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published in
Spine
2000

DOI (link to publisher)
10.1097/00007632-200008150-00017

document version
Publisher's PDF, also known as Version of record

SPINE Volume 25, Number 16, pp 2114–2125

Systematic Review of Psychosocial Factors at Work and Private Life as Risk Factors for Back Pain

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Study Design. A systematic review of observational studies.

Objectives. To assess whether psychosocial factors at work and in private life are risk factors for the occurrence of back pain.

Summary of Background Data. Several reviews on risk factors for back pain have paid attention to psychosocial factors. However, in none of the published reviews was a strict systematic approach used to identify and summarize the available evidence.

Methods. A computerized bibliographical search of several databases was performed, restricted to studies with a cohort or case–control design. A rating system was used to assess the strength of the evidence for various factors, based on the methodologic quality of the studies and the consistency of the findings.

Results. Eleven cohort and two case–control studies were included in this review. Strong evidence was found for low social support in the workplace and low job satisfaction as risk factors for back pain. Insufficient evidence was found for an effect of a high work pace, high qualitative demands, low job content, low job control, and psychosocial factors in private life.

Conclusions. Evidence was found for an effect of low workplace social support and low job satisfaction. However, the result for workplace social support was sensitive to slight changes in the rating system, and the effect found for low job satisfaction may be a result of insufficient adjustment for psychosocial work characteristics and physical load at work. In addition, the combined evaluation of job content and job control, both aspects of decision latitude, led to strong evidence of a role for low job decision latitude. Thus, based on this review, there is evidence for an effect of work-related psychosocial factors, but the evidence for the role of specific factors has not been established yet. [Key words: control, job satisfaction, low back pain, psychological demands, risk factors, support, systematic review, work pace] **Spine 2000; 25:2114–2125**

Back pain and other musculoskeletal symptoms are a major health problem in the Western world. Musculoskeletal disorders have been shown to be the largest group of occupational diseases in studies in different countries.[40] Figures of the British Occupational Physicians Reporting Activity show that of all new cases of diseases reported by occupational physicians in 1996 and 1997 nearly one half were musculoskeletal disorders.[28] According to the World Health Organization definition a work-related disorder is multifactorial, which indicates the role of physical, organizational, psychosocial, and sociologic factors in its development.[67] In occupational health research there has been an increasing interest in psychosocial factors at work during the past few years.

Four explanations for the association between psychosocial work characteristics and musculoskeletal symptoms have been suggested. First, psychosocial work characteristics can directly influence the biomechanical load through changes in posture, movement and exerted forces.[25,61,63] Second, these factors may trigger physiologic mechanisms, such as increased muscle tension or increased hormonal excretion, that may in the long term lead to organic changes and the development or intensification of musculoskeletal symptoms or may influence pain perception and thus increase symptoms.[23,25,61,63] Third, psychosocial factors may change the ability of an individual to cope with an illness which, in turn, could influence the reporting of musculoskeletal symptoms.[23,25,61,63] Fourth, the association may well be confounded by the effect of physical factors at work.[23,25,61,63] It seems plausible that psychosocial factors in private life could also affect musculoskeletal symptoms through the second and third mechanism.

In this article, the authors examine the evidence for psychosocial factors at work and in private life as risk factors for back pain. Several reviews on risk factors for back pain have paid attention to psychosocial factors.[9,23–25,27,30] However, none of the published reviews included clearly defined inclusion and exclusion criteria, a methodologic quality assessment of the studies, as well as explicit criteria on which the assessment of the strength of the evidence was based. In this review a strict systematic approach is used to identify and summarize the available evidence in the literature. The method used is comparable with that applied in the clinical literature regarding the efficacy of interventions for back pain.[65] In this field, the current interest in evidence-based medicine has led to an extensive increase in the publication of systematic reviews and to the development of methodologic guidelines for systematic reviews.[64]

Because individual psychological factors such as personality traits and cognitive and behavioral variables are also referred to as psychosocial factors, it is important to emphasize that this review concentrates only on psychosocial factors at work and in private life. The grouping of

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Acknowledgment date: September 3, 1999.
Acceptance date: December 8, 1999.
Device status category: 1.
Conflict of interest category: 12.

psychosocial work characteristics into categories in this review is mainly based on the demand–control–support model, developed by Karasek et al[36,39] and Johnson and Hall.[35] Although it is questionable whether job satisfaction should be regarded as a separate psychosocial work characteristic or as a response to working conditions such as psychosocial work characteristics and physical load at work, job satisfaction is included because many of the studies on work-related psychosocial factors as risk factors for back pain that have been performed so far focused on job dissatisfaction.

In this article, a systematic approach was applied to answer the following research questions: Are psychosocial factors at work risk factors for the occurrence of back pain? Are psychosocial factors in private life risk factors for the occurrence of back pain? A similar evaluation of the evidence for aspects of physical load as risk factors for back pain has been reported elsewhere.[34]

■ Methods

Identification and Selection of the Literature. The available literature in the English, Dutch, German, and French languages was identified by means of a computerized search of several bibliographical databases, including Medline (1966 through November 1997); Embase (1988 through October 1997); Psyclit (1974 through September 1997); NIOSHTIC, CISDOC, and HSELINE (1977 through July 1997); and Sportdiscus (1949 through October 1997). The following key words were used: back pain, low back pain, lumbago, backache, intervertebral disc displacement, hernia, herniated disc, sciatica, sciatic pain, risk factors, causality, causative, precipitating factors, determinants, predictor, etiology, epidemiology, case–control studies, retrospective studies, case-referent, prospective studies, longitudinal studies, follow-up studies, and cohort studies. The abstracts of all the citations were retrieved and examined. A selection was made from the identified articles. The first reviewer (WH) was responsible for the entire selection, but to check the reproducibility of the selection process, a second reviewer (MP) selected a random sample (n = 100) from the articles identified in Medline.

