Psychosocial work factors and long sickness absence in Europe

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Background: Studies exploring a wide range of psychosocial work factors separately and together in association with long sickness absence are still lacking.

Objectives: The objective of this study was to explore the associations between psychosocial work factors measured following a comprehensive instrument (Copenhagen psychosocial questionnaire, COPSOQ) and long sickness absence (>7 days/year) in European employees of 34 countries. An additional objective was to study the differences in these associations according to gender and countries.

Methods: The study population consisted of 16 120 male and 16 588 female employees from the 2010 European working conditions survey. Twenty-five psychosocial work factors were explored. Statistical analysis was performed using multilevel logistic regression models and interaction testing.

Results: When studied together in the same model, factors related to job demands (quantitative demands and demands for hiding emotions), possibilities for development, social relationships (role conflicts, quality of leadership, social support, and sense of community), workplace violence (physical violence, bullying, and discrimination), shift work, and job promotion were associated with long sickness absence. Almost no difference was observed according to gender and country.

Conclusions: Comprehensive prevention policies oriented to psychosocial work factors may be useful to prevent long sickness absence at European level.

Keywords: Sickness absence, Psychosocial work factors, Job stress, Workplace violence, Europe

Introduction

Sickness absence is considered as a global measure of health status, and as a marker of social, psychological, and physical functioning for working populations.¹ It has been shown that the longer the absence, the poorer the health status and some studies underlined the interest to examine sickness absence of more than 7 days as a marker of the severity of illness.¹ Furthermore, sickness absence was found to be a good predictor of subsequent morbidity and mortality.² The causes of sickness absence are multifactorial, and work-related factors may play an important role in the occurrence of sickness absence. Sickness absence leads to substantial human, social, and economic costs, and consequently may be seen as a crucial indicator in occupational health studies. Understanding the role of work-related factors, and especially psychosocial

work factors, in sickness absence may be very useful to better prevent this outcome.

Psychosocial work factors have been evaluated using various theoretical models that appeared in the literature within the last two or three decades. The job strain model developed by Karasek is composed of three main dimensions, psychological demands, decision latitude comprising two sub-dimensions, skill discretion and decision authority, and social support at work, and may be considered as one of the best known models for exploring psychosocial work factors.³ More recently, a new instrument for the measurement of psychosocial work factors has been developed: the Copenhagen psychosocial questionnaire (COPSOQ).⁴ According to Kristensen *et al.*,⁴ this instrument is comprehensive and “theory-based, but not attached to one specific theory” (such as the job content questionnaire, based on the job strain model). Consequently, the COPSOQ aims at covering all relevant factors of the psychosocial work environment, and may include factors that are not so

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far recognized as risk factors. Other concepts that are not included in the COPSOQ have also emerged related to workplace violence such as physical violence,⁵ sexual harassment,⁶ discrimination,⁷ and bullying,⁸ and related to working hours such as long working hours.⁹ Some of these factors, especially those from the job strain model, have been found to be associated with health outcomes, but for the most recent concepts, the literature remains sparse. Furthermore, previous studies explored some of these psychosocial work factors, but not all these factors together, making their respective effects on health outcomes difficult to disentangle. Some studies reported significant effects of psychological demands, decision latitude, its two sub-dimensions, and/or social support on sickness absence.^{10,11} However, emergent factors have been still understudied in association with sickness absence. Some of them have been found to be associated with sickness absence, such as workplace violence, bullying, job insecurity, or work–family imbalance, but these factors have rarely been studied altogether.^{12–15} There were some rare studies covering a wide set of factors simultaneously but most of them focused on specific occupational groups,^{14,16} making generalizations of the results difficult, except two studies based on the Danish working population.^{17,18} Furthermore, these studies did not always take important confounders into account especially those related to the physical working environment. The studies examined working populations from specific or national settings, but never considered European samples, except one that focused on Karasek's factors only.¹⁰ As underlined by Lund *et al.*,¹⁹ international comparisons of sickness absence and its underlying causes are urgently needed to increase the scientific knowledge in this research area.

