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Association of Working Conditions with Self-Reported Work-Related Symptoms: Results from the Swiss Dataset of the European Working Conditions Survey

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Abstract: Working conditions are important determinants of health. The aims of this article are to 1) identify working conditions and work characteristics that are associated with workers' perceptions that their work is harmful to their health and 2) identify with what symptoms these working conditions are associated.

We used the Swiss dataset from the 2005 edition of the European Working Conditions Survey. The dependent variable was based on the question "Does your work affect your health?". Logistic regression was used to identify a set of variables collectively associated with self-reported work-related adverse health effects.

A total of 330 (32%) participants reported having their health affected by work. The most frequent symptoms included backache (17.1%), muscular pains (13.1%), stress (18.3%) and overall fatigue (11.7%). Scores for self-reported exposure to physicochemical risks, postural and physical risks, high work demand, and low social support were all significantly associated with workers' perceptions that their work is harmful to their health, regardless of gender or age. A high level of education was associated with stress symptoms, and reports that health was affected by work was associated with low job satisfaction.

Many workers believe that their work affects their health. Health specialists should pay attention to the potential association between work and their patients' health complaints. This is particularly relevant when patients mention symptoms such as muscular pains, backache, overall fatigue, and stress. Specific attention should be given to complaints of stress in highly educated workers.

Keywords: Working conditions, work related symptoms, occupational health, stress, statistic analysis.

INTRODUCTION

Occupational health problems are crucial economic and social issues. They remain significant in all countries despite efforts dedicated to their prevention. An estimated two million fatalities and 330 million work-related accidents still occur each year worldwide [1]. In Switzerland, the direct costs of occupational diseases were 124 million in 2007 [2]. These costs only include cases that are approved for workers' compensation and, therefore, only represent the tip of the iceberg. Research findings reveal that socioeconomic characteristics predict several health outcomes [3] that are rarely recognized as work-associated diseases (e.g., cardiac disease and depression). In addition, recent research has shown that working conditions can typically explain such associations [4, 5]. Few studies have measured the association between several different working conditions and adverse health outcomes in the general working population. However, those types of studies are relevant for adopting prevention strategies and research priorities, which, in turn, might reduce the load on the health care system and improve the use of available resources (e.g., medical or financial).

In 2005, for the first time, Switzerland participated in the European Working Conditions Survey (EWCS) conducted by the European Foundation for the Improvement of Living and Working Conditions. The analysis of the Swiss dataset [6] highlighted some interesting particularities. Similar to some Nordic countries, job satisfaction was very high in Switzerland: 91% of Swiss workers reported themselves as "satisfied" or "very satisfied" with their working conditions at their primary paid job (compared to 80% for European workers). However, the high job satisfaction results contrasted with workers' perceptions that their work was harmful to their health. Thirty percent of Swiss respondents answered positively to the question "Does your work affect your health?", which was close to the average EU27 score (of 35%). This means that many workers in Switzerland are satisfied with their job despite the fact that they think it affects their health. Another particularity of the Swiss dataset was that workers with work-related symptoms have, in general, fewer symptoms than other European workers. In the Swiss dataset, a majority (69%) of workers with work-related symptoms reported three symptoms or less. The corresponding percentage for European workers was 30%. These differences highlight the need to further and more deeply investigate the particularities of work-related symptoms in Switzerland and identify potential influential factors. Occupational exposure to physicochemicals and physical and postural risk

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factors as well as poor psychosocial work environments are well known contributors to several health problems. The aim of this article is to identify working conditions (among those included in the European Working Conditions Survey) that are associated with workers' perceptions that their job is detrimental to their health.

MATERIALS AND METHODOLOGY

The data originated from the 2005 edition of the European Working Conditions Survey. This survey is carried out by the European Foundation for the Improvement of Living and Working Conditions and has been conducted every five years since 1991 [7]. This survey includes questions about diverse working conditions and also includes the question, "Does your work affect your health?" This article presents a secondary analysis of the Swiss dataset.

Study Population and Participants

A total of 1,040 participants were interviewed. The sample was meant to be representative of individuals employed in Switzerland at the time of the study. The sample included persons aged 15 and over who, during the reference week, performed work for at least one hour per week for pay, profit or family gain. This definition also included persons not at work who had a job or a business from which they were temporarily absent because of, for example, illness, holidays, industrial dispute or education and training. The establishment of the sample followed a multi-stage stratified and clustered design. A random selection of participants was made using a phone registry. An extensive description of the sampling procedure is available in prior work [8]. Paper-and-pencil structured interviews were conducted between 19.09.2005 and 19.11.2005 in the household of each respondent.

