ORIGINAL ARTICLE

High physical work load and low job satisfaction increase the risk of sickness absence due to low back pain: results of a prospective cohort study

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Occup Environ Med 2002;**59**:323–328

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Accepted 8 November 2001

Objective: To determine whether physical and psychosocial load at work influence sickness absence due to low back pain.

Methods: The research was a part of the study on musculoskeletal disorders, absenteeism, stress, and health (SMASH), a 3 year prospective cohort study on risk factors for musculoskeletal disorders. Workers from 21 companies located throughout The Netherlands participated in the part of this study on sickness absence due to low back pain. The study population consisted of 732 workers with no sickness absences of 3 days or longer due to low back pain in the 3 months before the baseline survey and complete data on the reasons for absences during the follow up period. The mean (range) period of follow up in this group was 37 (7–44) months. Physical load at work was assessed by analyses of video recordings. Baseline information on psychosocial work characteristics was obtained by a questionnaire. Data on sickness absence were collected from company records. The main outcome measure was the rate of sickness absences of 3 days or longer due to low back pain during the follow up period.

Results: After adjustment of the work related physical and psychosocial factors for each other and for other potential determinants, significant rate ratios ranging from 2.0 to 3.2 were found for trunk flexion, trunk rotation, lifting, and low job satisfaction. A dose-response relation was found for trunk flexion, but not for trunk rotation or lifting. Non-significant rate ratios of about 1.4 were found for low supervisor support and low coworker support. Quantitative job demands, conflicting demands, decision authority, and skill discretion showed no relation with sickness absence due to low back pain.

Conclusions: Flexion and rotation of the trunk, lifting, and low job satisfaction are risk factors for sickness absence due to low back pain. Some indications of a relation between low social support, either from supervisors or coworkers, and sickness absence due to low back pain are also present.

Low back pain is a major health problem, not only because of the high prevalence and incidence of low back problems,[1] but also because of the important consequences for disability, the use of health services, and sickness absence. This results in high costs. In 1991, the total cost of back pain to society in The Netherlands was estimated to be 1.7% of the gross national product.[2] More than half of the total cost was due to sickness absence related to back pain.[2] Back pain also accounts for many lost working days in other countries.[3–5]

The relation between physical and psychosocial load at work, and the occurrence of low back pain has been the subject of many studies. However, most of these studies did not actually measure the physical load at work, or assess both physical and psychosocial load at work. Moreover, hardly any of these studies focused specifically on sickness absence due to low back pain as an outcome measure. Two recent reviews[6 7] identified 32 cohort and case-control studies on the effect of physical and psychosocial factors on low back pain, four of which investigated their relation with sickness absence due to low back pain.[8–11] Only two studies collected data on sickness absence from sick leave records, but these studies did not include an assessment of the physical load at work.[9 10]

The objective of the analyses presented in this paper was to determine whether physical and psychosocial load at work influence company registered sickness absence due to low back pain. The analyses are based on data from the study on musculoskeletal disorders, absenteeism, stress, and health (SMASH), a prospective cohort study among a working population, which was initiated to identify risk factors for musculoskeletal disorders. The results from this study on the relation between physical and psychosocial load at work and self reported low back pain are reported elsewhere.[12 13]

PARTICIPANTS AND METHODS

Study population

For the SMASH, workers were recruited from 34 companies located throughout The Netherlands. The participating companies were asked to select workers who had been employed in their current job for at least 1 year and who were working 24 hours a week or more. Workers in blue collar jobs, as well as workers in white collar jobs and caring professions were included in the study. At baseline, 1789 (87%) of the 2064 workers who were invited to participate completed the questionnaire, 1738 of whom were eligible for participation in the part of the study focusing on risk factors for low back pain.[12]

Baseline survey

Between March 1994 and March 1995 the participants completed a questionnaire and underwent a physical examination. The questionnaire included questions on age, sex, smoking, exercise behaviour,[14] and coping skills.[15] Body mass index was assessed during the physical examination.