The present study was consequently an attempt to consider a wide range of psychosocial work factors in association with long sickness absence in a large European sample. The objectives were to explore the associations between psychosocial work factors defined using the COPSOQ as baseline as well as other factors and long sickness absence (>7 days of absence within the last 12 months). An additional objective was to study the differences in these associations according to gender and country. This study had the originality to be based on a large harmonized European database covering 34 countries, and to provide information about psychosocial work factors that have rarely been examined before.

Methods

The study was based on the data of the 5th European working conditions survey (EWCS 2010) carried out by Eurofound in 2010 among 34 countries – EU27,

Norway, Croatia, the Former Yugoslav Republic of Macedonia, Turkey, Albania, Montenegro, and Kosovo. This periodical survey aims at providing information on working conditions in European countries and may be considered as a major source of harmonized and comparable data. In each country, the EWCS sample followed a multi-stage, stratified, and clustered design with a “random walk” procedure for selection of respondents. All interviews were conducted face-to-face in the respondent's own household. The same protocol and questionnaire were used in all countries. Details on sampling design may be found elsewhere.²⁰ The sample included 43 816 workers, with a response rate of 60%. For this study, the sample was restricted to people who worked as employees, i.e. 32 708 employees, 16 120 men and 16 588 women. A previous study by our team has already been published on the associations between psychosocial work factors and sickness absence, but it examined the data from EWCS 2005 and not EWCS 2010, a limited number of psychosocial work factors, and did not explore long sickness absence.²¹

The outcome was the presence of a total duration of sickness absence >7 days within the last 12 months. Sickness absence concerned absences from work for reasons of health problems only.

Twenty-five psychosocial work factors were measured following well-known and emergent concepts, of which 16 were constructed according to the second edition of the COPSOQ.²² The scores were dichotomized if they were not already binary variables according to the median of the whole sample, to distinguish between high and low exposure. The 25 psychosocial work factors were the following (see Appendix):

1. Job demands: quantitative demands, emotional demands, demands for hiding emotions, and demands for responsibility at work
2. Influence and development: degree of freedom, influence at work, predictability, possibilities for development, and meaning of work
3. Social relationships and leadership: role clarity, role conflicts, quality of leadership, social support, and sense of community
4. Workplace violence: physical violence, sexual harassment, bullying (that may be called psychological harassment in some countries),²³ and discrimination
5. Working hours: long working hours (≥ 48 hours per week according to the European working time directive), night work, shift work (working in fixed or alternating shifts), and asocial working hours (working on Saturdays, Sundays, or evenings)
6. Others: job promotion, insecurity at work, and work–life imbalance.

The covariates used for adjustment were age, number of workers in household, occupation according to International Standard Classification for Occupation (ISCO), economic activity of the company according

to Statistical Classification of Economic Activities in the European Community (NACE) as well as physical, chemical, biological, and biomechanical exposure (see Appendix for these variables, dichotomized at the median of the total sample).

A description of the study sample according to gender was given for all studied variables and the differences between genders were tested using chi-square test. The association between psychosocial work factors and long sickness absence was studied using multilevel logistic regression analysis. As the data included three hierarchical levels, the 32 708 employees being nested within 399 regions, themselves nested within 34 countries, all analyses were done using multilevel modeling. Indeed, multilevel models are particularly appropriate to study data organized at more than one level (nested data) and to take the within- and between-variability induced by the hierarchical structure in the data into account. Two multilevel logistic regression models were performed. Models I: Each psychosocial work factor was studied in separate models with adjustment for covariates. Model II: All psychosocial work factors, that were significant for at least one gender in models I, were studied simultaneously with adjustment for covariates. Interaction terms were tested between gender and each psychosocial work factor (among the whole sample) and between the country level variable and each factor (for each gender separately) to examine the differences in the associations between each factor and sickness absence according to gender and countries. All these interactions were tested using Model II. All analyses were performed for men and women separately using SAS 9.3. Gender was the terminology preferred over sex; indeed sex refers mainly to biological and genetic differences between men and women whereas gender includes social differences between them and may be more appropriate in the area of psychosocial work factors.²⁴

