

ORIGINAL ARTICLE

Effort–reward imbalance and medically certified absence for mental health problems: a prospective study of white-collar workers

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ABSTRACT

Objective Little is known about the effects of psychosocial work factors on objectively assessed mental health problems leading to medically certified absence. Only one study has evaluated the prospective effects of effort–reward imbalance (ERI) at work with regards to this outcome. The present study aimed to evaluate the effects of ERI on the incidence of medically certified absence for mental health problems.

Methods The study included 2086 white-collar workers (63.3% women) employed in public organisations in Quebec city. Participants were followed over a 9-year period. Medical absences from work were collected from employers' files and psychosocial factors were measured using the ERI questionnaire. Cox regression models were used to estimate the incidence of certified sickness absence due to mental health problems that lasted 5 workdays or more, while controlling for confounders.

Results Workers exposed to ERI had a higher risk of a first spell of medically certified absence for mental health problems (HR=1.38, 95% CI 1.08 to 1.76) compared with unexposed workers. Low reward was significantly associated with a high risk among men (HR=2.80, 95% CI 1.34 to 5.89) but not in women (HR=1.24, 95% CI 0.90 to 1.73). Effort at work had no effect on certified absence. All these effects were adjusted for potential confounders.

Conclusions ERI and low reward at work were prospectively associated with medically certified absence for mental health problems. These effects seem to differ by gender. Primary prevention that is aimed at reducing these stressors should be considered to help reduce the incidence of such severe mental health problems.

INTRODUCTION

According to the WHO, mental health problems account for close to a third of the disease burden associated with non-communicable diseases in high-income countries.¹ Altogether, depression and anxiety represent the second leading reason for visiting a general practitioner in North America (USA and Canada).² Mental health problems have become a major health issue in working populations of industrialised countries.³ These problems also constitute the first or second cause of sickness absences from work^{4–5} and represent the leading cause of disability for ages 15–44.⁶ These absences usually have a long duration and a high risk of recurrence, thus leading to a considerable social burden and loss of productivity.^{5–7}

What this paper adds

- This is the first study evaluating a 5-year prospective effect of effort–reward imbalance on the incidence of medically certified absence for mental health problems in women and men.
- Low reward and effort–reward imbalance at work are associated with medically certified absence for mental health problems, these associations differing by gender.
- These results strengthen the need for primary prevention aiming to improve rewards and effort–reward imbalance at work, in order to reduce mental health problems leading to medically certified absence from work.

A strong body of evidence indicates that psychosocial factors at work have adverse effects on self-reported mental health problems.^{8–11} One noteworthy theoretical model used to assess work factors is the effort–reward imbalance (ERI) model proposed by Siegrist.¹² This model focuses on the concept of rewards and identifies a social reward deficiency that was not assessed by the demand–control (DC) model.¹³ This former model is based on the principle of reciprocity between extrinsic efforts (such as pressure to work overtime, increasingly demanding work, constant time pressure) and expected rewards (ie, salary, esteem, job security, promotion prospects, unforced job changes).¹² The model postulates that workers whose efforts at work are not adequately compensated by rewards (called “effort–reward imbalance”) have a higher risk of deteriorating health, including mental health.^{10–14} In fact, ERI is assumed to lead to a state of stress by provoking strong negative emotions,¹⁴ which in turn, activate the hypothalamic–pituitary–adrenocortical axis and alter the diurnal pattern of cortisol secretion,¹⁵ ultimately contributing to the development of affective disorders.¹⁶

Some prospective studies evaluated the association of ERI with absence from work using certified absence data.^{17–19} However, prospective studies that evaluate the association of psychosocial work factors and diagnosis-specific sickness absence are scarce, especially for mental health problems.^{4–20–23} Furthermore, it has been suggested that work factors and the frequency of certified

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sickness absence vary by gender.^{21 24 25} More precisely, psychosocial work factors have been shown to be more prevalent among women than men.²⁶ Work stress may also have different effects on women's and men's health, given similar levels of exposure.²⁷ To the best of our knowledge, only one study has assessed the prospective associations of ERI⁴ with the incidence of medically certified absence for mental health problems. However, this single study was restricted to nurses, had a low proportion of men (6%) and was limited by a short follow-up period (17 months).

To add to the available evidence on the relationship between psychosocial work factors and objectively assessed mental health problems, the present study will evaluate the effect of ERI on the incidence of medically certified absences for mental health problems of ≥ 5 workdays among white-collar workers. This paper will also consider a gender perspective.