Questionnaire

A forward and back translation technique was used to generate the French, German and Italian versions using the English version as reference. The questionnaire is available on the Dublin Foundation's web site (http://www.eurofound.europa.eu). Items from the questionnaire covered a broad range of working conditions, work characteristics, and worker satisfaction and perception towards different aspects of their job.

Independent Variables

A scale for self-reported exposure to physicochemical risk factors was calculated from 10 items. Risk factors included vibrations from tools or machinery, noise, high and low temperatures, smoke, fumes, powder or dust, contact with chemical products, radiation, passive smoke, and biological risks. A scale for exposure to physical and postural risks was calculated from 5 items (adopting tiring or painful positions, lifting or moving people, carrying or moving heavy loads, standing or walking, and performing repetitive hand or arm movements). A score for work demand was calculated from 13 items (frequent interruptions, precise quality standards, limited capacity to influence pace of work, self-appraisal of work quality, solving unforeseen problems without assistance, monotonous or complex tasks, frequent intellectually or emotionally demanding tasks, learning new things, working at a very high speed, working towards strict deadlines, or not having the time to get the job done). A scale for low social support was calculated from 3 items. The respondents were asked if it was possible to obtain assistance from colleagues, superiors, or external help when necessary. All scores were later divided by their maximal possible value to present them on a similar scale (0 to 1). Items included in different scores were verified for inter-item correlations and item-scale correlations [9]. Missing data were replaced by simple imputation: we used the mean of all observed values for all participants in place of the missing value. Only the score for low social support had higher than a 5% (19%) missing values. A single item question was used to measure satisfaction regarding working conditions at the primary paid job. This item was dichotomized as follows: "not very satisfied" or "not at all satisfied" = 0 and "satisfied" or "very satisfied" = 1.

Dependent Variable

The coding of the dependent variable (Does your work affect your health?) was 0 (no) and 1 (yes). Thus, odds ratios higher than 1 are to be interpreted as a positive association of independent variables and odds of providing a positive answer to the question "Does your work affect your health?". When respondents answered that their health was affected by their work, they were asked to explain how their health was affected. Answers were coded by the interviewer. Coding of symptoms was based on broad categories (e.g., hearing problems and stress, allergies), and participants had the ability to mention many symptoms.

Statistical Analysis

Descriptive statistics were used to describe participants' answers regarding demographics, work characteristics and self-reported adverse effects of work on their health. Associations between the dependent variable and the candidate covariates were analyzed using the logistic command. Robust standard errors were used [10]. Next, a multiple logistic regression model (logistic and logit command) was applied to assess the association between self-reported adverse effects of work on health and exposure. The data met the assumptions for logistic regression and were verified for multicolinearity, potential interactions, and outliers. The global goodness of fit of the model was evaluated using the area under the Receiver Operating Characteristic (ROC) curve. Analyses were performed with STATA software for Windows release 10.0 (Stata corporation, College Station, TX, USA).

RESULTS

A total of 1,040 persons took part in the structured interviews. From this number, a total of 1,028 (448 women and 580 men) provided a valid answer to the question "Does your work affect your health?". In the present article, only valid cases were considered. The mean (SD) age of the respondents was 44.4 (12.7) for men and 42.5 (12.2) for women. The mean number of years at work was 24.6 (14.3) for men and 20.5 (14.1) for women. Most of the participants (n=883, 85.9%) had an intermediate or high level of education. Individual characteristics are detailed in Table **1**.