Studies had to meet the following inclusion criteria:

- The design of the study had to be case–control, prospective cohort or historical cohort, and the follow-up period had to be at least 1 year. Studies with a cross-sectional design were excluded.
- The study had to concern a working population or a community-based population. Studies involving patient populations were excluded.
- The operationalization of back pain had to be based on symptoms or signs of nonspecific back pain, self-reported or measured otherwise, including such consequences of back pain as sick leave, medical consultation, or treatment and disability. Studies on back pain due to a definite herniated lumbar intervertebral disc and those on back pain due to osteoporosis, cancer, or other specific causes were excluded. Studies that focused on back pain during pregnancy were also excluded.
- The exposures that were studied included psychosocial factors at work or psychosocial factors in private life (no personality traits). Studies that involved only a comparison between different occupational groups were excluded.
- The publication had to be a full report. Letters and abstracts were excluded.

The references of all selected articles and recently published review articles[9,23–25,27,30] were screened for additional, potentially eligible publications.

Methodologic Quality Assessment and Data Abstraction and Analysis. The selected studies were scored by two reviewers (WH, MP) independently on the basis of a standardized set of criteria that were adapted from criteria lists used in systematic reviews of randomized controlled clinical trials on treatment[64] and criteria lists used in other reviews of observational studies.[26,62] The criteria concerned the study population, the exposure measurements, the assessment of back pain, and the analysis and presentation of the data. Two slightly different criteria lists were used for cohort studies and case–control studies (see the Appendix, Table A1). These lists were also used in a similar evaluation of the evidence for aspects of physical load as risk factors for back pain.[34] The reviewers rated each criterion positive, negative, or unknown on the basis of information provided in the article.

All disagreements between the reviewers were subsequently discussed during a consensus meeting. If disagreements were not resolved during this meeting, a third reviewer (PB) was consulted to achieve a final judgment. Each study was assigned a total methods score, which was the sum of all positive ratings for the criteria on validity and precision.

Data on the effect of the exposures of interest were abstracted from the text and tables of the original publications. Whenever possible, this included not only information on the statistical significance of the effect, but also on the magnitude of the estimated effect. For some studies that did not provide an effect estimate, this was computed from the information provided in the article. If a study (only) reported that a factor did not enter the model in stepwise modeling, this result was disregarded in the data extraction, because a stepwise analysis is not appropriate for modeling focused on the assessment of a causal association.[32]

To synthesize the available information, use was made of a method based on levels of evidence.[22] Due to the expected heterogeneity in study population, exposure measurements, and the assessment of back pain, it had been previously decided to refrain from statistical pooling of the findings of the individual studies. The rating system was applied to each psychosocial factor and consisted of three levels of scientific evidence based on the number, the quality, and the outcome of the studies:

- Strong evidence: provided by generally consistent findings in multiple high-quality studies
- Moderate evidence: provided by generally consistent findings in one high-quality study and one or more low-quality studies, or in multiple low-quality studies
- Insufficient evidence: only one study available or inconsistent findings in multiple studies

A study was considered to be of high quality if the methodologic quality score was more than 50% of the maximum score and of low quality if the methodologic score was less than 50% of the maximum score. The findings of the studies were considered to be inconsistent if less than 75% of the available studies reported the same conclusion. In the case of multiple high-

Table 1. Cohort Studies on Psychosocial Factors at Work and in Private Life as Risk Factors for Back Pain, Ranked According to Methodologic Quality Score*

First Author/Criteria	1	2	3	4	7	8	9	10	11	12	13	17	18	19	21	22	23	Percentage + V/P (=3–23)
Biering-Sørensen[10–18]	+	+	+	+	+	?	+	?	+	−	+	+	+	−	+	+	+	73%
Leino[42–47]	+	−	+	+	+	?	+	?	+	−	+	+	+	−	+	+	+	73%
Bigos[3–7,19–21,31]	+	+	−	?	+	?	+	?	+	+	+	?	+	+	+	+	+	67%
Riihimäki[54,56,57]	+	+	−	+	+	?	+	?	+	−	+	?	+	−	+	+	+	60%
Papageorgiou[29,48,51–53]	+	+	−	−	+	?	+	?	−	+	−	+	+	+	+	+	+	53%
Ready[55]	+	+	−	+	−	−	+	?	+	−	+	?	+	+	+	+	−	53%
Rossignol[58]	+	+	−	+	−	−	+	?	+	−	+	?	+	+	+	+	−	53%
Hemingway[33]	+	−	−	+	−	−	+	?	+	−	+	?	+	+	+	+	−	53%
Muramatsu[49]	+	+	−	+	−	−	−	−	+	−	+	?	−	−	−	+	+	33%
Viikari-Juntura[66]	+	+	?	−	?	?	+	?	+	?	−	?	+	−	+	+	−	33%
Bergenudd[8]	+	+	?	−	−	−	+	?	?	−	−	?	−	−	+	+	+	27%

* The numbers refer to the numbers of the criteria list for the methodologic quality assessment in Table A1 in the Appendix.
+ = yes; − = no; ? = don't know.

quality studies, the available low-quality studies were disregarded in the assessment of the level of evidence.

