Sickness absence and concurrent low back and neck–shoulder pain: results from the MUSIC-Norrtälje study

Teresia Nyman ·
Wilhelmus Johannes Andreas Grooten ·
Christina Wiktorin · Johan Liwing · Linda Norrman

Received: 5 October 2005 / Revised: 2 May 2006 / Accepted: 9 May 2006 / Published online: 2 June 2006
© Springer-Verlag 2006

Abstract In Sweden, musculoskeletal disorders, in particular low back disorders (LBD) and neck–shoulder disorders (NSD) constitute by far the most common disorders, causing sick leave and early retirement. Studies that compare sickness absence in individuals with LBD and individuals with NSD are lacking. Moreover, it is likely that having concurrent complaints from the low back region and the neck–shoulder region could influence sickness absence. The purpose of the present study was to explore potential differences in sickness absence and in long-term sickness absence during a 5-year period, 1995–2001, among individuals with (1) solely LBD, (2) solely NSD, and (3) concurrent LBD and NSD. The present study was based on 817 subjects from the MUSIC-Norrtälje study, whom were working at baseline and whom at both baseline and follow-up reported LBD and/or NSD. Three groups were identified based on pain and pain-related disability at both baseline and follow-up: (1) *solely LBD*, (2) *solely NSD*, and (3) *concurrent LBD and NSD*. Subjects who did not give consistent answers at both the baseline and follow-up occasions were assigned a fourth group:

(4) *migrating LBD/NSD*. Two outcomes were analysed: (1) prevalence of sickness absence, and (2) long-term sickness absence among those with sickness absence days. Logistic regression analysis was used to calculate odds ratios (OR) for sickness absence in the different disorder groups, taking into account confounding factors such as gender, age and other non-musculoskeletal-related disorders. In the group *concurrent LBD and NSD*, 59% had been sickness absent between baseline and follow up, compared to 42% in the group *solely LBD*, 41% in the group *solely NSD*, and 46% in the group *migrating LBD/NSD*. No difference in sickness absence was found between the group *solely LBD* compared to the group *solely NSD* [OR 0.65 (0.36–1.17)]. The adjusted OR for sickness absence in the group *concurrent LBD and NSD* compared to subjects with solely LBD or solely NSD was [OR 1.69 (1.14–2.51)]. The adjusted OR for having long-term sickness absence was 2.48 (95% CI = 1.32–4.66) for the group *concurrent LBD and NSD*. In the present study, having concurrent LBD and NSD were associated with a higher risk for sickness absence and also long-term sickness absence. This suggests that, when research on sickness absence and return to work after a period of LBD or NSD is performed, it is important to take into consideration any concurrent pain from the other spinal region. The study also implies that spinal co-morbidity is an important factor to be considered by clinicians and occupational health providers in planning treatment, or in prevention of these disorders.

T. Nyman (✉) · W. J. A. Grooten · C. Wiktorin ·
J. Liwing · L. Norrman
Department of Occupational and Environmental Health,
Stockholm County Council, Norrbacka,
171 76 Stockholm, Sweden
e-mail: teresia.nyman@sll.se

T. Nyman · W. J. A. Grooten · C. Wiktorin
Department of Public Health Sciences,
Division of Occupational Medicine,
Karolinska Institutet, Stockholm, Sweden

Keywords Co-morbidity · Low back pain ·
Neck–shoulder pain · Pain-related disability ·
Sickness absence

Introduction

Musculoskeletal disorders, in particular low back disorders (LBD) and neck–shoulder disorders (NSD), constitute by far the most common disorders causing sick leave and early retirement [3, 16–18]. For the individual, long-term sick leave and disability pension can often lead to negative consequences in the form of worsened economy and quality of life [27, 32]. In Sweden, in 2002, the total costs for disbursed sickness benefit and disability pension reached an all point high of 9.5 billion EUR [17]. Societal costs for sick leave have increased in Sweden during the last years, which have brought issues concerning sickness and rehabilitation to the fore.

According to a systematic literature review on the scientific evidence for causes to and consequences of sickness absence, performed in Sweden in 2003, there is limited published research on causes for sick leave from back and neck disorders. Factors that were found to influence the risk for sick leave due to back disorders were self-reported pain, physical impairment, and previous sick leave due to back disorders [11]. The influence of co-morbidity in terms of poor general health or non-musculoskeletal-related disorders, such as cardiovascular diseases, has also been reported to affect sickness absence due to LBD [6, 7, 19, 29].