METHODS

Population and design

The present study is part of a larger study on psychosocial work factors and health²⁸ using the same population. Workers (N=3987) from three public insurance organisations in Quebec City were invited to participate. Self-reported data collection was performed using three time measurements: at baseline in 2000–2003 (T₀), after 3 years (T₁) and after 5 years (T₂). The participation rates were 80.9% at baseline, and 86% and 85% at the second and third measurements, respectively. At their entry in the study, workers had to meet the following criteria: (1) being <60 years old; (2) not having a sickness absence of 5 workdays or more for mental health problems during the previous year (in order to exclude prevalent cases); (3) working at least 21 h per week; (4) not being pregnant; (5) not being treated for mental health problems; and (6) having ≤ 2 missing data on either one of the effort or rewards scales. A total of 2304 workers were enrolled in the current study. Participants had different white-collar occupations, including senior management (5.0%), professional positions (40.1%), technical jobs (24.7%) and office jobs (30.2%). Of these workers 2280 (98.9%) gave the informed consent for collection of their certified absence data. Each worker was followed from the completion of his/her first questionnaire until the first certified absence for mental health problems, their exit from work, or the end of the study, whichever came first. Sickness absence data were collected during follow-up (Mean follow-up: 4.88 years (SD=2.60)). Only five workers (0.2%) did not have matched data for work factors and sickness absence, and thus, were considered lost during follow-up. The study population was thus composed of 2086 employees (63.3% women), including new workers (621 and 203 at the second (T₁) and third (T₂) measurements, respectively).

Data collection

Data were collected using a self-administered questionnaire at work concerning demographic characteristics, psychosocial work factors, family responsibilities and lifestyle factors. Height and weight were measured by trained staff, using conventional instruments. Sickness absence data were collected from the computerised records of the employers.

Medically certified absence

Certified absence obtained from the employers' files included the diagnosis, the exact date of onset and the exact duration of each episode. The three organisations had a similar policy for medically certified absence: for each episode ≥ 5 workdays,

workers had to provide a medical certificate from a physician to their employer in order to get compensation. When the diagnosis was unavailable (15.07% of episodes), information on the related health problem(s) was collected from workers by telephone interviews. Concerning mental health problems, missing diagnoses were collected only for 5.34% of the episodes. Thirty-five absences remained without any diagnoses (N=6 in 2005 and N=29 in 2009), either because participants could not be reached or did not remember the reason for the absence. Diagnoses on medical certificates were coded by a medical archivist using ICD-10. The following ICD-10 codes were included as mental health problems: F10-F19; F30-F39; F40-F48; F50-F59; F60-F69; F99. In addition to these codes, occupation-related health problems (code Z56.7), non-specific sleep problems (code G47.9), professional harassment (Z65.8), fatigue, asthenia, burnout and professional exhaustion (code R53) were classified as mental health problems. A committee of physicians revised each diagnosis in order to exclude psychiatric disorders for other causes (eg, schizophrenia and paranoia). Overlapping and consecutive spells of sickness absence (<30 working days between two episodes) were merged into a single spell. If at least one of the single spell had a mental health diagnosis, then the merged spell was considered as a medically certified absence for a mental health problem. Note that the first incident episode of certified absence lasting 5 workdays or more for mental health problems constituted the main outcome of the present study.

Psychosocial factors

The modified French version of the ERI instrument was used to assess psychosocial work factors. Extrinsic efforts were measured at baseline using two original items ("having to do overtime" and "in recent years, my job became more demanding"),¹² and two proxies ("I have enough time to do my job" and "my task is often interrupted before I finish it, so I must come back later") (Cronbach $\alpha=0.65$). All the original items for effort were available at the second and third measurement. Rewards at work were measured using the 11 original items recommended by Siegrist¹² at each measurement. These items were divided into three scales assessing: esteem (five items), promotions and salary (four items) and job security (two items). The psychometric qualities and the one-year stability²⁹ of the French version of the ERI instrument have previously been demonstrated. In the current study, all items used a 4-point Likert-type response format, ranging from 1 (strongly disagree) to 4 (strongly agree). For participants having one or two missing items on the reward scale (1.63%) or one item missing on the effort scale (1.34%), an imputation was done, based on the mean score drawn from the other participants' answers to those particular items. Workers with more missing values at baseline were excluded from the analyses (N=7 (0.33%)). The ERI score was obtained using the formula $e/(rxc)$ where 'e' is the sum score of the effort scale, 'r' is the sum score of the reward scale, and 'c' defines a correction factor for different numbers of items in the nominator and denominator.¹² Workers with a ratio above 1.0 were defined as exposed. Effort and reward scale scores were also categorised in tertiles for separate analysis of each factor.

