

## RESEARCH REPORT

# Psychosocial factors and work related sickness absence among permanent and non-permanent employees

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**Study objective:** To examine the association between psychosocial work factors and work related sickness absence among permanent and non-permanent employees by sex.

**Design:** A cross sectional survey conducted in 2000 of a representative sample of the European Union total active population, aged 15 years and older. The independent variables were psychological job demands and job control as measures of psychosocial work environment, and work related sickness absence as the main outcome. Poisson regression models were used to compute sickness absence days' rate ratios.

**Setting:** 15 countries of the European Union.

**Participants:** A sample of permanent (n = 12 875) and non-permanent (n = 1203) workers from the Third European Survey on Working Conditions.

**Results:** High psychological job demands, low job control, and high strain and passive work were associated with higher work related sickness absence. The risks were more pronounced in non-permanent compared with permanent employees and men compared with women.

**Conclusions:** This work extends previous research on employment contracts and sickness absence, suggesting different effects depending on psychosocial working conditions and sex.

Sickness absence, which measures the working population's wellbeing<sup>1,2</sup> and contributes to lost productivity,<sup>3</sup> has emerged as an important public health surveillance indicator. Many studies have examined the relation between psychosocial work conditions and sickness absence.<sup>4–17</sup> Some have found that sickness absence is related to high demands,<sup>4,5</sup> low control,<sup>4,6–11</sup> or their combination,<sup>4,7,12–14</sup> while other studies have found no relation.<sup>15–17</sup> Furthermore, failing to clarify whether sickness absence is work related or not, has research and prevention implications.<sup>18–20</sup>

In the past decade, new forms of employment contracts, especially for non-permanent employees, have emerged as a significant change in the European Union (EU) labour market compared with more standard forms of production.<sup>21</sup> Differences in working conditions and health indicators between permanent and non-permanent employment have been reported recently. Non-permanent employees work in more hazardous psychosocial and ergonomic work environments<sup>22,23</sup> and experience higher mortality,<sup>24</sup> but tend to report better health and less sickness absence than permanent employees.<sup>23,25–27</sup> However, most sickness absence studies use stable working populations and whether the association between psychosocial factors and sickness absence applies to non-permanent employees is unclear. In addition, women tend to have more sickness absence than men,<sup>28</sup> and some differences in the relation between psychosocial work environment and sickness absence by sex have been found.<sup>6,8</sup> As far as we know, no studies have analysed the association of psychosocial work factors with sickness absence for permanent and non-permanent employees, for both sexes.

We hypothesised that psychosocial work factors (that is, high psychological demands, low control, and their combination) increase work related sickness absence risk. Furthermore, we hypothesised: (1) that sickness absence risk for psychosocial work factors would be higher for permanent than non-permanent employees; and, (2) women to be at higher risk than men. The objectives of this study

were: firstly, determine whether there is a relation between psychosocial work factors and work related sickness absence; secondly, assess whether patterns differ between permanent and non-permanent employees by sex.

## METHODS

### Participants and study sample

Data were drawn from the Third European Survey on Working Conditions (ESWC).<sup>29</sup> The sample design was a multi-stage random sample conducted on representative national samples of total active populations in EU member countries. The goal was to obtain 1500 employed persons per country (except 500 for Luxembourg). Employed was defined as people aged 15 years and older, having any paid job during the reference week, or who had a job but was temporarily absent. A total of 21 703 interviews were conducted at workers' homes between March and April 2000, with response rates ranging from 39% in Italy to 76% in Germany.<sup>29</sup>

Participants were asked about their employment status (employed or self employed), and contract (permanent or non-permanent, which included fixed term and temporary agency contracts). Among those employed, only permanent and non-permanent employees were selected for the analyses (n = 17 910). More details are given elsewhere.<sup>29</sup> Employees with incomplete data (n = 1858) were excluded. For a stable psychosocial work environment estimate, only employees with at least one year in their job were selected. The final sample (n = 14 078) included 12 875 permanent and 1203 non-permanent employees.

