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CONFLICT OF INTERESTS

ABSTRACT

Background: There have been numerous studies on the associations between psychosocial work factors and mental health, but very few of them explored the cumulative effects of these factors. The objectives were to study the associations between multiple occupational exposures and two common mental disorders, major depressive episode (MDE) and generalized anxiety disorder (GAD), among employees in France.

Methods: The data came from the 2016 French national Working Conditions Survey based on a representative sample of 20,430 employees (8,579 men, 11,851 women) aged 15 to 65 years. MDE and GAD were assessed using the MINI standardized diagnostic interview. Occupational exposures included 21 psychosocial work factors grouped into 5 dimensions, 4 factors related to working time/hours and 4 physical work exposures. Logistic regression modeling for weighted data was performed to evaluate the associations of occupational exposures with MDE and GAD in men and women separately.

Results: The prevalence of MDE and GAD was higher among women (8.6% and 8.7% respectively) than among men (4.3% and 4.6%). Most psychosocial work factors were associated with MDE and/or GAD. A linear increase in the risk of MDE/GAD with the number of psychosocial work factors was found for each dimension, except workplace violence. The risk of MDE also increased linearly with multiple physical work exposures.

Conclusions: Our results showed that a wide variety of occupational exposures were associated with clinical depression and anxiety, and that the risk of disease increased with multiple exposures to psychosocial and physical factors at work.

KEYWORDS: working conditions, occupational exposures, psychosocial work factors, multiple exposures, anxiety, depression

1 | INTRODUCTION

Depression and anxiety are the two most prevalent mental disorders and are major contributors to the high costs of common mental disorders (EU-OSHA, 2014; World Health Organization, 2017). In addition to the deterioration of health and quality of life, these disorders have costly consequences for the working age population, inducing lower work performance, sickness absence, disability/unemployment, and early retirement (Birnbaum et al., 2010; Knudsen, Harvey, Mykletun, & Øverland, 2013; Wedegaertner et al., 2013).

There is a large literature on the associations between psychosocial work factors and mental health, and several systematic reviews were published including a meta-review (Harvey et al., 2017). However, a large majority of the studies explored mental health symptoms, and far fewer studies focused on clinically diagnosed depression and anxiety. Only one systematic review and meta-analysis of data from published and unpublished studies concluded that job strain (i.e. low decision latitude and high psychological demands) was associated with an increased risk of clinical depression (Madsen et al., 2017). Other psychosocial work exposures may play a role in mental disorders: low social support, effort-reward imbalance, workplace violence or bullying, role stressors (i.e. role ambiguity and conflict), organizational injustice, organizational changes, and job insecurity (Kim & von dem Knesebeck, 2016; Netterstrøm et al., 2008; Nieuwenhuijsen, Bruinvels, & Frings-Dresen, 2010; Rönnblad et al., 2019; Rugulies, Aust, & Madsen, 2017; Schmidt, Roesler, Kusserow, & Rau, 2014; S. Stansfeld & Candy, 2006; Theorell et al., 2015; Verkuil, Atasayi, & Molendijk, 2015). However, studies evaluating the associations of these factors with clinical depression remain seldom and for anxiety, they are even rarer.

In addition, most previous studies examined psychosocial work factors, and other occupational exposures such as those related to working hours/time and the physical work

environment were often not considered. The effects of atypical working hours on common mental health problems remain inconclusive according to the meta-review by Harvey et al. (Harvey et al., 2017). A meta-analysis demonstrated that shift work increased the risk for poor mental health, particularly depressive symptoms in women (Torquati, Mielke, Brown, Burton, & Kolbe-Alexander, 2019). Night shift work was found to be associated with an increased risk of depression/depressive symptoms in another meta-analysis (Lee et al., 2017). In a meta-analysis based on previous studies and unpublished data, it was suggested that the association of long working hours with depressive symptoms may differ according to country, being strong in Asian countries, weaker in Europe and not significant in North America or Australia, because of differences in cultural and occupational health policy (Virtanen et al., 2018). However, the effects of overtime work on depressive disorders clinically diagnosed or assessed by a structured interview remained inconclusive in another review and meta-analysis (Watanabe, Imamura, & Kawakami, 2016). Finally, there is very little knowledge on the impact of physical work environment on the risk of depression and anxiety (Theorell et al., 2015). Another important limitation of the literature is that most studies explored a limited number of occupational exposures, and did not assess the effects of multiple exposures.

The objectives of this study in a large nationally representative sample of French workers were therefore to examine the associations of a wide variety of occupational exposures, including psychosocial work factors, factors related to working time/hours and physical work exposures, with major depressive episode (MDE) and generalized anxiety disorder (GAD), measured using a standardized diagnostic interview. We additionally assessed whether there were cumulative effects of occupational exposures on these two outcomes.

2 | METHODS

2.1 | Study sample

This cross-sectional study relied on the data from the national periodic survey on working conditions conducted by the French Ministry of Labour (DARES), the Working Conditions survey, that focused on psychosocial work factors in 2016. The data were collected on a nationally representative sample of the French working population aged 15 or more. Workers were selected through a two-stage random sampling process: firstly at the household level using national population and housing census data, and secondly at the individual level in households where there was more than one worker. Data collection was performed through a face-to-face interview at respondent's home followed by a self-administered questionnaire. The survey received approval from the French ethics committees (CNIL no 2015-079 and CNIS no 2015X073TV).

2.2 | Measures

2.2.1 | Mental disorders

MDE within the last two weeks and GAD within the last 6 months were assessed using the corresponding modules and diagnostic algorithms of the 5.0.0 version of the Mini International Neuropsychiatric Interview (MINI), which has been shown as a reliable diagnostic interview for the diagnosis of common mental disorders defined with the clinical criteria from the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) (Lecrubier et al., 1997; D. Sheehan et al., 1997; D. V. Sheehan et al., 1998).