Covariates

Demographic characteristics included gender, age (continuous), educational level (secondary school or less, community college or university), job type (clerical, technician, professional and executive) and living situation (living with a partner or not).

Workplace

Psychosocial factors outside work included the number of children, the share of domestic work and individual stressful events over the past 12 months. Home load was defined by an index based on the living situation, the number of children and the share of domestic work (in tertiles). Individual stressful life events were measured using the frequency of such events during the past 12 months: losing one's job, being sick, divorce or death of a spouse, financial difficulties, etc. Lifestyle factors assessed were cigarette smoking (≥ 1 cigarette/day), alcohol drinking (number of times per week), sedentary behaviours (leisure time physical activity ≤ 1 time/week) and body mass index (BMI) in kg/m^2 (< 25 , 25 – 27 , ≥ 27). Job strain from the DC model was used as a covariate in analysis. Psychological demands (PD) and decision latitude (DL) were measured using the validated French version of Karasek's questionnaire.^{13 30} Workers were then classified into the usual four categories of job strain: low strain (low PD and high DL), passive (low PD and low DL), active (high PD and high DL) and high strain (high PD and low DL).

ANALYSES

Baseline characteristics of participants were described by gender. Person-years of follow-up were calculated from the baseline questionnaire until the first of the following three events, whichever came first: (i) the participant had a sickness absence of 5 workdays or more for a mental health problem, (ii) the participant definitively had left the organisation (eg, retirement), or (iii) the end of the study. Sickness absences for other health problems were not considered as an endpoint, and their duration was excluded from the person-years estimate. Rates of sickness absence for mental health problems per 100 person-years were computed using the Kaplan–Meier method. Cox regression models were used to estimate HRs for the time-to-onset of the first spell of sickness absence for mental health problems, as well as their 95% CIs. The proportionality was assessed. A sequential adjustment for covariates was conducted. Model 1 was crude, Model 2 was adjusted for age and education and Model 3 was further adjusted for marital status, home load, stressful events and lifestyle factors. Sensitivity analyses were performed while (i) adjusting for job strain, (ii) adjusting for job category, (iii) excluding workers with self-reported diagnosis by telephone interview, (iv) excluding the first year of follow-up, (v) using PD items in the ERI ratio and (vi) using the number of spells as the outcome. All analyses were either adjusted for gender or conducted separately for women and men. Analyses were performed using SAS V9.2 software.

RESULTS

Table 1 presented the baseline characteristics by gender. Overall, 281 (14.5%) persons had at least one spell of absence lasting 5 workdays or more for a mental health problem. Most spells of certified absence related to mental health problems (64.77%) lasted 28 days or more, with a mean duration of absences of 95.6 days (SD=120.8). The cumulative incidence of certified absences was higher among women (16.8%) than men (7.7%). Also, the incidence density was almost two times higher among women than men (3.54 and 1.51 per 100 person-years, respectively). Note that the incidence of medically certified absence for alcoholism and drug abuse was higher among men (1017%) compared with women (1.80%) ($p=0.006$). However, absences for other mental health problems were higher among women, but associations were not statistically significant (p varying from 0.053 for anxiety to 0.22 for personality disorders) (See online supplementary appendix). Furthermore, women were younger,