Some earlier studies that have analysed sickness absence among subjects with NSD or LBD have not discriminated NSD from LBD or concentrated on one body region without controlling for potential influence from the other [4, 10, 31]. Other studies that have explored the influence of co-morbidity in terms of concurrent complaints from two body regions show disparate results [13, 14, 19]. It is possible that there are differences in sickness absence depending on the localisation of the complaints, i.e. in the neck–shoulder region or in the low back region. It is also likely that concurrent complaints from both body regions could influence the amount of sickness absence.

The purpose of the present study was to explore potential differences in sickness absence and long-term sickness absence during a 5-year period, 1995–2001, among individuals with (1) *solely LBD*, (2) *solely NSD*, and (3) *concurrent LBD and NSD*.

Materials and methods

Materials

The present study was based on the MUSIC-Norrtälje material, a population-based study of low back and

neck–shoulder pain. The MUSIC-Norrtälje material consists of a baseline study, with a case-referent design, performed 1994–1996 and a 5-year follow-up study of the same individuals ($n = 2,329$) [9, 20, 26, 33].

The present study was based on the cohort of all 2,329 subjects who participated in both the baseline study and the 5-year follow-up study. From this cohort, those 817 subjects who were working at least 50% at baseline and who at both baseline and follow-up reported LBD or NSD (for definition of LBD and NSD, see below) were included in the present study.

Methods

The present study concerned the associations between the LBD and/or NSD and sickness absence.

Independent variables

Low back disorder and/or NSD were identified based on self-reported pain and pain-related disability at both baseline and follow-up. At both test occasions, all subjects answered three questions concerning low back pain intensity covering (1) current pain, (2) worst pain experienced during the previous 6 months, and (3) average pain during the previous 6 months. The subjects also answered three questions concerning low back pain-related disability that concerned how much the pain had affected (1) everyday activities, (2) social and family activities, and (3) ability to work (including domestic work). All subjects also answered six corresponding questions concerning the neck–shoulder region. The rating scale for each of these in all 12 questions ranged from 0 to 10 where 0 meant no pain/disability at all and 10 meant pain/disability as bad as it could be. The questions were formulated according to von Korf and have been tested for validity and reliability [34].

A *pain intensity score* for each subject, each test occasion (baseline and follow-up) and each body region was constructed using the three questions that concerned pain intensity [34]. The score was calculated as the sum of the three derived figures on the rating scales and divided by 3. A *pain-related disability score* was constructed in the same manner as the *pain intensity score*. The chosen limit for a subject to be considered to have LBD or NSD at one test occasion was a pain intensity score ≥ 3 and/or a disability score ≥ 1 . These cut-off points were based on the distribution in the cohort of all 2,329 subjects who participated in both the baseline study and the 5-year follow-up study ($n = 2,329$) in the MUSIC-Norrtälje study. In both the baseline study and the follow-up study, about one-third

of the subjects had a pain score of ≥ 3 and/or a pain-related disability score of ≥ 1 . These distributions correspond to the 1-year prevalence of LBD and NSD in several earlier studies [2, 5, 21]. The authors also considered that these levels of pain and pain-related disability had a clinical relevance, and since the outcome in the study was sickness absence, the chosen cut-off score, was at a level where it was still possible for the subjects to be able to work.

Three groups of subjects reported consistent disorders at the two occasions and were classified into the groups (1) *solely LBD*, (2) *solely NSD*, or (3) *concurrent LBD and NSD* at both baseline and follow-up. Subjects who reported LBD and/or NSD at both baseline and follow-up, but did not give consistent answers at the two occasions were assigned a fourth group named (4) *migrating LBD/NSD* (Fig. 1).

Potential confounders

Three potential confounders were considered gender, age, and other non-musculoskeletal-related disorders (Table 1). Female sex and age (continuous) were identified at baseline. Other non-musculoskeletal-related disorders were identified by self-reports and were defined as physical illnesses and/or diminished psychological wellbeing experienced at both baseline and follow-up.