In the assessment of the level of evidence for an exposure, an increased risk was regarded as a positive effect, regardless of the statistical significance. A risk estimate (relative risk [RR] or odds ratio [OR]) in the region of 1 was considered to indicate no effect, and a decreased risk was considered to indicate a negative effect, notwithstanding the statistical significance of this effect. Studies that reported only nonsignificance, without presenting an effect estimate, were excluded from the evaluation. This exclusion, and ignoring the statistical significance of the findings, was based on the fact that in general the information provided in the articles was too meager to evaluate whether the effect was not statistically significant due to the absence of an effect or of statistical power.[41] Because ignoring the statistical significance could be controversial, those exposures for which it was concluded that there was strong or moderate evidence of an effect were subjected to a sensitivity analysis. In this analysis, all studies with a nonsignificant effect were considered to indicate no effect.

If studies reported results of analyses with different outcome measures, the assessment of the effect was based on the results obtained for symptoms and findings, rather than on measures of the consequences of back pain such as sick leave, medical consultation or treatment, and disability. If results of analyses in different subgroups were reported, the studies were considered to indicate a positive or a negative effect if such an effect was found in at least one of the subgroups.

■ Results

Selection and Methodologic Quality Assessment

The literature search in the various databases resulted in the identification of 1363 publications. The publications on 10 studies met the inclusion criteria.[1–7,10–21,29,31,33,42–54,56–58] After the references of these articles and recent reviews were screened,[9,27] an additional four studies were included.[8,55,60,66] The selection of studies for inclusion, from a random sample (n = 100) of the articles identified in Medline by the second reviewer, led to initial disagreement for only one study, which was due to differences in the interpretation of the third inclusion criterion regarding operationalization of back pain.

One of the 14 selected studies was excluded *post hoc*, because the early retirements that were studied did not necessarily have a back disorder as the main diagnosis.[1,2] For most studies, there was more than one publication, and the assessment of the methodologic quality of these studies was based on the information in all the publications.

The scoring of the 11 cohort and 2 case–control studies that were finally included in this review led to an overall initial disagreement of 22% (41/187) and 24% (9/38), respectively. The two reviewers reached consensus on all initial disagreements. Tables 1 and 2 show the

Table 2. Case-Control Studies on Psychosocial Factors at Work and in Private Life as Risk Factors for Back Pain, Ranked According to Methodologic Quality Score*

First Author/Criteria	1	2	5	6	7	8	9	10	11	12	13	14	15	16	17	20	21	22	23	Percentage + V/P (=5–23)
Nuwayid[50]	+	−	−	−	+	?	+	?	+	+	+	+	−	−	+	+	+	+	+	65%
Ryden[60]	+	+	−	?	−	−	+	?	+	−	+	+	?	+	?	−	+	+	−	41%

* The numbers refer to the numbers of the criteria list for the methodologic quality assessment in Table A1 in the Appendix.
+ = yes; − = no; ? = don't know.

Table 3. Summary of Cohort Studies on Psychosocial Factors and Back Pain

First author/MQS	Study Population	Operationalization of Back Pain	Follow-Up	Results
Bergenudd[8]/4*	1542 10-yr. residents of Malmö, Sweden, 830 included in 1983, Fup resp. = 69%.	Present BP at Fup in 1983 (questionnaire)	45 yrs., 3 or 4 measurements	Work (questionnaire): Low job satisfaction 1964, 1971, 1983 (S), mentally demanding work 1964, 1971, 1983? (S)
Biering-Sørensen[10–18]/11†	928 30-, 40-, 50- and 60-yr. inhabitants of Copenhagen, Fup resp. = 99%. Analysis restricted to 351 persons with no LB trouble before at baseline.	LBP within the last 12 mn. (questionnaire)	12 mn., 2 measurements	Work (questionnaire): Work speed (NS), monotony (NS), low job satisfaction (S)
Bigos[3–7, 19–21, 31]/10†	3020 blue collar workers at one of the plants of Boeing-Everett.	Incident reports or claims for acute back injury complaints	1 day–4 yrs. (mean 3 yrs.)	Work (questionnaire): Lack of coworker support (S), lack of supervisor support (S), job dissatisfaction (S) Work (questionnaire, adj. for hysteria and prior BP): Job dissatisfaction ($RR_{\text{increase 1 unit}}$ = 1.7; 1.31–2.21) Nonwork (questionnaire): Family support (NS)
Hemingway[33]/8‡	10308 nonindustrial civil servants aged 39–55, 94% allowed for collection of sick leave data. Data on the reasons for absence were available for 5620 participants.	1. Number of absences ≤7 days due to intervertebral disc, disc pain, sciatica, leg pain, BP, backache, LBP, lumbago, lumbar strain (self-reported reason for absence) 2. Number of absences of >7 days due to the same complaints (reason for absence from medical certificate) (Sick leave records)	Mean 4 yrs.	Work (questionnaire, adj. for age, education, housing tenure, access to use of car, body mass index, exercise, smoking habits, previous BP and the other variables shown, outcome 1): Males Control ($RR_{\text{medium–high}}$ = 1.31; 1.04–1.64, $RR_{\text{low–high}}$ = 1.44; 1.11–1.85), conflict ($RR_{\text{medium–high}}$ = 0.88; 0.71–1.09, $RR_{\text{low–high}}$ = 0.73; 0.55–0.95), pace ($RR_{\text{medium–high}}$ = 1.21; 0.96–1.54, $RR_{\text{low–high}}$ = 1.79; 1.39–2.31), work social support ($RR_{\text{medium–high}}$ = 1.01; 0.80–1.27, $RR_{\text{low–high}}$ = 1.12; 0.89–1.41), Job satisfaction ($RR_{\text{medium–high}}$ = 1.04; 0.80–1.33 $RR_{\text{low–high}}$ = 1.17; 0.92–1.48) Females Control ($RR_{\text{medium–high}}$ = 1.04; 0.71–1.53, $RR_{\text{low–high}}$ = 1.01; 0.70–1.47), conflict ($RR_{\text{medium–high}}$ = 1.17; 0.80–1.73, $RR_{\text{low–high}}$ = 1.30; 0.87–1.73), pace ($RR_{\text{medium–high}}$ = 1.50; 1.05–2.15, $RR_{\text{low–high}}$ = 1.42; 0.98–2.07), work social support ($RR_{\text{medium–high}}$ = 0.81; 0.58–1.14, $RR_{\text{low–high}}$ = 0.87; 0.63–1.19), Job satisfaction ($RR_{\text{medium–high}}$ = 1.08; 0.78–1.50 $RR_{\text{low–high}}$ = 1.15; 0.83–1.58) Work (questionnaire, adj. for age, gender, previous BP and the other variables shown, outcome 1): Control ($RR_{\text{low–high}}$ = 1.76; 1.54–2.01), conflict ($RR_{\text{low–high}}$ = 1.29; 1.13–1.46)
Leino[42–47]/11‡	902 blue and white collar employees of metal industry plants, Fup resp. = 67%.	1. LB symptoms score during the past 12 mn. at the last Fup (questionnaire) 2. LB clinical findings score (physiotherapist)	10 yrs., 3 measurements	Work (questionnaire, adj. for age, LB symptoms at baseline and physical load, outcome 1): Work content (NS), work control (NS, except in blue-collar women), social relations (NS, except in blue-collar men)
Papageorgiou[29,48,51–53]/8‡	4501 adults aged 18–75 yrs. registered with two general or family practices in Manchester, UK. Included in the Fup study were 2715 free of current LBP at baseline, Fup resp. = 64%.	1. Episodes of LBP leading to consultation with the general practitioner (computer records from the general practitioners) 2. Episodes of LBP not leading to consultation and >1 day over the past 12 mn. (questionnaire)	12 mn., 2 measurements	Work (questionnaire, adj. for age, adjustment for psychological distress and social class did not affect the OR found, outcome 2): Satisfaction with work ($OR_{\text{slightly inadequate}}$ = 1.7; 1.2–2.4, $OR_{\text{marked/severely inadequate}}$ = 2.0; 1.2–3.3), relationships at work ($OR_{\text{slight problems}}$ = 1.4; 0.9–2.0, $OR_{\text{marked/severe problems}}$ = 0.9; 0.3–3.0)