Abbreviations: SMASH, study on musculoskeletal disorders, absenteeism, stress, and health; JCQ, job content questionnaire; ICD-9, 9th revision of the international classification of diseases

Psychosocial work characteristics were assessed by a Dutch version of Karasek's job content questionnaire (JCQ),[16] which includes dimensions on quantitative job demands, decision authority, skill discretion, supervisor support, and coworker support. Conflicting demands and job security were both assessed on the basis of one single item from the JCQ.[16] Job satisfaction was assessed by one question concerning general opinion about the job.[17]

The physical load factors trunk flexion, trunk rotation, and lifting of loads at work were assessed by video recordings and force measurements at the workplace. Four video recordings of all workers were made randomly during the course of 1 day. The duration of each video recording was 10–14 minutes, depending on the variability of the worker's tasks. The project assistants who made the video recordings classified all workers into groups with similar tasks and a similar physical load. Within each group, analyses of the posture, movement, and force exertion of one in four workers were made by observations from the video recordings. The mean values for flexion and rotation of the trunk and lifting of the workers in each group for whom the video recordings were analysed were assigned to all workers in the same group.

Assessment of the percentage of the working time spent with the trunk in a minimum of 30° or 60° of flexion was based on continuous observations from the video recordings. The categories of trunk flexion that were observed were defined as neutral (<30°), mild flexion (30–60°), extreme flexion (60–90°), and very extreme flexion (≥90°). Assessment of the percentage of the working time spent with the trunk in rotation was based on multimoment observations from the four video recordings per person. The categories of trunk rotation were defined as neutral (<30°) and twisting (≥30°) and were observed every 15 seconds. Assessment of the number of times workers lifted a load of any weight, or a load of at least 10 or 25 kg during a working day, was based on continuous observations from the video recordings and on force measurements made at the workplace. The number of lifts during the period observed (four times 10 or 14 minutes) was extrapolated to the number of lifts for an 8 hour working day.[12]

Driving a vehicle at work and physical factors during leisure time were assessed by the Loquest questionnaire.[18]

Follow up and sickness absence

Adequate data on sickness absence were provided by 21 of the 34 participating companies. Of the 1213 participating workers from these 21 companies, 1080 (89%) had given their informed consent for a follow up based on their sick leave records. About two thirds of the workers were production workers—such as machine operators, product assemblers or packers—in different industries, for example the metal industry, the chemical industry, the pharmaceutical industry, the food industry, and the wood construction industry. About one third of the workers were office workers working as administrative staff in one of the manufacturing companies or working in a computer software or an insurance company.

Annually, from the start of the study, the companies provided the first and last dates of all sickness absences to the end of 1997. If available, the reasons for absence were provided by the companies or by the physicians of the occupational health services. Also, the physicians coded the reasons for absence according to an adapted Dutch version[19] of the 9th revision of the international classification of diseases (ICD-9).[20] The following diagnoses were considered to constitute sickness absence due to low back pain: lumbosacral spondylosis and spondylosis of unspecified site (ICD numbers 721, 721.3, 721.42, 721.9), lumbar intervertebral disc disorders and intervertebral disc disorders of unspecified site (ICD numbers 722, 722.10, 722.2, 722.52, 722.6, 722.73, 722.9), and other and unspecified back disorders (ICD numbers 724, 724.2, 724.3, 724.4, 724.5, 724.9).

The main measure of sickness absence used in the present study was the rate of sickness absences of 3 days or longer due to low back pain. For each employee, the number of absences of 3 days or longer due to low back pain during the follow up period was computed, and the overall person-time at risk (excluding time spent on sick leave) was calculated in person-years.[21] Workers with a follow up period of less than 6 months (n=20) and workers with sickness absences due to low back pain of 3 days or longer in the 3 months before the baseline measurement (n=30), or with missing data on the reasons for absences during this period (n=42) were excluded from the analyses in this study. This resulted in a final cohort of 988 workers.

Statistical analysis

Poisson regression models were used to calculate rate ratios (RRs) and corresponding likelihood ratio based 95% confidence intervals (95% CIs).[21] The analyses were carried out with the statistical package SAS (Version 6.12). To be able to make comparisons between results, the division into categories of the work related physical and psychosocial factors under study was the same as that used for the analyses of the relation of these factors with self reported low back pain, reported elsewhere.[12 13]

Potential confounding was adjusted for in multivariable analyses. To prevent collinearity it was checked whether the work related physical factors, psychosocial factors, and the other independent variables had a correlation coefficient ≤0.50. This was the case for all variables, except among the work related physical factors. The correlation between the work related physical and psychosocial factors was always lower than 0.30.

