Risk factors for sickness absence because of low back pain among scaffolders

5

a 3-year follow-up study

Abstract

Study design: Prospective cohort study

Objective: To find risk factors for short-term (≤ 14 days) and long-term (> 14 days) sickness absence because of low back pain among scaffolders.

Summary of background data: Although some studies have described the relationship between work-related risk factors for musculoskeletal disease and sickness absence, little is known about the role of individual, physical and psychosocial factors and different end points of low back pain as risk factors for sickness absence among scaffolders.

Methods: Between 1998 and 2001, 222 scaffolders and 66 supervisors (response rate 86%) completed a questionnaire at baseline. In addition, data on sickness absence were collected from absence records.

Results: At baseline, 60% of the study population had had an episode of low back pain in the 12 months preceding the investigation, 37% of which were of chronic nature. During the follow-up, 34% of the population had been on sick leave for at least one episode of low back pain. The risk factors for sickness absence less than 2 weeks were a high physical load from strenuous arm movements and severe low back pain. Workers with severe low back pain were at higher risk for sickness absence longer than 2 weeks. Psychosocial workload and individual characteristics did not predict the occurrence of sickness absence because of low back pain.

Conclusions: Because work-related physical load was a risk factor for sickness absence less than 2 weeks and severe low back pain was a risk factor for sickness absence both shorter than and longer than 2 weeks, a focus secondary prevention for scaffolders with severe low back pain is advised.

Key words: low back pain, musculoskeletal disorders, risk factors, scaffolders, sickness absence.

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Introduction

Musculoskeletal complaints are an important cause of sickness absence in almost any occupational group. In this category, low back pain is paramount, and the etiology is not clear yet.[1-3] It seems beyond any doubt that low back pain has a multifactorial origin.[4-7] Three categories of potential risk factors for low back pain can be acknowledged: physical risk factors such as lifting of heavy loads, psycho-social risk factors such as low job control, and individual characteristics such as age.[6,8]

In the past, research on work-related risk factors for low back pain focused mainly on physical risk factors. The estimated fraction of physical risk factors in the occurrence of low back pain in different occupations is estimated between 11% and 58%.[5] During the past decennium, the focus in research shifted towards psychosocial and personal characteristics. It seems that a combination of low social support, low decision latitude, monotonous work, and high perceived work load may lead to psychosocial stress and subsequently to an increase of low back pain.[4] In what way personal characteristics tend to influence the occurrence of low back pain remains uncertain.[9] However, there is sufficient evidence that physical, psychosocial and individual risk factors are able to interrelate with each other at any phase or stage of low back pain.[2,10]

Medical care utilization and sickness absence because of low back pain cause a high economic burden to society in many countries[11-14] and call for preventive measures to reduce sickness absence because of low back pain. In most cases low back pain is self-limiting even without medical intervention necessary.[15-17] Therefore, some authors suggest that prevention and treatment should focus on preventing chronicity of low back pain and disability resulting from low back pain rather than on preventing the onset of pain.[18-20] A policy aimed at prevention should address all factors associated with sickness absence.

At this point, research is scarce.[4,6] In one longitudinal study of musculoskeletal sickness absence and return to work among welders and metal workers, no risk factors were found during a 2-year follow-up period. However, the results were hampered by the small size of the study population.[21] In two other studies, both physical load and social support were found to be predictive for sickness absence because of low back pain.[7,22] A future policy on preventive measures in distinct occupational groups will largely benefit from more research on risk factors for sickness absence because of low back pain.

Therefore, the goal of this study is to identify risk factors for sickness absence because of low back pain both shorter and longer than 2 weeks in a group of workers exposed to high physical loads.

Methods

Subjects

The study population consisted of workers for a scaffolding company. The subjects were divided into two occupational groups: 1) scaffolders, scaffolders in training and scaffolders-porters, and 2) foremen, (assistant) managers, area managers, district managers, auditors and technical office staff.[23] Each scaffolder manually handles between 5.000 and 15.000 kg of scaffolding materials every day.[23]

Altogether, 337 subjects were invited to participate in a prospective cohort study on musculoskeletal complaints and sickness absence.