Table 1 Baseline characteristics of participants, by gender

Variables	Men	Women	p Value
N (%)	765 (36.67)	1321 (63.33)	
Age (%)			<0.001
<40 years old	29.02	35.81	
40–49 years old	43.01	47.62	
≥ 50 years old	27.97	16.57	
Education level (%)			<0.001
Secondary school or less	12.16	30.23	
Community college	32.28	33.86	
University	55.56	35.91	
Occupation (%)			<0.001
Clerical	14.38	38.83	
Technical	23.79	29.98	
Professional	53.73	27.18	
Executive	8.10	4.01	
Marital status (%)			<0.0001
Married/part of a couple	72.48	66.87	
Single/divorced/widower	27.52	33.13	
Overweight* (%)	67.64	43.76	<0.001
Sedentary behaviour† (%)	16.60	20.77	
Smoking‡ (%)	11.63	16.05	0.005
Alcohol consumption (%)			
<1 time a week	29.93	39.24	
1–10 times a week	55.56	54.85	<0.001
≥ 11 times a week	14.51	5.91	
Stressful events (%)			<0.001
None	54.46	44.79	
1 event	32.53	34.73	
≥ 2 events	12.89	18.38	
Home load (%)			<0.001
Low	33.12	26.12	
Intermediate	42.41	34.35	
High	24.47	39.53	
Absences (yes) (%)§	7.71	16.81	0.001
Effort (%)			<0.001
Low	24.71	26.65	
Intermediate	34.77	37.09	
High	40.52	36.26	
Reward (%)			
Low	36.73	32.25	
Intermediate	29.93	30.28	0.074
High	33.34	37.47	
ERI (%)	27.32	28.31	0.626

Bold indicates associations which are statistically significant.

*Had BMI greater or equal to $25 \text{ kg}/\text{m}^2$.

†Performed leisure physical activity one time or less a week.

‡Occasional or regular smokers were included.

§First medically certified absence during follow-up.

BMI, body mass index; ERI, effort-reward imbalance.

less educated, had more stressful events, home load and job strain, and were employed in greater proportions as office workers than men. Men and women were comparable in terms of reward but men had more high-effort jobs than women. At baseline, 28.31% of women and 27.32% of men were exposed to ERI.

In the present study, no association was found between effort at work and medically certified absence for mental health problems. The effect sizes of high and medium effort were weak and non-significant for all workers in the crude model, and remained so after adjustment for age, gender, education, living

situation, home load, stressful events and lifestyle factors (HR=1.06, 95% CI 0.77 to 1.44 and HR=1.14, 95% CI 0.84 to 1.56 respectively) (table 2). No statistically significant interaction was found between effort and gender ($p=0.74$), and the associations were of similar magnitude in each gender stratum (table 2).

A modifying effect of gender was observed in the association between reward at work and the risk of medically certified absence for mental health problems ($p=0.05$, table 3). Men with low and medium reward had higher risk when compared with men with high reward (HR=2.80; 95% CI 1.34 to 5.89 and HR=2.36; 95% CI 1.09 to 5.12 respectively). Among women, the associations were weak and non-significant for low (HR=1.24, 95% CI 0.90 to 1.73) and medium (HR=1.09 95% CI 0.77 to 1.54) reward. These associations were all adjusted for age, education, marital status (living situation), home load, stressful events and lifestyle factors (table 3).

There was a statistically significant effect of ERI on the risk of medically certified absence for mental health problems among exposed workers. Compared with unexposed workers, those exposed to ERI had a higher risk of certified sickness absence (HR=1.38, 95% CI 1.08 to 1.77) after adjustments for age, education, marital status (living situation), home load, stressful events and lifestyle factors (table 4, Model 5). However, the associations of ERI with certified absence were stronger among women (HR=1.41; 95% CI 1.07 to 1.87) than in men (HR=1.17; 95% CI 0.67 to 2.06). Although the effects of ERI tended to differ by gender, no positive interaction was found between ERI and gender ($p=0.66$).

DISCUSSION

The current study aimed to evaluate the effect of ERI on the incidence of medically certified absences for mental health problems of 5 workdays or more, among white-collar workers. Main results show a moderate and statistically significant effect of ERI on certified absence for mental health problems among all workers. These results are consistent with the single previous study on ERI and medically certified mental health problems.⁴

Table 2 Effort at work and the incidence of a first spell of medically certified absence for a mental health problem

	N*	Model 1	Model 2	Model 3
		N=2086	N=2085	N=2055
		HR (95% CI)	HR (95% CI)	HR (95% CI)
All†				
Low	542	1.00	1.00	1.00
Medium	756	1.12 (0.83 to 1.53)	1.13 (0.83 to 1.54)	1.14 (0.84 to 1.56)
High	787	1.03 (0.76 to 1.40)	1.10 (0.81 to 1.50)	1.06 (0.77 to 1.44)
Men				
Low	190	1.00	1.00	1.00
Medium	268	1.11 (0.57 to 2.15)	1.12 (0.57 to 2.19)	1.09 (0.54 to 1.17)
High	309	0.85 (0.44 to 1.67)	0.89 (0.45 to 1.74)	0.94 (0.47 to 1.89)
Women				
Low	352	1.00	1.00	1.00
Medium	486	1.13 (0.80 to 1.60)	1.15 (0.81 to 1.62)	1.13 (0.80 to 1.61)
High	480	1.14 (0.81 to 1.61)	1.18 (0.83 to 1.67)	1.11 (0.78 to 1.57)

N*=Number of subjects in Model 2.

