

# Exposure to psychosocial factors at work and mental well-being in Europe

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## KEY WORDS

Depressive symptoms; psychosocial work factors; European countries

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Sintomi depressivi; fattori psicosociali sul lavoro; paesi europei

## SUMMARY

**Background:** *Depression among workers is a major health concern and psychological work factors are considered important risk factors.* **Objectives:** *To investigate exposure to psychosocial work risk factors and prevalence of depressive symptoms in the European working population, and to identify the psychosocial work characteristics that predict them.* **Methods:** *The study is a secondary data analysis based on a sample of 33,907 European employees from the last edition of the European Working Condition Survey (EWCS 2010). The relationship between the outcome variable (depressive symptoms) and the predictors (psychosocial work factors) was analyzed using a multi-stage Poisson model, estimating gender-specific relative risks (RR) and 95 percent confidence intervals.* **Results:** *After adjustment for individual and work characteristics, countries and other psychosocial factors, among men the RR of depressive symptoms was significantly increased for exposure to intermediate psychological demands and to high demands for hiding emotions, whereas high skill discretion, high support from colleagues, high support from managers, high job rewards and high job security significantly decreased the risk. Among women, high psychological demands and intermediate emotional demands significantly enhanced the risk of depressive symptoms while high decision authority, intermediate support from colleagues, high support from managers, high social climate, high job rewards and high job security protected against risk.* **Conclusions:** *A high prevalence of depressive symptoms was found in the EWCS 2010, although with wide variations between countries. Several psychosocial factors at work were identified as risk factors for depressive symptoms, even after adjusting for workplace co-exposures and other potential confounders.*

## RIASSUNTO

«**Esposizione ai fattori psicosociali a lavoro e benessere mentale in Europa**». **Introduzione:** *La diffusione della depressione fra i lavoratori è un problema cruciale e le condizioni psicosociali di lavoro sono importanti fattori di rischio.* **Obiettivi:** *Analizzare l'esposizione a fattori psicosociali, l'incidenza di sintomi depressivi e studiarne*

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*l'associazione. Metodi: Analisi secondaria basata su un campione casuale rappresentativo di 33,907 lavoratori europei (EWCS 2010). La relazione fra fattori psicosociali e depressione è studiata con il modello di Poisson, stratificato per genere. Si presentano RR e IC al 95%. Risultati: Controllando per fattori confondenti quali la co-esposizione ad altri fattori psicosociali, caratteristiche individuali e lavorative, fra gli uomini, il rischio di sintomi depressivi aumenta per livelli intermedi di domande psicologiche e per elevata necessità di nascondere le proprie emozioni, mentre elevate possibilità di utilizzare e sviluppare le proprie competenze, supporto sociale dei superiori e dei colleghi, elevate ricompense e sicurezza lavorativa lo riducono significativamente. Fra le donne, livelli elevati di domande psicologiche e intermedi di domande emozionali aumentano significativamente il rischio di depressione. Svolgono un ruolo protettivo un'elevata autonomia decisionale, un livello di supporto intermedio da parte dei propri colleghi ed elevato da parte dei superiori, un clima aziendale positivo e elevate ricompense e sicurezza lavorativa. Conclusioni: Si riscontra un'elevata prevalenza di depressione fra i lavoratori europei dell'EWCS 2010 e una ampia variabilità fra paesi. Diversi fattori psicosociali sul lavoro sono stati identificati come fattori di rischio dei sintomi depressivi, anche controllando per l'esposizione ai restanti fattori psicosociali e per altri potenziali confondenti.*

## INTRODUCTION

In recent years, significant changes in the organization of work have taken place, which are relevant for workers' health. The ongoing shift towards a service and knowledge-based economy, together with the flexibilization of the labour market, have resulted in emerging risks and new challenges in the field of occupational health and safety (18). The psychosocial work environment (PWE) has gained a prominent role in this shift, particularly as an important risk factor for the development of mental disorders (9), which according to the Global Burden of Disease Study currently rank 11th on the list of 291 most disabling disorders (37).

Mental disorders such as anxiety and depression are common also in the working population. Using the Composite International Diagnostic Interview (WMH-CIDI), Alonso and colleagues (2) found that 3.4% workers in six European countries (Belgium, France, Germany, Italy, the Netherlands and Spain), reported a major depression episode during a 12-month period. Using prescriptions of antidepressant medications, Virtanen (51) found a prevalence of 6-12% of depressive symptoms, among Finnish employees.

A number of models exist to assess the impact of the PWE on employees' health and safety. The most influential are perhaps the 'job demand-control' (JDC) (28) with its extension, the 'Job De-

mand-Control-Support' (JDCS) (27, 29) and the 'effort-reward' imbalance (ERI) hypothesis (48). The JDCS predicts that the greatest risks for workers' well-being and health arise when high psychological workload, demands and pressures are combined with low control and low social support. The ERI model claims that failed reciprocity in terms of high efforts spent and low rewards received in turn is likely to elicit adverse health and well-being outcomes. These hypotheses have demonstrated good predictive validity for mental disorders (13, 41).

However, a focus on the factors included in the Demand-Control-Support model and/or in the ERI model would not be enough, since other work-related factors have been shown to be important as far as workers' health is concerned, such as, for example, emotional demand (11), job insecurity (16) and work-family conflicts (1).

The main objective of our study is to contribute to the debate on the relation between PWE and mental well-being, with a secondary data analysis of the 5<sup>th</sup> European Working Conditions Survey (EWCS 2010). Our contribution to the existing literature hinges on two factors. First, the availability of a very large data set (around 34,000 observations), representative of the whole European working population, covering all the EU and accessing countries, including under-researched ones. These features of the sample allow for excel-

lent generalizability of the results at the European level, as well as the possibility of examining exposures with low prevalence, because of the great statistical power. Second, we have the opportunity to assess the potential effect on mental health of several work-related psychosocial exposures, instead of relying on selected model-based factors, as often done in the epidemiologic literature, and to control for a rich set of individual, contextual and organizational confounders. This increases significantly the amount of explained variance in our health outcome and makes our results even stronger, as many possible confounders are kept under control.