Results

Tables 1 and 2 present description of the sample studied. The prevalence of long sickness absence was higher for women than for men. Women were more likely to live with another worker. Women were more likely to work as professionals, clerks, and service workers, whereas men were more likely to work as managers and blue collar workers. Women were more likely to work in the service sector than men. The prevalence of exposure to chemical, physical, and biomechanical exposure was higher for men than for women. Regarding psychosocial work factors (Table 2), women were more likely to be exposed to emotional demands, demands for hiding emotions, low degree of freedom, low quality

of leadership, workplace violence (sexual harassment, bullying, and discrimination), and low job promotion and men to quantitative demands, demands for responsibility, low predictability, low meaning of work, low role clarity, low social support, long and asocial hours, night work, and work-life imbalance.

The associations between each psychosocial work factor separately and long sickness absence are presented in Table 3 (Models I, with adjustment for covariates). For both genders, quantitative demands, demands for hiding emotions, role conflicts, quality of leadership, social support, sense of community, physical violence, bullying, discrimination, shift work, job promotion, and work-life imbalance were associated with sickness absence, as well as possibilities for development for men only, and demands for responsibility, degree of freedom, influence at work, predictability, meaning of work, and sexual harassment for women only. As emotional demands, role clarity, night work, asocial hours, and insecurity at work were not significantly associated with sickness absence for both genders in Models I, they were removed from the final model (Model II).

When all psychosocial work factors were studied simultaneously with adjustment for covariates (Model II, Table 4), sense of community, bullying, shift work for both genders, possibilities for development, quality of leadership, discrimination for men, quantitative demands, demands for hiding emotions, role conflicts, social support, physical violence, and job promotion for women were associated with long sickness absence. The strongest associations were observed for workplace violence variables.

Table 4 also presents the associations between covariates and sickness absence. Older age was a strong risk factor, and lower skilled occupations were more likely to have long sickness absence. Physical, chemical, and biomechanical exposures were also risk factors of long sickness absence.

Three significant interactions between psychosocial work factors and gender were found, suggesting that the associations of possibilities for development and discrimination with long sickness absence were stronger among men than among women whereas it was the reverse for the association between bullying and sickness absence. Significant interactions were observed between psychosocial work factors and country, but the number of these interactions was low: two for men and five for women. Furthermore, differences in the odds ratios between each country and whole of Europe were non-significant suggesting that the differences in the associations between psychosocial work factors and long sickness absence may be similar between countries.

Discussion

Among the 25 psychosocial work factors studied simultaneously in multivariate models, 12 were associated with long sickness absence for at least one gender in the 2010 EWCS European sample of employees from 34 countries. These factors were: quantitative demands, demands for hiding emotions, possibilities for development, role conflicts, quality of leadership, social support, sense of community, physical violence, bullying, discrimination, shift work, and job promotion. A less conservative approach including each factor separately, led to a still higher number of factors (19 factors) associated with long sickness absence for at least one gender. The

additional factors were: demands for responsibility, degree of freedom, influence at work, predictability, meaning of work, sexual harassment, and work–life imbalance. In all analyses, the strongest associations were observed for the factors related to workplace violence. These associations between psychosocial work factors and long sickness absence were found to be similar across countries. Three associations only displayed significant differences between genders.

This study has several strengths. It was based on a large sample of European employees, covering 34 countries and making comparisons between genders and countries possible. The response rate was satisfactory and the survey was based on a face-to-face

