

# Psychosocial work environment and stress-related disorders, a systematic review

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<b>Background</b>	Knowledge on the impact of the psychosocial work environment on the occurrence of stress-related disorders (SRDs) can assist occupational physicians in the assessment of the work-relatedness of these disorders.
<b>Aims</b>	To systematically review the contribution of work-related psychosocial risk factors to SRDs.
<b>Methods</b>	A systematic review of the literature was carried out by searching Medline, PsycINFO and Embase for studies published up until October 2008. Studies eligible for inclusion were prospective cohort studies or patient–control studies of workers at risk for SRDs. Studies were included in the review when data on the association between exposure to psychosocial work factors and the occurrence of SRDs were presented. Where possible, meta-analysis was conducted to obtain summary odds ratios of the association. The strength of the evidence was assessed using four levels of evidence.
<b>Results</b>	From the 2426 studies identified, seven prospective studies were included in this review. Strong evidence was found that high job demands, low job control, low co-worker support, low supervisor support, low procedural justice, low relational justice and a high effort–reward imbalance predicted the incidence of SRDs.
<b>Conclusions</b>	This systematic review points to the potential of preventing SRDs by improving the psychosocial work environment. However, more prospective studies are needed on the remaining factors, exposure assessment and the relative contributions of single factors, in order to enable consistent assessment of the work-relatedness of SRDs by occupational physicians.
<b>Key words</b>	Adjustment disorders; aetiology; common mental disorders; meta-analysis; workplace; work-related illness.

## Introduction

Work is viewed as an important aspect of quality of life. Conversely, being unemployed is associated with a higher risk of common mental disorders [1]. In spite of this beneficial effect of work, an unfavourable psychosocial working environment may also pose a threat to the mental health of workers. Trends such as increased work pace, more high-skilled jobs, and the increased use of information and communication technology have been placing increasingly higher demands on the mental functions of workers [2]. Not surprisingly, high levels of psychological distress are widespread in the working population. A recent study estimated the prevalence of high psychological distress (likely mental disorder) at 4.5% and that of moderate distress (mental disorder pos-

sible) at 9.6% in a sample of 60 556 employees of large employers in the USA [3].

Distress is a heterogeneously defined term that refers to unpleasant subjective stress responses [4]. When distress reaches the level of clinical relevancy, it may be described as a stress-related disorder (SRD). This term can be applied to many overlapping stress-related concepts and diagnoses such as neurasthenia, adjustment disorders and burnout [5]. SRDs represent a significant part of the work-related common mental disorders in both self-report surveys [6] and in reporting schemes by occupational physicians (79% in the Netherlands and 40% in the UK) [7,8]. However, the inter-physician variation for the assessment of work-relatedness of SRDs is high [9,10].

Diagnoses of work-related SRDs are critical on three levels. On the level of primary prevention, statistics are needed to monitor trends in their incidence and assessing the effect of national primary prevention initiatives. In the UK for instance, the Management Standards were developed by the Health and Safety Executive (HSE) helping work organizations reduce work-related stress [11]. On the level of work organizations, the identification of one or more cases of work-related SRDs may enhance preventive actions. And on the level of the worker, occupational physicians can provide recommendations for specific modifications to the worker's job, either as part of a return-to-work plan or permanently.

Several theories have been developed that predict negative consequences for the mental health of workers when exposed to certain psychosocial risk factors at work. Three influential theories are job demand–control theory of Karasek [12], the effort–reward imbalance model by Siegrist *et al.* [13] and the concept of organizational justice [14]. The psychosocial risks described in these models include psychological job demands (workload, work pressure), work decision latitude (control over the work tasks), social support from colleagues and supervisors, an experienced imbalance between high effort spent at work and low reward received, procedural justice (whether decision-making procedures include input from affected parties, are consistently applied, accurate and ethical) and relational justice (whether the treatment of workers by supervisors is fair, polite and considerate).

From, often cross-sectional, studies it can be deduced that an association exists between work-related psychosocial risk factors and distress symptoms [15–19]. However, it is not always clear whether such risk factors lead to clinically significant SRDs. Such knowledge would enhance the evidence base of the assessment of work-relatedness of SRDs. Reviews have examined the association of work-related psychosocial factors and depressive disorders [20] and all common mental disorders combined [21]. Our objective is to assess which work-related psychosocial risk factors may contribute to the occurrence of SRDs.