Table 3. Continued

First author/MQS	Study Population	Operationalization of Back Pain	Follow-Up	Results
Muramatsu[49]/5	2200 noninstitutionalized older adults in Japan aged 60 and over, Fup resp. = 90%. The analysis focused on those currently not suffering from LBP at baseline.	Self-reported "chronic LBP" (interview at Fup)	3 yrs., 2 measurements	Nonwork (interview, adj. for age, gender, education, marital status, physical activity, contact with child, psychological distress, smoking, drinking, comorbidity, self-rated health, and functional limitations and the other variables shown): Have friend/neighbor (NS), social contact (NS), social participation (NS), instrumental support (NS), emotional support (S)
Ready[55]/8	131 full-time female nurses and unit assistants, Fup resp. = 91%.	Back injuries reported by the employees on an employee accident report	18 mn.	Work (questionnaire): Job satisfaction ($RR_{\text{change job/change conditions-good}} = 2.29$; 1.08–4.85)
Riihimäki[54,56,57]/9‡§	2222 male longshoremen and earthmover operators, carpenters and municipal office workers aged 25–49 yr., Fup resp. = 82%. Analysis restricted to 1149 men who never had had sciatic pain at baseline.	3-yr. cumulative incidence of sciatic pain (questionnaire)	3 yrs., 2 measurements	Work (questionnaire, adj. for draft and cold, amount of twisted or bent postures, vibration, and the other variables shown): High pace of work (S), monotonous work (NS), problems with workmates or superiors (S).
Rossignol[58]/8	269 male aircraft assembly workers, Fup resp. = 76%.	1. Compensation for a back problem during Fup (computerized records) 2. Absenteeism for a back problem during Fup (computerized records) 3. Limitation in work performance in preceding week (questionnaire) 4. Back symptoms in preceding week (questionnaire)	12 mn., 2 measurements	Work (questionnaire, outcome 1, 2, 3, 4): Boredom at work (NS) Work (questionnaire, outcome 1): Work satisfaction (NS) Work (questionnaire, outcome 2, 3, 4): Work satisfaction (OR = ≥ 3.0, S)
Viikari-Juntera[66]/5*	2900 Finnish-speaking children under the age of 14 yrs., Fup resp. = 28%. Included in this study were 180 respondents who lived in the Helsinki metropolitan region, 162 of these participated.	1. Pain, ache, stiffness, or numbness in the LB region during the last 12 mn. and a mean disability index ≥15 at the last Fup in 1986–1987 2. Pain, ache, stiffness, or numbness in the LB >7 days, or a mean disability index ≥15 at the last Fup in 1986/1987 (Questionnaire)	32 yrs., 4 measurements	Work (questionnaire 1985, outcome 1 and 2): Job satisfaction (NS)

Fup = follow-up; resp. = response; LBP = low back pain; BP = back pain; LB = low back; yrs. = years; yr. = year; mn. = month(s); MQS = methodologic quality score based on items on validity and precision; S(tatistical significant) = $P \leq 0.05$.

* The article on this study does not make exactly clear when what was measured.