Table 1 Characteristics of the study population

		Men (n=16 120)		Women (n=16 588)		P-value
		n	%	n	%	
<i>Sickness absence</i>	≤7 days	13 185	81.79	13 049	78.67	***
	>7 days	2935	18.21	3539	21.33	
<i>Age (years)</i>						***
18–29		3261	20.37	2998	18.17	
30–39		4167	26.02	4149	25.14	
40–49		4209	26.29	4767	28.89	
≥50		4375	27.32	4587	27.80	
<i>Number of workers in household</i>						***
1		8013	49.71	6776	40.85	
2		6769	41.99	8337	50.26	
≥3		1338	8.30	1475	8.89	
<i>Occupation</i>						***
Managers		1047	6.53	638	3.85	
Professionals		2172	13.54	3500	21.14	
Technicians/associate professionals		2252	14.04	2789	16.85	
Clerical support workers		1134	7.07	2213	13.37	
Service and sales workers		2216	13.81	4293	25.93	
Skilled agricultural, forestry, and fishery workers; craft and related trades workers		3452	21.52	627	3.79	
Plant and machine operators and assemblers		2124	13.24	606	3.66	
Elementary and armed forces occupations		1645	10.25	1888	11.41	
<i>Activity of company</i>						***
Agriculture, hunting, forestry, and fishing		460	2.89	200	1.22	
Mining, quarrying, manufacturing, electricity, gas, and water supply		3700	23.22	2118	12.88	
Construction		1820	11.42	217	1.32	
Services		9957	62.48	13 907	84.58	
<i>Physical exposure</i>						***
Low		7171	44.64	11 070	66.87	
High		8893	55.36	5484	33.13	
<i>Chemical exposure</i>						***
Low		6783	42.25	10 408	62.91	
High		9271	57.75	6137	37.09	
<i>Biological exposure</i>						ns
Low		12 501	78.05	12 912	78.14	
High		3515	21.95	3613	21.86	
<i>Biomechanical exposure</i>						***
Low		7440	46.30	9031	54.57	
High		8630	53.70	7518	45.43	

Chi-square test for comparison between men and women.

***: $P < 0.001$; **: $P < 0.01$; *: $P < 0.05$; ns: non-significant.

interview at home. The study included a wide range of psychosocial work factors, including a number of factors that have seldom been studied before and measured following a theory-based and comprehensive instrument (COPSOQ). We used multilevel modeling, that allowed to take into account the hierarchical nature of the data. We not only took important covariates into account, those related to other occupational exposures, but also calibration variables that were used to make the study representative of the European working population at national level. Thus, the results may be generalized to the whole European working population. Expected findings were observed for these covariates confirming the results from the literature and the validity of our results. Indeed, older age, lower occupational groups, and exposures of a physical-chemical-biomechanical nature increased the risk of long sickness absence, confirming previous results.^{1,18,19,25}

However, some limitations of the present study must be considered. The study design was cross-sectional, thus no causal conclusion could be drawn from the study. Furthermore, a reverse causation may not be excluded as long sickness absence may

also have an impact on psychosocial work environment. The outcome of sickness absence was based on self-reports, however studies reported a high agreement between self-reported sickness absence and information from official registers.²⁶ Furthermore, self-reported sickness absence may be useful in such a large European sample because it may be less dependent on practices and regulations in each country. However, the number of spells of absence within the last 12 months was not available. Psychosocial work factors were not based on validated questionnaires, but other studies underlined the validity and interest of constructing proxies.²⁷ Some psychosocial work factors may have been neglected such as cognitive demands.¹⁸ A reporting bias might be suspected related to common method variance, as both exposures and outcome were self-reported, and might have led to an overestimation of the associations observed. Our study did not take previous illness into account, and consequently was unable to test its potential impact on the association between psychosocial work factors and long sickness absence. Finally, healthy worker effect may be suspected (unhealthy workers may have changed to

Table 2 Prevalence of psychosocial work exposures for men and women

	Men (n=16 120)		Women (n=16 588)		P-value
	n	%	n	%	
High quantitative demands	7896	49.25	7274	43.99	***
High emotional demands	5252	33.05	6770	41.27	***
High demands for hiding emotions	4042	25.75	5286	32.41	***
High demands for responsibility	9048	57.45	6038	37.53	***
Low degree of freedom	6883	42.73	7825	47.22	***
Low influence at work	7451	46.97	7431	45.94	ns
Low predictability	4048	25.65	3841	23.61	***
Low possibilities for development	7862	49.06	8025	48.56	ns
Low meaning of work	8052	50.36	7593	46.10	***
Low role clarity	5125	31.96	4891	29.61	***
High role conflict	6652	42.22	6762	41.72	ns
Low quality of leadership	7429	46.51	8025	48.73	***
Low social support	4030	25.00	3986	24.03	*
Low sense of community	6078	38.48	6093	37.93	ns
Physical violence	292	1.81	312	1.88	ns
Sexual harassment	65	0.40	199	1.20	***
Bullying	663	4.12	844	5.10	***
Discrimination	992	6.16	1155	6.97	**
Long working hours	3179	20.09	1620	9.87	***
Night work	2314	14.58	1168	7.08	***
No shift work	12 671	79.23	13 111	79.51	
Fixed	1608	10.06	1616	9.80	ns
Alternating	1713	10.71	1762	10.69	
Asocial working hours	5943	37.08	5129	30.98	***
Low job promotion	6190	38.54	6892	41.72	***
High insecurity at work	4402	30.20	4427	29.73	ns
High work-life imbalance	3243	20.24	2743	16.61	***