2.2.2 | Occupational factors

A total of 79 items were used to construct 21 psychosocial work factors, following international concepts, such as those from COPSOQ (Kristensen, Hannerz, Høgh, & Borg, 2005; Pejtersen, Kristensen, Borg, & Bjorner, 2010). These factors were grouped as follows:

1. Demands at work: quantitative demands (7 items), cognitive demands (3 items), emotional demands (2 items), demands for hiding emotions (2 items)

2. Work organization and job content: influence at work (6 items), degree of freedom (3 items), possibilities for development (5 items), meaning of work (3 items)

3. Interpersonal relations and leadership: social support from supervisors and colleagues (7 items), sense of community (3 items), quality of leadership (5 items), predictability (2 items), role clarity (2 items), role conflict (9 items)

4. Work-individual interface: job satisfaction (3 items), work-family conflict (2 items), job insecurity (2 items), changes at work (2 items), temporary employment (1 item)

5. Workplace violence: internal violence at work (i.e. from colleagues, supervisors, etc.) (6 items), external violence at work (i.e. from the public, patients, clients, customers, etc.) (4 items)

The score of each factor was calculated by summing all items and was dichotomized at the median of the total sample to define low or high exposure groups. Multiple exposure was assessed by counting the number of factors to which the individual was exposed, firstly for each group of factors, and secondly for all groups together. Thus, the overall measure of psychosocial work exposure ranged from 0 to 21.

Four factors related to working time/hours were studied: long working hours (1 item: working more than 48 hours per week, following the European directive on working time),

night work (1 item: working between midnight and 5 am at least 50 nights a year), shift work (1 item: working on alternating/rotating shifts), and unsocial work days (1 item: working on Saturday or Sunday at least 40 times a year).

Physical work exposures included four factors that were: biomechanical exposure (7 items: long-term exposure to standing, difficult or tiring position, walking, heavy loads, painful or tiring movements, vibrations, repetitive tasks), exposure to fumes or dust (1 item), exposure to toxic and dangerous products (1 item) and exposure to noise (1 item).

Two indexes of multiple exposure were also calculated for working time/hours and physical work exposures.

2.2.3 | Covariates

The covariates were the following: age, marital status (living with or without a partner), social support outside work (2 items: having someone to rely one to discuss personal issues or take a difficult decision, and need more help than help received), life events before the age of 18 (5 items), life events within the last 3 years (4 items), and employment characteristics including occupation and economic activity of the company.

These covariates were chosen because they were known to be risk factors for depressive and/or anxiety disorders (Gutiérrez-Rojas et al., 2020; Michael et al., 2007), or because they were the main variables characterizing occupational activity which are important variables to consider when studying the associations between occupational exposures and health outcomes among working populations.

2.3 | Statistical analyses

All analyses were performed using weighted data to take non-response and calibration into account, and to provide results that could be extrapolated to the whole French working population in 2016. Non-response was corrected both at household level and at individual level. The following calibration variables were used: gender, age, economic activity of the company, occupation and employment status.

Comparisons between genders were performed for all studied variables using the Rao-Scott chi-square test. Differences in the prevalence of MDE/GAD according to covariates were tested using the same test. Weighted logistic regression models were used to investigate the associations between each occupational factor and MDE/GAD. Odds-ratios adjusted for all covariates and 95% confidence intervals were calculated. Multiple exposures to occupational factors were also studied using weighted logistic regression models, and trend tests were performed to assess whether the risk of MDE/GAD increased with the number of exposures. These analyses were also adjusted for covariates.

Sensitivity analyses were performed: (1) for the study of the associations between each occupational factor and MDE/GAD, additional adjustment was performed for full/part time work, public/private sector, and company size, as these variables may be associated with occupational exposures and/or outcomes, (2) for the study of multiple exposure to psychosocial work factors, additional adjustment was done for working time/hours factors and physical work exposures, to control for the potentially confounding effects of these exposures, and (3) tertiles of the score for each occupational factor were studied instead of exposure dichotomized at the median, to assess dose-response associations.

Statistical analyses were performed among men and women separately using SAS version 9.4M5 (SAS Institute Inc., Cary, NC, USA). Gender differences in the associations of occupational factors with MDE/GAD were tested by including interaction terms.

3 | RESULTS

3.1 | Description of the study sample

The overall rate of participation in the 2016 Working Conditions survey was 74.4%. Among the 27,610 participants, there were 21,742 employees aged 15 to 65 years working at the time of the survey, and among them, 20,430 (94.0%) responded to the self-administered questionnaire and constituted the study sample, i.e. 8,579 men and 11,851 women (see Table 1 for the description of the study sample according to covariates). Significant gender differences were observed for all covariates ($p \leq .006$), except for age ($p = .073$).

3.2 | Prevalence of MDE and GAD

Table 1 also shows that the prevalence of MDE and GAD was higher among women (8.6% and 8.7% respectively) than among men (4.3% and 4.6%). There was no difference between age groups, but the prevalence increased with lower social support outside work and with the number of life events during childhood and within the last 3 years in both genders. A higher prevalence of MDE was observed in women living without a partner. MDE and GAD were more prevalent among female unskilled occupational groups. No significant difference in the prevalence of MDE and GAD was found according to economic activity of the company.

3.3 | Associations of each occupational factor with MDE/GAD

Tables 2-3 present the associations between each occupational exposure and MDE/GAD before and after adjustment for covariates.

For both genders, most psychosocial work factors were associated with MDE and/or GAD. There was however no association of emotional demands, predictability and external violence in men, degree of freedom in women, and temporary employment in both genders with both MDE and GAD after adjustment for covariates.

No factors related to working time/hours were significantly associated with MDE or GAD, after adjustment for covariates. However, among women, unsocial work days were associated with MDE and a protective association was observed between shift work and MDE.

All physical work factors were associated with MDE, except toxic and dangerous products exposure in men, after adjustment for covariates. High biomechanical exposure and exposure to toxic and dangerous products were associated with GAD in women, while noise exposure was found to be associated with GAD in men.