† Some results of multivariable analyses in the article(s) on this study were disregarded in the data abstraction because it was only reported that a factor did not enter the model in stepwise modeling.

‡ More results of these studies, for example, with different operationalizations of back pain, are presented in a more detailed version of this table, which is available from the author. The results that are presented here were used in the assessment of the levels of evidence.

§ The results for work-related risk factors from a multivariable analysis, including occupation in the article on this study, were disregarded in the data abstraction because of the possibility of overadjustment due to the high correlation between occupation and work-related risk factors.

Table 4. Summary of Case-Control Studies on Psychosocial Factors and Back Pain*

First Author (References)/MQS	Study Population	Definition of Cases and Controls	Results
Nuwayid[50]/11	Over 900 firemen and 1900 fire officers assigned to 142 ladder and 210 engineer companies	Cases: full-duty firefighter, who reported LBP to the New York City Fire Department clinic, was evaluated by the physician in charge and received ≥1 day medical leave during the 6-month study period. Persons with previous LBP; professional care or lost workdays were excluded.	Work (interview): Satisfaction at work (NS)
	N = 115 cases (resp. 62%) and 109 controls (resp. 75%)	Controls: full-duty firefighter with no previous LBP experience or with earlier episodes that did not entail professional care nor loss of workdays.	
Ryden[60]/7	Employees at a Children's Hospital and Health Center	Cases: employees with reported LBP injuries while employed at Children's Hospital and Health Center 1983–1985.	Work multivariate (employee health records, adj. for age, sex, and department): Problems at work (OR = 0.67; 0.01–59.66)
	N = 84 cases and 168 matched controls.	Controls: selected from the same population and matched by age, sex, and department/physical requirements of the job.	Nonwork (employee health records, adj. for age, sex, and department): Problems at home (OR = 0.69; 0.18–2.68)

resp. = response; LBP = low back pain; BP = back pain; LB = low back; yrs. = years; yr. = year; mn. = month(s); MQS = methodologic quality score based on items on validity and precision; S(tatistical significant) = $P \leq 0.05$.

cohort and case–control studies on psychosocial factors as risk factors for back pain, in order of methodologic quality score. Nine (82%) cohort studies[3–7,10–21,29,31,33,42–48,51–58] and one (50%) case–control study[50] had a positive score for more than 50% of the criteria on validity and precision and were therefore considered to be of high quality. Tables 3 and 4 give a detailed description of important aspects of the cohort and case-control studies included in the review.

Psychosocial Factors at Work

Work Pace. Three high-quality studies examined the effect of a high work pace. In one of these studies only did the investigators report that no statistically significant effect was found.[17] One group found a statistically significant negative effect of a high work pace on back-related short absenteeism,[33] and the other found a statistically significant positive effect of a high work pace on sciatic pain.[57] Application of the rating system showed that there is insufficient evidence of an effect of a high work pace on the risk of back pain, because of inconsistent findings.

Qualitative Demands. One high- and one low-quality study evaluated the effect of high qualitative job demands. Qualitative job demands include conflicting demands, interruption of tasks, and intense concentration for long periods. Hemingway et al[33] found that high conflicting demands had a statistically significant negative effect on short and long absences from work due to back pain. However, in men, high conflicting demands turned out to have a statistically significant positive effect on short absences. The low-quality study[8] found that high mentally demanding work had a statistically significant positive effect on the point prevalence of back pain. Application of the rating system showed that there is insufficient evidence of an effect of high qualitative demands on the risk of back pain, because of inconsistent findings.

Job Content. Four high-quality studies evaluated the effect of poor job content. Job content includes monotonous work and work with few possibilities to learn new things and to develop knowledge and skills. In all studies it was reported only that no statistically significant effect was found.[17,45,57,58] However, in one of these studies, which examined both low back symptoms and findings, the investigators also found that poor work content had a statistically significant positive effect on low back clinical findings in blue collar workers.[45] Application of the rating system showed that there is insufficient evidence of an effect of poor job content, because there was only one usable study available.

Job Control. Job control includes aspects such as autonomy and influence. In one high-quality study, researchers examined the effect of work control and reported that no statistically significant effect was found, except in blue collar women, for whom low work control had a positive effect on both low back symptoms and clinical findings.[45] Application of the rating system showed that there is insufficient evidence of an effect of low job control, because there was only one study available.

In another high-quality study, job control was also examined.[33] However, in this study job control included

aspects of both job content and control. This combination is often called decision latitude in the demand–control–support model.[36,39] Low job control was found to have a statistically significant positive effect on short and long absences due to back pain, except in men in lower grade jobs and women in higher grade jobs, in whom the effect was reversed.[33] Application of the rating system also showed that there is insufficient evidence for low decision latitude as a risk factor for back pain, because there was only one study available.

Social Support in the Workplace. Five high-quality studies and one low-quality study evaluated the effect of low social support in the workplace.[20,33,45,53,57,60] Support in the workplace includes social support of coworkers and supervisors, relationships at work, and problems with workmates and superiors. Results in two high-quality studies showed that low support had a statistically significant positive effect.[20,57] In one high-quality study, investigators found a nonsignificant positive effect.[53] Leino and Hänninen[45] did not consistently find an effect in the analyses in all subgroups, but low support had a statistically significant positive effect or no effect, both on low back symptoms and clinical findings. Finally, no effect was found in one high-quality study, except in men in whom a nonsignificant negative effect of low workplace support on long absences due to back pain was found.[33] The results were considered to indicate no effect, because no effect was found on short absences, the operationalization of back pain that is closest to self-reported symptoms. Because findings in four of five studies indicated a positive effect, application of the rating system showed that there is strong evidence for low social support in the workplace as a risk factor for back pain. The magnitude of the risk estimates (RR/OR) ranged from 1.3 to 1.9.