### Work related sickness absence

Work related sickness absence was defined using two questions: In your main job, over the past 12 months, how many days were you absent because of... "an accident at work" or "health problems caused by your work". The analysis was based on 13 957 employees after excluding non-answering subjects (n = 119) or those reporting incongruent figures (that is, more than 365 days absent per year) (n = 2).

**Table 1** Distribution of work related sickness absence by psychosocial work factors, employment status, and sex in a sample of workers (n = 13957) from the Third European Survey on Working Conditions (2000)

Variables	Permanent				Non-permanent			
	Person years	Work related sickness absence			Person years	Work related sickness absence		
		Number	%	Rate*		Number	%	Rate*
<b>Men</b>	6870	1192	17	430	551	91	16	335
Psychological job demands								
Low	3243	421	13	318	270	35	13	277
High	3594	763	21	531	278	56	20	394
Job control								
High	3727	528	14	324	242	26	11	102
Low	3132	662	21	555	309	65	21	517
Job strain								
Low strain	1812	209	11	279	123	14	11	120
Passive	1427	212	15	368	147	21	14	408
Active	1904	316	16	366	120	12	10	84
High strain	1688	446	26	714	158	44	27	628
<b>Women</b>	5749	848	15	377	632	87	14	319
Psychological job demands								
Low	2873	297	10	273	352	32	9	206
High	2854	542	19	484	277	55	20	466
Job control								
High	2983	363	12	277	242	29	12	212
Low	2758	485	17	486	391	58	15	385
Job strain								
Low strain	1546	143	9	225	132	11	8	232
Passive	1322	154	12	331	220	21	9	190
Active	1423	216	15	336	108	18	17	189
High strain	1431	326	23	631	169	37	21	644
<b>Total</b>	12619	2040	16	406	1183	178	15	326

\*Rate, work related sickness absence days per 100 person years. Figures are rounded to the nearest point.

Annual absence days rates, expressed per 100 person years, were computed by dividing the total absence days number during the past year by the working days at risk for each person.<sup>8</sup> We calculated the number of days worked by subtracting absence days due to work from total possible working days, considering a working year of 365 days. Absence days was assumed to be a countable variable that can take values 0,1,2,... without a determined limit, so we considered the absence days number, for each subject, followed a Poisson distribution.

### Psychosocial work risk factors

The Karasek's job strain model guided psychosocial exposure measurement.<sup>4</sup> Psychological job demands were measured by three questions. Two asked the frequency (1–7 options) the employee's main job entailed working "at very high speed" and "to tight deadlines". Options "almost never" or "never" were assigned a 0, and any other responses ("all the time", "almost all of the time", "around three quarters of the time", "around half of the time", or "around a quarter of the time") were assigned 1. The third question asked whether participants "have enough time to get the job done". A "yes" was given a 0 and "no" 1.

Job control was assessed by 11 items measuring whether the employee's main job entailed "solving unforeseen problems on your own", "learning new things" or "monotonous tasks", the possibility to "influence your working hours", "take a break when you wish", "decide when to take holidays or days off", discuss the "working conditions in general" or the "work organisation when changes take place", change the "tasks order", the "work methods", or the "speed or rate of work". A "yes" to the "monotonous tasks" item and a "no" to all remaining items were assigned 1.

Subjects were assigned the mean of the total sum of the item scores for each scale based on the items they had answered. It was required that more than half of the items

were endorsed (that is, two for demands and six for control) for the respondent to be assigned a score, otherwise the scale was set to missing. Cronbach's  $\alpha$  was 0.53 for job demands and 0.75 for job control.

Following standard procedures, both psychosocial factors were dichotomised on the median, with values equal to the median classified in the low exposure category (low demands or high control).<sup>30</sup> Both psychosocial factors were combined to create four work states: high strain (high demands and low control), active work (high demands and high control), passive work (low demands and low control), and low strain (low demands and high control). In multivariate analyses, low strain was the reference group.