The adjusted RRs were determined in a full model including one of the risk factors under study, the individual factors, other psychosocial work characteristics, physical factors during leisure time, and other work related physical factors. A stepwise procedure was used to construct the full model. This made it possible to determine whether the results were mainly influenced by adjustment for the group of individual factors, the group of other psychosocial work characteristics, the group of physical factors during leisure time, or the group of other work related physical factors.

To determine the presence or absence of a healthy worker effect, the multivariable analyses described were repeated for those workers who had been employed in their current job for 5 years or less at baseline. Moreover, as risk factors for sickness absence (or the size of their effect) may differ for absences of different duration, the multivariable analyses were also repeated separately for short (3–7 days) and long absences (>7 days).

RESULTS

From the cohort of 988 workers, data on the reasons for all absences of 3 days or longer during the follow up were available for 732 workers (74%). About 25% of the workers in this group were women. The mean (range) age of the workers was 36.4 (18–59) years. The mean (range) period of follow up of sickness absences in this group was 37 (7–44) months. Table 1 shows the rates and number of absences of 3 days or longer due to low back pain according to age and sex. The rate of sickness absence due to low back pain was about twice as high among men as among women. Of the 149 (20.4%) workers who were absent due to back pain during the follow up, 100 (67.1%) were absent once, 34 (22.8%) were absent twice, 14 (9.4%) were absent three times, and one was absent four times for this reason. The diagnosed codes of most absences due to back pain were unspecified back disorders (ICD number 724).

Table 2 shows the effect of work related physical factors on sickness absence due to low back pain. Trunk flexion, as well as trunk rotation and lifting at work, were significantly associated with the occurrence of sickness absence due to low back pain. A dose-response relation was found for trunk flexion,

Table 1 Rates and number of absences of 3 days or longer due to low back pain according to age and sex (n=732)

	Men		Women	
Age	Absences (n)	Rate of absences (n/100 person-years)	Absences (n)	Rate of absences (n/100 person-years)
18–25	15	12.44	6	4.75
26–30	34	11.68	5	4.57
31–35	41	12.49	6	9.84
36–40	37	11.16	1	2.07
41–45	24	10.21	4	6.32
>45	34	10.53	7	7.83
Total	185	11.35	29	5.82

but not for trunk rotation or lifting. For lifting, the initial dose-response relation that was found in the crude analysis disappeared after adjustment for confounders. The decrease in the estimated RRs for lifting and trunk flexion and rotation was caused by adjustment for the individual factors, the psychosocial work characteristics, and driving a vehicle at work. The effects of flexion and rotation of the trunk and lifting at work were not adjusted for each other for reasons of collinearity. In the subgroup of workers who reported that they had been working in their current job for 5 years or less at baseline, the adjusted RRs for all work related physical factors under study were higher than those in the complete cohort.

Table 3 shows the effect of psychosocial work characteristics on sickness absence due to low back pain. After adjustment for confounders, a significantly increased RR was only found for low job satisfaction. The RRs for low supervisor support and low coworker support remained increased after adjustment for potential confounders, but were no longer significant. The decrease in the estimated RRs for these factors and the disappearance of the effect of decision authority and skill discretion was mainly caused by adjustment for the other psychosocial work characteristics. The disappearance of the effect of skill discretion was also caused by the adjustment for work related physical factors. In the subgroup of workers who reported that they had been working in their current job for 5 years or less at baseline, the adjusted RR for low supervisor support was substantially higher than in the complete cohort. Moreover, a clearly increased RR was found for medium decision authority, which showed no relation with sickness absence due to low back pain in the complete cohort.

Tables 4 and 5 show the effect of work related physical factors and psychosocial work characteristics on short and long absences due to low back pain, separately. The work related physical factors had a stronger relation with long absences than with short absences. The strongest relation between psychosocial work characteristics and short absences was found for low supervisor support, and the strongest relation with long absences was found for low job satisfaction.