A total of 201/580 men (34.7%) and 129/448 women (28.8%) reported that their health was affected by their work. Symptoms that were most frequently mentioned were back-

Table 1. Individual Characteristics of Participants

	Women n=448		Men n=580		Total n=1028	
	n	%	n	%	n	%
Age						
15-24	36	8.0%	33	5.6%	69	6.6%
25-34	83	18.4%	104	17.7%	187	17.9%
35-44	138	30.5%	183	31.1%	321	30.9%
45-54	111	24.5%	129	21.9%	240	23.1%
55-64	74	16.4%	113	19.2%	187	18.0%
65 and more	10	2.2%	26	4.4%	36	3.5%
Number of working years						
still studying	8	1.8%	9	1.5%	17	1.6%
less than 5	41	9.1%	42	7.2%	83	8.0%
5-10	85	18.8%	56	9.5%	141	13.6%
11-20	108	23.9%	131	22.3%	239	23.0%
21-29	118	26.0%	158	26.9%	276	26.5%
30-45	83	18.4%	161	27.4%	244	23.5%
45+	9	2.0%	31	5.2%	40	3.8%
Educational level						
Low (e.g., elementary school)	73	16.2%	75	12.8%	148	14.2%
Intermediate (e.g., vocational education)	255	56.4%	268	45.6%	523	50.3%
High (e.g., university or equivalent)	124	27.4%	245	41.6%	369	35.5%

ache (17.1%), muscular pains (13.1%), stress (18.3%) and overall fatigue (11.7%).

Alpha values (Cronbach) calculated for each working risk factor ranged from 0.55 to 0.75. At $p<0.05$, the score for exposure to physicochemical risks was significantly correlated with both the score for postural and physical risks and the score for high work demand. Other inter-score correlations were not significant, but the p value was close to the significance level for two pairs of scores (score of postural and physical risks and score for high work demand, $p=0.06$; score for postural and physical risks and score for low social support, $p=0.07$). Mean values for scores, as well as the association of each score with the self reported effects of work on health, are shown in Table **2**. Reporting that health was affected by work was associated with a low satisfaction with the working conditions of the respondents' primary paid job ($\chi 2(1, N=1028)=46.9$, $P<0.001$).

The multiple variable model is shown in Table **3**. A test of the full model with all variables against a constant only model was statistically significant, Wald $\chi 2(8, N=1028)=130.7$, $P<0.001$. The area under the ROC curve was 75%. All four scores for working conditions were associated with self reported effects of work on health (Tables **2** and **3**), and the strength of the association was different across symptoms (Table **4**). When symptoms were separately analyzed, level of education was the only one associated with stress-related symptoms. Age and gender were not significantly associated with self reported adverse effects of work on health.

DISCUSSION

Nearly one-third of participants in the survey reported that their health was affected by their work. This is striking considering that the number of compensated cases of work-related diseases in Switzerland is rather low and that workers are generally satisfied with their jobs [6]. There is scientific evidence that work-related diseases are under-recognized and under-reported in many countries [11]. Our results are consistent with those findings. This is a significant issue because reliable statistics on this topic are critical for establishing occupational health policies. Physicians can play a decisive role in the notification and recognition of work-related diseases by recording patients' occupational histories, identifying potential links between diseases and work, and supporting patients when completing a claim [12]. Thus, research aimed at better understanding the barriers faced by physicians during the process of reporting work-related diseases is of high importance.

Table 2. Mean Scores (SD) and Simple Association to Self-Reported Adverse Effects of Work on Health (P Values Resulting from Logistic Regression Procedures Using Robust Standard Error)

Variables	Health Affected by Work Mean (SD)	Health Not Affected by Work Mean (SD)	P Value
Women n=448	n=129	n=319	
Age	42.4(12.12)	42.6(12.28)	0.847
Exposure to physicochemical risks	.235(0.092)	.191(.063)	<0.001
Exposure to postural and physical risks	.442(.173)	.338(.134)	<0.001
Work demand	.711(.178)	.616(.189)	<0.001
Low social support	.423(.302)	.361(.275)	0.040
Men n=580	n=201	n=379	
Age	42.9(11.3)	45.1(13.3)	0.041
Exposure to physicochemical risks	.288(.122)	.221(.088)	<0.001
Exposure to postural and physical risks	.403(.155)	.319(.119)	<0.001
Work demand	.742(.150)	.682(.146)	<0.001
Low social support	.417(.307)	.353(.285)	0.014
Total n=1028	n=330	n=698	
Age	42.7(11.59)	43.9(12.90)	0.123
Exposure to physicochemical risks	.267(.114)	.207(.079)	<0.001
Exposure to postural and physical risks	.418(.163)	.328(.126)	<0.001
Work demand	.730(.162)	.652(.170)	<0.001
Low social support	.419(.305)	.357(.280)	0.001