## Methods

We searched three databases: Medline, using the Pubmed interface (1950 to October 2008), Psycinfo via Silverplatter (1970 to October 2008) and Embase via Ovid (1980 to October 2008). The search strategy consisted of a combination of three search strings: terms related to SRDs, terms related to the work setting and a methodological filter searching for longitudinal studies. See Appendix 1 (available as Supplementary data at *Occupational Medicine* online) for the complete search strings used in each database. In addition, the reference lists of all literature reviews that were retrieved in our electronic search were checked for eligible studies.

Study selection was conducted based on four inclusion criteria: (i) participants are adult workers; (ii) exposure to at least one psychosocial work factor was measured; (iii) the reported outcome was either a SRD defined as absenteeism due to mental health problems or a high level of psychological complaints as reflected in a score above a cut-off point on a validated questionnaire for fatigue, stress or non-specific mental ill-health or an adjustment disorder according to the Diagnostic and Statistical Manual (DSM)-IV or International Classification of Diseases (ICD)-10 criteria and (iv) design was either a prospective cohort study (exposure measurement precedes the measurement of outcome) or patient–control study where the information of exposure was recorded before the onset of the disorder.

The study selection was carried out in two stages. In the first stage, studies were included on the basis of title and abstract. Two reviewers (D.B. and K.N.) independently excluded studies if it was clear from the abstract that the study did not concern adult workers or that the study did not have a prospective design. In the second stage, the first 40 full papers were assessed for eligibility by two reviewers independently (D.B. and K.N.) and discussed until consensus was reached. The remaining articles were first assessed by one reviewer, after which all possible inclusions were discussed by two reviewers (D.B. and K.N.). Both reviewers then independently extracted data from the original articles.

The psychosocial work factors that were measured in the original studies were grouped in 10 categories, derived from the three models on work-related psychosocial risk factors: job demands, job control, co-worker support, supervisor support, career perspective, task variation/skill discretion, emotional demands, procedural justice, relational justice and effort–reward imbalance.

The methodological quality of included studies was assessed by means of a methodological quality assessment list. It was suggested that such an instrument should cover three fundamental domains: selection of participants, measurement of variables and control of confounding [22]. We have therefore adapted an instrument that covered those three domains and has been used in reviews of aetiology [23,24]. See Appendix 2 (available as Supplementary data at *Occupational Medicine* online) for the items of the quality assessment list. Two reviewers (D.B. and K.N.) independently rated each item on the list with positive, negative or unclear and then discussed until consensus was reached. For each study, a total quality score was calculated by dividing the items rated positively by the items applicable for the study design (either prospective cohort study or case–control study). A total score of  $\geq 50\%$  was considered high quality while  $< 50\%$  was considered low quality.

We pooled summary estimates if at least two studies reported data on the same outcome measure using the Cochrane Review Manager 5 software and inverse

variance weighing. Summary estimates [odds ratios (OR)] were calculated for the relative risk of high versus low exposure to each separate psychosocial work factor. All meta-analysis was first conducted using fixed effects models. For each model, heterogeneity was identified by quantifying the inconsistency across studies using the  $I^2$  statistic being  $\geq 50\%$  as criterion. In such cases, we conducted sensitivity analyses to explore the possible reasons for heterogeneity. When no explanation for the heterogeneity could be found, a meta-analysis using a random effects model was conducted.

The strength of the evidence for the relationship between psychosocial risk factors and SRDs was assessed following the definition of four levels of evidence. Following the strategy of Smidt *et al.* [25], we conducted an evidence synthesis based on statistical pooling (quantitative analysis) or on the findings of individual studies (qualitative analysis) where statistical pooling was not possible. The qualitative criteria for the four levels of evidence were derived from a systematic review on psychosocial risk factors for neck pain [23] and are presented in Table 1.

## Results

Seven studies were included (reported on in six papers) [26–31]. Details of the search process and numbers identified at each stage are presented in Figure 1. According to our definition of a quality score of  $\geq 50\%$ , all included studies were of high quality. In Tables 2 and 3, the details on study characteristics and quality are summarized.

Table 4 presents the studies, definition of exposure and outcome measures, effect estimates, adjustments used in the multivariate models and where applicable the pooled effect estimate for each of the psychosocial work factors.