Model 1: crude HR.

Model 2 is adjusted for age and education.

Model 3 is further adjusted for marital status, home load, stressful events, smoking status, alcohol consumption, body mass index and sedentary behaviours.

†Analyses were also adjusted for gender.

Table 3 Reward at work and the incidence of a first spell of medically certified absence for a mental health problem

	N*	Model 1	Model 2	Model 3
		N=2086	N=2085	N=2055
		HR (95% CI)	HR (95% CI)	HR (95% CI)
All†				
High	711	1.00	1.00	1.00
Medium	626	1.35 (0.99 to 1.85)	1.29 (0.95 to 1.76)	1.25 (0.91 to 1.71)
Low	748	1.68 (1.25 to 2.24)	1.57 (1.17 to 2.10)	1.48 (1.10 to 1.99)
Men				
High	282	1.00	1.00	1.00
Medium	228	2.39 (1.11 to 5.15)	2.30 (1.07 to 4.97)	2.36 (1.09 to 5.12)
Low	255	3.65 (1.78 to 7.46)	3.42 (1.66 to 7.06)	2.80 (1.34 to 5.89)
Women				
High	430	1.00	1.00	1.00
Medium	396	1.16 (0.82 to 1.63)	1.13 (0.80 to 1.60)	1.09 (0.77 to 1.54)
Low	494	1.31 (0.95 to 1.81)	1.30 (0.94 to 1.79)	1.24 (0.90 to 1.73)

Bold indicates associations which are statistically significant.

N*=Number of subjects in Model 2.

Model 1: crude HR.

Model 2 is adjusted for age and education.

Model 3 is further adjusted for marital status, home load, stressful events, smoking status, alcohol consumption, body mass index and sedentary behaviours.

†Analyses were also adjusted for gender.

When effort and reward were analysed separately, no association was found between effort and certified absence for mental health problems whereas a strong association was found with low reward. This deleterious effect of low reward on mental health has been previously reported.^{4 31} Furthermore, some gender-specific associations were also observed for the effect of low reward and ERI at work.

High efforts at work and medically certified absence for mental health problems

The current study found a lack of association between high effort at work and medically certified sickness absence for mental health problems, regardless of gender. These results are consistent with previous studies on both self-reported depression and anxiety.^{14 32} One study⁴ reported a strong association between high effort and certified absence for mental health problems, while using the psychological demands (PD) scale. In fact, a complementary analysis conducted showed that certified absences were also more strongly associated with high PD than with high effort in the current study (data not shown).

This lack of association between effort at work and medically certified absence for mental health problems may be related to our measure of effort, which uses a few items from the ERI model and two proxies. These items might have been unable to capture all the various forms of effort since they are diverse in nature and notoriously difficult to measure.^{11 33} This could have led to a non-differential information bias thus underestimating the effect of effort at work.³⁴ Future studies should use original items to assess effort at work.

Low reward at work and medically certified absence for mental health problems

In the present study, the risk of certified absence for mental health problems associated with low reward at work was strong and significant among men, but moderate and non-significant among women. Men with low reward had a threefold higher risk of certified absence for mental health problems compared

Table 4 Effort-reward imbalance at work and the incidence of a first spell of medically certified absence for a mental health problem

	N*	Model 1 N=2086 HR (95% CI)	Model 2 N=2085 HR (95% CI)	Model 3 N=2055 HR (95% CI)
All†				
Non-exposed	1504	1.00	1.00	1.00
Exposed	581	1.39 (1.09 to 1.78)	1.42 (1.11 to 1.82)	1.33 (1.08 to 1.77)
Men				
Non-exposed	559	1.00	1.00	1.00
Exposed	208	1.24 (0.72 to 2.14)	1.20 (0.69 to 2.09)	1.17 (0.67 to 2.06)
Women				
Non-exposed	946	1.00	1.00	1.00
Exposed	372	1.44 (1.09 to 1.90)	1.47 (1.11 to 1.94)	1.41 (1.07 to 1.87)

Bold indicates associations which are statistically significant.