Some significant gender differences in the exposure-outcome associations were observed: the strength of the associations of low job satisfaction and internal violence with MDE were stronger in men than in women, and the associations of role conflict and changes at work with GAD were significant for women but non-significant for men.

In the sensitivity analyses, the results remained unchanged after additional adjustment. Furthermore, when we analyzed occupational exposures using tertiles instead of dichotomized exposures, we found a large number of dose-response associations with MDE and GAD.

3.4 | Associations of multiple occupational exposures with MDE and GAD

All psychosocial work dimensions except workplace violence displayed dose-response associations with MDE and GAD (Figures 1-2). Linear trend tests were all significant. The risk of GAD also increased with the exposure to workplace violence in women. Consequently, there was a significant linear association between the total number of psychosocial work exposures and MDE/GAD in both genders (*p* for trend < .002).

In addition, there was a significant increase in the odds ratios for MDE with the number of physical work exposures in both genders, but the linear association was not significant for GAD. No linear trend was found between the number of working time/hours factors and MDE or GAD.

The results remained unchanged in the sensitivity analyses.

4 | DISCUSSION

4.1 | Main findings

When each occupational factor was studied separately, most psychosocial work factors were found to be associated with MDE and GAD. Furthermore, linear associations between the number of these factors and MDE/GAD were observed, except for workplace violence. Regarding working time/hours, unsocial work days was significantly associated with GAD in women. High biomechanical work exposure, occupational exposures to fumes and dust, and noise for both genders, and toxic and dangerous products in women, were associated with MDE. An increasing risk of MDE with multiple exposure to physical work factors was observed in both genders.

4.2 | Comparison with the literature

In our study, MDE and GAD were measured by a standardized diagnostic interview based on DSM-IV criteria. The observed prevalence of MDE and GAD, as well as the differences in prevalence between genders, were consistent with previous estimates in the working population in France (Murcia, Chastang, & Niedhammer, 2013).

Our results on job demands are in line with literature reviews on common mental disorders (that were mainly symptomatic outcomes) (Netterstrøm et al., 2008; Nieuwenhuijsen et al., 2010; S. Stansfeld & Candy, 2006; Theorell et al., 2015), and with the few previous studies on depression based on diagnostic interviews (Blackmore et al., 2007; Plaisier et al., 2007; S. A. Stansfeld, Clark, Caldwell, Rodgers, & Power, 2008; J. Wang & Patten, 2001; JianLi Wang, 2004). The association of job demands with anxiety disorders has been much less studied and the results remain inconsistent: some rare studies showed that high job demands were either a risk factor (Isabelle Niedhammer, Malard, & Chastang, 2015; S. A. Stansfeld et al., 2008), or a non-significant factor (Plaisier et al., 2007) or a protective factor (Wieclaw et al., 2008). Our results add to the literature by showing that that various types of job demands, including quantitative demands, cognitive demands and demands for hiding emotions, were associated with MDE or GAD. High emotional demands were previously reported to be associated with MDE (Wieclaw et al., 2008) or GAD (Isabelle Niedhammer et al., 2015). To our knowledge, no previous study has reported an association between cognitive demands and MDE/GAD.

According to some literature reviews, there was moderate to strong evidence of association between low job control and depressive or mental health symptoms (Bonde, 2008; Nieuwenhuijsen et al., 2010; S. Stansfeld & Candy, 2006; Theorell et al., 2015). Some rare studies showed an association between low job control and clinical depression (Blackmore et al., 2007; J. Wang & Patten, 2001; JianLi Wang, 2004). Inconclusive results were reported for

the association of job control with anxiety disorders (Isabelle Niedhammer et al., 2015; Plaisier et al., 2007; Wieclaw et al., 2008). In our study, we were able to explore various components of job control: influence at work, possibilities for development, and degree of freedom, something that has never been done before for diagnostic interview outcomes. Our study is also the first to show that low meaning of work was a risk factor for both MDE and GAD.

Almost all psychosocial factors related to interpersonal relationship and leadership were associated with MDE in our study. The associations found for low social support at work, low role clarity and role conflict are in line with literature reviews based mainly on studies using symptomatic outcomes (Netterstrøm et al., 2008; Nieuwenhuijsen et al., 2010; Schmidt et al., 2014; S. Stansfeld & Candy, 2006; Theorell et al., 2015) and with results from studies on clinical depression (Blackmore et al., 2007; J. Wang & Patten, 2001; JianLi Wang, 2004). Low social support and ethical conflict were found to be predictive of GAD in a previous study among French employees (Isabelle Niedhammer et al., 2015). We found significant associations between low role clarity, role conflict and GAD in women. The studies are lacking for all these factors in association with diagnostic interview outcomes, especially GAD.

The associations of job insecurity and changes at work with MDE in our study are consistent with the literature focusing mainly on mental health and depressive symptoms (Fløvik, Knardahl, & Christensen, 2019; Kim & von dem Knesebeck, 2016; Rönnblad et al., 2019; S. Stansfeld & Candy, 2006; Theorell et al., 2015). The studies using diagnostic instruments or on anxiety are missing. Job insecurity was found to be predictive of depression and anxiety in a study among French employees (Isabelle Niedhammer et al., 2015), but no association with anxiety disorders was observed in a study in the Dutch population (Plaisier et al., 2007).

Previous reviews underlined the associations of workplace bullying and violence with mental health problems, more particularly symptomatic outcomes (Theorell et al., 2015; Verkuil et al., 2015). Some rare studies reported associations between bullying/violence and clinical depression (Gullander et al., 2014; Oenning, Ziegelmann, Goulart, & Niedhammer, 2018; Rugulies et al., 2012). Our results provide additional information by showing that internal violence may be more strongly associated with MDE and GAD than external violence.

We found almost no association between working time/hours and MDE and GAD in our study. The lack of association for long working hours in our study is consistent with a systematic review based on depressive disorders clinically diagnosed or assessed by a structured interview (Watanabe et al., 2016). The literature is lacking for anxiety. Inconclusive results were reported by literature reviews regarding the association between shift work and mental health outcomes (Lee et al., 2017; Torquati et al., 2019). Two previous studies using diagnostic interviews (Isabelle Niedhammer et al., 2015; Oenning et al., 2018) also found no significant association of night/shift work with depression and anxiety.