Table 2 Rate ratios (RR) of absences of 3 days or longer due to low back pain according to work related physical factors

Risk factor	Absences (n)	Workers* (n)	Crude RR (95% CI†)‡ (n=635)	Adjusted RR (95% CI)§ (n=635)	Workers employed ⩽5 years in the current job at baseline, adjusted RR (95% CI)§ (n=265)
Percentage of the working time with trunk flexed ⩾30°:					
⩽5	75	441	1.00	1.00	1.00
5–10	32	116	1.75 (1.12 to 2.67)	1.36 (0.83 to 2.21)	0.90 (0.39 to 1.97)
10–15	32	67	2.83 (1.81 to 4.32)	2.03 (1.19 to 3.40)	3.01 (1.23 to 7.27)
15–20	24	35	4.02 (2.40 to 6.45)	3.24 (1.80 to 5.69)	9.16 (2.44 to 33.0)
>20	21	43	3.01 (1.80 to 4.84)	2.33 (1.32 to 3.97)	1.69 (0.46 to 5.42)
Percentage of the working time with trunk flexed:					
⩽5 ⩾30°	75	441	1.00	1.00	1.00
5–10 ⩾30°	32	116	1.75 (1.12 to 2.67)	1.37 (0.83 to 2.21)	0.93 (0.40 to 2.05)
>10 ⩾30° and ⩽5 ⩾60°	48	97	2.91 (1.97 to 4.25)	2.27 (1.45 to 3.52)	3.15 (1.33 to 7.41)
>5 ⩾60°	29	48	3.65 (2.31 to 5.62)	2.65 (1.59 to 4.32)	3.59 (1.36 to 9.27)
Percentage of the working time with trunk rotated ⩾30°:					
⩽5	106	544	1.00	1.00	1.00
5–10	69	125	2.90 (2.11 to 3.97)	2.12 (1.45 to 3.07)	2.78 (1.36 to 5.67)
>10	9	33	1.65 (0.78 to 3.10)	1.10 (0.49 to 2.21)	0.33 (0.02 to 2.02)
Number of lifts/8 hour working day:					
Never	32	251	1.00	1.00	1.00
Never ⩾10 kg/working day	27	112	2.31 (1.35 to 3.92)	2.47 (1.42 to 4.29)	3.10 (1.13 to 8.80)
Never ⩾25 kg/working day	65	208	2.76 (1.78 to 4.39)	2.32 (1.41 to 3.89)	2.46 (1.02 to 6.48)
1–15 ⩾25 kg/working day	37	82	3.60 (2.18 to 5.99)	2.27 (1.25 to 4.14)	2.06 (0.69 to 6.30)
>15 ⩾25 kg/working day	23	49	3.81 (2.14 to 6.68)	2.18 (1.07 to 4.37)	2.77 (0.81 to 9.56)

*For 702 of the 732 workers with data on the reasons for all absences of 3 days or longer, data were available on the work related physical factors presented in this table; †95% CI=95% confidence interval; ‡crude rate ratio from Poisson regression in the population with no missing values for sex, age, smoking, body mass index, exercise behaviour during leisure time, coping skills (active problem solving, avoidance behaviour, social support seeking), quantitative job demands, conflicting demands, decision authority, skill discretion, supervisor support, coworker support, job security, job satisfaction, moving of heavy loads during leisure time, flexion or rotation of the upper part of the body during leisure time, driving a vehicle during leisure time and driving a vehicle at work; § rate ratio from Poisson regression, adjusted for the risk factors mentioned.