**Table 1.** Levels of evidence and criteria used in the evidence synthesis

Level of evidence	Criteria
Strong evidence	Summary OR of at least two high-quality studies is statistically significant or where meta-analysis cannot be conducted: consistent findings of at least two high-quality studies.
Moderate evidence	Summary OR of at least two studies of which only one is a high-quality study, is statistically significant, or where meta-analysis cannot be conducted: consistent findings of at least two studies of which only one is a high-quality study.
Some evidence	Findings of only one high-quality study or summary OR of at least two studies of low quality is statistically significant.
Inconclusive evidence	Concerns all other cases, i.e., summary OR is not statistically significant, inconsistent findings of at least two studies, findings of only one low-quality study.

Three studies investigated the effect of job demands on the occurrence of SRDs (Bultmann *et al.* [27], Mino *et al.* [31] and Stansfeld *et al.* [29]). All studies used a version of the General Health Questionnaire (GHQ) as an outcome measure. The pooled OR of all three studies was found to be 1.35 (CI 1.22–1.50). Based on these results, it was concluded that there is strong evidence for a positive relationship between job demands and SRDs.

Two studies investigated the effect of job control or the lack of it on the occurrence of SRDs (Bultmann *et al.* [27] and Stansfeld *et al.* [29]). Both studies used the GHQ as outcome measure. The pooled OR of the two studies was 1.22 (CI 1.10–1.36). The pooled OR of men and women separately were 1.24 (CI 1.09–1.41) and 1.18 (CI 0.97–1.44) respectively. We therefore concluded that there is strong evidence that low job control is a risk factor for developing an SRD, especially for men.

Two studies investigated the effect of co-worker support, or the lack of it, on the occurrence of SRDs (Bultmann *et al.* [27] and Stansfeld *et al.* [29]). Both studies used the GHQ as outcome measure. The pooled OR of the two studies was 1.24 (CI 1.13–1.37). The pooled OR of men and women separately were 1.27 (CI 1.13–1.43) for men and 1.18 (CI 0.99–1.41) for women. Based on these results, it was concluded that there is strong evidence for a positive relationship between low co-worker support and SRDs for men, while this relationship is less clear in women.

Three studies investigated the effect of supervisor support, or the lack of it, on the occurrence of SRDs (Bultmann *et al.* [27], Mino *et al.* [31] and Stansfeld *et al.* [29]), all using the GHQ as outcome measure. The pooled OR of all three studies was found to be 1.24 (CI 1.13–1.35). We therefore concluded that there is strong evidence that low supervisor support is a risk factor for developing an SRD. However, the stratified analysis for men and women separately (based on the Bultmann and Stansfeld studies) revealed a significant relationship for men (1.25; CI 1.05–1.49) and a non-significant relationship for women (1.11; CI 0.96–1.3).

Only Bultmann *et al.* [27] studied the impact of lack of career perspective (operationalized as job insecurity) on the occurrence of SRDs. When looking at the Checklist Individual Strength (CIS) as outcome measure, no significant relationship was found. For the GHQ as outcome measure, job insecurity was a significant predictor of SRDs for men but not for women. It was therefore concluded that there is some evidence of job insecurity being a risk factor for SRDs for men but not women.

Only Bonde *et al.* [28] investigated the relationship between task variation (operationalized as repetitive work) and SRDs, using the Setterlind Stress Inventory as outcome measure. As they did not find a significant positive relationship (OR 1.3; CI 0.6–2.2), we concluded that there is inconclusive evidence for repetitive work as a risk factor for developing an SRD.