Job Satisfaction. The effect of low job satisfaction was reported in seven high- and two low-quality studies.[8,17,20,33,50,53,55,58,66] In one high-quality study it was reported only that no statistically significant effect was found.[50] Results in another high-quality study indicated no effect of low job satisfaction.[33] Researchers in five high-quality studies found that low job satisfaction had a statistically significant positive effect.[17,20,53,55,58] Because results in five of six studies indicated a positive effect of low job satisfaction, application of the rating system showed that there is strong evidence for low job satisfaction as a risk factor. The magnitude of the risk estimates (RR/OR) ranged from 1.7 to 3.0.

Sensitivity Analysis. Strong evidence of an effect was found for low social support in the workplace and low job satisfaction. When all the studies in which a nonsignificant effect for these exposures was found were considered as indicating no effect, the result for job satisfaction did not change. For low support in the workplace, this would mean that results in two studies indicated no effect and those in three indicated a positive effect, which would provide insufficient evidence of an effect of low social support in the workplace because of inconsistent findings.

Psychosocial Factors in Private Life

The effect of psychosocial factors in private life was reported in only one high-quality and two low-quality studies,[20,49,60] and the factors studied were very different. They included family support, presence of a close friend or neighbor, social contact, social participation, instrumental support, and emotional support. In general, in these studies it was reported only that no statistically significant effect was found. The only effect found was that high emotional support had a statistically significant positive effect for chronic low back pain in a group of elderly subjects.[49] Therefore, application of the rating system showed that there is insufficient evidence of an effect of psychosocial factors in private life.

■ Discussion

Selection of Studies

Although efforts were made to find all published cohort and case–control studies, the possibility of selection and publication bias cannot be excluded. The exclusion of studies with a cross-sectional design is an important difference between this review and previously published reviews on the same topic. The main argument for the exclusion of this type of study is that the criterion of temporality, the only unarguable and therefore necessary criterion for causality,[59] is not met in cross-sectional studies, in which exposure and outcome are assessed simultaneously.

Studies with a fairly broad spectrum of outcome measures were included in this review. Given the suggested explanations for the association between psychosocial work characteristics and musculoskeletal pain, there may be psychosocial factors that affect only the reporting of symptoms and sick leave.[23,25,61,63] In addition, different groups of back pain, classified based on characteristics such as, for example, the absence or presence of radiation, may have different causes. However, because of the limited number of studies and the heterogeneity in the assessment of back pain, it was not possible to specifically examine the association between psychosocial factors and different types of back pain, such as back pain with and without radiation, and different measures of back pain, such as back pain on survey, reports of back pain, and such consequences of back pain as sick leave, medical consultation, or treatment and disability. Because of the limited number of studies, it was also not possible to examine the evidence available from case–control and cohort studies separately.

Quality of the Studies

Based on the scoring on the criteria list, the methodologic quality of most studies (69%) was considered to be high. The quality of studies in working populations turned out

to be generally higher than that of studies in community-based populations.

None of the publications on any of the studies clearly demonstrated with reference to repeatability data that standardized methods of acceptable quality were used for the assessment of psychosocial factors at work. Only one study[33] made use of the Job Content Questionnaire[37] to measure psychosocial work characteristics. Although factors examined by different investigators were combined in the same category in this review, factors that seemed to have similar names could differ unexpectedly, because of differences in measurement methods or in the items included in the scale. Although most studies presented quantitative measures of effect for some of the factors studied, in many studies, effect estimates were missing for at least some of the psychosocial factors of interest.

A few aspects of the quality of the studies were not included in the criteria list but were observed during the scoring of the studies. For instance, the reviewed studies provide little insight into the effect of adjustment for certain covariates, because only one study showed the effect estimate for a certain exposure with and without adjustment for covariates.[33] The prevalence of back pain instead of the cumulative incidence was examined in some of the cohort studies, because the occurrence of back pain was assessed for only a part of the follow-up period.[8,42–47]

Assessment of Evidence

The main difference between this review and previously published reviews on the same topic is the application of a systematic approach that includes explicitly defined criteria, on which the assessment of the strength of the evidence was based. As in the clinical literature, it is still unclear which items are especially important causes of bias and should therefore be included in the methodologic quality assessment.[64] One of the specific problems encountered in this review of observational epidemiologic studies, compared with reviews of clinical trials in which usually only one contrast is evaluated, is that the relatively broad objective of this review and most of the evaluated studies resulted in a relatively nonspecific list of criteria. Another problem that arises from the rating system applied in this review of observational studies is that the synthetic approach can give a false impression of consistency across study results.

In spite of these limitations, in the authors' opinion, the use of a systematic approach with scoring of the quality of the studies and defining levels of evidence was appropriate in the present qualitative review. One important advantage is that the reader is given considerable insight into the process of assessment of the evidence. This makes it possible to repeat the analysis and to examine how the results are influenced if slight changes are made in the assessment of the findings or the methodologic quality of the studies.

Evidence for Psychosocial Factors as Risk Factors for Back Pain

Strong evidence for a positive effect was found for low social support in the workplace and low job satisfaction. The results of the sensitivity analysis showed that insufficient evidence instead of strong evidence was found for low social support when nonsignificant findings were dealt with differently. This was because the effect found for social support in the workplace was of relatively low magnitude and nonsignificant in one of the four studies in which a positive effect was found.[53] The assessment of the evidence can also be changed by using a slightly different definition of high- and low-quality studies. The use of a cut-off point of 40% for the assessment of high-quality studies, implying that more studies are considered to be of high quality, results also in insufficient evidence instead of strong evidence for social support in the workplace. The results for the other factors are not affected. The use of a cutoff point of 60% has no effect on the results for any of the factors studied.