## METHODS

### Study Population

The study is based on data from the fifth European Working Condition Survey (EWCS), carried out in 2010 by the European Foundation for the Improvement of Living and Working Conditions. The fifth edition covered the 27 EU member countries, as well as four candidate countries (Croatia, Macedonia, Montenegro, and Turkey), two potential candidates (Albania and Kosovo) and one country as a member of the European Free Trade Association (Norway). The sample was composed of 43,816 workers (22,781 males, 21,035 females), selected according to a multistage and stratified random sampling design (19). Interviews were administered in the respondents' houses, using a face-to-face technique. The questionnaire covers more than one hundred questions on socio-demographics, occupation, economic activity, features of work organization and exposure to psychosocial, ergonomic and environmental hazards, as well as questions on health status, sickness absence and presenteeism. Response rate of the survey was 44% overall, although with wide variation among countries (from a minimum of 31% in Spain to a maximum of 74% in Latvia).

Our study focused only on individuals aged 15-70 years (99.7%) working as employees (82.6%), excluding the armed force sector (0.45%). Conse-

quently, the study sample consisted of 33,907 employees, 18,449 males (54.4%) and 15,457 females (45.6%) (table 1).

### Measurements

#### *Measurement of depressive symptoms: the WHO-5 index*

Depressive symptoms were assessed by the WHO-5 well-being index (53). The index was initially developed to measure well-being and quality of life of patients with diabetes and consisted of 28 items. Further psychometric analysis reduced the number of items towards the final 5-items version in 1998. This scale was specifically proposed for monitoring the course of depressive symptoms in the general population, and as a first step in a two-stage screening process for depression to be followed by a clinical interview (54).

It has been shown that the WHO-5 has the highest content validity, when compared to scales with a much larger number of items and not specific diagnostic scope, such as the 22-item Psychological General Well-Being Index, the 36-item Medical Outcome Short Form (SF-36) or the 100-item World Health Organization Quality of Life Scale (23). Its validity and good screening properties for depression have also been demonstrated against some of the gold standard screening tools for depression, such as the CES-D (14), the BDI-1A (46) and the CIDI (24).

The WHO-5 is based on five positively worded items assessing how often in the last two weeks the following mood and emotions were experienced: *'I have felt cheerful and in good spirits'*; *'I have felt calm and relaxed'*; *'I have felt active and vigorous'*; *'I woke up feeling fresh and rested'*; *'My daily life has been filled with things that interest me'* (Cronbach's alpha = 0.88). The answers are scored on a six-point Likert scale from 0 (*'at no time'*) to 5 (*'all of the time'*). The sum of the scores is then multiplied by 4, obtaining a scale from 0 (worst well-being) to 100 (best well-being). Conventionally, a score lower than 50 is interpreted as indicating possible depression and the necessity for a further screening (8, 14). Other authors sug-

**Table 1** - Frequency distribution of characteristics of the sample and prevalence of depressive symptoms

	Men				Women			
	No.	%	Depressive symptoms (%)	P <sup>a</sup>	No.	%	Depressive symptoms (%)	P <sup>a</sup>
<b>Total</b>	18,449	54	19		15,457	46	22	
<b>Age (years): 15-24</b>	1,733	9	14	***	1,477	10	19	***
25-34	4,831	26	18		3,727	24	20	
35-44	4,903	27	19		4,550	30	21	
45-54	4,606	25	22		3,872	25	26	
55-70	2,300	13	18		1,773	12	22	
<b>Education: No edu. &amp; Primary</b>	1,189	6	30	***	622	4	35	***
Low secondary	4,852	26	19		4,015	26	22	
High secondary	7,345	40	20		5,803	38	22	
Tertiary & more	5,000	27	15		4,973	32	20	
<b>HH type: Single, no kids</b>	4,848	26	18	**	3,278	21	21	***
Single with kid(s)	238	1	27		1,328	9	29	
Couple, no kids	4,650	25	16		3,585	23	19	
Couple with kid(s)	8,669	47	21		7,225	47	23	
<b>Employment type: Permanent</b>	14,250	79	17	***	11,756	77	21	**
Fixed or temporary	1,951	11	18		2,057	14	23	
No or other contract	1,917	11	31		1,373	9	28	
<b>Social Class: High-skilled white collar</b>	3,733	20	12	***	3,677	24	22	***
Low-skilled white collar	6,001	33	19		9,017	58	20	
High-skilled blue collar	4,287	23	20		607	4	28	
Low-skilled blue collar	4,352	24	24		2,120	14	31	
<b>Sector of activity: Agriculture</b>	550	3	18	***	248	2	20	***
Industry	4,602	25	21		1,970	13	30	
Construction	2,228	12	19		252	2	20	
Wholesale, retail, food & accommodation	2,973	16	18		3,070	20	20	
Transport	1,642	9	24		402	3	22	
Financial services	680	4	16		652	4	19	
Public administration and defence	1,328	7	17		1,077	7	22	
Education	1,044	6	13		2,101	14	22	
Health	778	4	14		2,840	19	20	
Other services	2,404	13	18		2,671	17	22	
<b>Working Time: Part-time (&lt;=34 hrs.)</b>	1,793	10	15	***	5,600	37	20	***
Full-time (35-47 hrs.)	12,704	70	17		8,306	54	22	
Long-hour (>=48 hrs.)	3,635	20	28		1,385	9	31	

Note: EWCS 2010 sample restricted to employees, 15-70 years old, not in the armed forces. Data weighted

<sup>a</sup> P-value for the Pearson's chi-squared test for independence. Legend: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

gested a slightly more restrictive cut-off point of 48 (46), which then is what we chose to adopt for case classification of depressive symptoms in our work.