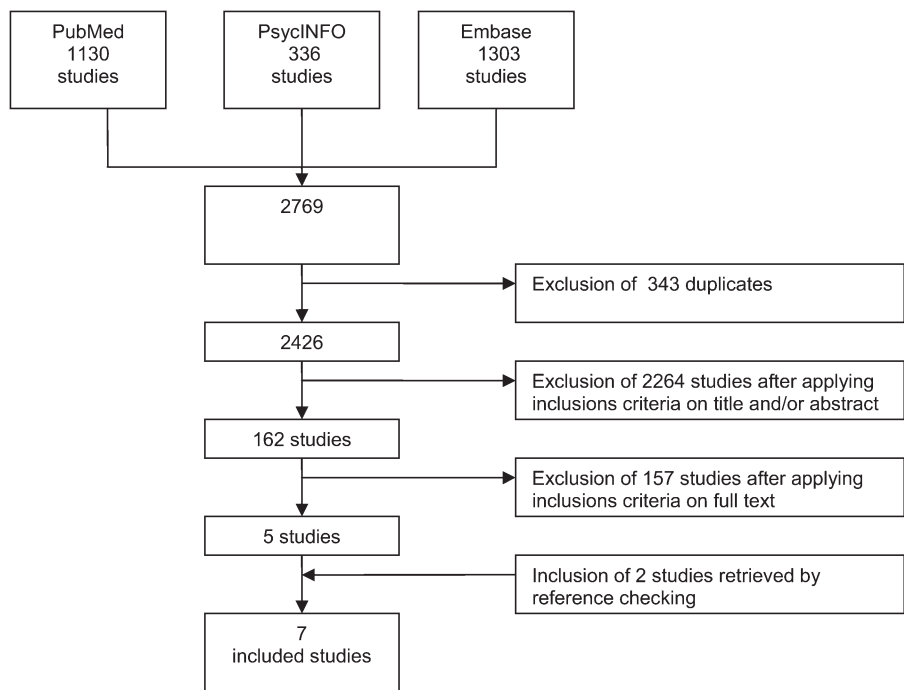


Figure 1. Flowchart of the inclusion process.

Table 2. Information on design, population, gender, age, response at baseline and sample size of included studies

Information	Bonde <i>et al.</i> [28]	Bultmann <i>et al.</i> [27]	Godin <i>et al.</i> [30]	Kivimaki <i>et al.</i> [26], 10-town	Kivimaki <i>et al.</i> Mino [26], hospital <i>et al.</i> [31]	Stansfeld <i>et al.</i> [29]
Design	P	P	P	P	P	P
Duration of follow-up (months)	36	12	12	36–48	24–48	24
Population						
Workplace	Various industries and service work companies	45 companies and organizations	Private/public service sector	Local government employees	Hospital workers	Machine production company
Country	Denmark	The Netherlands	Belgium	Finland	Finland	Japan
Gender, % female	62	26	46	72	84	56
Age, mean number of years	38.4	41.0	40.5	44.5	43.1	<30: 26% 30–40: 8% 40–50: 29% >50: 18%
Response at baseline, %	74	45	40	67	70	98
Sample size	3123	8833	3804	31 749	15 338	462

P, prospective cohort study.

Only Bultmann *et al.* [27] studied the impact of emotional demands (measured with the questionnaire on perception and judgement of work) on the occurrence of SRDs. When looking at the CIS as outcome measure, a significant positive relationship was found for men (1.47; CI 1.14–1.88) but not for women (OR 1.04 (0.73–1.48). When the GHQ was employed, a positive significant relationship was found for both men (1.73; 1.40–2.14) and women (1.39; 1.01–1.91). Therefore, the conclusion was that there is some evidence for emo-

tional demands as a risk factor for SRDs in men and conflicting evidence for women.

The impact of procedural justice, or the lack of it, on the occurrence of SRDs was the subject of both the 10-town and the hospital study described by Kivimaki *et al.* [26]. Both studies used the GHQ as outcome measure. The pooled OR was 1.78 (CI 1.59–2.00), leading to the conclusion that there is strong evidence for the lack of procedural justice as risk factor for SRDs.

**Table 3.** Quality of included studies

Information	Bonde <i>et al.</i> [28]	Bultmann <i>et al.</i> [27]	Godin <i>et al.</i> [30]	Kivimaki <i>et al.</i> [26], 10-town	Kivimaki <i>et al.</i> [26], hospital	Mino <i>et al.</i> [31]	Stansfeld <i>et al.</i> [29]
Quality criteria							
Were the main features of the study population stated?	+	+	+	+	+	–	–
Was the participation rate at baseline at least 50%?	+	–	–	+	+	+	+
Case-control: were cases and controls drawn from the same population and was a clear definition of cases and controls stated?	NA	NA	NA	NA	NA	NA	NA
Prospective cohort: was the response at latest follow-up at least 70%, or was the non-response not selective?	+	+	+	+	+	–	+
Were data on psychosocial work factors collected using standardized instruments?	–	+	+	–	+	–	–
Case-control: was exposure measured in an identical way in cases and controls?	NA	NA	NA	NA	NA	NA	NA

NA = not applicable.

The relationship between low relational justice and SRDs was examined in both the 10-town and the hospital study described by Kivimaki *et al.* [26]. Both studies used the GHQ as outcome measure. The pooled OR was 1.51 (CI 1.35–1.69), leading to the conclusion that there is strong evidence for low relational justice as risk factor for SRDs.