Very few studies are available on the associations between physical working conditions and depression or anxiety related outcomes (Theorell et al., 2015). Our findings are in agreement with the results from a Brazilian population-based study showing associations between intense physical activity, exposure to noise and chemicals and clinical depression among women (Oenning et al., 2018). In contrast, there was no association of biomechanical, physical and chemical exposures with MDE and GAD in a previous French study (Isabelle Niedhammer et al., 2015).

Studies on the combined effects of multiple occupational exposures on mental disorders are lacking. Job strain which combines high psychological demands and low job control and effort-reward imbalance that combines high effort and low reward were found to be

associated with clinical depression (Madsen et al., 2017) and depressive disorders (including symptom scales) (Rugulies et al., 2017). To our knowledge, only one recent study assessed the impact of the psychosocial work environment as a whole (Stauder et al., 2017) and showed an increased prevalence of high stress and burn-out symptoms with multiple exposure to psychosocial work factors. Our study is thus a major contribution to the literature on the topic of multiple occupational exposure in association with depression and anxiety as assessed using diagnostic interview.

4.3 | Strengths and limitations

The study was based on a large nationally representative sample of the French working population. The participation rate to the survey (74%) and the response rate to the self-administered questionnaire (94%) were high. All statistical analyses were performed using weighted data, results could thus be extrapolated to the whole French working population of employees. The analyses were stratified by gender because of differences in the prevalence of MDE/GAD, occupational exposures and covariates, as well as in the exposure-outcome associations between men and women, following the best practices regarding gender-related research (I. Niedhammer, Saurel-Cubizolles, Piciotti, & Bonenfant, 2000). Our study focused on two common mental disorders, MDE and GAD, that were measured by a standardized diagnostic interview and DSM-IV criteria. There was comorbidity between MDE and GAD, as 47.4% of men and 47.0% of women having MDE also had GAD and 42.8% of men and 46.3% of women having GAD also had MDE, which may explain common and specific occupational risk factors for these two disorders. MDE and GAD were studied with comorbid cases in our analyses, as excluding these cases would have led to a reduced statistical power. Additional analyses performed to study MDE and GAD without comorbid

cases confirmed the results, although statistical significance was reduced for some associations with GAD among men. The assessment of occupational exposures included a large number of psychosocial work factors, together with factors related to working time/hours and physical work exposures. A major strength of the study was the assessment of multiple exposures to occupational factors that has been greatly understudied. Furthermore, all our analyses were adjusted for covariates that were important factors in association with MDE/GAD. The results of the unadjusted and adjusted models (slightly lower ORs after adjustment) showed that these covariates had a low confounding effect on the associations between occupational factors and MDE/GAD, and underlined the need and interest to adjust for these covariates. Sensitivity analyses were performed and confirmed the results.

Because of the cross-sectional design of our study, no causal or temporal inference can be made. A healthy worker effect may also be assumed and lead to an underestimation of the associations, as employees with MDE/GAD may have changed job or left the labour market because of their occupational exposures. Our assessment of occupational exposures was not based on validated questionnaires. However, the very detailed data collection allowed us to study a wide range of occupational exposures. However, some rare factors may be missing such as organisational injustice (Nieuwenhuijsen et al., 2010; Theorell et al., 2015). As both occupational factors and outcomes were assessed using self-reported data, a reporting bias may be suspected. Nevertheless, this bias may be small because MDE and GAD were measured by a standardized diagnostic interview.

4.4 | Conclusion

This study showed that a wide variety of occupational exposures were associated with clinical depression and anxiety. It also underlined the increase in risk of depression/anxiety with multiple occupational exposures. More studies are needed to confirm these associations and the cumulative effects of occupational exposures on these outcomes. More attention should be given to multiple exposures at the workplace, in order to improve mental health among working populations.

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TABLE 1 Characteristics of the study sample, 2-week prevalence of major depressive episode (MDE) and 6-month prevalence of generalized anxiety disorder (GAD) according to covariates

	Men					Women				
	Overall (N = 8,579)		Prevalence of MDE (n = 8,574)		Prevalence of GAD (n = 8,557)	Overall (N = 11,851)		Prevalence of MDE (n = 11,827)		Prevalence of GAD (n = 11,810)
	n	%	%	p value	%	p value	n	%	%	p value	%	p value
All			4.3		4.6				8.6		8.7
Age (years)				0.078		0.099				0.220		0.389
< 30	1020	19.0	3.9		2.6		1283	18.1	7.2		7.1
30-39	1864	25.5	2.6		5.0		2473	23.6	7.0		8.0
40-49	2799	28.6	5.4		5.6		3820	28.1	9.7		9.6
≥ 50	2896	26.9	4.9		4.7		4275	30.2	9.6		9.5
Marital status				0.421		0.174				0.012		0.157
Living with a partner	6827	76.2	4.1		4.9		8849	72.6	7.7		8.2
Alone	1752	23.8	4.8		3.7		3001	27.4	11.0		10.1
Social support outside work				<0.001		<0.001				<0.001		<0.001
Yes and don't need more help	6924	81.7	2.8		3.1		8939	78.5	5.0		6.1
No and don't need more help	340	4.2	4.8		6.2		353	2.9	13.1		7.5
Yes but need more help	1006	12.0	12.4		12.3		1952	15.3	21.9		20.9
No and need more help	191	2.0	17.6		18.1		432	3.3	30.0		18.9
Life event(s) during childhood				<0.001		<0.001				<0.001		<0.001
None	4154	48.1	1.5		2.5		4608	38.5	4.6		5.7
1	2462	28.4	4.3		4.1		3556	30.1	7.0		7.7
≥ 2	1926	23.6	9.9		9.7		3644	31.3	15.0		13.6
Life event(s) within the last 3 years				<0.001		<0.001				<0.001		<0.001
None	4675	56.4	2.3		2.3		4854	42.6	3.4		4.4
1	2588	29.4	4.3		4.5		3945	32.1	8.7		9.5
≥ 2	1286	14.2	12.1		14.4		3012	25.3	17.3		15.2
Occupation				0.428		0.372				0.047		0.046
Managers, professionals	2025	22.4	3.3		3.5		1691	14.9	6.2		5.9