Table 3 Rate ratios (RR) of absences of 3 days or longer due to low back pain according to psychosocial work characteristics

Risk factor	Absences (n)	Workers* (n)	Crude RR (95% CI†)‡ (n=635)	Adjusted RR (95% CI)§ (n=635)	Workers employed ⩽5 years in the current job at baseline adjusted RR (95% CI)§ (n=265)
Quantitative job demands:					
Low (score 6–11)	59	200	1.00	1.00	1.00
Medium (score 12–16)	137	472	0.95 (0.68 to 1.33)	1.02 (0.71 to 1.48)	1.06 (0.57 to 2.06)
High (score 17–20)	15	51	0.92 (0.42 to 1.77)	0.68 (0.30 to 1.40)	1.62 (0.36 to 6.03)
Conflicting demands:					
Disagree	133	472	1.00	1.00	1.00
Agree	54	199	1.02 (0.72 to 1.43)	0.76 (0.52 to 1.10)	0.53 (0.26 to 1.06)
Strongly agree	17	49	1.28 (0.67 to 2.22)	1.20 (0.61 to 2.19)	0.43 (0.10 to 1.52)
Decision authority:					
High (score 10–12)	35	159	1.00	1.00	1.00
Medium (score 7–9)	155	467	1.58 (1.05 to 2.49)	1.17 (0.70 to 2.02)	4.29 (1.39 to 16.5)
Low (score 3–6)	24	98	1.27 (0.70 to 2.28)	0.69 (0.34 to 1.40)	1.58 (0.36 to 7.58)
Skill discretion:					
High (score 17–20)	41	165	1.00	1.00	1.00
Medium (score 12–16)	129	473	1.12 (0.76 to 1.68)	0.85 (0.52 to 1.42)	0.61 (0.25 to 1.59)
Low (score 5–11)	44	87	2.08 (1.29 to 3.37)	1.10 (0.58 to 2.10)	0.65 (0.19 to 2.24)
Supervisor support:					
High (score 13–16)	20	90	1.00	1.00	1.00
Medium (score 11, 12)	111	427	0.95 (0.58 to 1.63)	1.06 (0.60 to 1.97)	1.81 (0.66 to 5.73)
Low (score 4–10)	82	207	1.61 (0.98 to 2.79)	1.43 (0.77 to 2.74)	3.59 (1.20 to 12.3)
Coworker support:					
High (score 13–16)	34	144	1.00	1.00	1.00
Medium (score 11, 12)	141	498	0.96 (0.65 to 1.47)	0.97 (0.62 to 1.56)	0.65 (0.30 to 1.46)
Low (score 4–10)	38	81	2.02 (1.23 to 3.32)	1.46 (0.82 to 2.61)	1.12 (0.37 to 3.31)
Job satisfaction:					
Good	104	430	1.00	1.00	1.00
Reasonable	85	251	1.21 (0.86 to 1.67)	1.06 (0.74 to 1.53)	0.75 (0.39 to 1.42)
Not good/moderate	24	45	2.39 (1.43 to 3.79)	1.95 (1.08 to 3.39)	2.04 (0.72 to 5.49)

*For between 720 and 726 of the 732 workers with data on the reasons for all absences of 3 days or longer, data were available on the various psychosocial work characteristics presented in this table; †95% CI, 95% confidence interval; ‡crude rate ratio from Poisson regression in the population with no missing values for sex, age, smoking, body mass index, exercise behaviour during leisure time, coping skills (active problem solving, avoidance behaviour, social support seeking), moving of heavy loads during leisure time, flexion or rotation of the upper part of the body during leisure time, driving a vehicle during leisure time, trunk flexion, lifting, driving a vehicle at work, job security and the other psychosocial work characteristics mentioned in the table; §rate ratio from Poisson regression, adjusted for the risk factors mentioned.

Table 4 Rate ratios (RR) of short (3–7 days) and long (>7 days) absences due to low back pain according to work related physical factors