In the only study in which no effect of low job satisfaction was found, the statistically significant association found in univariate analysis disappeared after adjustment for both prior back pain and psychosocial work characteristics such as demands, control, and support.[33] Three of the five studies in which a positive effect of low job satisfaction was found had also adjusted for prior back pain, but not for other psychosocial work characteristics.[17,20,53] In none of the studies were the results adjusted for physical load at work. Therefore, the positive association between low job satisfaction and back pain may be due to an intercorrelation between psychosocial work characteristics and physical load on the one hand and job satisfaction on the other.

Insufficient evidence was found for either a high work pace or high qualitative demands, because of inconsistent findings. The contradictory findings for a high work pace[33,57] may be caused by a lack of or improper adjustment for physical load at work. The contradictory findings of the two studies on the effect of high qualitative demands may be because each study focuses on different aspects of qualitative demands—namely, conflicting demands[33] and high mental demands.[8] However, the studies also differ in their operationalization of back pain, the adjustment for confounding, and the period between the measurement of exposure and back pain. In one of the studies,[8] even the timing of the different measurements was not quite clear.

Insufficient evidence was found for an effect of job content, job control, or decision latitude, because the available information was too limited. However, the division into categories in this review is debatable. Job content and job control, the subdimensions of decision latitude, appear to be highly correlated.[38] If the assessment of the evidence was focused on all three categories together, strong evidence would have been found for the total group. This evidence would be based on one high-quality study in which a positive effect was found for

both job content and job control separately,[45] and another study in which a positive effect of decision latitude was found.[33]

In general, it can be concluded that in many of the studies no adjustment had been made for physical load at work, and even if this factor was controlled for, in most cases a rough measure was used, or the adjustment was restricted to certain aspects of physical load at work. In the workplace a high correlation often exists between psychosocial factors and physical load.

Insufficient evidence was found for an effect of psychosocial factors in private life, simply because the data were very limited.

Comparison With the Results of Previous Reviews

It is interesting to see how the results of this review compare with the conclusions drawn in other recently published reviews on the same topic.[9,23–25,27] Bongers et al[25] concluded that there is evidence for monotonous work or poor work content and poor support by colleagues as risk factors for back pain. Burdorf and Sorock[27] concluded that job dissatisfaction and monotonous work were important factors. The results of Bernard[9] showed that there was evidence for intensified workload as a risk factor, and limited evidence for low job control and job dissatisfaction.

The conclusions drawn in the various reviews appear to be rather heterogeneous. In all reviews, evidence was found for the effect of some of the psychosocial work characteristics, but there is no psychosocial work characteristic for which evidence was found in all reviews. The differences in the results of the present review, compared with those in other reviews, are mainly based on the fact that cross-sectional studies were excluded from this review. In the other reviews the evidence for (quantitative and qualitative) job demands,[9] monotonous work,[9,25,27] and job control[9] was based solely on the findings of cross-sectional studies. Furthermore, a difference in the interpretation of the results of the study of Bigos et al[20,21] played an important role in the different result for social support in the workplace. In the review of Bernard[9] the findings were interpreted as indicating no effect of support, while in this review and in the review of Bongers et al[25] the findings were interpreted as indicating a positive effect of low support.

The role of psychosocial factors in private life was also evaluated in one of the reviews,[24] and it was concluded that the few studies that analyzed the effects of life events or social relationships outside the work environment indicate that these are of minor importance. However, an effect of life events was found in several cross-sectional studies. In the present review, however, no case–control or cohort studies on the effect of life events were identified.

Having evaluated the strength of the evidence for both physical[34] and psychosocial factors as risk factors for back pain, using the same methods, the question arises of whether the findings indicated a difference in the evidence for physical and psychosocial factors. Strong or moderate evidence has been found for heavy physical work; lifting; bending, and twisting; and whole-body vibration at work. Unlike the results for psychosocial factors, these results were rather insensitive to slight changes in the assessment of the findings and the methodologic quality of the studies and in agreement with the results of previous reviews on physical load.[34] This indicates that the body of evidence supporting the role of these physical load factors as risk factors for back pain is somewhat more consistent than that for the psychosocial factors.

■ Conclusions and Recommendations

On the basis of the approach applied, strong evidence was found for a positive effect of low social support in the workplace and low job satisfaction. However, the result for low social support was sensitive to changes in the assessment of the findings and the methodologic quality of the studies. The effect found for low job satisfaction may be a result of insufficient adjustment for psychosocial work characteristics and physical load at work. Insufficient evidence was found for an effect of a high work pace, high qualitative demands, low job content, low job control, and psychosocial factors in private life. However, the combined evaluation of studies on job content and job control, both aspects of decision latitude, led to strong evidence for low job decision latitude as a risk factor for back pain.

Results of further analysis of the available evidence led to the conclusion that investigators in future studies should adjust for all the different aspects of physical factors at work before more definite conclusions can be drawn on the effect of psychosocial work characteristics. Furthermore, researchers should examine more extensively the pathway of the associations between back pain and psychosocial work characteristics such as job demands, job control and social support, physical load at work, and job satisfaction. Efforts should also be made to measure psychosocial factors in an identical manner in different studies. Concerning psychosocial factors in private life, there is a need for more longitudinal and case–control studies based on a similar set of factors, including life events.