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Associate professionals, technicians	2402	25.9	3.9	4.3	3978	27.9	7.3	7.7
Clerks, service workers	1397	14.4	5.1	5.1	5357	**48.3**	9.4	9.7
Blue-collar workers	2681	37.3	4.8	5.4	751	**8.9**	12.2	11.5
			0.371	0.538			0.757	0.918
Economic activity								
Agriculture	116	1.5	2.5	3.4	75	0.6	11.1	12.7
Manufacturing	1776	21.8	4.9	4.2	802	8.2	6.8	9.2
Construction	687	10.6	5.6	6.1	102	1.1	7.7	10.8
Services	5993	66.2	3.9	4.6	10866	90.1	8.7	8.7

All percentages are weighted. Differences in the weighted prevalence of MDE/GAD according to covariates were tested using Rao-Scott Chi-square test.

TABLE 2 Associations of occupational exposures with major depressive episode (MDE), each occupational factor studied separately

	Men (n = 7,773) [†]				Women (n = 10,648) [†]			
	Unadjusted		Adjusted for covariates [‡]		Unadjusted		Adjusted for covariates [‡]	
	OR [95% CI]	p value	OR [95% CI]	p value	OR [95% CI]	p value	OR [95% CI]	p value
Psychosocial work factors [§]								
Demands at work								
High quantitative demands	2.75 [1.79 - 4.23]	***	2.43 [1.58 - 3.74]	***	2.15 [1.61 - 2.88]	***	2.03 [1.43 - 2.88]	***
High cognitive demands	1.82 [1.17 - 2.84]	**	1.66 [0.98 - 2.81]	NS	2.08 [1.53 - 2.83]	***	2.15 [1.57 - 2.96]	***
High emotional demands	1.80 [1.19 - 2.71]	**	1.49 [0.94 - 2.37]	NS	2.00 [1.43 - 2.80]	***	1.82 [1.27 - 2.61]	**
High demands for hiding emotions	6.48 [4.08 - 10.3]	***	4.11 [2.49 - 6.78]	***	4.64 [2.95 - 7.32]	***	3.47 [2.24 - 5.38]	***
Work organization and job content								
Low influence	1.59 [1.05 - 2.40]	*	1.47 [0.94 - 2.30]	NS	1.72 [1.30 - 2.27]	***	1.60 [1.20 - 2.14]	**
Low degree of freedom	1.88 [1.22 - 2.90]	**	1.47 [0.98 - 2.22]	NS	1.59 [1.16 - 2.17]	**	1.34 [0.98 - 1.84]	NS
Low possibilities for development	3.59 [2.32 - 5.56]	***	2.96 [1.78 - 4.93]	***	2.15 [1.60 - 2.87]	***	1.76 [1.30 - 2.37]	***
Low meaning of work	3.15 [1.89 - 5.27]	***	2.62 [1.54 - 4.44]	***	2.48 (1.84 - 3.33]	***	2.14 [1.58 - 2.90]	***
Interpersonal relations and leadership								
Low predictability	0.91 [0.60 - 1.40]	NS	0.83 [0.53 - 1.31]	NS	1.35 [1.02 - 1.79]	*	1.38 [1.02 - 1.86]	*
Low role clarity	2.31 [1.55 - 3.43]	***	1.87 [1.21 - 2.89]	**	2.22 [1.67 - 2.94]	***	1.89 [1.40 - 2.56]	***
High role conflict	3.11 [1.97 - 4.89]	***	2.19 [1.37 - 3.51]	**	3.27 [2.38 - 4.49]	***	2.67 [1.92 - 3.72]	***
Low quality of leadership	3.86 [2.50 - 5.96]	***	2.91 [1.85 - 4.60]	***	2.50 [1.84 - 3.41]	***	2.00 [1.47 - 2.74]	***
Low social support	3.90 [2.40 - 6.34]	***	3.00 [1.81 - 4.99]	***	2.61 [1.87 - 3.62]	***	1.94 [1.39 - 2.71]	***
Low sense of community	4.41 [2.82 - 6.88]	***	3.41 [2.14 - 5.43]	***	3.34 [2.46 - 4.53]	***	2.63 [1.92 - 3.61]	***