Questionnaire

Between June 1998 and September 1998, a base-line questionnaire was administered. If necessary, a Turkish questionnaire also was either self-administered or administered by interview. Information on individual characteristics such as age, height, nationality, and job and working history was derived from a standardized questionnaire.[21]

Questions on physical work load concerned manual handling of materials such as lifting and carrying heavy loads, awkward working postures in which the back is bent or twisted, and strenuous arm movements such as working with hands above shoulder level. A 4-point scale was used to rate 'seldom or never', 'now and then', 'often', or 'always' performed during a normal workday. The answers 'often' and 'always' were classified as high exposure.[23] The subjects also rated their perceived exertion on a Borg-scale ranging from 6 (very light) till 20 (very heavy), with a score of 16 or higher regarded as high perceived exertion.[24]

Psychosocial aspects were derived from the Karasek model. The subjects were obliged to rate their situation on a 4-point scale in terms of each item occurring 'seldom or never', 'now and then', 'often', and 'always' during a normal workday. [23,25] According to the Karasek model, subjects who experience 'high job demands' and 'low job control' are exposed to high psychosocial load.[25] The sum scores have been used to classify subjects into quartiles, comparing those who have a high (> 75th percentile) or moderate load (25-75th percentile) with those who have a low psychosocial load (< 25th percentile).

In the questionnaire, two measures of health were included. The first health measure represented short-term effects of a day at work, expressed by 11 questions on need for recovery that considered such aspects as tiredness after work, fatigue, lack of concentration, putting interest in other people, ability to recover from work, and the influence on work performance.[26] Finally, perceived general health was measured by 11 dichotomized questions about the worker's health status and was rated according to the VOEG scale with a good internal scale reliability (Cronbach's α, 0.86) and test-retest reliability (Pearson's *r*, 0.76).[27] For both general health end points, a sum score was calculated. Subjects with a score above the 75th percentile were considered to have a high need for recovery and poor general health. Subjects with a score between the 25-75th percentile were considered to have a moderate general health and moderate need for recovery. A score less than the 25th percentile indicated that subjects had a good general health and a low need for recovery.

The questionnaire on musculoskeletal disorders was derived from the standard Nordic questionnaire, which has proved to be a valid instrument for collecting information on the nature, duration (days), and frequency (occurrences per month) of symptoms.[28] Furthermore, pain was rated on a scale according to von Korff, with a range of 0 to 10.[29]

Four different end points of low back pain were defined: 1) at least one episode of low back pain in the preceding 12 months with a duration of at least a few hours, 2) chronic low back pain in the preceding 12 months that was present almost every day for at least 3 months, 3) severe low back pain in the preceding 12 months defined as pain intensity score of 50 according to the Von Korff scheme for grading severity of chronic pain, and 4) low back pain and perceived disability in the preceding 12 months defined as the subjects who exceeded the disability score of 50 according to the Von Korff scheme for grading disability. The last three definitions are subgroups of the low back pain in the preceding 12 months. These definitions are not mutually exclusive since chronicity, severity, and disability may overlap.

Sickness absence

During the 3-year follow-up period, the registration of sickness absence in the scaffolding company recorded the occurrence and duration of every absence episode. It also retrieved information for each subject about the symptoms and their frequency reported to have caused the sickness absence. If a worker fell ill, he was obliged to report his absence to the health service of the company. He then was sent a short questionnaire by mail with 19 questions about his actual health status. This self-administered questionnaire enabled the worker to report one or more complaints underlying the sickness absence. The occupational health physician of the company marked every returned questionnaire with an International Classification of Disease (ICD), version 9, code. In the case of doubt, the physician acquired additional information by telephone to ascertain a specific diagnosis. Almost all workers who had been absent 2 weeks or more were medically examined by the occupational health physician.

The following outcomes of sickness absence per worker were collected: prevalence of absence (at least one period of sickness absence during the 3-year follow-up period), frequency of absence (number of sickness absence periods), duration of absence (number of calendar days of sickness absence) and absence ratio (percentage of working days of sickness absence). In the last three measures, workers without absence were excluded from the calculations. It must be noted that in The Netherlands, sickness absence measures are calculated in relation to calendar days and not work days.