Table 3. Multiple Logistic Model: Association of Demographics and Work Characteristics with Self-Reported Adverse Effects of Work on Health (n=330 Cases with Self-Reported Adverse Effects of Work on Health)

	Coef.	Robust Std. Err.	P>z	OR	95% Conf. Interval	
Total n=1028						
Age (in decade)	0.011	0.061	0.857	1.01	0.90	1.14
Gender [b]	-0.312	0.157	0.843	0.97	0.71	1.32
Educational level - intermediate. [a]	0.408	0.233	0.080	1.50	0.95	2.38
Educational level - high [a]	0.650	0.260	0.012	1.91	1.15	3.19
Exposure to physicochemical risks	0.389	0.093	<0.001	1.48	1.23	1.77
Exposure to postural and physical risks	0.397	0.661	<0.001	1.49	1.31	1.69
Work demand	0.319	0.052	<0.001	1.38	1.24	1.52
Low social support	0.082	0.024	0.001	1.09	1.04	1.38

[a]Educational level – "low" used as reference.
[b]Men used as reference.

Table 4. Multiple Logistic Models: Association of Demographics and Work Characteristics with Specific Self-Reported Symptoms

	Backache Coef. (Robust SD)	Muscular Pains Coef. (Robust SD)	Stress Coef. (Robust SD)	Overall Fatigue Coef. (Robust SD)
positive cases	n=176	n=135	n=188	n=120
Age (in decade)	0.017(0.074)	-0.041(0.078)	-0.065(0.066)	-0.105(0.079)
Gender [b]	-0.186(0.203)	0.268(0.215)	-0.014(0.183)	0.177(0.210)
Educational level - intermediate.[a]	0.097(0.261)	0.299(0.297)	0.412(0.294)	0.286(0.319)
Educational level – high [a]	-0.261(0.311)	0.537(0.342)	0.748(0.313) *	0.525(0.342)
Exposure to physico-chemical risks	0.405(0.103) ***	0.300(0.104) **	0.153(0.104)	0.226(0.105) *
Exposure to postural and physical risks	0.536(0.076) ***	0.476(0.081) ***	0.235(0.073) **	0.243(0.079) **
Work demand	0.203(0.063) **	0.221(0.067) **	0.512(0.071) ***	0.392(0.080) ***
Low social support	0.041(0.030)	0.075(0.033) *	0.123(0.028) ***	0.101(0.033) **

[a]Educational level – "low" used as reference.
[b]Men used as reference.
*Significant at P<.05.
**Significant at P<.01.
***Significant at P<.001.
Note: Coefficients correspond to natural logs of odds ratios.
Note: Some cases reported more than one symptom. Each model includes all cases.

All four scores for working conditions were significantly associated with self-reported adverse effects of work on health. This is consistent with the scientific literature regarding working conditions (e.g., psychosocial, physicochemical and poor ergonomics related risks) and their potential adverse effects on health. The strength of the association differed across symptoms (Table **4**). This supports the idea that the observed correlations reflect true associations of working conditions with symptoms and not inflated values due to common method variance (although common method bias cannot be entirely excluded).

Self rating of health is common (e.g.,[13]), and there is consistent scientific evidence regarding the validity of this method in epidemiological studies [14]. Conversely, self reporting of work-related symptoms is less common. This is peculiar because such measures offer clear advantages for occupational health research and might complement more common measurement techniques (e.g., medical evaluation and expert assessment). For example, methods based on the self-reported work relationship of symptoms are less expensive, less time consuming, and easier to implement than methods involving an extensive medical examination. Compared to data from compensation agencies, the self-reported relationship between work and symptoms allows researchers to obtain information at an early stage in the pathological process (e.g., before the respondent experiences any disabling disorders resulting from the exposure). Recent literature suggests that self-reported work-related symptoms (e.g., musculoskeletal disorders) are in agreement with expert assessments and do not lead to exaggerated work associations [15]. They will not replace medical examination but these measures are likely to become more frequently used in research for occupational health, although their validity still needs further evidence.