Chi-square test for comparison between men and women.

***: $P < 0.001$; **: $P < 0.01$; *: $P < 0.05$; ns: non-significant.

less exposed jobs or left the labor market) leading to an underestimation of the associations between exposures and sickness absence.

Long working hours were a protective factor for long sickness absence among men. Such a protective effect was also reported in the literature,²⁸ and might be explained by a healthy worker effect; only very healthy workers may be able to do long working hours, something that is not incompatible with harmful long-term effects on health.⁹ Another explanation may be that long working hours may be associated with a higher pressure at work and difficulty for workers to take sickness absence. As shown previously,²⁹ working over 48 hours per week decreased sickness absenteeism but increased sickness presenteeism. High psychological demands have already been observed as a risk factor for sickness absence by others^{10,19} including sickness absence of more than 7 days,¹⁹ in line with our results regarding quantitative demands. Some studies also reported an association between demands for hiding emotions and sickness absence, in agreement with our findings.¹⁷ To our knowledge, no study has showed

an association between demands for responsibility and sickness absence before. Our results are also consistent with other studies for influence at work,¹⁰ predictability, and meaning of work.³⁰ Regarding social relationships at work, our results are in line with rare previous findings for role conflicts,^{17,18} quality of leadership,^{31,32} and social support,¹¹ but we found no previous study confirming our results for sense of community. Bullying was observed as a risk factor of sickness absence in our study, confirming the findings from two previous studies among Finnish female hospital employees,¹³ and among Swedish female public sector workers for very long absence (more than 28 days).¹⁵ To our knowledge, no previous study found an association between discrimination and sickness absence, except our own results on the 2005 EWCS data.²¹ This is in line with other studies reporting the impact of discrimination on other health outcomes and of physical violence on sickness absence.⁷ Shift work was a risk factor for sickness absence, although the rare previous studies provided inconclusive results.³³ Low job promotion increased the risk of sickness

Table 3 Psychosocial work factors and long sickness absence: results from multilevel logistic regression analysis, each factor studied separately with adjustment for covariates (Models I)

	Men			Women		
	OR	95% CI	P-value	OR	95% CI	P-value
High quantitative demands	1.15	[1.05–1.25]	**	1.29	[1.19–1.40]	***
High emotional demands	1.05	[0.95–1.15]	ns	1.01	[0.93–1.10]	ns
High demands for hiding emotions	1.16	[1.05–1.29]	**	1.24	[1.14–1.35]	***
High demands for responsibility	1.05	[0.95–1.15]	ns	1.14	[1.04–1.24]	**
Low degree of freedom	1.04	[0.95–1.14]	ns	1.08	[1.00–1.17]	ns
Low influence at work	1.04	[0.95–1.14]	ns	1.11	[1.02–1.21]	*
Low predictability	1.05	[0.95–1.16]	ns	1.16	[1.05–1.27]	**
Low possibilities for development	1.16	[1.06–1.27]	**	1.00	[0.92–1.09]	ns
Low meaning of work	1.04	[0.95–1.14]	ns	1.08	[1.00–1.17]	*
Low role clarity	1.01	[0.92–1.11]	ns	1.06	[0.97–1.15]	ns
High role conflict	1.18	[1.08–1.29]	***	1.29	[1.19–1.39]	***
Low quality of leadership	1.20	[1.10–1.31]	***	1.16	[1.07–1.26]	***
Low social support	1.16	[1.06–1.28]	**	1.27	[1.16–1.39]	***
Low sense of community	1.24	[1.13–1.36]	***	1.31	[1.20–1.42]	***
Physical violence	1.55	[1.17–2.06]	**	1.62	[1.25–2.08]	***
Sexual harassment	1.03	[0.51–2.07]	ns	1.40	[1.01–1.93]	*
Bullying	1.73	[1.44–2.08]	***	2.23	[1.91–2.59]	***
Discrimination	1.82	[1.56–2.12]	***	1.46	[1.27–1.68]	***
Long working hours	0.81	[0.71–0.92]	***	0.95	[0.82–1.10]	ns
Night work	1.10	[0.98–1.25]	ns	1.06	[0.91–1.23]	ns
Shift work none	1		***	1		***
Fixed	1.18	[1.02–1.36]		1.25	[1.09–1.42]	
Alternating	1.27	[1.11–1.46]		1.38	[1.21–1.56]	
Asocial working hours	0.94	[0.85–1.03]	ns	1.07	[0.98–1.17]	ns
Low job promotion	1.16	[1.06–1.27]	***	1.20	[1.11–1.30]	***
High insecurity at work	1.05	[0.95–1.16]	ns	1.06	[0.97–1.17]	ns
High work–life imbalance	1.15	[1.03–1.28]	**	1.26	[1.13–1.39]	***