Statistical analysis

The two principal outcomes of the study were time of follow-up period without sickness absence and duration of sickness absence due to low back pain. In the statistical analyses, differences between continuous variables were tested with the unpaired Student's *t* test. The differences between frequencies of categorical and dichotomous variables were tested with x^2 test. Kaplan-Meier curves were produced to describe the proportion of workers without sickness absence relative to time since start of follow up period, and the proportion of workers returning to work as a function of duration of sickness absence. A generalised log linear regression model with binominal distribution was used to identify risk factors for sickness absence simultaneously, and to adjust for potential confounders. The regression analysis was executed using Proc Genmod in SAS Statistical software. Prevalence Ratios (PRs) were estimated as a measure of association. The PR is a better approximation of the relative risk than the often-used odds ratio in situations wherein the disease prevalence is high.[30]

In the analysis, a distinction was made between sickness absence less than 2 weeks (≤ 14 days) and sickness absence longer than 2 weeks (>14 days). In both periods, workers on sick leave were compared with those not on sick leave. Personnel that had left the company during the follow-up period were included until their last day of employment. Because age seems strongly to influence the probability of musculoskeletal symptoms such as back pain and sickness absence, it was included in each logistic model, regardless of the level of significance. For the initial selection of variables in univariate models a P value less than 0.10 was considered significant. All self-reported factors presented in Table 1 were investigated as well as all relevant individual characteristics and work history aspects. In the final multivariate models, only variables with a P level less than 0.05 were retained.

Results

Response

The initial response for participation in the study was 86% (288 respondents). Scaffolders and supervisors did not differ in terms of response on the questionnaires. The mean age of those who left the company (89 persons, 31%) in the 3-year follow-up period did not differ from the mean age of those who still were employed during the same period. Of those who had left the company, 16% percent had been supervisors and 84% had been scaffolders. There was a difference in the ratios of sickness absence because of low back pain during follow-up period between personnel that had left the company (7.1%) and the personnel that remained (1.7%). The personnel that had left the company had a comparatively prolonged duration of sickness absence because of low back pain. Eighteen subjects (20%) left the company involuntarily because they became permanently disabled after they had been on the sick list for one complete year. Seven of these cases were the result of low back disorders. When the sickness absence ratio because of low back pain was adjusted for these 7 cases, it was 2.9% for all the other subjects who left the company.

However, in the baseline questionnaire survey, both previously employed personnel and those still employed reported a similar prevalence of low back pain in the preceding 12 months (both 60%) and a slightly, but significantly different prevalence, of chronic low back pain in the preceding 12 months (34% and 25%, respectively).

Personal characteristics and working experience

Of the 288 workers included in the analysis, 222 were scaffolders and 66 were supervisors. The population consisted predominantly of Dutch workers (81%), and only a small proportion had the Turkish nationality (19%). Among the Turkish workers, 96% were employed as a scaffolder. On the average, the scaffolders (age, 34.8 years) were younger than supervisors (age, 41.3 years). Clear differences existed in work histories. The supervisors had worked, on the average, 6 years longer in the current company than the scaffolders (15.3 vs 9.1 years). The supervisors also had worked, on the average, more years in the current job than scaffolders (9.0 vs 7.3 years).

Physical load, psychosocial load, and perceived health

Scaffolders experienced a significantly higher physical load than the supervisors. The psychosocial load almost showed the same pattern. Moderate and low job control, and a high need for recovery differed significantly between scaffolders and supervisors. Table 1 also shows the differences in prevalence of four end points of low back pain. Only severe low back pain showed a significant difference between the two occupational groups.

Table 1 Physical factors, psychosocial factors, health characteristics and end points of low back pain in scaffolders and supervisors at baseline

	Scaffolders (n=222)		Supervisors (n=66)	
	n	%	n	%
Physical load:				
High manual handling of materials*	145	65,3	10	15,2
High awkward back posture*	129	58,1	5	7,6
High strenuous arm movements*	158	71,2	6	9,1
High perceived exertion*	163	73,4	13	19,7
Psychosocial load:				
Moderate job control*	130	58,6	30	45,5
Low job control*	62	27,9	4	6,1
Moderate job demand	123	55,4	41	62,1
High job demand	61	27,5	18	27,3
Perceived general health:				
Moderate need for recovery	109	49,1	29	47,0
High need for recovery*	79	35,6	14	21,2
Moderate general health	101	45,5	25	37,9
Poor general health	72	32,4	16	24,2
Low back pain characteristics:				
Low back pain	132	59,5	40	60,6
Chronic low back pain	50	22,5	13	19,7
Severe low back pain*	68	30,6	11	16,7
Low back pain and perceived disability	47	21,2	12	18,2