	Short absenteeism		Long absenteeism	
Risk factor	Absences of 3–7 days n (workers† (n))	Adjusted RR (95% CI*)§ (n=688)	Absences of >7 days n (workers‡ (n))	Adjusted RR (95% CI*)§ (n=751)
Percentage of the working time with trunk flexed ⩾30°:				
⩽5	31 (465)	1.00	59 (523)	1.00
5–10	15 (127)	1.56 (0.74 to 3.20)	22 (144)	1.07 (0.59 to 1.89)
10–15	11 (78)	1.35 (0.55 to 3.07)	39 (85)	3.21 (1.91 to 5.34)
15–20	6 (38)	2.18 (0.74 to 5.60)	18 (38)	3.66 (1.86 to 6.91)
>20	7 (51)	1.17 (0.43 to 2.82)	17 (50)	2.93 (1.55 to 5.33)
Percentage of the working time with trunk flexed:				
⩽5 ⩾30°	31 (465)	1.00	59 (523)	1.00
5–10 ⩾30°	15 (127)	1.59 (0.76 to 3.26)	22 (144)	1.07 (0.59 to 1.88)
>10 ⩾30° and ⩽5 ⩾60°	16 (107)	1.69 (0.80 to 3.47)	48 (116)	3.08 (1.90 to 4.96)
>5 ⩾60°	8 (60)	1.15 (0.46 to 2.63)	26 (57)	3.49 (2.03 to 5.89)
Percentage of working time with trunk rotated ⩾ 30°:				
⩽5	43 (582)	1.00	84 (648)	1.00
5–10	21 (134)	1.52 (0.78 to 2.89)	56 (147)	2.30 (1.51 to 3.47)
>10	6 (43)	1.04 (0.37 to 2.56)	15 (45)	2.54 (1.30 to 4.71)
Number of lifts/8 hour working day:				
Never	14 (259)	1.00	20 (281)	1.00
Never ⩾10 kg/working day	12 (118)	2.68 (1.13 to 6.46)	27 (152)	3.19 (1.72 to 6.01)
Never ⩾25 kg/working day	21 (232)	1.46 (0.64 to 3.44)	54 (246)	2.99 (1.68 to 5.54)
1–15 ⩾25 kg/working day	18 (92)	2.46 (0.96 to 6.41)	30 (99)	2.78 (1.40 to 5.58)
>15 ⩾25 kg/working day	5 (58)	0.89 (0.24 to 2.89)	24 (62)	3.26 (1.52 to 6.98)

*95% CI, 95% confidence interval; †from the cohort of 988 workers, data on the reasons for all absences of 3–7 days were available for 789 workers, for 759 of these 789 workers, data were available on all work related physical factors presented in this table; ‡from the cohort of 988 workers, data on the reasons for all absences of more than 7 days were available for 878 workers, for 840 of these 878 workers, data were available on all work related physical factors presented in this table; §rate ratio from Poisson regression, adjusted for sex, age, smoking, body mass index, exercise behaviour during leisure time, coping skills (active problem solving, avoidance behaviour, social support seeking), quantitative job demands, decision authority, skill discretion, supervisor support, co worker support, job security, job satisfaction, moving of heavy loads during leisure time, flexion or rotation of the upper part of the body during leisure time, driving a vehicle during leisure time, and driving a vehicle at work.

Table 5 Rate ratios (RR) of short (3–7 days) and long (>7 days) absences due to low back pain according to psychosocial work characteristics