Bold: significant at 5%.

***: $P < 0.001$; **: $P < 0.01$; *: $P < 0.05$; ns: non-significant.

Covariates: age; number of workers in household; occupation; economic activity of the company; physical, chemical, biological, and biomechanical exposure.

absence in our study, in agreement with one previous study among male employees of three companies in a Dutch province.³⁴ Work-life imbalance was found as a risk factor of sickness absence, in agreement with

some rare studies that underlined its role among female Dutch workers.¹²

In our model with all psychosocial work factors studied simultaneously (Model II), the significant

Table 4 Psychosocial work factors and long sickness absence: results from multilevel logistic regression analysis, all factors studied simultaneously with adjustment for covariates (Model II)

	Men (N=13 550)			Women (N=13 927)		
	OR	95% CI	P-value	OR	95% CI	P-value
High quantitative demands	1.07	[0.97–1.18]	ns	1.16	[1.06–1.27]	**
High demands for hiding emotions	1.08	[0.97–1.21]	ns	1.10	[1.00–1.21]	*
High demands for responsibility	1.01	[0.91–1.12]	ns	1.05	[0.96–1.15]	ns
Low degree of freedom	0.91	[0.82–1.01]	ns	0.95	[0.87–1.05]	ns
Low influence at work	0.95	[0.85–1.06]	ns	0.99	[0.90–1.09]	ns
Low predictability	1.00	[0.89–1.12]	ns	1.03	[0.93–1.15]	ns
Low possibilities for development	1.12	[1.01–1.25]	*	0.93	[0.84–1.02]	ns
Low meaning of work	0.96	[0.86–1.06]	ns	1.01	[0.92–1.11]	ns
High role conflicts	1.08	[0.97–1.19]	ns	1.11	[1.01–1.22]	*
Low quality of leadership	1.13	[1.02–1.24]	*	1.05	[0.96–1.15]	*
Low social support	1.04	[0.93–1.16]	ns	1.16	[1.05–1.28]	**
Low sense of community	1.18	[1.06–1.30]	**	1.17	[1.07–1.29]	**
Physical violence	1.11	[0.80–1.55]	ns	1.40	[1.06–1.85]	*
Sexual harassment	0.64	[0.29–1.43]	ns	0.85	[0.59–1.22]	ns
Bullying	1.40	[1.13–1.73]	**	1.89	[1.59–2.25]	***
Discrimination	1.57	[1.31–1.87]	***	1.09	[0.93–1.28]	ns
Long working hours	0.74	[0.64–0.85]	***	0.89	[0.75–1.05]	ns
Shift work none	1		*	1		**
Fixed	1.14	[0.97–1.33]		1.12	[0.97–1.29]	
Alternating	1.19	[1.03–1.39]		1.26	[1.09–1.45]	
Low job promotion	1.09	[0.99–1.20]	ns	1.10	[1.01–1.20]	*
High work-life imbalance	1.06	[0.94–1.20]	ns	1.07	[0.95–1.21]	ns
Age			***			***
30–39 vs 18–29	1.22	[1.06–1.41]		1.24	[1.08–1.42]	
40–49 vs 18–29	1.33	[1.15–1.54]		1.27	[1.11–1.45]	
≥ 50 vs 18–29	1.54	[1.34–1.77]		1.53	[1.34–1.76]	
Number of workers in household			ns			*
2 vs 1	1.05	[0.95–1.15]		0.93	[0.85–1.02]	
≥ 3 vs 1	0.99	[0.83–1.18]		0.81	[0.68–0.95]	
Occupation			***			*
Managers	1			1		
Professionals	1.24	[0.96–1.60]		1.18	[0.92–1.51]	
Technicians/associate professionals	1.61	[1.26–2.06]		1.15	[0.90–1.47]	
Clerical support workers	2.13	[1.62–2.80]		1.36	[1.05–1.75]	
Service and sales workers	1.39	[1.07–1.82]		1.14	[0.89–1.46]	
Skilled agricultural, forestry, fishery workers; craft and related trades workers	1.67	[1.30–2.15]		1.42	[1.02–1.98]	
Plant and machine operators and assemblers	1.51	[1.16–1.96]		1.60	[1.15–2.22]	
Elementary and armed forces occupations	1.61	[1.23–2.12]		1.27	[0.97–1.66]	
Activity of company			ns			ns
Agriculture, hunting, forestry, and fishing	1			1		