* $?^2$ test, P <0,05

Sickness absence

Altogether, 982 episodes of sickness absence were recorded in the follow up period: 875 episodes for the scaffolders (n=222) and 107 episodes for the supervisors (n=66). During the 3-year follow-up period, 13% of the scaffolders (n= 28) and 27% of the supervisors (n=18) took no sick leave at all. The frequency of sickness absence among scaffolders who did report sickness absence once or more was, on the average, 4.5, whereas the same estimate for supervisors was 2.2. The absence ratio among scaffolders (12,8%) was more than three times higher than the absence ratio among the supervisors (4%).

During the 3-year follow period, low back pain accounted for 25% of the days lost among scaffolders and 13% of the days lost among the supervisors. Low back pain also accounted for 17% of the episodes among the scaffolders and 8% of the episodes among the supervisors.

Approximately 89 scaffolders reported 146 episodes of sickness absence because of low back pain, whereas a total of 9 supervisors reported 9 episodes. This accounted for prevalence rates of 40% and 14%, respectively, for sickness absence because of low back pain. On the average, the scaffolders were on sick leave 43 days for every episode of low back pain, whereas the supervisors were on sick leave 36 days per episode for the same reason. The absence ratio for low back pain was 3,2% for the scaffolders and 0.5% for the supervisors. Figure 1 shows the distribution of the time at work before a first period of sickness absence because of low back pain between scaffolders and supervisors. Each year, approximately 15% of the scaffolders became ill because of back complaints, whereas this proportion was less than 5% among the supervisors.

Figure 1 Survival time to a first period of sickness absence because of back pain for scaffolders and supervisors

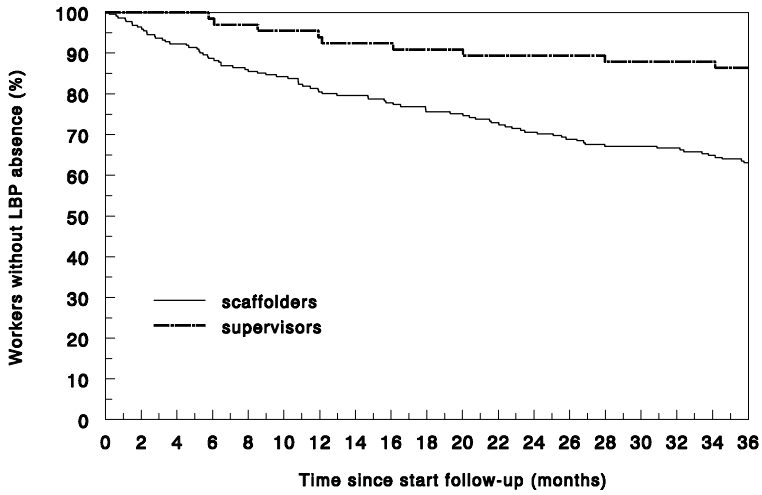
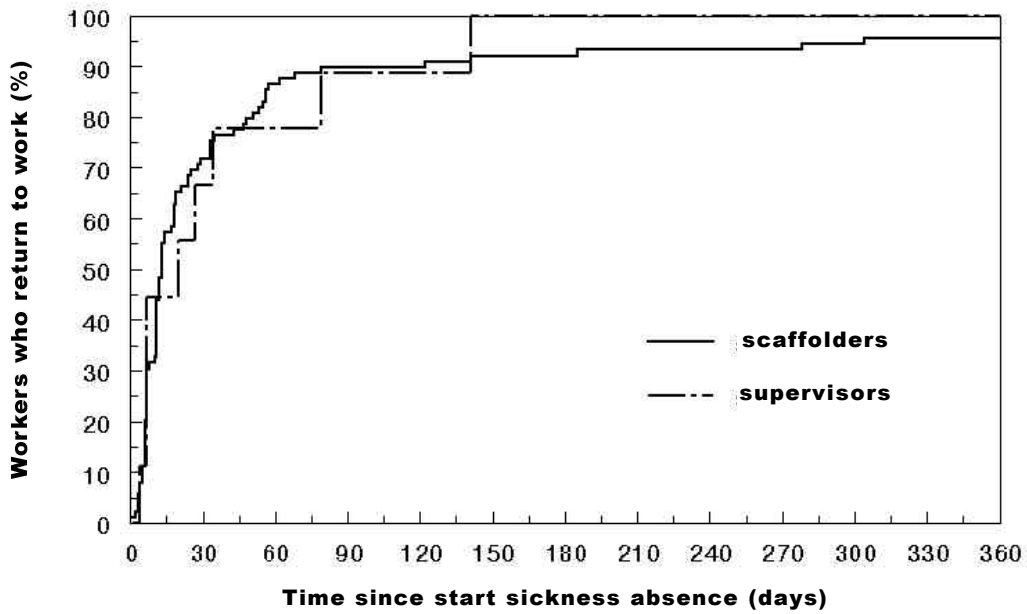