Risk factor	Short absenteeism		Long absenteeism	
	Absences of 3–7 days n (workers† (n))	Adjusted RR (95% CI*)§ (n=688)	Absences of >7 days n (workers‡ (n))	Adjusted RR (95% CI*)§ (n=751)
Quantitative job demands:				
Low (score 6–11)	30 (217)	1.00	47 (235)	1.00
Medium (score 12–16)	44 (507)	0.60 (0.34 to 1.06)	117 (570)	1.13 (0.76 to 1.70)
High (score 17–20)	3 (56)	0.10 (0.01 to 0.57)	13 (63)	0.86 (0.37 to 1.80)
Conflicting demands:				
Disagree	51 (508)	1.00	113 (563)	1.00
Agree	20 (216)	0.77 (0.40 to 1.39)	45 (243)	0.75 (0.49 to 1.11)
Strongly agree	5 (53)	1.49 (0.49 to 3.67)	13 (58)	0.93 (0.40 to 1.89)
Decision authority:				
High (score 10–12)	12 (157)	1.00	32 (176)	1.00
Medium (score 7–9)	58 (505)	0.97 (0.46 to 2.20)	124 (539)	1.32 (0.75 to 2.41)
Low (score 3–6)	7 (110)	0.44 (0.13 to 1.37)	24 (144)	0.80 (0.37 to 1.72)
Skill discretion:				
High (score 17–20)	16 (174)	1.00	31 (185)	1.00
Medium (score 12–16)	51 (515)	0.83 (0.39 to 1.84)	107 (566)	0.84 (0.48 to 1.51)
Low (score 5–11)	10 (93)	1.27 (0.44 to 3.61)	42 (118)	1.19 (0.59 to 2.46)
Supervisor support:				
High (score 13–16)	6 (92)	1.00	17 (98)	1.00
Medium (score 11, 12)	38 (457)	1.83 (0.70 to 5.55)	99 (508)	0.77 (0.42 to 1.49)
Low (score 4–10)	33 (232)	2.89 (1.06 to 8.94)	63 (262)	0.77 (0.39 to 1.59)
Coworker support:				
High (score 13–16)	14 (153)	1.00	26 (165)	1.00
Medium (score 11, 12)	48 (541)	0.67 (0.34 to 1.38)	123 (599)	1.07 (0.65 to 1.82)
Low (score 4–10)	13 (85)	0.88 (0.36 to 2.17)	30 (101)	1.49 (0.79 to 2.87)
Job satisfaction:				
Good	40 (461)	1.00	91 (517)	1.00
Reasonable	29 (273)	1.01 (0.57 to 1.78)	71 (303)	1.00 (0.68 to 1.46)
Not good or moderate	8 (49)	1.45 (0.50 to 3.63)	17 (50)	2.13 (1.09 to 3.95)

*95% CI, 95% confidence interval; †from the cohort of 988 workers, data on the reasons for all absences of 3–7 days were available for 789 workers, for between 772 and 783 of these 789 workers, data were available on the various psychosocial work characteristics presented in this table; ‡from the cohort of 988 workers, data on the reasons for all absences of more than 7 days were available for 878 workers, for between 859 and 870 of these 878 workers, data were available on the various psychosocial work characteristics presented in this table; §rate ratio from Poisson regression, adjusted for sex, age, smoking, body mass index, exercise behaviour during leisure time, coping skills (active problem solving, avoidance behaviour, social support seeking), moving of heavy loads during leisure time, flexion or rotation of the upper part of the body during leisure time, driving a vehicle during leisure time, trunk flexion, lifting, driving a vehicle at work, job security, and the other psychosocial work characteristics mentioned in the table.

DISCUSSION

In this longitudinal study, RRs ranging from 2.0 to 3.2 were found for the relation of trunk flexion, trunk rotation, and lifting at work with sickness absence due to low back pain. Trunk flexion showed a dose-response relation with increasing duration and also, although less clear, with an increasing degree of trunk flexion. Lifting loads of any weight increased the risk of sickness absence due to low back pain. No increase in risk was found with increasing frequency of lifting, or with increasing weight of the load lifted. Due to the strong correlation between flexion and rotation of the trunk and lifting at work in the study population, the independent effects of these exposures could not be assessed. The associations between trunk flexion, trunk rotation, and lifting at work and sickness absence due to low back pain were stronger than the associations between these factors and self reported low back pain found in the same study (RRs of about 1.5).[12] Moreover, the risk started to increase at lower levels of exposure.

The RRs ranged from 1.4 to 2.0 for low supervisor support, low coworker support, and low job satisfaction. The adjusted RRs for supervisor and coworker support were not significant. Quantitative job demands, conflicting demands, decision authority, and skill discretion showed no relation with sickness absence due to low back pain in the complete cohort. The strength of the associations between low supervisor support, low coworker support, and low job satisfaction and sickness absence due to low back pain was similar to those of the association between these factors and self reported low back pain found in the same study.[13]

The analysis of the group of workers who had been employed in their current job for 5 years or less at baseline showed stronger associations with sickness absence due to low back pain for the work related physical factors under study, for medium decision authority, and for low supervisor support. A weaker association was found for low coworker support. These results may indicate the presence of a healthy worker effect in the complete cohort. The results for supervisor support and coworker support are similar to the results of the analyses of the relation with self reported low back pain in the same subgroup.[13] Comparison of complete cohort and subgroup results might indicate that different types of support are important during different stages of employment. The separate analyses for short and long absences showed the strongest associations for the relations between long absences and trunk flexion, trunk rotation, lifting, and low job satisfaction, and for the relation between short absences and low supervisor support.

