidence interval.

^a Adjusted for age, sex, occupational grade, and marital status at baseline, and employment status at follow-up.^b Additionally adjusted for chronic illness, smoking, and alcohol use at baseline.

Several factors may underlie these findings. One mechanism suggested to explain the association between long working hours and mental health symptoms is the behavioural pathway, such as unhealthy alcohol consumption or smoking (van der Hulst, 2003). We found that participants working long hours used more alcohol but were less often current smokers than other participants. Their alcohol use, however, did not explain the association between long working hours and onset of depressive and anxiety symptoms.

Long working hours may indicate the adverse effects of work exposure and stress. There is some evidence that, for example, work overload is specifically related to anxiety symptoms whereas low decision latitude, implying loss of or insufficient control over work, is more often associated with depression (Broadbent, 1985; Warr, 1990). Our findings indicating that long working hours are a greater risk for anxiety and depression in women may reflect the fact that women often also have an extra burden due to extended hours of work and domestic chores (Gjerdingen *et al.* 2000; Lundberg & Parr, 2000; Artazcoz *et al.* 2001; Lundberg & Hellström, 2002; Matthews & Power, 2002). In addition, for women, working long hours is less normative and may therefore be more stressful, for example, in terms of work–family conflicts (Jansen *et al.* 2003). More women than men also work in monotonous jobs and have less control over the content and pace of work (Lundberg, 2002; Virtanen *et al.* 2007) and also less control over work time (Ala-Mursula *et al.* 2004).

There is also some evidence of increased myocardial infarction in women but not in men who work overtime (Alfredsson *et al.* 1985). Myocardial infarction is associated with depression (Blumenthal, 2008), although in an earlier report from the Whitehall II study, no significant sex differences were observed in the association between long working hours and increased risk of coronary heart disease (Virtanen *et al.* 2010). Long working hours have been associated with elevated salivary cortisol levels, particularly among women (Lundberg & Hellström, 2002), and other studies suggest that elevated cortisol levels may be related to the development of depression (Handwerker, 2009). However, our sex-specific findings may more simply reflect well-known sex differences in responses to external stressors; symptoms of depression and anxiety are more common among women and alcohol use disorders are more prevalent among men (Jenkins *et al.* 1997; Batty *et al.* 2009). Future studies should therefore extend the investigation of long working hours to include alcohol use disorders.

There is some discussion in the literature on whether the association between long working hours and mental ill health is due to selection; that is,

employees with pre-existing mental disorders tend to work or have to work longer; or employees with mental disorders are forced to stay in unsatisfactory jobs, including those with longer working hours, because their potential for finding alternative employment is limited (Waghorn & Chant, 2005; Kleppa *et al.* 2008). Alternatively, employees with mental health problems may reduce their working hours to enable recovery (De Raeve *et al.* 2009). However, we did not find evidence of reverse causality in our analysis. We excluded part-time employees from our main analysis because people with health problems may choose part-time work and therefore be selected for poorer health (Ettner *et al.* 1997; De Raeve *et al.* 2009). However, future studies should examine whether working part-time has implications for employee mental health.

We found similar associations of long working hours with depressive and anxiety symptoms. As these mental health problems are highly co-morbid in the general population (Prince *et al.* 2007) and also exhibited a considerable degree of correlation in our sample ($r=0.64$, $p<0.001$), it is possible that there are common pathways, such as occupational burnout, explaining the association between work exposures and various forms of common mental disorders (Ahola *et al.* 2005; Ahola & Hakanen, 2007; Peterson *et al.* 2008).

Some limitations of the study are noteworthy. Cohorts such as the Whitehall II study that follow the same individuals over an extended time period are subject to a 'healthy survivor' effect as participants with severe illnesses are more prone to drop out of the study over time (Ferrie *et al.* 2009). However, work exposures such as working hours cannot be examined reliably among participants who are no longer exposed to work. Thus, in our study, the loss of unhealthy participants may result in an underestimation rather than an overestimation of the true effect. Our sensitivity analyses suggested similar results when the study samples were restricted to those who were employed over the whole follow-up period.

Another limitation relates to our measures of depressive and anxiety symptoms not being validated against clinical diagnoses. The present results should therefore be confirmed using standardized measures of depressive and anxiety disorders. Furthermore, we were not able to assess how long a person was exposed to long hours before the baseline and over the follow-up period. Finally, although our cohort of civil servants included several occupational grades, it did not include blue-collar workers. Thus, it remains unclear whether our findings are generalizable to blue-collar workers and employees in the private sector.

In conclusion, a follow-up of approximately 5 years suggests an association of long working hours with subsequent depressive and anxiety symptoms, particularly among women. If these associations are causal, the findings of the present study suggest that long of working hours should be recognized as a potential risk factor for the development of anxiety and depression in women.

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Declaration of Interest

None.

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