Mining, quarrying, manufacturing, electricity, gas, water supply	1.18	[0.87–1.61]		1.29	[0.85–1.96]	
Construction	1.16	[0.84–1.61]		1.32	[0.76–2.30]	
Services	1.19	[0.88–1.61]		1.41	[0.93–2.13]	
Physical exposure	1.20	[1.07–1.35]	**	1.13	[1.03–1.25]	*
Chemical exposure	1.14	[1.01–1.28]	**	1.15	[1.04–1.28]	**
Biological exposure	1.03	[0.92–1.16]	ns	1.01	[0.90–1.13]	ns
Biomechanical exposure	1.52	[1.35–1.71]	***	1.30	[1.18–1.43]	***

Bold: significant at 5%.

***: $P < 0.001$; **: $P < 0.01$; *: $P < 0.05$; ns: non-significant.

Covariates: age; number of workers in household; occupation; economic activity of the company; physical, chemical, biological, and biomechanical exposure.

associations found were independent of the other psychosocial work factors taken into account. As underlined by Rugulies *et al.*,¹⁸ there may be overlaps between concepts or some factors may be causes or consequences of other factors. As a result of the unclear nature of associations between psychosocial work factors, these authors suggested to study each factor separately and not to adjust for all factors together. Our model (Model II) may thus be based on a conservative approach. Indeed, the significant associations reported in Model II were also found when studying each factor separately (Models I). Consequently, the results from Models I may also be pertinent.

Finally, this study also gave the opportunity to explore differences between genders and countries. Gender differences were observed for long sickness absence, covariates, and exposure to psychosocial work factors. However, very few gender differences were found in the associations between psychosocial work factors and long sickness absence. Significant differences in long sickness absence were found between countries and the results showed that some countries (Germany, Poland, Czech Republic, Austria, and Slovenia) had the highest prevalence of long sickness absence and some others had the lowest prevalence (Greece, Spain, Ireland, Turkey, and Romania) for both genders. These differences

may be related to actual differences in workers' health status between countries but also to compensation policies that may be different between countries. Nevertheless, the study also demonstrated that the differences in the associations between psychosocial work factors and long sickness absence were not significant, suggesting that these associations may be similar across countries. This finding confirmed previous results on sickness absence (defined using at least 1 day absence).²¹

This study underlines that a wide range of psychosocial work factors may be associated with sickness absence of more than 7 days a year. More research may be needed on the associations of these factors especially of those that have rarely been studied to date and sickness absence using prospective studies. Comprehensive prevention policies focused on the psychosocial work environment may be useful. In addition, this study suggests that prevention policies at European level may be pertinent given the homogeneity of the associations between psychosocial work factors and sickness absence across European countries.