Figure 2 displays the differences in return to work after the first period of sickness absence because of low back pain between scaffolders and supervisors. When the duration of the first sickness absence because of low back pain was analyzed, a small difference appeared to exist between scaffolders and supervisors, but the return-to-work curve among supervisors is based on only nine cases. After 1 week of sickness absence, 30% of the scaffolders and 44% of the supervisors resumed work. In 3 weeks, these percentages increased to 65 and 56%, respectively. After 5 weeks, they were as high as 76% and 78%, respectively, and after 11 weeks they even reached values of 90% and 89%, respectively.

Figure 2 Distribution of return to work after sickness absence because of low back pain for scaffolders and supervisors



Finally, it is worth noting that half of the scaffolders who were on sick leave for the first time during the follow-up period resumed work after 12 days, whereas under the same conditions, half of the supervisors resumed work after 7 days. After 360 days, 5% of the scaffolders still were on sick leave. All supervisors returned to work in 143 days.

Risk factors

Table 2 shows the results from the univariate analysis of risk factors for sickness absence because of low back pain less than 2 weeks in the 3-year follow-up period. As compared with the supervisors, the scaffolders had a significantly increased chance for sickness absence because of low back pain during this period. Next to occupation, Turkish nationality also was significantly associated with this short period of sickness absence.

An increased chance of sickness absence because of low back less than 2 weeks existed for the scaffolders dealing with manual handling of materials, working in awkward postures with the back bent or twisted, and working while experiencing strenuous arm movements such as using the hands above the shoulder level. Moderate (25-75%) and high (> 75%) job demands were associated with sickness absence less than 2 weeks, with significance levels between 0.05 and 0.10. Other psychosocial factors and health characteristics such as a combination of high job demand and low job control as well as the need for recovery and perceived general health were not associated with a short period of sickness absence. However severe low back pain and low back pain with disability were significantly associated with sickness absence because of low back pain less than 2 weeks.

Table 2 Univariate analysis of risk factors for the occurrence of sickness absence due to low back pain less than 2 weeks (≤ 14 days) during a 3-year follow-up study among scaffolders and supervisors (n=245 episodes)

Risk factors	n	PR	95% CI
Scaffolder	184	4.23	1.59 - 11.21
Age			
35-44 years	74	0.60	0.34 - 1.05
45+ years	49	0.41	0.19 - 0.92
Turkish nationality	40	1.59	0.94 - 2.69
High manual handling of materials	127	2.26	1.34 - 3.83
High awkward back posture	112	1.78	1.11 - 2.87
High strenuous arm movements	139	3.43	1.81 - 6.49
Moderate job demand	132	2.00	0.94 - 4.25
High job demand	57	2.11	0.93 - 4.77
Severe low back pain	53	1.76	1.10 - 2.83
Low back pain and perceived disability	44	1.71	1.04 - 2.81

n = number of workers | PR = prevalence ratio | CI = confidence interval

Table 3 presents the univariate analysis of risk factors for sickness absence because of low back pain longer than 2 weeks. In contrast with the supervisors, the scaffolders had an increased chance of a longer period of sickness absence. This increased chance also was associated with the Turkish nationality. High manual handling of materials was associated with sickness absence longer than 2 weeks. Moderate and bad general health showed a significant association with this period of sickness absence (PR=2.89), and a poor general health was a risk factor of almost equal importance (PR=2.55). Sickness absence longer than 2 weeks was associated with moderate job demands (PR=2.02) and high job demands (PR=1.62). Shoulder pain in the preceding 12 months and all end points of the low back also were associated with a longer period of sickness absence because of low back pain.