### Covariates

Covariates included sociodemographic variables: age, household chores, children living at home, marital status, and country; physical work conditions: noise too loud, vibrations, breathing in vapours or fumes, extreme temperatures and carrying heavy loads; and, employment related variables: company size and economic sector.

### Statistical analysis

Crude and adjusted rate ratios (RR) and their 95% confidence intervals (95%CI) were calculated. The use of Poisson models assumes the mean is equal to the variance, but frequently the mean differs from the variance causing underestimation of the standard error. A marginal approach based on quasi-likelihood estimation methods<sup>31</sup> was used to account for problems with variance over dispersion and to reduce the risk of committing a type I error. Interaction between psychosocial factors and employment status was assessed by creating a multiplicative term and testing the term's significance.<sup>32 33</sup> All analyses were performed using Stata/SE version 8.2 (StataCorp, College Station, TX).

**Table 2** Distribution of sickness absence by sociodemographic variables, occupational factors, economic sector, and country in a sample of workers (n = 13957) from the Third European Survey on Working Conditions (2000)

Variables	Permanent						Non-permanent					
	Men			Women			Men			Women		
	Number	%	Rate*	Number	%	Rate*	Number	%	Rate*	Number	%	Rate*
<b>Sociodemographic variables</b>												
Age (y) (15–24)	84	17	357	70	17	355	21	16	200	12	9	130
25–34	305	16	351	209	13	322	28	14	261	34	15	422
35–44	399	18	491	282	15	386	23	20	355	23	14	351
45–54	298	17	456	216	15	404	13	19	669	13	14	262
55+	106	16	432	71	15	454	6	13	509	5	13	367
Household chores (Yes)	374	20	494	739	15	375	32	19	429	71	15	302
Marital status (Living alone)	349	18	422	281	16	339	41	16	377	33	12	307
Children at home (Yes)	513	17	451	377	14	344	32	17	368	39	14	324
<b>Occupational risk factors</b>												
Noise too loud (Yes)	628	24	591	264	24	625	51	24	578	35	23	448
Vibrations (Yes)	513	24	599	131	24	619	43	24	609	15	20	318
Vapours and fumes (Yes)	527	26	697	185	23	680	41	25	534	14	15	253
Extreme temperatures (Yes)	286	29	736	92	29	969	29	29	820	6	18	131
Loads (Yes)	659	25	692	366	22	620	59	23	574	52	25	582
Company size (1–9 workers)	241	16	366	207	12	300	34	19	215	23	10	194
10–499 workers	735	17	441	524	16	392	46	16	332	55	16	351
500 + workers	191	19	498	94	17	513	6	9	581	5	14	694
<b>Economic sector (NACE)†</b>												
Agriculture, hunting, forestry, and fishing	25	19	278	8	17	242	2	15	167	3	18	495
Mining, quarrying, and manufacturing	338	19	476	122	16	328	10	11	330	7	13	499
Electricity, gas, and water supply	12	11	254	4	22	1123	2	25	252	–	–	–
Construction	178	24	647	6	7	69	28	32	601	–	–	–
Wholesales and retail trade, repairs	111	13	367	105	11	316	11	16	277	13	15	366
Hotels and restaurants	27	15	304	52	20	372	1	3	27	4	10	54
Transportation and communication	141	19	465	44	20	762	6	15	78	4	22	662
Financial intermediation	30	12	217	24	10	156	–	–	1	7	72	
Real state and business	57	13	348	43	13	389	2	6	24	6	14	137
Public administration	108	16	385	59	13	336	6	13	236	5	12	557
Other services	158	17	364	373	15	424	21	16	384	44	14	300
<b>Country</b>												
Belgium	85	15	505	64	17	445	7	22	379	4	14	799
Denmark	63	12	234	63	12	258	9	26	282	4	12	148
Germany	133	23	443	74	16	271	5	16	154	9	26	445
Greece	19	8	79	6	4	248	6	23	674	1	5	10
Italy	64	12	210	24	7	156	2	7	86	2	5	426
Spain	75	15	359	20	10	177	16	17	403	8	12	156
France	98	18	578	65	15	386	9	16	323	5	10	290
Ireland	51	11	195	35	9	138	1	3	11	3	6	110
Luxembourg	62	25	754	21	15	307	3	38	115	–	–	–
Netherlands	121	23	651	107	22	885	6	29	2031	4	11	583
Portugal	56	14	545	45	11	357	4	11	95	7	10	422
United Kingdom	67	15	245	41	10	203	6	11	216	4	10	67
Finland	100	25	629	117	28	636	8	23	349	14	20	328
Sweden	90	18	529	103	19	599	5	19	151	18	34	354
Austria	108	21	484	63	12	256	4	13	302	4	11	524