#### Measurement of psychosocial work factors as predictors

A comprehensive instrument which allows covering a greater number of relevant psychosocial fac-

tors than permitted by the use of classical work-stress models is the Copenhagen Psychosocial Questionnaire (COPSOQ) (32). We relied on this assessment tool for some of the exposure measures.

We constructed 19 psychosocial work environment indicators, using a total of 49 questions of the EWCS, organizing them into 5 broad domains: demands at work, work organization and content, interpersonal relations and leadership, work-individual interface and workplace violence. Since most of the 49 questions assessed exposure frequency through a Likert scale 1-5 or 1-7, answers' scores were first standardized to a 0-100 scale and then a composite indicator was obtained taking the arithmetic mean of the selected standardized items. Cognitive demand and the workplace violence's indicators made an exception, as they were assessed through yes/no questions. Internal consistency of the psychosocial work factors was estimated through Cronbach's alphas, where appropriate (Cronbach's alpha range: 0.33-0.81). A brief description of the indicators follows.

Five measures related to the JDCA model were constructed: psychological demand (4 items, covering work pace, intensity and role ambiguity); skill discretion and development (5 items embracing variety of work, opportunity for skills use and development); decision authority (7 items describing the workers' ability to make decisions on their own job and influence their work team and company's policies); social support from co-workers (one item) and supervisors (6 items, including supervisor support and leadership quality measures). Job strain was then defined by the psychological demand/job control ratio, where control is the sum of skill discretion and decision authority.

Emotional demand and demand for hiding emotions (both single item based) reproduced in a close way the corresponding COPSOQ scales. They were based on Hochschild (25), who defined emotional labour as the requirement for workers employed in jobs implying relationships with clients, customers, pupils or patients to display certain emotional expressions as part of the tasks. For cognitive demands, we relied on a single item asking whether the job involved performing complex tasks.

The quality of social community (3 items) was assessed by two items covering the social climate at work, plus an item on the ability of the work organization in stimulating its employees, as an indicator of the social embeddedness of the worker in the scope of his/her work organization.

Job rewards (3 items) was assessed using the ERI model as a reference, but, since esteem questions were not available in EWCS, we based it only on earnings and career opportunities. An effort-reward imbalance score was built dividing the score of psychological job demand by the score of reward.

The work-individual interface dimension permits the investigation of how well work organization fits with individual needs and commitments. This dimension is explored through two indicators. The first is work-life balance, measured through 4 questions assessing directly the presence of a work-life conflict and its negative effects in terms of energy and time subtracted to non-work activities due to working time constraints. The second indicator used is job security, assessed through a single question asking workers to appraise the possibility to lose their job in the next six months.

Five factors related to workplace threat and violence. Abuse included three items, focusing on verbal abuse, unwanted sexual attention and threats and humiliating behavior, experienced over the last month. We kept other forms of violence separated, as they assessed different concepts and they referred to a longer period (experienced over the last year), i.e. sexual harassment (one item), bullying (one item) and physical violence (one item). Discrimination was built using seven items, measuring discrimination due to age, race, nationality, sex, religion, disability and sexual orientation. Exposure to abuses and discrimination was defined by exposure to at least one situation.

#### *Measurement of covariates as possible confounders*

We added as covariates also several variables available in EWCS, since they have been associated with psychosocial work characteristics, risk of depression or both, as emerged in recent reviews (38, 43). The controls included were: country age



class, educational level, household composition, self-reported health conditions, occupational social class, economic activity of the company, employment status, working time, shift work and establishment size.

### *Statistical analysis*

The relationship between the outcome variable (depressive symptoms) and the predictors (psychosocial work factors) was analysed using Poisson models, to estimate gender-specific relative risks and 95% confidence intervals. The Poisson model has been recognized to be a valid alternative to the most commonly used Logit or Cox model in cross-sectional studies (7), especially in the presence of frequent outcomes (22). In this case, it has been shown that Poisson models with robust standard error produce correct point- and interval estimates (7), and relative risks can be estimated which are easier to interpret than odds ratios (57).

All psychosocial work factors were examined as suspected risk factors for depressive symptoms first individually and then jointly, as potential mutual confounders. For binary variables (cognitive demand, abuse, discrimination, violence, bullying and sexual harassment), we estimated the effect of exposure against non-exposure. All other psychosocial factors were evaluated by dividing them into tertiles (low, intermediate, high) and using the lowest tertile as a reference.

Covariates were included in three different models. In the first one, the association of each factor with depressive symptoms was evaluated separately, adjusting for age and country (table 3, column 1). A second model was built controlling for age, country and health conditions (hearing problems; skin problems; backache; muscular pain in shoulders, neck and/or upper limbs; muscular pain in lower limbs; headaches and eyestrain; stomach ache; respiratory difficulties; cardiovascular diseases; injuries) (table 3, column 2). Finally, a fully adjusted multivariable Poisson model was fitted to control simultaneously for all the psychosocial work factors and all the relevant covariates (table 3, column 3). The final specification of the model was constructed by an iterative procedure, entering the

psychosocial work factors one-by-one, in their rank order according to their impact size as emerged in the first model, together with a full set of controls. At each step, a variable was retained if it was statistically significant at the 5% level or if its addition changed the coefficients of any other significant variable in the model by more than 20%. At the completion of each round of inclusion, the insertion of the excluded variables was tested again, repeating the process as many times as necessary to reach a stable specification. Job strain and effort-reward imbalance hypotheses were assessed by eliminating from the model the variables already included in the corresponding scales. All analyses were performed using the STATA (version 11) statistical package.