Work-individual interface							
Low job satisfaction	4.69 [2.99 - 7.36]	***	3.43 [2.14 - 5.50]	***	2.49 [1.81 - 3.41]	***	1.92 [1.37 - 2.68] ***
Work-family conflict	2.43 [1.61 - 3.67]	***	2.16 [1.40 - 3.35]	**	1.55 [1.17 - 2.06]	**	1.38 [1.02 - 1.86] *
High job insecurity	2.96 [1.99 - 4.39]	***	2.20 [1.41 - 3.43]	***	2.72 [2.05 - 3.60]	***	2.22 [1.67 - 2.94] ***
High changes at work	3.67 [2.27 - 5.91]	***	2.44 [1.47 - 4.05]	**	3.53 [2.55 - 4.88]	***	2.72 [1.90 - 3.90] ***
Temporary employment	1.03 [0.45 - 2.34]	NS	1.23 [0.51 - 2.98]	NS	0.81 [0.48 - 1.35]	NS	0.66 [0.42 - 1.04] NS
Workplace violence							
High internal violence	6.35 [3.85 - 10.5]	***	4.22 [2.52 - 7.07]	***	2.83 [2.03 - 3.95]	***	2.28 [1.63 - 3.19] ***
High external violence	1.41 [0.95 - 2.10]	NS	1.06 [0.68 - 1.65]	NS	1.33 [1.01 - 1.77]	*	1.15 [0.85 - 1.56] NS
Working time/hours factors							
Long working hours (> 48h/week)	0.59 [0.35 - 0.99]	*	0.68 [0.37 - 1.23]	NS	0.89 [0.50 - 1.60]	NS	0.90 [0.44 - 1.84] NS
Night work (> 50/year)	1.02 [0.49 - 2.12]	NS	0.80 [0.39 - 1.64]	NS	0.86 [0.45 - 1.65]	NS	0.87 [0.45 - 1.70] NS
Unsocial work days (> 40/year)	1.34 [0.82 - 2.19]	NS	0.97 [0.55 - 1.71]	NS	1.50 [1.07 - 2.10]	*	1.52 [1.03 - 2.25] *
Shift work	1.13 [0.64 - 1.99]	NS	1.07 [0.61 - 1.90]	NS	0.50 [0.28 - 0.89]	*	0.41 [0.22 - 0.78] **
Physical work exposures							
High biomechanical exposure §	2.11 [1.35 - 3.31]	**	1.64 [1.06 - 2.53]	*	2.23 [1.67 - 2.97]	***	1.89 [1.36 - 2.63] ***
Fumes and dust exposure	1.95 [1.29 - 2.94]	**	1.81 [1.18 - 2.77]	**	2.18 [1.59 - 2.99]	***	1.84 [1.28 - 2.65] **
Toxic and dangerous products exposure	1.49 [1.00 - 2.23]	NS	1.26 [0.84 - 1.89]	NS	2.10 [1.55 - 2.87]	***	1.87 [1.33 - 2.62] ***
Noise exposure	2.80 [1.86 - 4.23]	***	2.67 [1.78 - 4.01]	***	1.78 [1.29 - 2.46]	***	1.57 [1.11 - 2.22] *

Results from weighted logistic regression analyses stratified by gender.

Odds-ratio with $p < 0.05$ highlighted in bold, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Abbreviations: NS, not significant; OR, odds-ratio; 95% CI, 95% confidence interval

† Reported results are those from complete case analyses that included only employees with no missing data for the variables of interest (outcomes, all occupational

exposures, covariates). The findings were similar using all available data

‡ Adjusted for age, marital status, social support outside work, life events before the age of 18, life events within the last 3 years, occupation, and economic activity of the company

§ Median cut-off of the total sample was used to classify workers in low or high exposure groups

TABLE 3 Associations of occupational exposures with generalized anxiety disorder (GAD), each occupational factor studied separately

| | Men (n = 7,773) [†] | | | | | | Women (n = 10,648) [†] | | | | | |
| | Unadjusted | | | Adjusted for covariates [‡] | | | Unadjusted | | | Adjusted for covariates [‡] | | |
	OR	[95% CI]	p value	OR	[95% CI]	p value	OR	[95% CI]	p value	OR	[95% CI]	p value
Psychosocial work factors [§]												
Demands at work												
High quantitative demands	2.19	[1.43 - 3.34]	***	1.85	[1.22 - 2.81]	**	2.37	[1.76 - 3.20]	***	2.37	[1.69 - 3.32]	***
High cognitive demands	2.26	[1.49 - 3.44]	***	2.21	[1.41 - 3.47]	**	1.89	[1.37 - 2.60]	***	1.96	[1.41 - 2.71]	***
High emotional demands	1.64	[1.12 - 2.39]	*	1.41	[0.95 - 2.10]	NS	1.45	[1.03 - 2.05]	*	1.32	[0.92 - 1.88]	NS
High demands for hiding emotions	4.13	[2.65 - 6.44]	***	2.74	[1.72 - 4.37]	***	3.53	[2.38 - 5.24]	***	2.84	[1.87 - 4.30]	***
Work organization and job content												
Low influence	1.90	[1.30 - 2.78]	**	1.91	[1.23 - 2.95]	**	1.64	[1.23 - 2.19]	**	1.49	[1.11 - 2.01]	**
Low degree of freedom	2.24	[1.52 - 3.30]	***	1.86	[1.23 - 2.83]	**	1.36	[1.00 - 1.86]	NS	1.18	[0.87 - 1.61]	NS
Low possibilities for development	2.19	[1.44 - 3.33]	***	1.75	[1.08 - 2.85]	*	2.21	[1.65 - 2.95]	***	1.87	[1.38 - 2.53]	***
Low meaning of work	2.48	[1.62 - 3.79]	***	2.08	[1.31 - 3.31]	**	2.69	[1.99 - 3.63]	***	2.41	[1.78 - 3.25]	***
Interpersonal relations and leadership												
Low predictability	0.87	[0.59 - 1.28]	NS	0.80	[0.51 - 1.24]	NS	0.95	[0.71 - 1.28]	NS	0.93	[0.69 - 1.26]	NS
Low role clarity	1.82	[1.24 - 2.66]	**	1.41	[0.96 - 2.08]	NS	2.26	[1.67 - 3.05]	***	2.05	[1.51 - 2.77]	***
High role conflict	1.85	[1.20 - 2.87]	**	1.32	[0.86 - 2.02]	NS	3.12	[2.28 - 4.28]	***	2.65	[1.93 - 3.63]	***
Low quality of leadership	2.08	[1.38 - 3.12]	***	1.54	[1.01 - 2.35]	*	2.99	[2.18 - 4.10]	***	2.55	[1.86 - 3.49]	***
Low social support	2.24	[1.43 - 3.53]	***	1.64	[1.02 - 2.64]	*	1.94	[1.43 - 2.65]	***	1.55	[1.14 - 2.11]	**
Low sense of community	2.08	[1.39 - 3.13]	***	1.58	[1.04 - 2.41]	*	3.23	[2.29 - 4.57]	***	2.78	[1.98 - 3.90]	***