N*=Number of subjects in Model 2.

Model 1: crude HR.

Model 2 is adjusted for age and education.

Model 3 is further adjusted for marital status, home load, stressful events, smoking status, alcohol consumption, body mass index and sedentary behaviours.

†Analyses were also adjusted for gender.

with men with high reward. In line with our results, Niedhammer *et al*³⁵ found low reward to be associated with a higher prevalence of sickness absence among men. However, this study was cross-sectional and used self-reported data of absence. Bourbonnais *et al*⁴ reported significant associations for all workers but did not stratify analysis by gender. As previously mentioned, this latter study was restricted to nurses, had a low proportion of men (6%), and a short follow-up period (17 months).⁴

It has been suggested that women used to receiving less recognition than men for housework or caring for family members.²⁷ Considering this sociocultural context, women may become less sensitive to low reward such that low reward at work might have a less adverse effect on their health. Women may also tend to choose less skilled and underpaid jobs for strategic reasons or to spend more time with their family.³⁶ Furthermore, there is a difference in job tasks by gender (even for jobs with the same title),²⁷ and more men than women hold professional and executive jobs; therefore, it is likely that men held more challenging jobs with a lack of recognition.^{27 33} Finally, women may also have different values concerning work; they might attribute more importance, for example, to the social utility of their work instead of the remuneration.²⁷ It may therefore be that low reward is more relevant to men's relation to work and mental health than women's. Future studies evaluating medically certified absence for mental health problems are needed to better understand the gender-specificity of low reward at work.

Effort-reward imbalance at work and medically certified absence for mental health problems

The incidence of certified absence was higher among workers exposed to ERI than those unexposed. This is consistent with the theoretical background of the ERI model, which posits that the imbalance between effort and reward had more deleterious health effects than each single factor.¹² These results are also consistent with previous studies showing an adverse effect of ERI on self-reported mental health problems^{11 13} and medically certified sickness absence for mental health problems.⁴ However, a recent study reported a lack of association between ERI and long-term sickness absence.¹⁸ Nielsen *et al* (2013) stated that this finding was surprising since mental health is a major risk factor for mental health problems.¹⁸

In the current study, the effects were strong among women even though no gender interaction with ERI was found. The gender-specificity of these results might be partly explained by the fact that women are generally paid less than men for the same job,²⁷ and may thus perceive that the effort invested is not adequately compensated by the reward received. Furthermore, the differences in mental health diagnoses between men and women were mostly statistically non-significant (See online supplementary appendix). Although men had more incident cases of certified absence related to alcoholism and drug abuse than women, both diagnoses represent only 3.56% of all mental health diagnoses and cannot fully explain the gender-specificity of the current results. Finally, the lack of association with effort at work and the strong association with low reward at work probably attenuated the overall ratio of ERI, leading to a weak and non-significant effect among men. This lack of association of ERI among men may also be explained by the small number of certified absences among men (n=59) as compared with women (n=222).

Other considerations

Several complementary analyses were performed using the fully adjusted model (model 5, table 5). No association was found between high effort at work and certified absence for mental health problems. The adjustment for job category (Model A) and the exclusion of participants with self-reported diagnoses (Model C) led to similar results compared with the fully adjusted model (model 5).

After adjustment for job strain (the combination of high psychological demand and low job control of the DC model) (Model 7), the effect of low reward was stronger among men (HR=3.14; 95% CI 1.43 to 6.89) and remained statistically non-significant among women (HR=1.11; 95% CI 0.79 to 1.57). However, the effect of ERI slightly decreased and became statistically non-significant among women (HR=1.29; 95% CI 0.94 to 1.79). These findings are in line with previous studies supporting the independent effect of low reward compared with job strain,³¹ even though there is a theoretical overlapping between the DC and ERI models.³¹

Likewise, reverse causality was tested in the current study by excluding the first year of follow-up (table 5, Model D) and by drawing curves of cumulative hazards of absence for mental

Table 5 Association of effort, reward and ERI at work and medically certified sickness absence for mental health problems: sensitivity analyses