## RESULTS

### **Exposure to psychosocial work factors**

Exposure to adverse psychosocial work factors was unbalanced between men and women (table 2). The difference was statistically significant for all factors, but for low skill discretion, low support from colleagues and supervisors, work-life balance, abuse, physical violence and bullying. The greatest differences were found for exposure to psychological demand, cognitive demands (men more exposed), emotional demand, demand for hiding emotions, low job rewards, discrimination and sexual harassment (women more exposed).

Table 2 also shows differences in exposure across socioeconomic classes. Overall, a lower socioeconomic position was associated with a higher risk of exposure to adverse psychosocial work factors. Indeed, blue collars displayed higher exposure to high psychological demand and to all factors in the domains of work organization, interpersonal relations and work-individual interface.

High cognitive and emotional demands and high demands for hiding emotion was more diffused among white collars, who were also more exposed to workplace violence, particularly among women.

**Table 2** - Exposure to psychosocial work factors in Europe, by social class and sex

	Men (% exposed)					Women (% exposed)					Total		
	High skilled white collar	Low skilled white collar	High skilled blue collar	Low skilled blue collar	P <sup>a</sup>	High skilled white collar	Low skilled white collar	High skilled blue collar	Low skilled blue collar	P <sup>a</sup>	Men	Women	P <sup>b</sup>
<b>Demands at work</b>													
H. psychological demands	31.5	33.6	41.4	42.8	***	29.6	28.1	44.8	37.5	***	37.2	30.4	***
H. cognitive demands	80.3	61.3	67.0	39.0	***	70.5	51.2	46.8	27.6	***	61.2	52.4	***
H. emotional demands	23.9	15.1	14.9	13.7	***	34.7	19.8	23.0	16.8	***	16.5	23.1	***
H. demands for Hiding emotions	32.2	27.6	17.5	21.3	***	32.4	31.1	22.8	21.4	***	24.7	29.8	***
<b>Work organization</b>													
L. skill discretion	21.2	39.9	51.2	64.9	***	22.7	46.4	68.3	80.7	***	44.7	46.3	
L. decision authority	12.2	35.2	40.8	57.3	***	15.9	37.9	56.6	49.4	***	37.1	35.0	*
<b>Interpersonal relations</b>													
L. support from colleagues	23.5	29.3	24.2	34.7	***	21.2	27.2	33.5	38.3	***	28.2	27.3	
L. support from supervisors	30.6	36.1	35.9	48.3	***	29.2	38.1	45.5	52.1	***	37.8	38.2	
L. Social community	27.6	36.1	37.3	45.2	***	26.8	33.6	45.0	48.0	***	36.8	34.4	**
L. job rewards	23.8	35.3	44.3	53.6	***	32.8	45.7	64.7	66.0	***	39.4	46.1	***
<b>Work-individual interface</b>													
L. work life balance	24.7	34.9	42.1	48.4	***	34.7	36.4	42.3	40.4	***	37.7	36.8	
H. job insecurity	23.9	33.4	41.8	43.9	***	22.2	35.0	49.6	47.6	***	35.9	34.1	*
<b>Workplace violence</b>													
Abuse	14.1	12.7	8.0	13.0	***	14.0	14.2	5.1	7.8	***	11.9	12.9	
Discrimination	4.2	6.4	5.0	6.2		7.2	6.2	8.6	8.8		5.6	6.9	**
Violence	2.7	2.8	0.5	1.2	***	3.3	1.8	0.0	0.4	***	1.9	1.9	
Bullying	4.2	4.3	2.7	4.5	*	5.7	4.2	3.0	3.5	**	4.0	4.4	
Sexual harassment	0.6	0.6	0.1	0.3	**	0.9	1.5	0.3	1.4	***	0.4	1.3	***

Note: EWCS 2010 sample restricted to employees, 15–70 years old, not in the armed forces. Data weighted. For each work factor, the score is dichotomized using the third tertile (for exposure to high level of...) or the first tertile (for exposure to low level of...) computed on the total sample. Since cognitive demand, abuse, discrimination, bullying, sexual harassment are categorical 0–1, the relative figures correspond to the prevalence of one.

<sup>a</sup> P-value for the Pearson's chi-squared test for independence. Legend: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<sup>b</sup> P-value for the F-test for equality of means. Legend: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## Prevalence of depressive symptoms

In the overall sample the prevalence of depressive symptoms was 19% among men and 22% among women ( $p < .001$ ). Significant differences were observed by age, education, household composition, type of employment, occupational social class and working time (table 1). The prevalence of depressive symptoms across different age groups followed

an inverted u-shaped relationship, with a pick at 45–54 years old (more marked for females). Workers with the lowest level of education, without work contract, employed in low skilled occupations or working more than 48 hours had a prevalence of depressive symptoms far above the average.

The most striking differences emerged across countries (figure 1), going from a very low 4% among males in Denmark, to an impressive 41%

among females in Lithuania. North Europe and Scandinavian countries (together with Spain and Ireland) presented the lowest prevalence of depressive symptoms, in contrast to new accession countries and Eastern Europe, which had the highest.

### **Association between psychosocial work factors and depressive symptoms**

In the analysis adjusted for age class and country (table 3, column 1) all psychosocial factors showed significant associations with depression, except cognitive demand and sexual harassment for both sexes, and physical violence for males. Further adjustment for health conditions (table 3, column 2) generally reduced the strength of the associations, but all the factors associated in the previous step retained statistical significance, except for emotional demand among men and violence among women.

In the fully adjusted models (table 3, column 3), the number of psychosocial factors associated with depression decreased, but still several significant associations were identified, mainly for the highest tertile of exposure. In both genders, job rewards, good interpersonal relations (social support and climate at work) and job security behaved as protective factors, whereas psychological demand was a significant risk factor, although only the intermediate level was associated among men. Of notice, two dimensions which share some common features, such as emotional demand and need for hiding emotions, showed differences in the associations with depression among the two genders, with the first one significant for males and the second one for females. Similarly, skill discretion and decision authority, although highly correlated, were significant just for men and women, respectively.