Effort–reward imbalance was studied in relation to SRDs in the studies of Godin *et al.* [30], Stansfeld *et al.* [29] and in both the 10-town and the hospital study described by Kivimaki *et al.* [26]. The pooled OR for effort–reward imbalance of the three studies using the GHQ as outcome measure was 1.98 (CI 1.78–2.20), leading to the conclusion that there is strong evidence for effort–reward imbalance as a risk factor for developing an SRD.

## Discussion

Despite the extensive body of research on the relation of psychosocial risk factors and symptoms of distress, only seven prospective studies on these factors in relation to SRDs were identified. Based on these seven meta-analyses, strong evidence was found that high job demands, low job control, low co-worker support, low supervisor support, low procedural justice, low relational justice and a high effort–reward imbalance predicted the occurrence of SRDs. Further, we concluded that there is some evidence for emotional demands as a risk factor for SRDs in men and conflicting evidence for women. With regard to job insecurity, it was concluded that there is some evidence of this being a risk factor for SRDs for men but not women. And finally, we found



**Table 4.** Studies, definition exposure and outcome, effect estimate, adjustments and pooled effect estimate per psychosocial work factor

Factor	Study	Definition Exposure	Definition Outcome	Effect estimate OR (CI)	Adjustments	Pooled effect estimate <sup>a</sup> OR (CI)
Job demands	Bultmann <i>et al.</i> [27]	JCQ, job demands (highest versus lowest tertile)	(i): >76 on the CIS  (ii): ≥ 4 on the GHQ 12	(i) Men: 1.28 (1.0–1.64) Women: 1.57 (1.09 to 2.26)  (ii) Men: 1.51 (1.23–1.85) Women: 1.44 (1.03–2.01)	(i) Age, educational level, living alone, employment status, presence of disease, baseline GHQ score (ii) Same but baseline CIS score instead of GHQ	1.35 (1.22–1.50)
	Mino <i>et al.</i> [31]	Single item (always/sometimes present versus absent)	≥8 on the GHQ 30	1.25 (CI 0.96–1.61)	Sex, age, degree of satisfaction with family life, perceived physical health	
	Stansfeld <i>et al.</i> [29]	Adapted JCQ, job demands (highest versus lowest tertile)	>4 on the GHQ 30	Men: 1.33 (1.1–1.6) Women: 1.24 (1.0–1.6)	Sub-cohort of non-cases at baseline, adjusted for age, employment grade and baseline GHQ score	
Job control	Bultmann <i>et al.</i> [27]	JCQ, decision latitude (lowest versus highest tertile)	(i) >76 on the CIS  (ii) ≥4 on the GHQ 12	(i) Men: 1.59 (1.23–2.06) Women: 1.51 (1.04–2.19)  (ii) Men: 1.14 (0.9–1.43) Women: 0.88 (0.62–1.24)	(i) Age, educational level, living alone, employment status, presence of disease, baseline GHQ score (ii) Same but baseline CIS score instead of GHQ	All: 1.22 (1.10–1.36)  Men: 1.24 (1.09–1.41) Women: 1.18 (0.97–1.44)
	Stansfeld <i>et al.</i> [29]	Adapted JCQ, decision latitude (lowest versus highest tertile)	>4 on the GHQ 30	Men: 1.29 (1.1–1.5) Women: 1.37 (1.1–1.8)	Sub-cohort of non-cases at baseline, adjusted for age, employment grade and baseline GHQ score	
Co-worker support	Bultmann <i>et al.</i> [27]	JCQ, co-worker support (low versus high)	(i) >76 on the CIS  (ii) ≥ 4 on the GHQ 12	(i) Men: 1.45 (1.18–1.78) Women: 1.78 (1.20–2.47)  (ii) Men: 1.25 (1.04–1.49) Women: 1.31 (0.97–1.78)	(i) Age, educational level, living alone, employment status, presence of disease, baseline GHQ score (ii) Same but baseline CIS score instead of GHQ	All: 1.24 (1.13–1.37)  Men: 1.27 (1.13–1.43) Women: 1.18 (0.99–1.41)
	Stansfeld <i>et al.</i> [29]	Adapted JCQ, co-worker support (lowest versus highest tertile)	>4 on the GHQ 30	Men: 1.29 (1.1–1.5) Women: 1.12 (0.9 to 1.4)	Adjusted for age, employment grade and baseline GHQ score	
Supervisor support	Bultmann <i>et al.</i> [27]	JCQ, supervisor support (low versus high)	(i) >76 on the CIS  (ii) ≥4 on the GHQ 12	(i) Men: 1.38 (1.12–1.69) Women: 1.17 (0.86–1.58)  (ii) Men: 1.25 (1.05–1.49) Women: 1.12 (0.85–1.47)		All: 1.24 (1.13–1.35)  Men: 1.28 (1.14–1.44) Women: 1.11 (0.96–1.3)