Acknowledgements

This study was supported by the French Agence Nationale de Sécurité Sanitaire, de l'Alimentation, de l'Environnement et du Travail (ANSES, previously called AFSSET, grant no 2009-1-43).

Appendix

Variable	Items
<i>Job demands</i>	
Quantitative demands (3 items)	-working at very high speed -working to tight deadlines -enough time to get the job done
Emotional demands (1 item)	-emotionally involved in your work
Demands for hiding emotions (1 item)	-hiding feelings
Demands for responsibility at work (2 items)	-mistakes could cause physical injury to other people/financial loss to your company
<i>Influence and development</i>	
Degree of freedom at work (3 items)	-degree of freedom regarding working time arrangements -able to take an hour or two off during working hours -able to take a break
Influence at work (7 items)	-able to choose or change tasks order -able to choose or change work methods -able to choose or change speed or rate of work -consulted before targets are set -involved in improving work organization or work processes -able to choose working partners -influence on decisions that are important
Predictability (2 items)	-working time arrangements set by the company/organization -predictability regarding changes of work schedules
Possibilities for development (3 items)	-monotonous tasks -learning new things -applying ideas in work
Meaning of work (1 item)	-feeling of doing useful work
<i>Social relationships and leadership</i>	
Role clarity (1 item)	-knowing what is expected of you at work
Role conflicts (2 items)	-feeling of work well done -tasks that are in conflict with personal values

Appendix Continued

Variable	Items
Quality of leadership (5 items)	In general, immediate manager/supervisor -provides you with feedback on your work -respects you as a person -is good at resolving conflicts -is good at planning and organizing the work -encourages you to participate in important decisions
Social support (1 item)	-help and support from colleagues
Sense of community (2 items)	-feeling at home in this organization -having very good friends at work
<i>Workplace violence</i>	
Physical violence	Over the past 12 months, at work exposed to: -physical violence
Sexual harassment	-sexual harassment
Bullying (1 item each)	-bullying/harassment
Discrimination (7 items)	Over the past 12 months, at work exposed to: -age discrimination -discrimination linked to race, ethnic background, or color -discrimination linked to nationality -discrimination on the basis of your sex -discrimination linked to religion -discrimination linked to disability -discrimination linked to sexual orientation At least one situation=exposure
<i>Working hours</i>	
Long working hours (1 item)	Number of hours per week in main paid job? Long hours defined by ≥ 48 hours per week
Night work (1 item)	Working at night, for at least 2 hours between 10.00 pm and 05.00 am Night work defined by >4 per month
Shift work (2 items)	Working daily split shifts or permanent shift/alternating shift
Asocial working hours (3 items)	-working in the evening, for at least 2 hours between 6.00 pm and 10.00 pm -working on Sundays -working on Saturdays Asocial working hours defined by >4 per month (from all 3 items)
<i>Other psychosocial work factors</i>	
Job promotion (3 items)	-present skills correspond well with duties -well paid for the work -good prospects for career advancement
Insecurity at work (2 items)	-fear of losing job in the next 6 months -would be easy to find a job of similar salary
Work-life imbalance (1 item)	Working hours fit in with family or social commitments outside work
<i>Other occupational exposures</i>	
Physical exposure (3 items)	Exposed at work to: -noise so loud that you would have to raise your voice to talk to people -high temperatures which make you perspire even when not working -low temperatures whether indoors or outdoors
Chemical exposure (4 items)	Exposed at work to: -smoke, fumes (such as welding or exhaust fumes), powder, dust (such as wood dust or mineral dust) etc. -vapors such as solvents and thinners -handling or being in skin contact with chemical products or substances -tobacco smoke from other people
Biological exposure (1 item)	Exposed at work to: -handling or being in direct contact with materials which can be infectious, such as waste, bodily fluids, laboratory materials, etc
Biomechanical exposure (5 items)	Exposed at work to: -vibrations from hand tools, machinery, etc -tiring or painful positions -lifting or moving people -carrying or moving heavy loads -repetitive hand or arm movements

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