For both men and women, high psychological demand was among the risk factors with the highest RRs in the analyses adjusted only for age and country, but in the fully adjusted model reduced drastically its effect.

A similar pattern holds also for workplace violence. Most indicators in this domain were highly significant predictors of depressive symptoms in the analyses adjusted only for age and country, but the strength of the association considerably re-

duced adjusting also for health problems. In the fully adjusted model the point-estimates reduced further, becoming either not significant, or, in the case of bullying and abuse for women, only marginally significant (p-values: 0.07 and 0.12 respectively, not shown in the table).

The job strain hypothesis has been tested (data not shown), including it in the fully adjusted model. For females, exposure to high strain (higher tertile) did not have any significant predictive power, while for men, the relative risk was 1.25 (95% CI 1.07-1.46).

The effort-reward imbalance hypothesis has been explored, too (data not shown). The inclusion of this factor in the fully adjusted model produced a significant RR of depressive symptoms of 1.47 (95% CI 1.23-1.76) for men and 1.35 (95% CI 1.16-1.57) for women.

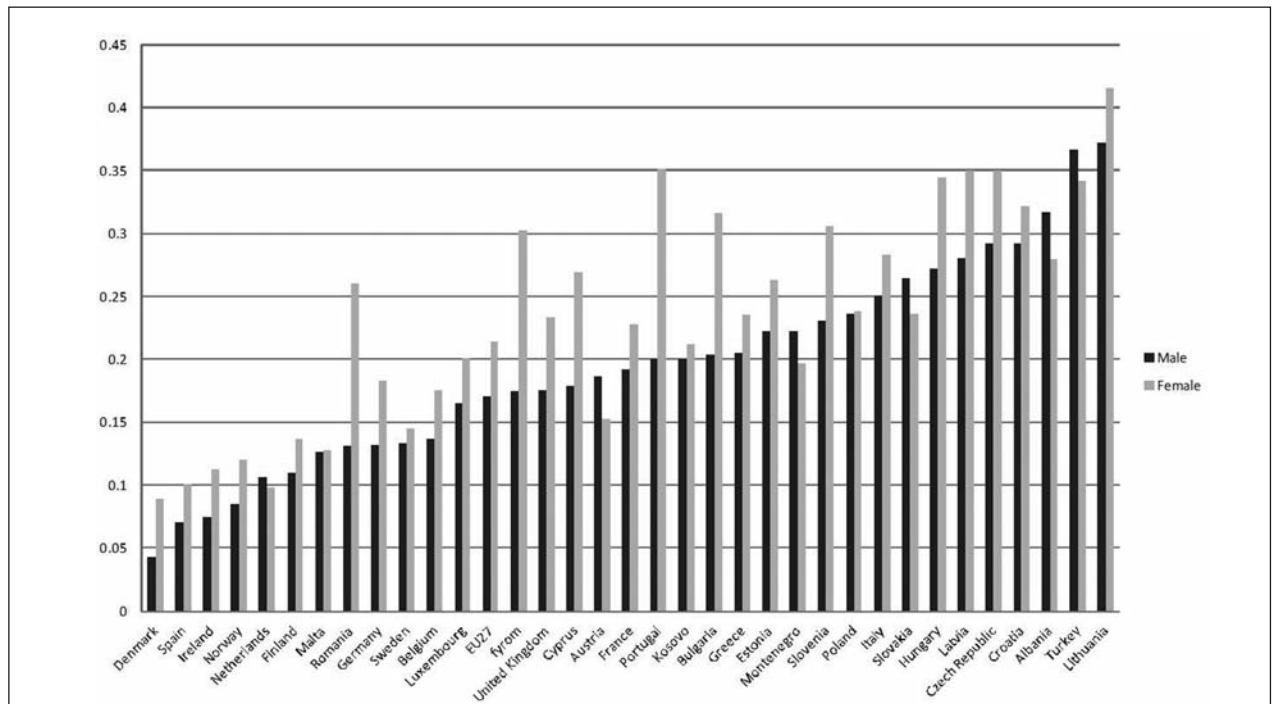
For both genders, among covariates significantly associated with depression (data on covariates not shown), or which modified by 20% or more the effect of other significant predictors, there were health problems, country and sector of activity. Among men, the mid-age class yielded the highest RR with respect to workers 15-24 years old. For females, the age class' coefficient was non-significant, while occupational social class resulted significant for females and non-significant for males. In the multivariate analysis, most of the countries remained significant even in the fully adjusted model. For women, the highest RR of depression were in Kosovo (RR 1.84; 95% CI 1.25-2.70), UK (RR 1.75; 95% CI 1.45-2.12), and Cyprus (RR 1.60; 95% CI 1.25-2.06). For men the risk of depression was higher in Albania (RR 2.02; 95% CI 1.33-2.45), Turkey (1.90; 95% CI 1.57-2.28) and Croatia (RR 1.89; 95% CI 1.53-2.34). Many of the health problems considered in the analyses were found significant predictors of depressive symptoms. For both genders, backache, headaches, eye-strain, respiratory difficulties and cardiovascular diseases were strongly associated with depression; for males, muscular pain in lower limbs and stomach ache, while for women muscular pain in upper limbs, hearing and skin problems were also associated with an increased risk.