Table 4 presents the results from the multivariate analysis of risk factors for sickness absence because of low back pain both shorter than and longer than 2 weeks. After correction for confounding variables, the risk factor with the strongest relation to the short period of sickness absence was high strenuous arm movements (PR=3.0), followed by severe low back pain (PR=1.7). Severe low back pain showed the strongest association with the longer period of sickness absence (PR=4.7).

Although the older workers seemed to have an increased chance of sickness absence longer than 2 weeks and the younger scaffolders were more likely to show sickness absence less than 2 weeks, age was not a significant predictor for sickness absence because of low-back pain. Other individual characteristics and psychosocial workload also did not contribute to the prediction of sickness absence period because of low back pain during the 3-year follow-up period.

Table 3 Univariate analysis of risk factors for the occurrence of sickness absence due to low back pain longer than 2 weeks (>14 days) during a 3-year follow-up study among scaffolders and supervisors (n=233 episodes)

Risk factors	n	PR	95% CI
Scaffolder	171	2.76	1.14 - 6.68
Age			
35-44 years	70	0.61	0.30 - 1.24
> 45 years	54	0.97	0.51 - 1.83
Turkish nationality	41	2.23	1.30 - 3.82
High manual handling of materials	116	1.88	1.06 - 3.34
Moderate job demand	127	2.02	0.89 - 4.60
High job demand*	51	1.62	0.62 - 4.23
Moderate general health	103	2.89	1.16 - 7.18
Poor general health	68	2.55	0.98 - 6.68
Shoulder pain in past 12 months	73	1.57	0.92 - 2.70
Low back pain in past 12 months	137	3.60	1.67 - 7.76
Chronic low back pain	51	4.51	2.69 - 7.55
Severe low back pain	61	4.31	2.52 - 7.38
Low back pain and perceived disability	44	2.30	1.35 - 3.93

* not significant | n = number of workers | PR = prevalence ratio |95% CI = 95% confidence interval

Table 4 Multivariate analysis of risk factors for sickness absence due to low back pain less and longer than 2 weeks

	Sickness absence			
	Less Than 2 weeks (n=55)		Longer Than 2 weeks (n=43)	
Risk factors	PR	95% CI	PR	95% CI
Age (yrs)				
< 35	1,00	-	1.00	-
35 - 44	0.62	0.36 - 1.06	0.52	0.27 - 1.01
> 44	0.53	0.24 - 1.14	0.93	0.53 - 1.62
Severe low back pain*	1.68	1.08 - 2.61	4.52	2.66 - 7.67
High strenuous arm movements*	2.98	1.57 - 5.66	NS	

* $?^2$ test, P <0.05 | PR = prevalence ratio | CI = confidence interval | NS = not significant

Discussion

The aim of this prospective cohort study, in which 222 scaffolders and 66 supervisors participated, was to identify risk factors for sickness absence because of low back pain. Attention was focused on personal, physical, and psychosocial factors, as well as health characteristics. In the 12 months before the start of the investigation, 60% of the study population had reported an episode of low back pain. This percentage exceeds the prevalence of low back pain in the general population (44%),[31] but is similar to results from previous research among occupational populations exposed to heavy work.[5,32] During the 3-year follow-up period, 34% of the total study population reported at least one episode of sickness absence because of low back pain, which is comparable with the results of a study among home care personnel,[32] but higher than the results of a study among welders and metal workers.[21]

The regression analysis showed that work-related physical factors are a risk factor for sickness absence less than 2 weeks (≤14 days), whereas severe low back pain is a risk factor for sickness absence both shorter and longer than 2 weeks. These results comply well with the results from two studies in which physical load appeared to be the most important work-related risk factor for sickness absence.[7,22] The findings in the aforementioned studies, and in contrast to those in the current study, showed that psychosocial factors also were associated with sickness absence. A possible explanation for the lack of such association in the current study could be that the physical load for a scaffolder is so dominant that it supersedes the impact of psychosocial factors in the analysis.