Physical illnesses concerned five groups of illnesses: (1) cardiovascular, (2) respiratory, (3) gastrointestinal, (4) urogenital, and (5) metabolic diseases. Subjects were considered as having a physical illness, if the same group of physical illnesses was present at both baseline and follow-up.

Diminished psychological wellbeing was at follow-up assessed with the general health questionnaire (GHQ-12), which has been tested for validity and reliability [8]. A subject was considered to have diminished psychological wellbeing if the GHQ-12 score was 2 or > 2 . This is a generally recommended cut-off score, often used as an indicator of potential mental health distress [8].

The baseline questionnaire did not contain the GHQ-12 questionnaire. Instead, here a subject was defined as having diminished psychological wellbeing if he/she, several times per week or more often, suffered from both at least 1 out of 12 sleep-related problems and at least 1 out of 17 problems of psychosomatic nature. The 12 questions concerning sleep-related problems were phrased according to the Karolinska Sleep Questionnaire and have been tested for validity and reliability [15]. The 17 questions of psychosomatic problems covered stomach symptoms, headache, heart symptoms, nervousness, and depressive symptoms. The questions were derived from a questionnaire that originally included 22 questions, from which 5 questions

Fig. 1 The study subjects were classified into one of the four groups according to self-reported pain and pain-related disability measured at two points in time, both at baseline and at follow-up. From these measurements four groups were identified and included in the present study: (1) solely LBD at both baseline and follow-up, (2) solely NSD at both baseline and follow-up, (3) concurrent LBD and NSD at both baseline and follow-up, and (4) migrating NSD and/or LBD at baseline and follow-up. All other subjects were excluded

		5-YEAR FOLLOW-UP			
		No NSD or LBD	LBD	NSD	NSD and LBD
BASELINE	No NSD or LBD				
	LBD		(1) Solely LBD		(4) Migrating LBD/NSD
	NSD			(2) Solely NSD	
	NSD and LBD		(4) Migrating LBD/NSD		(3) Concurrent LBD and NSD

Table 1 The number of subjects (*n*) in the four disorder groups and the distribution in percent (%) of women, age, and prevalence of non-musculoskeletal-related disorders for the studied subjects (*n* = 817) in each group

	Subjects (<i>n</i>)	Women (%)	Mean age (SD)	Non-musculoskeletal related disorders ^a (%)
Solely LBD	120	48	41 (10)	13
Solely NSD	94	73	40 (10)	30
Concurrent LBD and NSD	271	65	44 (10)	36
Migrating LBD/NSD	332	67	41 (10)	28
All subjects	817	64	42 (10)	29

^aIncluding physical illnesses and diminished psychological well-being

about symptoms of the musculoskeletal system had been excluded. This questionnaire has been used in several earlier studies [24, 25]. The cut-off score for having diminished psychological wellbeing at baseline was chosen in accordance with an earlier publication from the MUSIC-Norrtälje study [28].

Outcome

Official register data concerning sickness absence was received from the National Social Insurance Board. Two outcomes were analysed in the present study: (1) prevalence of sickness absence, defined as at least one period of governmental compensated sickness absence > 14 consecutive days between baseline and follow-up and (2) long-term sickness absence, defined as > 180 days during at least one of the five 1-year periods between baseline and follow-up among those subjects with sickness absence.

The official health insurance responsibility in Sweden is divided between the employer and the Insurance Office. This means that, if a person falls ill, he/she is entitled to sick pay from the employer for the first 14 days of the illness. After these 2 weeks, the employer notifies the Insurance Office who is then responsible for disbursing sickness benefit.

A person may draw partial or full sickness benefit, depending on the extent to which he/she is unable to work. When a person is ill for a long period and unable to work, he/she may be entitled to disability pension. Disability pension, in likelihood with sickness benefit, can be disbursed as either partial or full pension.

The National Social Insurance Board is responsible for the extensive social insurance data systems. From the social insurance offices at regional and local level, the National Social Insurance Board receives data

containing the number of days a subject has drawn benefit from the Insurance Office, where the period is longer than 14 days (longer than 28 days for the period between 1 January 1997 until 1st April 1998 due to a temporary change in the legislation). Data for periods shorter than 14 days are reported only for unemployed individuals.