Work-individual interface

	OR [95% CI]	Sig.	OR [95% CI]	Sig.	OR [95% CI]	Sig.	OR [95% CI]	Sig.
Low job satisfaction	3.04 [1.96 - 4.71]	***	2.29 [1.46 - 3.59]	***	2.56 [1.83 - 3.58]	***	2.11 [1.51 - 2.95]	***
Work-family conflict	2.16 [1.48 - 3.17]	***	1.82 [1.22 - 2.71]	**	1.76 [1.31 - 2.37]	***	1.59 [1.17 - 2.16]	**
High job insecurity	1.98 [1.35 - 2.90]	***	1.49 [0.98 - 2.26]	NS	2.48 [1.84 - 3.35]	***	2.09 [1.55 - 2.82]	***
High changes at work	2.14 [1.38 - 3.33]	**	1.42 [0.91 - 2.22]	NS	3.75 [2.70 - 5.21]	***	3.11 [2.22 - 4.37]	***
Temporary employment	0.77 [0.39 - 1.51]	NS	1.09 [0.50 - 2.37]	NS	1.15 [0.67 - 1.96]	NS	1.03 [0.63 - 1.69]	NS

Workplace violence

High internal violence	4.41 [2.78 - 7.01]	***	3.08 [1.87 - 5.07]	***	3.53 [2.41 - 5.17]	***	3.07 [2.09 - 4.50]	***
High external violence	1.51 [1.03 - 2.20]	*	1.20 [0.78 - 1.84]	NS	1.53 [1.14 - 2.07]	**	1.44 [1.06 - 1.96]	*

Working time/hours factors

Long working hours (> 48h/week)	0.89 [0.50 - 1.57]	NS	1.07 [0.61 - 1.86]	NS	0.68 [0.41 - 1.15]	NS	0.76 [0.45 - 1.30]	NS
Night work (> 50/year)	0.88 [0.47 - 1.65]	NS	0.75 [0.40 - 1.41]	NS	0.91 [0.45 - 1.85]	NS	0.85 [0.40 - 1.83]	NS
Unsocial work days (> 40/year)	0.94 [0.59 - 1.51]	NS	0.66 [0.38 - 1.12]	NS	1.31 [0.93 - 1.84]	NS	1.29 [0.89 - 1.87]	NS
Shift work	1.39 [0.74 - 2.59]	NS	1.60 [0.79 - 3.27]	NS	1.07 [0.45 - 2.52]	NS	0.90 [0.47 - 1.72]	NS

Physical work exposures

High biomechanical exposure §	1.72 [1.16 - 2.54]	**	1.21 [0.76 - 1.92]	NS	1.73 [1.29 - 2.32]	***	1.45 [1.05 - 2.00]	*
Fumes and dust exposure	1.51 [1.03 - 2.20]	*	1.16 [0.73 - 1.83]	NS	1.65 [1.17 - 2.33]	**	1.30 [0.86 - 1.97]	NS
Toxic and dangerous products exposure	1.26 [0.86 - 1.84]	NS	0.97 [0.64 - 1.47]	NS	1.70 [1.22 - 2.36]	**	1.44 [1.01 - 2.05]	*
Noise exposure	2.44 [1.64 - 3.63]	***	2.17 [1.43 - 3.31]	***	1.49 [0.99 - 2.24]	NS	1.18 [0.79 - 1.74]	NS

Results from weighted logistic regression analyses stratified by gender.

Odds-ratio with $p < 0.05$ highlighted in bold, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Abbreviations: NS, not significant; OR, odds-ratio; 95% CI, 95% confidence interval

† Reported results are those from complete case analyses that included only employees with no missing data for the variables of interest (outcomes, all occupational

exposures, covariates). The findings were similar using all available data

‡ Adjusted for age, marital status, social support outside work, life events before the age of 18, life events within the last 3 years, occupation, and economic activity of the company
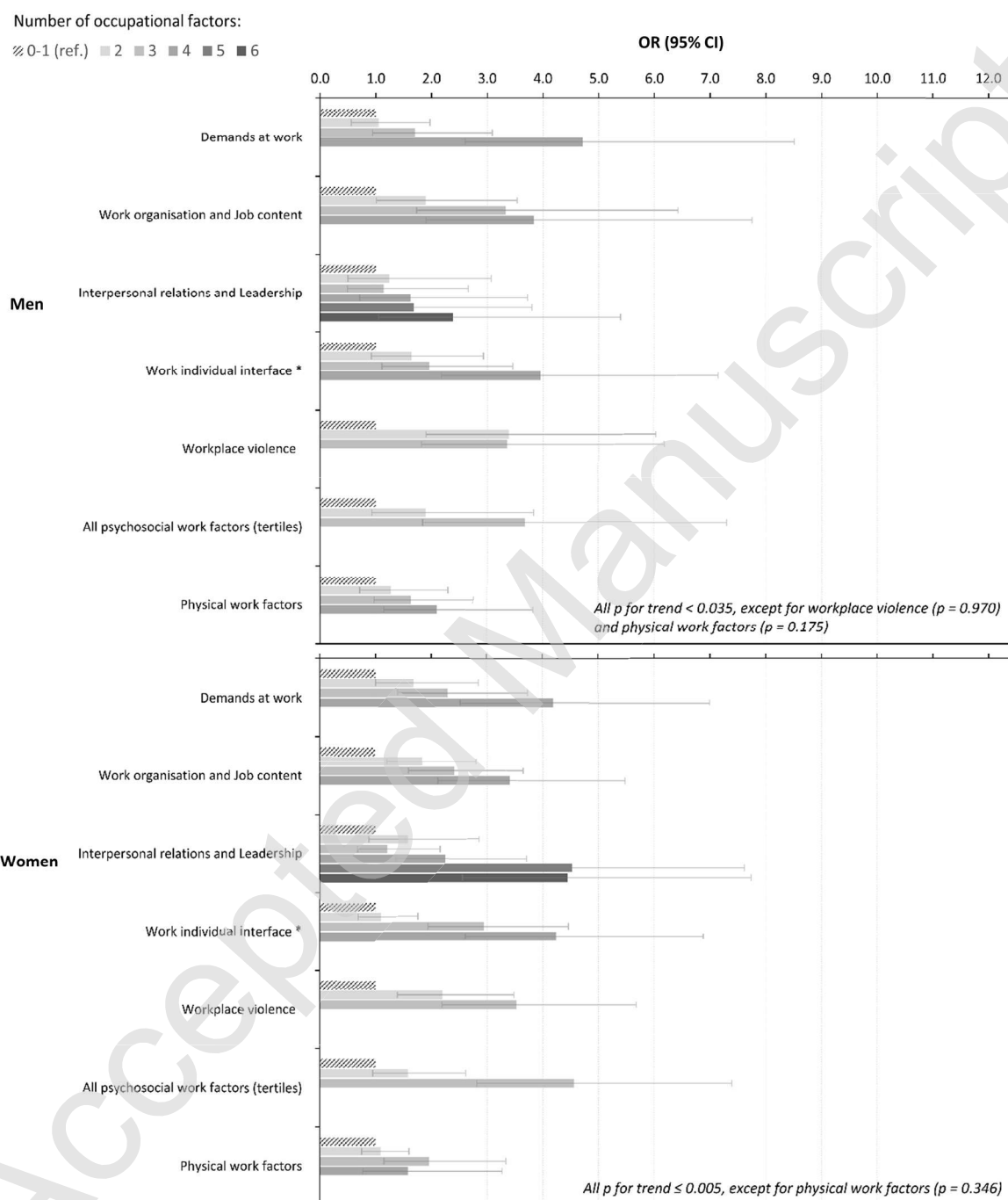
§ Median cut-off of the total sample was used to classify workers in low or high exposure groups