	Main model N=2055	Model A N=2051	Model B N=2051	Model C N=2040	Model D N=1921	Model E N*=3337
Effort (HR (95% CI))						
Men						
Low	1.00	1.00	1.00	1.00	1.00	1.00
Medium	1.09 (0.54 to 1.17)	1.17 (0.58 to 2.36)	1.17 (0.57 to 1.39)	1.22 (0.60 to 2.49)	1.32 (0.61 to 2.83)	1.33 (0.70 to 2.51)
High	0.94 (0.47 to 1.89)	1.03 (0.50 to 2.12)	1.14 (0.46 to 1.78)	1.00 (0.49 to 2.05)	0.98 (0.44 to 2.14)	1.17 (0.62 to 2.20)
Women						
Low	1.00	1.00	1.00	1.00	1.00	1.00
Medium	1.13 (0.80 to 1.61)	1.16 (0.82 to 1.65)	1.03 (0.71 to 1.49)	1.11 (0.78 to 1.59)	1.18 (0.80 to 1.76)	1.03 (0.71 to 1.49)
High	1.11 (0.78 to 1.57)	1.17 (0.81 to 1.69)	1.03 (0.71 to 1.38)	1.05 (0.73 to 1.50)	1.14 (0.76 to 1.70)	1.08 (0.74 to 1.56)
Reward (HR (95% CI))						
Men						
Low	1.00	1.00	1.00	1.00	1.00	1.00
Medium	2.36 (1.09 to 5.12)	2.34 (1.07 to 5.13)	2.53 (1.13 to 5.66)	2.50 (1.11 to 5.62)	2.46 (1.05 to 5.75)	1.68 (0.76 to 3.71)
High	2.80 (1.34 to 5.89)	2.67 (1.23 to 5.80)	3.14 (1.43 to 6.89)	3.08 (1.42 to 6.65)	2.67 (1.16 to 6.15)	2.31 (0.97 to 5.51)
Women						
Low	1.00	1.00	1.00	1.00	1.00	1.00
Medium	1.09 (0.77 to 1.54)	1.07 (0.76 to 1.52)	1.01 (0.71 to 1.44)	1.08 (0.75 to 1.55)	1.10 (0.75 to 1.63)	1.12 (0.79 to 1.60)
High	1.24 (0.90 to 1.73)	1.19 (0.85 to 1.67)	1.11 (0.79 to 1.57)	1.27 (0.90 to 1.77)	1.17 (0.81 to 1.70)	1.62 (1.16 to 2.25)
Effort-reward imbalance (HR (95% CI))						
Men						
Non-exposed	1.00	1.00	1.00	1.00	1.00	1.00
Exposed	1.17 (0.67 to 2.06)	1.18 (0.66 to 2.11)	1.34 (0.70 to 2.55)	1.22 (0.69 to 2.17)	0.98 (0.52 to 1.86)	1.15 (0.62 to 2.13)
Women						
Non-exposed	1.00	1.00	1.00	1.00	1.00	1.00
Exposed	1.41 (1.07 to 1.87)	1.42 (1.07 to 1.90)	1.29 (0.94 to 1.79)	1.42 (1.06 to 1.90)	1.46 (1.06 to 2.01)	1.54 (1.15 to 2.06)

Bold indicates associations which are statistically significant.

Main model is adjusted for age, education, marital status, home load, stressful events, smoking status, alcohol consumption, body mass index and sedentary behaviours.

Model A is adjusted for variables in model 5 and job category.

Model B is adjusted for variables in model 5 and job strain.

Model C was performed while excluding workers with self-reported diagnosis by telephone interview.

Model D is adjusted for variables in model 5 while excluding the first year of follow-up.

Model E is adjusted for variables in model 5 while using the number of spells of certified absence as the outcome.

ERI, effort-reward imbalance.

health problems by exposure to ERI (see figure 1). Both approaches suggest that the possibility of a reversed causality is highly minimised in the current study, particularly because of the prospective design, the exclusion of prevalent cases and the use of registered medically certified absences.