**Table 4.** (*Continued*)

Factor	Study	Definition Exposure	Definition Outcome	Effect estimate OR (CI)	Adjustments	Pooled effect estimate <sup>a</sup> OR (CI)
Career perspective	Mino <i>et al.</i> [31]	Single item (always/ sometimes present versus absent)	≥8 on GHQ 30	1.54 (CI 1.07 to 2.19)	Sex, age, degree of satisfaction with family life, perceived physical health	
	Stansfeld <i>et al.</i> [29]	Adapted JCQ, supervisor support (lowest versus highest tertile)	>4 on the GHQ 30	Men: 1.31 (1.1–1.5) Women: 1.11 (0.9–1.3)	Adjusted for age, employment grade and baseline GHQ score	
	Bultmann <i>et al.</i> [27]	QPJW, single-item job insecurity (yes versus no)	(i) >76 on the CIS	(i) Men: 0.93 (0.62–1.39) Women: 1.33 (0.77–2.28)	(i) Age, educational level, living alone, employment status, presence of disease, baseline GHQ score	NA
			(ii) ≥4 on the GHQ 12	(ii) Men: 1.63 (1.18–2.27) Women: 0.94 (0.56–1.59)	(ii) Same but baseline CIS score instead of GHQ	
Task variation/skill discretion	Bonde <i>et al.</i> [28]	Repetitive work (yes versus no)	≥4 on Setterlind Stress Inventory	1.3 (0.6–2.2)	Sub-cohort of non-cases at baseline, adjusted for gender, age, physically active, body mass index, intrinsic effort personality, married, self-report psychiatric disorder	NA
Emotional demands	Bultmann <i>et al.</i> [27]	QPJW, emotional demands (high versus no)	(i) >76 on the CIS	(i) Men: 1.47 (1.14–1.88) Women: 1.04 (0.73–1.48)	(i) Age, educational level, living alone, employment status, presence of disease, baseline GHQ score	NA
			(ii) ≥4 on the GHQ 12	(ii) Men: 1.73 (1.40–2.14) Women: 1.39 (1.01–1.91)	(ii) Same but baseline CIS score instead of GHQ	
Procedural justice	Kivimaki <i>et al.</i> [26] (10-town study)	Organizational justice, procedural injustice (highest versus lowest quartile)	≥4 on the GHQ 12	1.81 (1.60–2.06)	Adjusted for age, sex and occupational status	1.78 (1.59–2.00)
	Kivimaki <i>et al.</i> [26] (hospital study)	Organizational justice, procedural injustice (highest versus lowest quartile)	≥4 on the GHQ 12	1.67 (1.29–2.15)	Adjusted for age, sex and occupational status	

Table 4. (Continued)

Factor	Study	Definition Exposure	Definition Outcome	Effect estimate OR (CI)	Adjustments	Pooled effect estimate <sup>a</sup> OR (CI)
Relational justice	Kivimaki <i>et al.</i> [26] (10-town study)	Organizational justice, relational injustice (highest versus lowest quartile)	≥4 on the GHQ 12	1.50 (1.32–1.70)	Adjusted for age, sex and occupational status	1.51 (1.35–1.69)
	Kivimaki <i>et al.</i> [26] (hospital study)	Organizational justice, relational injustice (highest versus lowest quartile)	≥4 on the GHQ 12	1.56 (1.21–2.02)	Adjusted for age, sex and occupational status	
Effort–reward imbalance	Godin <i>et al.</i> [30]	Effort–reward imbalance (highest quartile versus rest on ratio)	Upper quartile of distribution short fatigue inventory	Men: 3.4 (1.7–6.7) Women: 2.0 (0.9–4.1)	Age, education, threat from global economy, job dissatisfaction, workplace instability	1.98 (1.78–2.20)
	Stansfeld <i>et al.</i> [29]	Indicator of effort–reward imbalance <sup>1</sup> (high efforts/low rewards versus no high efforts nor low rewards)	>4 on GHQ 30	Men: 2.57 (1.8–3.6) Women: 1.67 (1.0–2.9)	Sub-cohort of non-cases at baseline, adjusted for age, employment grade and baseline GHQ score	
	Kivimaki <i>et al.</i> [26] (10-town study)	Proxy of effort–reward imbalance (highest versus lowest quartile)	≥4 on the GHQ 12	2.04 (1.80–2.32)	Adjusted for age, sex and occupational status	
	Kivimaki <i>et al.</i> [26] (hospital study)	Proxy of effort–reward imbalance (highest versus lowest quartile)	≥4 on the GHQ 12	1.59 (1.24–2.05)	Adjusted for age, sex and occupational status	