\*Rate, work related sickness absence days per 100 person years. †Classification of Economic Activities in the European Community. Figures are rounded to the nearest point.

## RESULTS

Permanent (17% in men, 15% in women) and non-permanent employees (16% in men, 14% in women) showed similar sickness absence percentages (table 1). Employees exposed to high demands or low control showed higher sickness absence days' rates compared with low demands or high control, respectively. Overall, sickness absence days' rates were slightly higher in permanent than in non-permanent employees, and in men as compared with women. High strain work showed the highest percentages (around 21%–27%), while the lowest were found in low strain (around 8%–11%). Also, high strain had the highest rates (that is, in men, 628 days in non-permanent, and 714 days in permanent), followed by passive work (that is, in men, 368 days in permanent, 408 days in non-permanent).

There were small differences in sickness absence days' rates and percentages between types of employment by age (table 2). Permanent employees showed slightly higher sickness absence figures regarding household chores, living alone, and with children at home than non-permanent. Both types of employees reported similar exposures to physical working conditions. Sickness absence increased with company size, although in non-permanent employees the opposite was found for sickness absence percentages. Construction, transport and communication, mining and quarrying, electricity, gas and water supply were sectors with high sickness absence. By country, permanent employee sickness absence percentage ranged from 4% in Greek women and 8% in Greek men to 28% in Finnish women to 25% in Finnish men. Greater variability was found in

**Table 3** Risk of work related sickness absence by psychosocial work factors for permanent and non-permanent employees and gender in a sample of workers (n = 13957) from the Third European Survey on Working Conditions (2000)

Variables	Permanent				Non-permanent			
	RRc*	95%CI	RRa†	95%CI	RRc*	95%CI	RRa†	95%CI
<b>Men</b>								
Psychological job demands‡	1		1		1		1	
Low	1.70	(1.50 to 1.92)	1.29	(1.14 to 1.47)	1.42	(0.94 to 2.14)	0.80	(0.54 to 1.20)
High								
Job controls§	1		1		1		1	
High	1.64	(1.46 to 1.84)	1.45	(1.28 to 1.63)	5.05	(2.87 to 8.89)	5.05	(3.05 to 8.35)
Low								
Job strain	1		1		1		1	
Low strain	1.23	(1.01 to 1.49)	1.24	(1.02 to 1.50)	3.40	(1.59 to 7.29)	5.20	(2.68 to 10.07)
Passive	1.31	(1.10 to 1.57)	1.14	(0.95 to 1.36)	0.70	(0.24 to 2.05)	0.85	(0.36 to 2.00)
Active	2.48	(2.11 to 2.92)	1.80	(1.51 to 2.13)	5.24	(2.52 to 10.89)	4.11	(2.14 to 7.89)
High strain								
<b>Women</b>								
Psychological job demands‡	1		1		1		1	
Low	1.71	(1.50 to 1.95)	1.17	(1.02 to 1.34)	2.26	(1.50 to 3.41)	2.12	(1.35 to 3.32)
High								
Job controls§	1		1		1		1	
High	1.82	(1.59 to 2.07)	1.92	(1.68 to 2.20)	1.82	(1.15 to 2.86)	2.09	(1.33 to 3.28)
Low								
Job strain	1		1		1		1	
Low strain	1.64	(1.33 to 2.03)	1.86	(1.51 to 2.30)	0.82	(0.42 to 1.58)	0.89	(0.46 to 1.71)
Passive	1.54	(1.25 to 1.90)	1.13	(0.92 to 1.40)	0.81	(0.37 to 1.79)	0.72	(0.33 to 1.59)
Active	2.88	(2.38, 3.47)	2.22	(1.84 to 2.70)	2.77	(1.58 to 4.87)	2.98	(1.66 to 5.38)
High strain								