Finally, low reward and ERI were also associated with the number of spells of medically certified absence (Model E, table 5). Low reward at work had a strong but marginally significant effect on the number of absence spells among men (HR=2.31; 95% CI 0.97 to 5.51), and a moderate effect among women (HR=1.62; 95% CI 1.16 to 2.25). The lack of statistical significance of the association among men may be explained by the fact that given a similar prevalence of low reward, women had more spells of medically certified absence (n=301) than did men (n=82). Although some associations changed slightly when using the number of spells, the effect size of ERI remained similar. The effect of ERI on the number of spells of absence was statistically significant only among women (HR=1.54; 95% CI 1.15 to 2.06) but no modifying effect of gender was found. In a previous study, Koopmans *et al*⁷ found that gender differences in the incidence of medically certified absence for mental health problems seemed to disappear after an initial episode of sickness absence. This previous study also showed that the risk factors of a first spell of medically certified sickness absence are not always associated with the recurrence of absence.^{7 37} Future studies using both definitions are needed

to better understand the relationship between exposure to adverse psychosocial factors and medically certified absence for mental health problems.³⁷

Strengths and weaknesses of the study

A major strength of the current study is the 5-year follow-up using a large occupational cohort composed of various job types. More specifically: (i) the longitudinal design contributes to the causal interpretation of the effect of ERI on health issues, (ii) the exclusion of prevalent cases at baseline helps to minimise reversed causality, (iii) the use of medically certified absences from employee records minimises the common method bias,³² and (iv) gender specific analysis contributes to the progression of knowledge. Furthermore, this paper focuses on the incidence of a first spell of sickness absence which has been shown to be more relevant than other measurements with regard to work characteristics,^{38 39} the duration and the severity of sickness absence being more informative with regard to illness and mortality.³⁹

There are also some limitations to the present study. First, not all the original items of the effort component were available during the first measurement. However, the internal validity of the current version remained acceptable. Second, the results were not controlled for the potential confounding effect of personality types. Since medically certified absences are objective indicators of mental health problems, they might be less influenced than are self-reported data, by reporting bias due to

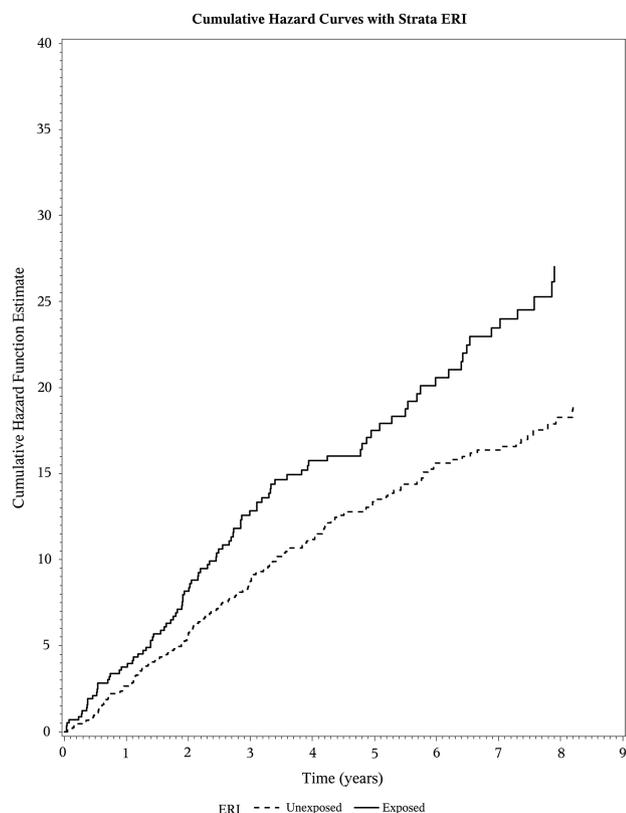


Figure 1 Cumulative proportional hazards by exposure to effort–reward imbalance (ERI).

personality aspects⁴⁰ or voluntary absenteeism.¹⁵ Fourth, there were relatively few cases among men, thus reducing the precision of the gender-stratified analysis. The effect of ERI among men must therefore be interpreted with caution. Finally, since the study population was composed of white-collar workers, results may not generalise to other populations.

CONCLUSION

This study showed low reward and ERI at work are adverse psychosocial work factors associated with a higher risk of medically certified absence for mental health problems. The deleterious effect of ERI was found when using the first spell or the number of spells as the outcome. The incidence of a first spell of medically certified absence for a mental health problem differed by gender, especially for low reward at work. The present results suggest that the improvement of reward and ERI at work may contribute to reducing mental health problems, and related absence or loss of productivity. Furthermore, it might be worthwhile considering gender specificity at work in a context of occupational research and primary prevention at work.

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Competing interests None.

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Effort–reward imbalance and medically certified absence for mental health problems: a prospective study of white-collar workers

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