There is strong scientific evidence that socio-economic status is related to health [3], and level of education is known to be a determinant of socioeconomic status [16]. However, our results give the impression that, compared to participants with a low level of education, participants with a high educational level are more likely to report that their health is affected by their work (Table **3**). Part of this association might result from the common variance among the scores included in our models. For example, models including "exposure to physicochemical risks" or "postural and physical risks" comprise an important socio-economic component that also correlates with a low educational level. We think that including those scores in multivariate models partly controls for socio-economic status. Therefore, our results imply that when controlling for all scores (and consequently for socio-economic status), highly educated workers appear more likely to report that their health is affected by their work than participants with a lower level of education. A possible explanation for this result is that highly educated workers might be more aware of potentially harmful working conditions, and therefore more capable of relating their health problems with their occupation. Our analyses point towards another potential explanation: in Table **4**, the level of education was significant only in the model for stress symptoms. Therefore, the observed association in Table **3** appears to be due to the dominance of stress symptoms in the overall association and to the fact that these symptoms specifically affect highly educated workers. This is interesting because highly educated workers are supposed to have access to jobs with significant decision latitude and reward. One would expect

the stress symptoms to be less frequent in highly educated workers than in the rest of the working population. Our results suggest that it is not necessarily the case, and further research focused on stress related symptoms in highly educated workers is necessary. Such studies could provide information about self-reported perceived and objective stress levels. This also highlights the need for work-related stress interventions for this specific subgroup of workers.

As mentioned above, the Swiss and European datasets differ in regards to satisfaction, but are comparable in the proportion of workers reporting that their health is affected by their work. One possible explanation for this discrepancy could be that perceived health effects related to work do not impair job satisfaction. Our results suggest that this is not the case: self-reported effects of work on health were clearly associated with a low satisfaction with working conditions at a primary paid job. Work is said to be socially valued in Switzerland, and it is no surprise that Swiss workers report that they are generally more satisfied with their job than workers in most European countries. Thus, Swiss workers might be more likely to be satisfied with their job despite harmful working conditions. This could also be a consequence of the interview-based method and the potential social desirability for "satisfied" or "very satisfied" responses. Another possibility could be that risk factors in Switzerland are often related to rewarding aspects of work. For example, this might be the case with stress-related symptoms in jobs with a high level of responsibility. This question goes beyond the scope of this article, and further research is required to better understand the complex relations between health, satisfaction, and different working conditions. More precisely, our analyses suggest a need to further investigate why workers with occupational health problems remain satisfied with their job. In other words, what is the compensation for tolerating harmful working conditions? Answering this question is crucial for establishing preventive programs at an organizational level.

Several potential limitations of this study must be addressed. The cross-sectional design precludes any causal inferences. In fact, it is unclear in which direct the effect occurs, as health problems may influence the perception of work characteristics, at least for some items included in our scores. However, the scientific literature is clear regarding the pathogenesis of occupational health disorders, and there is evidence, for example, that awkward postures, breathing noxious vapors or being exposed to stressful working conditions are health-related risk factors. In addition, a healthy worker effect is likely to have occurred because only people from the working population were interviewed. All study variables were based on self-reports that bear the risk of creating inflated relationships due to the influence of common methods. However, models for the specific symptoms (Table **4**) are different; this suggests that observed associations are not only the consequence of monomethod biases. Potential respondents who were not able to speak the language used in the survey were not included. Therefore, a selection bias that excluded respondents with the most precarious and challenging working conditions cannot be ruled out because many of those jobs are occupied by foreign workers and first generation immigrants. This is also reflected by the sample's high proportion of highly educated workers. The question used to measure the dependent variable was broad and may represent severe chronic or invalidating conditions, as well as minor symptoms. However, symptoms of overall fatigue [17] or non-severe back pain can be interpreted as precursors to more serious impairments.

CONCLUSION

The prevention of work-related diseases should be a priority for policy makers. Risk factors related to bad ergonomics (OR=1.49; 95% CI = 1.31-1.69), physicochemical risks at work (1.48; 1.23-1.77) and poor psychosocial working environments (e.g., high work demand (1.38; 1.24-1.52), low social support (1.09; 1.04-1.38) are well suited for predicting the self-reported adverse effects of work on health, irrespective of age or gender. Frequently reported effects of work on health include back and muscle pain as well as fatigue and stress related symptoms. When treating patients for such problems, health specialists should pay attention to their potential relationship to work. This is crucial for implementing necessary changes at work. This is also the starting point for a reporting process that might be conducted to obtain a better recognition of work-related diseases. Particular attention should be given to stress-related symptoms in highly educated workers. Particularities of the highly educated workers should be better investigated, specifically with regard to satisfaction and the number and the types of symptoms they report.

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