NA= pooled estimate could not be calculated because number of studies with same outcome measure was less than two.

<sup>a</sup>Pooled estimate of all studies using GHQ as outcome measure.

some evidence that repetitive work is not a risk factor for developing a SRD.

The number of studies that examined the adverse effects of each factor was low. We reasoned that the risk of over-reporting of negative working conditions may be especially high in a group of workers with mental disorders. Thus, to avoid the risk of artificially inflated associations between exposure and outcome, only studies with a prospective design were included. One negative consequence of the low number of studies per factor is that the potential impact of one other study with different or even opposite results is high. In this respect, two methodological considerations of our review are of interest. First, because of the potential impact of single studies, it is crucial that we have included all published studies on the subject in this review. Therefore, a sensitive literature search in three databases was employed, not limited to pre-defined psychosocial risk factors. While we have thus reduced the odds of missing studies on this subject, we cannot exclude that a potentially influential study was omitted.

The second methodological consideration concerns our summarizing the evidence by using levels of evidence. This strategy can be useful for reviews without or with incomplete statistical pooling but is controversial because this process is arbitrary and subjective [32,33]. Moreover, the decision rules rely heavily on the quality assessment. As such, the label of one study as being either of high or low quality can lead to different conclusions, for instance, strong versus moderate evidence. Although the labels of the levels of evidence should be interpreted with caution, the advantage of this strategy is that the process is explicit and reproducible, enabling readers to draw their own conclusions using alternative decision rules. For instance, one might argue that the strength of the evidence needed to inform a preventive program in a company is lower than that needed to decide on the work-relatedness of an individual case of SRD in a reporting scheme or claim procedure.

Our finding that exposure to psychosocial risk factors at work increases the risk of SRDs concurs with comparable findings for all common mental disorders[21],



sickness absence in general [34] and depressive disorders [35]. This suggests that unfavourable working situations are not only related to distress symptoms but also to clinically relevant health outcomes.

Our findings suggest that SRDs may be best prevented by addressing multiple psychosocial risk factors as the risk estimates (ORs) of the individual risk factors were all below two. A comprehensive approach, such as described in the HSE management standards, may be advisable. However, studies are needed to establish the effect of such preventive interventions on the incidence of SRDs.

In future studies, the evidence base of work-related SRDs may be enhanced by conducting more longitudinal studies on the relation between psychosocial risk factors and SRDs. Understudied factors such as interpersonal conflicts or emotional demands may be included in such designs.

None of the studies included in this review have investigated the intensity and duration of exposure in relation to the onset of SRDs. Moreover, all but one study [28] included in this review assessed exposure to psychosocial risk factors at work by means of self-report. In future studies, a more accurate assessment of exposure should be considered. Part of the advancement in this field may be achieved by detailed measurement of duration of self-reported exposure. However, for evaluation of the intensity of the exposure, other measurement methods such as interviews or observations can be applied. For measuring psychosocial risk factors at work, these methods are not as well established as self-report questionnaires. Nonetheless, recent studies on depression and anxiety adopting externally assessed measurement of these risk factors have shown promising results [36,37].

In conclusion, based on a small number of studies, we found strong evidence for the relation between high job demands, low job control, low co-worker support, low supervisor support, low procedural justice, low relational justice and a high effort–reward imbalance and the occurrence of SRDs. Our findings are relevant for the assessment of work-relatedness of individual cases of SRDs. They further point to a potential benefit of addressing the psychosocial work environment when reducing the incidence of SRDs.

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