Table 3 - Relative risk of depressive symptoms related to psychosocial workplace factors by gender

	Men						Women					
	COL 1: adjusted for age & country		COL 2: adjusted for age & country & health		COL 3: fully adjusted		COL 1: adjusted for age & country		COL 2: adjusted for age & country & health		COL 3: fully adjusted <sup>b</sup>	
	IRR	(95% CI)	IRR	(95% CI)	IRR	(95% CI)	IRR	(95% CI)	IRR	(95% CI)	IRR	(95% CI)
Psychological demands	1.43***	(1.24,1.64)	1.31***	(1.14,1.51)	1.17*	(1.01,1.36)	1.39***	(1.24,1.56)	1.25***	(1.11,1.39)	1.10	(0.97,1.25)
High	1.86***	(1.63,2.12)	1.53***	(1.33,1.75)	1.13	(0.97,1.31)	1.77***	(1.59,1.98)	1.40***	(1.25,1.57)	1.14*	(1.01,1.29)
Cognitive demands	0.92	(0.82,1.02)	0.86**	(0.78,0.95)			0.97	(0.88,1.07)	0.91*	(0.83,0.99)		
Emotional demands	0.85***	(0.76,0.95)	0.86**	(0.77,0.96)			0.99	(0.89,1.10)	0.97	(0.88,1.07)	1.14*	(1.02,1.27)
High	0.65***	(0.55,0.76)	0.62***	(0.53,0.72)			0.78***	(0.69,0.90)	0.75***	(0.66,0.85)	1.06	(0.92,1.22)
Demand for hiding emotions	1.09	(0.95,1.24)	1.05	(0.92,1.19)	1.01	(0.88,1.16)	1.14*	(1.01,1.29)	1.05	(0.93,1.18)	1.05	(0.92,1.19)
High	1.24***	(1.10,1.39)	1.16*	(1.04,1.31)	1.14*	(1.01,1.28)	.31***	(1.18,1.46)	1.12*	(1.01,1.24)	1.09	(0.98,1.23)
Skill discretion	0.74***	(0.66,0.83)	0.80***	(0.72,0.90)	0.91	(0.81,1.02)	0.83***	(0.74,0.92)	0.85**	(0.77,0.95)		
High	0.59***	(0.51,0.69)	0.66***	(0.57,0.76)	0.83*	(0.70,0.97)	0.82**	(0.72,0.94)	0.89	(0.78,1.01)		
Decision authority	0.81***	(0.72,0.90)	0.82***	(0.73,0.92)			0.89*	(0.80,0.98)	0.89*	(0.81,0.98)	1.00	(0.90,1.12)
High	0.56**	(0.49,0.64)	0.57***	(0.50,0.66)			0.56***	(0.50,0.64)	0.58***	(0.51,0.66)	0.75	(0.64,0.87)
Support from colleagues	0.67***	(0.60,0.75)	0.71***	(0.63,0.80)	0.84**	(0.75,0.95)	0.72***	(0.64,0.80)	0.75***	(0.67,0.83)	0.87*	(0.78,0.97)
High	0.46***	(0.40,0.53)	0.50***	(0.43,0.57)	0.68***	(0.59,0.79)	0.57***	(0.51,0.65)	0.61***	(0.54,0.69)	0.9	(0.79,1.02)
Support from managers	0.61***	(0.55,0.68)	0.68***	(0.61,0.75)	0.91	(0.81,1.02)	0.59***	(0.53,0.65)	0.65***	(0.59,0.72)	0.88*	(0.79,0.98)
High	0.38***	(0.32,0.45)	0.45***	(0.38,0.53)	0.79*	(0.65,0.97)	0.44***	(0.38,0.51)	0.50***	(0.43,0.59)	0.77**	(0.64,0.93)
Social climate	0.47***	(0.42,0.53)	0.53***	(0.47,0.59)	0.69***	(0.61,0.79)	0.46***	(0.42,0.51)	0.52***	(0.47,0.57)	0.62***	(0.55,0.69)
High	0.26***	(0.21,0.31)	0.30***	(0.24,0.37)	0.49***	(0.39,0.62)	0.33***	(0.28,0.38)	0.38***	(0.32,0.44)	0.53	(0.44,0.64)
Job rewards	0.58***	(0.52,0.65)	0.65***	(0.58,0.73)	0.81***	(0.72,0.91)	0.54***	(0.48,0.61)	0.60***	(0.54,0.67)	0.70***	(0.62,0.80)
High	0.35***	(0.29,0.42)	0.42***	(0.35,0.50)	0.62***	(0.51,0.76)	0.37***	(0.31,0.45)	0.43***	(0.36,0.51)	0.64	(0.53,0.78)
Work Life balance	0.71***	(0.63,0.79)	0.78***	(0.70,0.88)			0.75***	(0.68,0.84)	0.82***	(0.74,0.91)		
High	0.59***	(0.51,0.69)	0.66***	(0.57,0.76)			0.68***	(0.59,0.77)	0.75***	(0.66,0.85)		
Job security	0.76***	(0.68,0.86)	0.84**	(0.74,0.94)	0.98	(0.87,1.11)	0.77***	(0.69,0.86)	0.84**	(0.75,0.93)	0.94	(0.84,1.05)
High	0.52***	(0.45,0.60)	0.59***	(0.51,0.67)	0.80**	(0.69,0.93)	0.61***	(0.54,0.70)	0.68***	(0.60,0.77)	0.83**	(0.73,0.95)
Abuse	1.59***	(1.39,1.81)	1.23**	(1.07,1.41)			1.67***	(1.50,1.86)	1.36***	(1.22,1.51)		
Discrimination	1.80***	(1.52,2.14)	1.40***	(1.16,1.68)			1.70***	(1.50,1.94)	1.33***	(1.17,1.52)		
Violence	1.23	(0.88,1.72)	0.94	(0.67,1.31)			1.39*	(1.05,1.85)	1.08	(0.82,1.43)		
Bullying	1.99***	(1.66,2.39)	1.45***	(1.19,1.77)			2.08***	(1.80,2.41)	1.56***	(1.35,1.80)		
Sexual harassment	1.40	(0.82,2.38)	1.01	(0.57,1.77)			1.19	(0.81,1.74)	1.10	(0.76,1.58)		

Note: EWCS 2010 sample restricted to employees, 15-70 years old, not in the armed forces. Data weighted. For each psychosocial factor, the reference category is not shown in the table. Legend for significance level: \* p<0.05, \*\*p <0.01, \*\*\* p<0.001. (a) Controlled for the psychosocial work factors shown in the table and country (34 dummies), age (5 age classes), health problems (backache, headaches, stomach pain, low-muscular pain, respiratory difficulties, cardiovascular diseases), sector of activity (Nace rev2, 10 categories), household composition (4 categories). (b) Controlled for the psychosocial work factors shown in the table and for country (34 dummies), health (hearing problems, backache, headaches, upper-muscular pain, respiratory difficulties, cardiovascular diseases, skin problems), sector of activity (Nace rev2, 10 categories), socioeconomic class (4 categories).