For each subject, data about two types of benefit due to illness were received: (1) sickness benefit, and (2) disability pension. This data was collected yearly for the years 1995–2001. The data did not include any specified information about the reason for sickness absence, i.e. the diagnosis on the sickness certificate issued by the physician. Data concerning sickness benefit was received as reported number of sick spells per year, number of days per year, and as partial or full benefit. Received disability pension data complied (a) date for newly allowed disability pension, and (b) partial or full benefit.

A subject was considered as having sickness absence if he had received partial or full sickness benefit or disability pension during at least one period of > 14 consecutive days (longer than 28 days for the period 1 January 1997 until 1 April 1998), during the period between baseline and follow-up.

Long-term sickness absence was only analysed among those subjects who had been sickness absent at least 14 consecutive days between baseline and follow-up. It was defined as > 180 days with disbursed sickness benefit and disability pension during at least one 1-year period between baseline and follow-up. Consideration was taken to whether the disbursed benefits were partial or full, in the manner that days with partial benefit were recalculated into whole days.

Statistical methods

The outcomes of interest were (1) the proportion of the study subjects who had been sickness absent respectively (2) who had had long-term sickness absence during at least one of the five 1-year periods.

Univariate Logistic regression analysis was applied to determine the associations between the four groups of LBD and NSD and the two outcomes—sickness absence respectively long-term sickness absence during at least one of the years. The same method was applied to analyse the associations between each potential confounder and the two outcomes. All variables showing a tendency to be associated with the outcome ($P \leq 0.10$) were included in an initial multivariate logistic regression model. Thus, the initial multivariate logistic regression model consisted of the four groups of LBD and NSD and confounders of relevance. The

odds ratios (OR) for sickness absence respectively long-term sickness absence were calculated for the different groups of LBD and NSD as well as for the potential confounders. The group *solely LBD* was used as the reference category. The potential confounders gender and non-musculoskeletal-related disorders were dichotomised and the reference category became the group that was believed to have the most promising prognosis, namely the group having a lower proportion of subjects with sickness absence respectively long-term sickness absence during at least one of the years, i.e. for gender *men*, and for non-musculoskeletal-related disorders *no non-musculoskeletal-related disorders* was chosen as reference category. The potential confounder age was used as a continuous variable. All confounders from the initial multivariate logistic regression model with a P value ≤ 0.10 were included in a final multivariate logistic regression model. Age was always considered a confounder.

All analyses were made using the statistical package SPSS for Windows (Version 13.0; Chicago, IL, USA).

Results

In the study group ($n = 817$) 33% of the subjects suffered from *concurrent LBD and NSD*, 15% suffered from *solely LBD*, 12% suffered from *solely NSD*, and 41% suffered from *migrating LBD/NSD*. In this last group, 17% suffered from solely LBD at one test occasion, and solely NSD at the other. The rest of the subjects in this group (83%) suffered from concurrent LBD and NSD at one of the test occasions, but not at both.

Sickness absence

In the whole study group, the prevalence of sickness absence (sickness absence at least 14 consecutive days between baseline and follow-up) was 49%. In the group *concurrent NSD and NSD* the prevalence of sickness absence was 59%. This can be compared to 42% in the group *solely LBD*, 41% in the group *solely NSD*, and 46% in the group *migrating LBD/NSD*.

The crude analysis showed a higher proportion of subjects with sickness absence in the group *concurrent LBD and NSD* [OR 1.99 (1.28–3.07)] compared to the group *solely LBD* (Table 2). Female sex ($P = 0.00$), and other non-musculoskeletal-related disorders ($P = 0.00$) were identified as confounders. In the initial multivariate analysis, when adjusting for these confounders including age, the OR for the group *concurrent LBD and NSD* was modified, [OR 1.39

(0.86–2.24)]. Since the OR for *solely NSD* did not differ from the reference category [OR 0.65 (0.36–1.17)] and the number of subjects in these groups was small, these two groups were merged into one—*solely LBD or solely NSD*. This new group was then used as the reference category in the final multivariate analysis. In this analysis, the adjusted OR for sickness absence in the group *concurrent LBD and NSD* was 1.69 (1.14–2.51). *Migrating LBD/NSD* did not differ from the reference group *solely LBD or solely NSD* [OR 1.00 (0.69–1.46)] (Table 3).