Selectiveness in the permission obtained for the collection of data from sick leave records might be a source of bias in this study. The percentage of workers with low back pain in the 12 months before baseline, and in the highest exposure category of the work related physical factors under study, was higher among the group of workers who did not give consent for the collection of data on their sickness absence than among the group of workers who did (data not shown). This may explain the decline in the RR in the highest exposure category of the variables ⩾30° of trunk flexion and ⩾30° trunk rotation.

The choice was made to consider the same set of variables in the analyses presented in this paper as in the analyses with self reported low back pain as the outcome measure.[12 13] However, sickness absence due to low back pain may be influenced by other variables that may also confound the relation between work related factors and sickness absence due to low back pain. Socioeconomic status might be such a variable.

However, the role of socioeconomic status is complex because the type of job (occupational class) with its specific level of physical load is one of the main indicators of socioeconomic status.[22] In the present study, workers in very different occupations were included to ensure adequate variation in the work related physical exposures. This means that adjustment for socioeconomic status may lead to overadjustment. Therefore, we decided not to do this.

Company is another variable that was not taken into account in the analyses, but that may be important in relation to sickness absence. There may be different cultures on sickness absence within different companies. Also, return to work policies may differ between companies. To determine the influence of company, a multilevel analysis could be performed, in which different hierarchical levels in the sample (in the present study, company and individual level) can be taken into account and the influence of variables measured at different levels can be examined simultaneously.[23] However, one of the problems of multilevel models for the present analyses is that these models have not been completely worked out for outcome variables with a Poisson distribution. This results in differences in findings for the same dataset, depending on the specific software package used.

Three other prospective cohort studies also collected data on sickness absence from company records.[9 10 24] The present study confirms the findings of Wickström and Pentti,[24] who reported an RR of 2.6 for the relation between self reported exposure to harmful biomechanical loads at work and sickness absence due to back pain. They also found an RR of 1.7 for the relation between sickness absence due to back pain and a lack of recognition and respect at work, one of the aspects of lack of social support. Rossignol *et al*[10] examined the effect of boredom at work and job satisfaction on sickness absence due to back pain. They only found an effect of low job satisfaction. The Whitehall study[9] investigated the effect of psychosocial work characteristics on short and long absences due to low back pain. Low decision latitude, a combined measure of decision authority and skill discretion, showed the most consistent effects. The fact that this result was not confirmed in the present study might be explained by the lack of adjustment for physical load at work in the Whitehall study, or by the fact that the Whitehall study population only included office workers. The effect of psychosocial work characteristics may be more pronounced in a population that is relatively homogeneous for other potential determinants (physical load at work) of low back pain.

The findings from the present study are in agreement with the results of two recent reviews of the literature on physical and psychosocial risk factors for low back pain, which also showed that the evidence is strongest for trunk flexion and rotation, manual material handling, low social support, and low job satisfaction as risk factors for low back pain.[6 7]

The main conclusion which can be drawn from this study is that the work related physical factors of flexion and rotation of the trunk and lifting at work are risk factors for sickness absence due to low back pain. Of the psychosocial work characteristics under study, low job satisfaction was found to be a risk factor for sickness absence due to low back pain. Some indications of a relation between low social support, either by supervisor or coworker, and sickness absence due to low back pain are also present. The other psychosocial work characteristics were not found to be related to sickness absence due to low back pain in the present study.

The results suggest that high physical load is more strongly related than high psychosocial load to increased sickness absence due to low back pain. Furthermore, high physical load seems to be more strongly related to sickness absence due to low back pain than to low back complaints. This implies that decreasing the physical load at work, especially for workers with low back complaints, may be an important tool in the prevention of sickness absence due to low back pain. Also, improving job satisfaction and social support at work may contribute to the prevention of sickness absence due to low back pain.

ACKNOWLEDGEMENTS

This study was financially supported by the Dutch Ministry of Social Affairs and Employment, the Dutch Ministry of Public Health, Welfare, and Sports, and the Dutch National Institute for Social Security.

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