\*Crude rate ratio; †adjusted rate ratio for age, marital status, children at home, household chores, country, economic sector, company size, vibrations, fumes, noise, extreme temperatures, carrying load; ‡2 + job control; §2 + job demands.

non-permanent employees (5% in Italian women to 34% in Swedish women and 3% in Irish men to 38% in Luxembourgian men).

After adjustment, employees with high demands (that is, for permanent, RR = 1.29 in men, RR = 1.17 in women) or low control (that is, for permanent, RR = 1.45 in men, RR = 1.92 in women) had higher risk of sickness absence than those with low demands or high control, respectively (table 3). This association was stronger in non-permanent than in permanent employees. For instance, male permanent employees with low job control had a RR = 1.45 while non-permanent had a four times higher risk (RR = 5.05). In women, high demands in permanent employees showed a RR = 1.17 while it was 2.12 in non-permanent. Compared with low-strain work, high strain had a significantly greater

impact in non-permanent (RR = 4.11 in men, RR = 2.98 in women) than in permanent employees (RR = 1.80 in men, RR = 2.22 in women). Similarly, stronger associations were found in men non-permanent (RR = 5.20) than in permanent employees (RR = 1.24) working in passive work.

High control (or low demands) permanent employees were the reference category when assessing the interaction between psychosocial factors and employment status (table 4). Compared with permanent employees with high control, an interesting pattern was seen in non-permanent: high control was associated with lower sickness absence risk, in men (RR = 0.37) and women (RR = 0.94), but low control was associated with higher risk, in men (RR = 1.63) and in women (RR = 1.70). Similar results were found for demands in women. Compared with permanent employees with low

**Table 4** Risk of work related sickness absence by combined exposure to psychosocial work risk factors and employment status for men and women in a sample of workers (n = 13957) from the Third European Survey on Working Conditions (2000)

Variables	Permanent		Non-permanent		Test for interaction*
	RRa†	95%CI	RRa†	95%CI	
<b>Men</b>					
Psychological job demands‡					
Low	1	–	0.96	(0.66 to 1.38)	
High	1.27	(1.12 to 1.44)	1.02	(0.74 to 1.39)	p = 0.455
Job controls§					
High	1	–	0.37	(0.20 to 0.66)	
Low	1.45	(1.28 to 1.63)	1.63	(1.25 to 2.14)	p = 0.001
<b>Women</b>					
Psychological job demands‡					
Low	1	–	0.69	(0.49 to 0.98)	
High	1.19	(1.04 to 1.37)	1.28	(0.97 to 1.68)	p = 0.047
Job controls§					
High	1	–	0.94	(0.63 to 1.39)	
Low	1.91	(1.67 to 2.19)	1.70	(1.30 to 2.22)	p = 0.824

\*Wald test; †adjusted rate ratio for age, marital status, children at home, household chores, country, economic sector, company size, vibrations, fumes, noise, extreme temperatures, carrying load; ‡1 + job control; §1 + job demands.