Long-term sickness absence

Among the subjects who had been sickness absent at least 14 consecutive days between baseline and follow-up, the proportion of subjects who had been on a long-term sickness absence (> 180 days during at least one 1-year period between baseline and follow-up) was 43% in the group *concurrent LBD and NSD*, compared to 21% in the merged group *solely LBD or solely NSD*. In the group *migrating LBD/NSD*, the corresponding proportion of subjects with long-term sickness absence was 30%.

In the multivariate analysis of long-term sickness absence, the merged group, *solely LBD or solely NSD*, was used as reference category. Besides age, other non-musculoskeletal-related disorders ($P = 0.03$) were identified as confounders. After adjustments, the OR for having long-term sickness absence during at least one 1-year period was 2.48 (1.32–4.66) for the group *concurrent LBD and NSD* compared to the merged group *solely LBD or solely NSD*. *Migrating LBD/NSD* did not differ from the reference group *solely LBD or solely NSD* [OR 1.62 (0.84–3.13)] (Table 4).

Table 2 Crude odds ratios (OR) with 95% confidence intervals (95% CI) for sickness absence in the four disorder groups

	Subjects		OR	95% CI	P value
	Total	With sickness absence			
Solely LBD	120	50	1.00		
Solely NSD	94	39	0.99	0.57–1.72	0.98
Concurrent LBD and NSD	271	159	1.99	1.28–3.07	0.00
Migrating LBD/NSD	332	152	1.18	0.78–1.80	0.44

The total number of subjects in each group (total), and the number of subjects with sickness absence is also presented. The group *solely LBD* is set as the reference category

Table 3 Adjusted OR with 95% CI for sickness absence in three disorder groups

	Subjects		OR ^a	95% CI	P value
	Total	With sickness absence			
Solely LBD or solely NSD	214	89	1.00		
Concurrent LBD and NSD	271	159	1.69	1.14–2.51	0.01
Migrating LBD/NSD	332	152	1.00	0.69–1.46	0.99

The total and the number of subjects with sickness absence is also presented. The merged group *solely LBD or solely NSD* is set as the reference category

^aAdjusted for female sex, age, and other non-musculoskeletal-related disorders

Discussion

The findings in the present study indicated that a substantial number of subjects suffered from concurrent pain in both the neck/shoulder region and the low back region. This group of subjects with consistent spinal co-morbidity had the highest prevalence of sickness absence (> 14 consecutive days at least once between baseline and follow-up) and also of long-term sickness absence (> 180 days during at least one of the five 1-year periods between baseline and follow-up). No differences in sickness absence were found between subjects with solely LBD and subjects with solely NSD. This may strengthen the findings that the number of

Table 4 Adjusted OR with 95% CI for long-term sickness absence among subjects with sickness absence in three disorder groups

	Subjects		OR ^a	95% CI	P value
	With sickness absence	With long-term sickness absence			
Solely LBD or NSD	89	19	1.00		
Concurrent LBD and NSD	159	68	2.48	1.32–4.66	0.05
Migrating LBD/NSD	152	46	1.62	0.84–3.13	0.15

The total number of subjects with sickness absence and the number of subjects with long-term sickness absence is also presented. The merged group *solely LBD or solely NSD* is set as reference category

^aAdjusted for age, and other non-musculoskeletal-related disorders

body regions affected rather than the localisation of the complaint (low back region or neck–shoulder region) has the greater influence on sickness absence. However, the mixed group *migrating LBD/NSD* partly consisted of subjects who at least at one of the two occasions suffered from concurrent LBD and NSD. Still, this group did not show any significantly higher sickness absence compared to the group with solely LBD or solely NSD, neither in prevalence of sickness absence nor long-term sickness absence. This might indicate that using at least two measuring points in time gives a higher precision when identifying subjects with these types of musculoskeletal disorders.

The higher sickness absence among subjects with concurrent LBD and NSD is supported by a previous study by Nordin et al. [19] who found that workers with LBD and concurrent musculoskeletal complaints from another anatomical region (including spinal co-morbidity) were more likely to remain sick-listed than subjects with solely LBD. On the other hand, IJzelenberg and Burdorf [14] did not find that concurrent LBD and NSD increased the risk of sickness absence. This discrepancy in results in comparison to the present study could be explained by the fact that IJzelenberg and Burdorf used self-reported sickness absence data and in the present study official register data was used which is more accurate [23, 30]. Another explanation could be the use of two measuring points, as was used in the present study.