Comparing the results of this and other reviews on psychosocial factors showed that although there was evidence for the effect of some psychosocial work characteristics in all reviews, the results were rather heterogeneous. The merit of the approach used in this review is that the reader is given much insight into the process of assessment of the evidence. The results of this review appeared to be sensitive to slight changes in the assessment of the findings or the methodologic quality of the studies, considering the possibility of (residual) confounding, and a change in the division into categories of the psychosocial work characteristics. This leads to the conclusion that there seems to be evidence for an effect of

psychosocial factors at work but that the evidence for the role of specific work-related psychosocial factors has not been established yet.

■ Key Points

- There are 13 case–control and cohort studies available assessing whether psychosocial factors at work and in private life are risk factors for back pain.
- There is evidence for an effect of psychosocial factors at work on the occurrence of back pain, but the evidence for the role of specific psychosocial factors has not been established yet.
- Further studies are necessary, and in these studies psychosocial factors should be measured in an identical manner, and potential confounding by physical load at work should be taken into account.
- Rating of the strength of the evidence based on the methodologic quality of studies and consistency of findings is a useful tool for summarizing the results of observational studies.

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■ Appendix

Methodologic Quality Assessment

■ TABLE A1

Criteria Lists for Assessment of the Methodologic Quality of Prospective and Historical Cohort Studies and Case–Control Studies

Criteria	Design*	I, V/P†
Objective of the study		
1. Positive if the study had a clearly defined objective	CH/CC	I
Study population		
2. Positive if the main features (description of the sampling frame, distribution of the population according to age and sex) of the study population were described	CH/CC	I
3. Positive if the participation rate at baseline was at least 80%	CH	V/P
4. Positive if the response after 1 year of follow-up was at least 80% of the number of participants at baseline, or if the nonresponse was not selective (data shown)	CH	V/P
5. Positive if cases and controls were drawn from the same population and a clear definition of cases and controls was given. Subjects with low back pain during the previous 90 days must be excluded from the control group	CC	V/P
6. Positive if the participation rate of cases and controls selected and invited to participate at baseline was at least 80%	CC	V/P
Exposure measurements, physical load at work		
7. Positive if data on physical load at work were collected and included in the statistical analysis. Data on physical load at work based on information about job title (job-exposure matrix) were not considered to be appropriate	CH/CC	V/P
8. Positive if data were collected by means of standardized methods of acceptable quality‡	CH/CC	V/P
Exposure measurements, psychosocial factors at work		
9. Positive if data on psychosocial factors at work were collected and included in the statistical analysis	CH/CC	V/P

Criteria	Design*	I, V/P†
10. Positive if data were collected by means of standardized methods of acceptable quality‡	CH/CC	V/P
Exposure measurements, other		
11. Positive if data on physical or psychosocial exposure during leisure time were collected and included in the statistical analysis	CH/CC	V/P
12. Positive if data on historical exposure at work were collected and included in the statistical analysis	CH/CC	V/P
13. Positive if data on history of back pain, age, and sex were collected and included in the statistical analysis. Data on history of back pain should be based on information about the presence of back pain during at least 1 year before baseline	CH/CC	V/P
14. Positive if the exposure was measured in an identical manner among cases and controls	CC	V/P
15. Positive if the exposure assessments were blinded to disease status	CC	V/P
16. Positive if the exposure was assessed before the occurrence of the outcome	CC	V/P
Assessment of back pain		
17. Positive if based on standardized methods of acceptable quality, *i.e.*, positive if one of the following criteria were met:	CH/CC	V/P
Self-reported: data presented or in reference show that the intraclass correlation coefficient >0.60 or $\kappa >$ 0.40 for test–retest reliability		
Registered: data presented or in reference must demonstrate that the registration system is valid and reliable		
Physical examination blinded to exposure status: data presented or in reference show that the intraclass correlation coefficient >0.60 or $\kappa >$ 0.40 for the intraobserver reliability if only one observer is involved or the interobserver reliability if more than one observer is involved		
If no intraclass correlation coefficient or κ has been computed, but the data presented show clearly that the reliability of the method is good, this criterion is also rated positively		
18. Positive if the period on which the assessment of back pain was based was at least one year	CH	V/P
19. Positive if data were collected at least once every 3 months or obtained from a continuous registration system	CH	V/P
20. Positive if incident cases were included (prospective enrollment)	CC	V/P
Analysis and data presentation		
21. Positive if the method used for the statistical analysis was appropriate for the outcome studied and the measures of association estimated according to this model (including confidence intervals [CI]) were presented	CH/CC	V/P
22. Positive if the analysis included a stratified or multivariable analysis	CH/CC	V/P
23. Positive if the number of cases in the final multivariable model was at least 10 times the number of independent variables in the analysis	CH/CC	V/P

* This column shows whether a criterion pertains to the criteria list for cohort (CH) and/or case–control (CC) studies.

† I = criterion on informativeness; V/P = criterion on validity/precision.

‡ This criterion is rated positively if one of the following criteria is met:
Direct measurement method: data presented or in reference show that the intraclass correlation coefficient >0.60 or $\kappa >$ 0.40.
Observational method: Data presented or in reference show that the intraclass correlation coefficient >0.60 or $\kappa >$ 0.40 for the intraobserver reliability if only one observer is involved or the interobserver reliability if more than one observer is involved.
Self-reported: Data presented or in reference show that the intraclass correlation coefficient >0.60 or $\kappa >$ 0.40 for the test–retest reliability.
If no intraclass correlation coefficient or κ has been computed, but the data presented show clearly that the reliability of the method is good, this criterion is also rated positively.