**Figure 1** - Prevalence of depressive symptoms by sex and country (EWCS 2010)

Note: EWCS 2010 sample restricted to employees, 15-70 years old, not in the armed forces. Data weighted. Depressive symptoms defined by  $WHO5 \leq 48$

## DISCUSSION

### Exposure to psychosocial work factors

Exposure to psychosocial work factors varied substantially across gender. Men were more exposed to psychological and cognitive demand, while women to emotional demand, demand for hiding emotion and sexual harassment. Thielen (50) showed the same differences in exposure in a sample of Danish employees, as well as Niedhammer (39) on a sample of European workers. The diversity of exposure is not unexpected, since women are more likely to be employed in services and person-related work (health care, education, social services, customer services), which are the sectors more exposed to emotional demand, demand for hiding emotion, threat and violence (34). Consistently with the results by Sverke et al. (49), prevalence of job insecurity was higher in lower social classes and among males, with almost half of the blue collars reporting job insecurity. In contrast to what emerged in other studies, we found no sig-

nificant difference between genders in exposure to low social support, whereas generally men have been found having higher exposure. In addition, in our study men were more exposed than women to low decision authority, whereas usually the opposite has been observed (e.g. 42).

### Prevalence of depressive symptoms

Our results were confirmed by a recent literature review on depression (43), which showed that, across studies, there is agreement on the following points: higher depression rates in women than men; curvilinear relationship between age and frequency of depression, with a peak in middle age; higher prevalence of depression in less privileged social groups. In turns, the finding that depression varies widely across countries is not yet conclusive. Two recent reviews on pan-European studies concluded that when taking into account design, sampling and other methodological differences between studies, little evidence seems to exist for considerable country variation (43, 55). On the

other hand, the WHO (15) concluded that overall prevalence of depression varies widely, from 8.2% in Italy to 20.5% in Ukraine as also pointed in the ODIN project (6), showing high prevalence for UK and Ireland, low prevalence for Spain and intermediate for all the remaining countries. However, the number of sampled countries was very small, limited to twelve in the best-case scenario. Furthermore, none of the previously mentioned studies provided tentative explanation of such country variation in addition to the differential response rate by country. Reasons probably include the fact that the wider EU is composed of states with different socioeconomic characteristics, different cultural, legal, social and health care systems, and different psychopathological traditions, all factors that may directly affect the prevalence of mental problems and indirectly through the way they are interpreted and communicated. The issue clearly deserves further investigation.

### **Association between psychosocial work factors and depressive symptoms**

In the multivariate analyses (table 3), the set of psychosocial factors that significantly predict depression does not vary substantially by gender. In general, the strength of the associations is moderate, with rather small differences between factors and genders. However, some interesting peculiarities emerged.

For both genders, the strongest predictor for depressive symptoms was social climate, also when effort-reward imbalance or job strain indicators were included in the fully adjusted models (data not shown in the table). The importance of this work characteristic has been found also in a longitudinal study, in which it resulted as the first predictor for depression (56), and in two cross-sectional researches, where it was found associated with work-related symptoms, sickness absence and high stress (33), and with poor mental health (5). The quality of the social community at work is a construct only partially overlapping with that of social support from coworkers; in fact, differently from the latter, the concept of social community is not task-oriented but refers to the opportunity for

pleasant and meaningful contacts and for feeling part of a greater social system (45).

Both the 'Demand-Control' (DC) and the 'Efforts-Rewards Imbalance' (ERI) models were supported by the results of our study. In both genders, psychological demand and at least a subscale of the job control dimension were associated with depressive symptoms, although high job strain increased significantly the risk only among men. This is in line with what has been reported in one of the most recent reviews on this topic, which found that the job strain hypothesis seems working better for men than women (9).

Job reward as well as ERI, were among the strongest predictors in both genders, even though in the fully adjusted model the protective role of job reward, was reduced by half. The predictive power of the ERI hypothesis is confirmed by previous research, showing that high effort-reward imbalance was associated with a high risk of depression in both genders, with a stronger association among men (e.g. 12).

The association of depressive symptoms with low social support at work was also confirmed, consistently with several studies. Very similar and significant risk estimates were found in both men and women for supervisor support, whereas for social support from co-workers the risk was stronger among men, in line with previous research (e.g. 47).

In the fully adjusted model, we found that emotional demand increased significantly the risk of depressive symptoms only among women, while other studies observed the positive association also among men (e.g. 4). However, the effect of emotional demand could be driven by a correlation with possible confounders, since in the partially adjusted model, the direction of the association was even reversed, as emotional demand reduced significantly the risk of depression in both genders (table 3, column 1 and 3).

The observed association with job security is in agreement with numerous studies showing an increased risk of depression, psychological distress or poor mental health (e.g. 49). Although the results of some studies would indicate a stronger association in men (e.g. 20), other studies found similar

associations in both genders (e.g. 21), as we did, leaving the issue still open to debate.