The questionnaires used in this study contained questions about different categories of risk factors. A recent study on interrelations of risk factors and low back pain concluded that various work-related risk factors interrelated differently with each other and with different end points of low back pain.[23] This might explain why Turkish scaffolders showed an increased risk for both periods of sickness absence in the univariate analysis. The variables of Turkish nationality and scaffolding were highly interrelated. Because of the strong correlation between different variables, only the most dominant variables were included into the multivariate model. A distinction was made between sickness absence shorter than and longer than 2 weeks because risk factors could differ for both lengths of absence.[22] The results in Table 2 and 3 support this assumption. Nevertheless, in the literature, there is a lack of consensus about the duration of sickness absence, whether short-term or long-term.

A recent study on work-related risk factors for low back pain used a cut-off point of 7 days or less (3-7 days) for short-term sickness absence, and defined any period longer than 7 days as long-term sickness absence. In the same study, there was a relation between physical load and sickness absence for long-term sickness absence, whereas psychosocial factors showed only a limited relation to different episodes of sickness absence, regardless of duration.[22]

As compared to personnel still working in the company, personnel that had left the company showed longer periods of sickness absence associated with low back pain because part of this group had become disabled. However, when disability was excluded, there was little difference in sickness absence between these two groups. Hence, self-selection seemed to be in evidence, with scaffolders still working in this company being health survivors. This indicates the presence of a healthy worker effect, whereby those with better health continue working. This effect may have resulted in an underestimation of the risk factors for sickness absence because of low back pain.[10,22]

Another point to note is the promotion from scaffolder to supervisor. A possible explanation for the finding that the prevalence of low back pain was similar among the scaffolders and supervisors may be that most supervisors started their career in this company as a scaffolder.[23] Sometimes scaffolders with complaints were granted to continue working as a supervisor, which seemed to be a good option considering the better possibility that they could adjust to working conditions and have more autonomy in this position. This may also partly explain why the supervisors, on the average, showed longer periods of employment compared to the scaffolders.

The results of this study indicate that sickness absence was determined by specific musculoskeletal problems. Acknowledging that severe low back pain is a risk factor for sickness absence both shorter and longer than 2 weeks, it is important which factors underlie the occurrence of severe back pain. These factors are thus indirectly responsible for an episode of sickness absence. In contrast to the limited number of studies on sickness absence, various studies have assessed risk factors for low back pain. However, in the literature, there seems to be ample evidence for a relation between physical load and low back pain, but evidence for a relation between psychosocial load and low back pain is inconsistent, even if heavy physical work is involved.[5,7]

In conclusion, high physical load characterized by high strenuous arm movements was a risk factor for a short period of sickness absence (≤ 14 days), whereas severe low back pain was a risk factor for a short period of sickness absence as well as a longer period of sickness absence, especially among scaffolders. According to the results of this study, an effective preventive strategy should target scaffolders with severe low back pain to reduce physical load because this is considered a risk factor for a short period of sickness absence as well as the indirect cause of a longer period of sickness absence. In future, more research is necessary to elaborate on the relations between risk factors and sickness absence because of low back pain in different occupational groups.

Key points

- The occurrence of severe low back pain predicts sickness absence of both short and longer duration.
- In an occupation with high physical load, physical risk factors are far more important than psychosocial factors in predicting musculoskeletal sickness absence.
- With regard to musculoskeletal sickness absence prevention should focus on chronicity of low back pain rather than the onset of low back pain.