### Key points

- Sickness absence is an important measure of the working population's wellbeing and lost productivity.
- The association between psychosocial work factors and work related sickness absence was higher in non-permanent employees than in permanent employees.
- Men had slightly higher sickness absence than women.

demands, female non-permanent with low demands had lower sickness absence risk (RR = 0.69), but non-permanent with high demands had higher risk (RR = 1.28). Interaction between psychosocial factors and employment status was significant only in men for control and in women for demands.

### DISCUSSION

This study has explored for the first time the association between psychosocial work factors and work related sickness absence by sex taking into account permanent and non-permanent employees. Specifically, we found: (1) high sickness absence among employees with high psychological demands and low control. Also, high strain work and passive work were positively related to sickness absence; (2) These associations were stronger in non-permanent employees, except for demands in men; (3) Sickness absence was slightly higher in men compared with women and the association with psychosocial work factors was also more pronounced among men; and, (4) potential confounders did not largely modify the results.

The association between psychosocial work factors and sickness absence supports the job strain model and is consistent with previous findings.<sup>1-3 10-12</sup> However, we specifically examined work related sickness absence, which none of the previous studies investigated. In accordance with previous studies,<sup>6 13</sup> we found a stronger association for low control than for high demands. High strain and passive work, both characterised by low control, were positively associated with sickness absence. Our findings underscore the importance of lack of job control in relation to work related sickness absence.

We have examined two comparatively unexplored work types; passive and active work, suggested by the Karasek's model.<sup>24</sup> Passive work, in male workers, was associated with higher sickness absence compared with low strain. Recently, passive work has been related to increase mortality risk compared with active jobs.<sup>35</sup> Although our comparison group was different, when active work was used as reference, similar results were obtained (data not shown). Passive work may reflect meaningless work and lack of motivational content, which could lead to high risk behaviours causing health problems that, in turn, may increase sickness absence.<sup>35</sup> Unfortunately, the ESWC did not contain specific data on this issue. On the other hand, active jobs were negatively related to sickness absence. One previous study found active jobs predict long spells of sickness absence,<sup>36</sup> but the rural community sample of women 40–50 years limits comparability with our results. To elucidate the potential multiple links of passive and active jobs with sickness absence is a future challenge.

Consistent with other research, non-permanent employees tend to report less sickness absence than permanent employees.<sup>23 25-27</sup> We examined whether this relation varied by psychosocial work conditions and gender. Only non-permanent employees with either low demands or high control had the traditionally observed low risk. Additionally,

we found gender differences in sickness absence rates. Only male non-permanent employees working in high control jobs and women non-permanent employees in low demands jobs had lower sickness absence risk. Typically, sickness absence research suggests that the lower non-permanent employee rates are attributable to the insecurity of not being re-employed or lack of benefits, which leads non-permanent employees to remain at work.<sup>37-39</sup> Furthermore, our research suggests that for female non-permanent employees, high psychological job demands may increase their risk of sickness absence, whereas, for men, having low control or few resources to manage job demands increased sickness absence risk. Clearly, it is important to consider psychosocial work conditions and gender in explaining the impact of employment contracts on sickness absence.

Prudence is needed when generalising our findings to all types of non-permanent employees. The non-permanent employees form a heterogeneous population, within which working conditions and ill health may vary.<sup>40</sup> It would be useful to distinguish between non-permanent employees who have freely chosen this type of employment—as a complementary to other tasks they do such as studying or taking care of somebody at home—and those working in an undesirable non-permanent situation. Involuntary and voluntary employees are likely to differ in their work motivation.<sup>41</sup> Involuntary employees would be more concerned about gaining a secure future employment than voluntary, which could influence their decision to take sick leave.