Work-family balance was a significantly protective factor in the analysis adjusted for age, country and health, but this association became non-significant after accounting for potential confounders, although some studies in the literature reported that conflicts between work and family roles have a detrimental effect on mental health (1, 3). However, similarly to us, other found that work-family conflict was significantly associated with depression in both genders, but these associations almost disappeared adjusting for other psychosocial work exposures (e.g. 36).

Although bullying was the strongest predictor of depression in both genders in the analysis adjusted only for age and country, once we controlled for health problems, the size of the associations greatly reduced, and reduced even further in the fully adjusted model, becoming at most marginally significant. Due to the very simplified “yes/no question” we used to measure bullying, we cannot conclude that the lack of a significant relationship implies a null effect. However, it is clear the role of other PWE variables as confounders, producing an upward bias in the association. Our result then is only partly in contrast with the literature showing bullying at work as a significant source of negative outcomes, like depression (31, 40) and increased sickness behavior (30). All these studies in fact did not control for other psychosocial work factors, but included only basic socio-demographic, behavioural and employment work characteristics. Our results suggest that the association found may be upward biased as a result of confounding by other unmeasured workplace factors, such as social climate for men and supervisor support for women, whose inclusion in our analyses made bullying only marginally significant.

One difference between genders is worthy to be mentioned. While for males the inverted u-shaped relationship between age and depression persisted also in the fully adjusted model (column 3), for females in the fully adjusted model age was no longer significant. This could be signalling that what matters for the development of depression among women, rather than a cyclical unavoidable path, is the content of the job itself.

## Strengths and limitations

A first strength of this study is the large sample, composed of almost 34,000 employees, which allowed us to examine the association of work-related factors on mental well-being in the general employed population and for a large number of countries, as well as to stratify all the analyses by gender, a crucial point in occupational studies (35). To our knowledge, this kind of analysis has been done before only by Niedhammer and colleagues (39), based on the previous wave of the EWCS (2005), but importantly, with a focus only on exposure to psychosocial work factors, since the WHO-5 well-being index was included in the questionnaire for the first time only in EWCS 2010.

A second strength of our study rests in the richness of the EWCS questionnaire, which allowed us to assess the potential effect of each psychosocial indicator controlling for a great number of other psychosocial and work-related factors. To our knowledge, most studies focused on a very limited number of exposures. Also, as a measure of outcome, the WHO-5 well-being index has been found as a reliable and valid instrument for detection of depressive symptoms, tested and validated against some of the most widely adopted and recognized scales, such as the CES-D (14), the BDI-1A (46) or the CIDI (24).

The validity of our results are subjected to some usual threats. One major limitation is that the measures of exposure to psychosocial factors were not based on standard and validated scales, although followed as much as possible theoretical models and concepts. This issue may lead to some imprecision in their measurement, particularly for what concerns the workplace violence indicators, which were measured through yes/no questions. Also, the internal consistency of some of the used measures was too low. Furthermore, the cross-sectional design does not allow to infer causal relationships from the observed associations between exposure to psychosocial factors at work and depressive symptoms, since there is the possibility that the presence of depressive symptoms has selected workers in jobs with higher exposure to adverse psychosocial factors, such as low job security

or low decision latitude; this eventuality appears however less plausible for other factors, such as high psychological demand. Another possible source of selection bias is the relatively low participation rate, which in the fifth EWCS was only 44%, with considerable variation among countries (19). Interestingly, an exploration of the correlation between prevalence of depression and response rate at the country level showed that there exists a positive rank correlation (Spearman's rho) between prevalence of depression and response rate (for women: rho=0.35, p-value=0.04; for men: rho=0.24, p-value=0.17). This finding suggests that the prevalence of depression could be overestimated in this study, although the distortion of the relative risks estimated for the work factors examined is expected to be rather small, also considering that non-respondents have likely higher rates of mental disorders than respondents (17).

A major concern is due to the so-called common method bias, which is attributable to the measurement method, rather than to the construct that the measure represents (44). In this context, both exposure and outcome measures are based on self-reports, which is the source of potential systematic measurement error, or differential misclassification. In fact, depression, and in general mental health, can influence perception of work, making difficult to exclude that subjects affected by depressive symptoms overestimated their exposure to psychosocial hazards, compared to non-cases, because of their symptoms. Several longitudinal studies have indeed demonstrated reverse causality between exposure to psychosocial factors and depression or common mental disorders, although the effects of work characteristics on well-being were causally predominant (13).

Furthermore, exposures and outcome cannot be conceived as completely independent, as personality traits or other individual characteristics may play an important role. In particular, individuals who are high in negative affectivity (NA), a broad personality trait that refers to the stable tendency to experience negative emotions (52), are more likely to report negative affective mood states across time and regardless of the situation, as well as to overestimate exposure to unfavourable events. Hence, it

could fairly be that the relationship obtained between psychosocial work factors and depression was overestimated, as found in some studies (10). Anyway, there is not unanimity over the inflating nature of NA and other scholars found that adjustment for personality traits had little effect on the relationship between self-reported mental health and work stress factors (42).

In conclusion, a high prevalence of depressive symptoms was found in the EWCS 2010, with wide variations between countries and with respect to socio-demographic characteristics. Several psychosocial factors at work were associated with depressive symptoms after adjusting for workplace co-exposures and other possible confounders. The results are mainly consistent with previous research, which strengthens the validity of our results. However, for a few psychosocial dimensions, such as for work-family conflict, workplace bullying, abuse, discrimination or violence, associations previously observed in other studies, were confirmed in the partially adjusted model only. To the best of our knowledge, the present study is almost the first one to consider so many psychosocial work dimensions simultaneously, suggesting that further research is needed to assess the presence and size of an independent association of these factors, in which adequate adjustment for all the dimensions defining the psychosocial work environment is performed.

NO POTENTIAL CONFLICT OF INTEREST RELEVANT TO THIS ARTICLE WAS REPORTED

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