References

1. Cats-Baril WL, Frymoyer JW. Identifying patients at risk of becoming disabled because of low-back pain. The Vermont Rehabilitation Engineering Center predictive model. Spine 1991;16:605-7.
2. Davis KG, Heaney CA. The relationship between psychosocial work characteristics and low back pain: underlying methodological issues. Clin Biomech (Bristol, Avon) 2000;15:389-406.
3. Frank JW, Pulcins IR, Kerr MS, et al. Occupational back pain-an unhelpful polemic. Scand J Work Environ Health 1995;21:3-14.
4. Bongers PM, de Winter CR, Kompier MA, et al. Psychosocial factors at work and musculoskeletal disease. Scand J Work Environ Health 1993;19:297-312.
5. Burdorf A, Sorock G. Positive and negative evidence of risk factors for back disorders. Scand J Work Environ Health 1997;23:243-56.
6. Riihimaki H. Low-back pain, its origin and risk indicators. Scand J Work Environ Health 1991;17:81-90.
7. Wickstrom GJ, Pentti J. Occupational factors affecting sick leave attributed to low-back pain. Scand J Work Environ Health 1998;24:145-52.
8. Frank JW, Kerr MS, Brooker AS, et al. Disability resulting from occupational low back pain. Part I: What do we know about primary prevention? A review of the scientific evidence on prevention before disability begins. Spine 1996; 21:2908-17.
9. Dempsey PG, Burdorf A, Webster BS. The influence of personal variables on work-related low-back disorders and implications for future research. J Occup Environ Med 1997;39:748-59.
10. Devereux JJ, Buckle PW, Vlachonikolis IG. Interactions between physical and psychosocial risk factors at work increase the risk of back disorders: an epidemiological approach. Occup Environ Med 1999;56: 343-53.
11. Abenhaim L, Suissa S. Importance and economic burden of occupational back pain: a study of 2,500 cases representative of Quebec. J Occup Med 1987; 29:670-4.
12. Guo HR, Tanaka S, Halperin WE, et al. Back pain prevalence in US industry and estimates of lost workdays. Am J Public Health 1999;89:1029-35.
13. Hagen KB, Thune O. Work incapacity from low back pain in the general population. Spine 1998;23:2091-5.
14. van Tulder MW, Koes BW, Bouter LM. A cost-of-illness study of back pain in The Netherlands. Pain 1995;62:233-40.
15. Burton AK, Tillotson KM, Main CJ, et al. Psychosocial predictors of outcome in acute and subchronic low back trouble. Spine 1995;20:722-8.
16. Coste J, Delecoeuillerie G, Cohen de Lara A, et al. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. Bmj 1994;308:577-80.
17. Waddell G. Epidemiology review: the epidemiology and cost of back pain. London: Her Majesty's Stationary Office; 1994.
18. Frank JW, Brooker AS, DeMaio SE, et al. Disability resulting from occupational low back pain. Part II: What do we know about secondary prevention? A review of the scientific evidence on prevention after disability begins. Spine 1996;21:2918-29.
19. Frymoyer JW, Cats-Baril W. Predictors of low back pain disability. Clin Orthop 1987:89-98.
20. Hadler NM. Regional back pain. N Engl J Med 1986;315:1090-2.
21. Burdorf A, Naaktgeboren B, Post W. Prognostic factors for musculoskeletal sickness absence and return to work among welders and metal workers. Occup Environ Med 1998;55:490-5.
22. Hoogendoorn WE. Work-related risk factors for low back pain. Amsterdam; 2001. Thesis. Amsterdam: Ponsen en Looijen, Wageningen;2001
23. Elders LAM, Burdorf A. Interrelations of risk factors and low back pain in scaffolders. Occup Environ Med 2001;58:597-603.

24. Borg G. Psychophysical scaling with applications in physical work and the perception of exertion. Scand J Work Environ Health 1990;16:55-8.
25. Karasek R, Baker D, Marxer F, et al. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. Am J Public Health 1981;71:694-705.
26. Sluiter JK, van der Beek AJ, Frings-Dresen MH. The influence of work characteristics on the need for recovery and experienced health: a study on coach drivers. Ergonomics 1999;42:573-83.
27. Sonsbeek. A list of subjective health complaints. Report No M37. The Hague: SDU Publishers; 1990.
28. Kuorinka I, Jonsson B, Kilbom A, et al. Standard Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon 1987;18:233-7.
29. Von Korff M, Ormel J, Keefe FJ, et al. Grading the severity of chronic pain.Pain 1992;50:133-49.
30. Thompson ML, Myers JE, Kriebel D. Prevalence odds ratio or prevalence ratio in the analysis of cross sectional data: what is to be done? Occup Environ Med 1998; 55:272-7.
31. Biering-Sorensen F. A prospective study of low back pain in a general population. I. Occurrence, recurrence and aetiology. Scand J Rehabil Med 1983;15:71-9.
32. Moens GF, Dohogne T, Jacques P, et al. Back pain and its correlates among workers in family care. Occup Med (Lond) 1993;43:78-84.