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FIGURE 1 Odds-ratio (OR) and 95% confidence interval (CI) for major depressive episode (MDE) according to the number of occupational factors, after adjustment for covariates
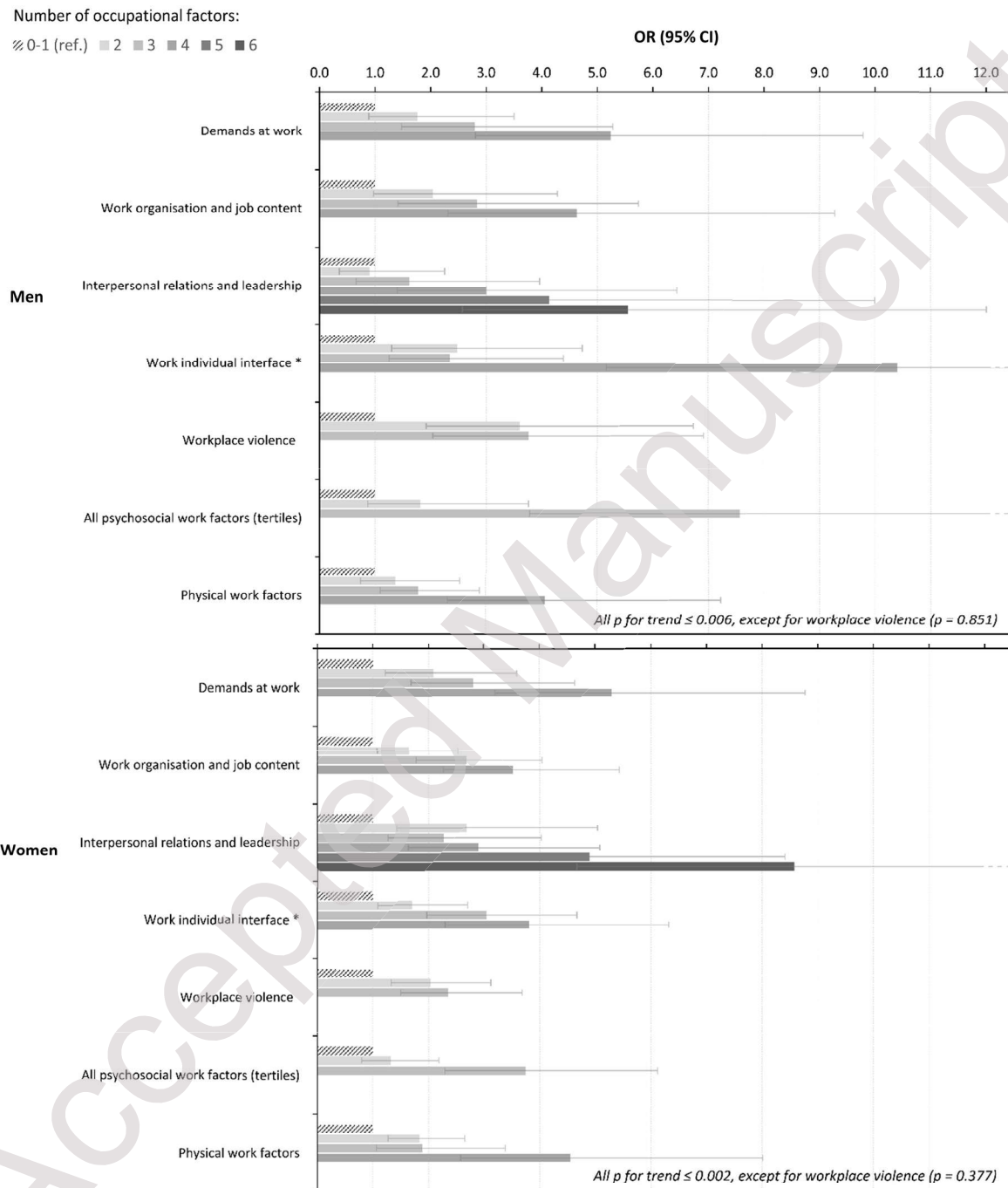
* Employees with 4 and 5 occupational factors were grouped, because of the low number of participants with 5 factors

FIGURE 2 Odds-ratio (OR) and 95% confidence interval (CI) for generalized anxiety disorder (GAD) according to the number of occupational factors, after adjustment for covariates

* Employees with 4 and 5 occupational factors were grouped, because of the low number of participants with 5 factors