The job strain model does not use job security in constructing work stress, but the effort-reward imbalance (ERI) does. The ERI model considers job stability as a type of social reward that workers expect for their work effort. Very little research exists with sickness absence as an outcome using the ERI model.<sup>42</sup> One study showed workers in a low demand job with poor rewards, defined as job insecurity, engaged in with passive (that is, sickness absence behaviour) rather than active coping (that is, internalisation of stress). Non-permanent status may be an indicator of job insecurity in our research. Interestingly, our results showed that male non-permanent workers in passive work have the higher sickness absence risk than workers in the three other work states defined by the demand-control model. The idea of passive coping depicted by Peter and Siegrist represents a similar disengagement for passive work.<sup>34 35</sup> Alienation and disengagement from work and society related to work depleted of meaningful content, defined by the passive work state, can be manifested. Future research would benefit from theoretical and empirical work considering the joint application of these work stress models to non-permanent work.

Association of psychosocial factors and sickness absence by employment was more pronounced among men as compared with women, and in contrast with expected, sickness absence tended to be slightly higher in men. Gender differences in sickness absence have been attributed to both the unequal

### Policy implications

- Public policies aimed at reducing health inequalities and increasing labour rights equity between types of employment and sex should be considered.
- With regard to non-permanent employees, business and healthcare professionals should especially pay attention to the increased risk of lost productivity related to health and lack of control at work.

distribution of working conditions<sup>43-44</sup> and family demands.<sup>45</sup> Firstly, division of labour by gender might be diluted when a heterogeneous working population such as ours is analysed. Secondly, most studies<sup>28-36-46</sup> did not control for family demands as we did. Moreover, unlike other studies, we specifically measured work related sickness absence whereas usually all cause sickness absence is used.

One study limitation is that sickness absence data were self reported and measured retrospectively for the previous year, which may introduce biases.<sup>47</sup> Despite concerns about the exclusive use of self reported sickness absence,<sup>48</sup> the main practical reason to use it is the unfeasibility to get registries from each employee's workplace in large public samples such as ours.<sup>49</sup> However, self reported data have some advantages, as declaration instead of registry could make sickness absence less conditioned by practices and regulations of each setting.<sup>49</sup> For example, lately it has been noted that medical experts could underestimate the work related attribution of health problems as compared with employees.<sup>50</sup>

In addition, two opposed effects might be considered when using self reports. Firstly, an overestimation of the relation between psychosocial factors and sickness absence could exist because working conditions can affect not only the generation of employees' ill health and sick leave taking, but also their return to work by means of the perception about the cause of the absence.<sup>19</sup> Secondly, social desirability processes are likely to underestimate the associations making people reluctant to admit being sick because of work strain.

A healthy worker effect might be present as employees with unusual working time schedule or worse health level (that is, a long term disability state) would have not being available for the interview. This potential bias would underestimate the associations as selected employees would be healthier, and possibly had less sickness absence than non-selected employees. In addition, our study relies on cross sectional data so we cannot to rule out the possibility of reverse causality (that is, sickness absence would modify psychosocial work factors). Another concern is the low response rate in countries such as Greece (47%), Denmark (42%), the Netherlands (41%), and Italy (39%). This could be a major issue in country specific or between country analyses, but we are analysing the whole EU sample and thus the potential bias is less severe.

Finally, from a methodological perspective, the questions used to measure the psychosocial work environment were non-standard. Good internal consistency was found for the job control scale ( $\alpha = 0.75$ ) but for job demands the  $\alpha$  was low ( $\alpha = 0.53$ ). All selected items measured similar constructs contained in the standard scales.<sup>51</sup> However, the small number of job demands items captured only work intensity and not the full conceptual demands range. This could explain the lower than expected reliability.

In summary, psychosocial work risk factors in non-permanent employees, particularly low control, were more strongly associated to work related sickness absence than in their permanent employed counterparts, and more so in men than in women. Several implications can be drawn from our findings. From a research point of view, the findings support the need to investigate permanent and non-permanent employees separately. Our results suggest the need to develop public policies given the complex reality of how the workplace environment and psychosocial factors are interrelated. Changes in EU legislation and preventive actions aimed at reducing employment and gender inequalities should be considered.

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