Several studies have also found that having poor general health or a medical or psychological complaint in addition to having LBD or NSD, increased the risk of sickness absence [6, 7, 19, 22, 29]. Hence, in the present study, having other non-musculoskeletal-related disorders (including diminished psychological wellbeing) was adjusted for. Still, after adjustments, consistently having concurrent LBD and NSD was associated with an increased risk for sickness absence.

Maybe having concurrent LBD and NSD reflects a more general musculoskeletal pain syndrome, with a different underlying pathoanatomical cause than the cause for solely LBD or solely NSD. Other factors in the work environment or in the life style might also explain why those with concurrent LBD and NSD have increased risk for sickness absence. This remains to be investigated.

Clinical and research significance

The results in the present study suggests that, when research on sickness absence and return to work after a period of LBD or NSD is performed, it is important to take into consideration any concurrent pain from the

other spinal region. Repeated measurements should also be performed.

In a clinical view, when planning treatment for LBD or NSD, it is important to take into account spinal co-morbidity. Since subjects with concurrent LBD and NSD during an extended period of time, according to the present study, have almost two and a half time higher risk for long-term sickness absence, early onset of rehabilitation might be of great importance for this group.

Also in prevention of sickness absence, this group with concurrent LBD and NSD should be given special attention, since the risk for sickness absence in the present study was 70% higher than among subjects with a spinal disorder at just one anatomical location, i.e. neck–shoulder region or low back region.

The fact that spinal co-morbidity increased the risk of sickness absence is also an important factor to consider for occupational health providers when instigating workplace interventions, since an ergonomic intervention aimed at reducing complaints from one body region could have a deficient impact on another body region.

Methodological considerations

Sickness absence as an outcome variable

Sickness absence research can be considered a very diverse field. The theoretical framework and explanatory models vary, since research is conducted within a large number of scientific disciplines [1]. There are several difficulties when trying to compare studies on sickness absence, since not only the study design but also outcome measures, terminology, and insurance systems (among nations as well as over time) differ widely [12].

In the present study, official register data was used as outcome measurement which makes it possible not only to get accurate figures concerning length and frequency of sickness absence, and hereby eliminating any recall bias, but also to summarise all sickness-related governmentally compensated sickness absence including rehabilitation and disability pension. This is a strength in the present study. However, the official register data from the National Social Insurance Board in Sweden does not allow analyses of short-term sickness absence (less than 14 consecutive days).

Moreover, the official register data used in the present study does not contain the official reason for the sickness absence, i.e. the diagnosis on the sickness certificate (issued by a physician) which the Insurance Office needs for making their decision about disbursing

sickness benefit. However, this certificate usually contains only one diagnosis/reason for sickness absence, and the objective of the present study was to compare a more general sickness absence behaviour between subjects with self-reported spinal co-morbidity and subjects with solely LBD or solely NSD. It would not have been possible to use a single diagnosis/reason for sickness absence in the analyses in the present study.

Further research is needed for identifying the underlying causes to the higher prevalence of sickness absence and long-term sickness absence among those subjects who consistently report concurrent LBD and NSD.

Conclusions

In the present study, sickness absence among those having solely LBD did not differ from those having solely NSD. Moreover, having concurrent LBD and NSD was associated with a higher risk for sickness absence and also long-term sickness absence. This suggests that, when research on sickness absence and return to work after a period of LBD or NSD is performed, it is important to take into consideration any concurrent pain from the other spinal region. The study also implies that spinal co-morbidity is an important factor to consider for clinicians and occupational health providers in planning treatment, or in prevention of these disorders.

Acknowledgements This study was supported by grants from Stockholm County Council and the Swedish Work Environment Fund.

References

1. Allebeck P, Mastekaasa A (2004) Swedish Council on Technology Assessment in Health Care (SBU). Chapter 3. Causes of sickness absence: research approaches and explanatory models. *Scand J Public Health Suppl* 63:36–43
2. Andersson GB (1999) Epidemiological features of chronic low-back pain. *Lancet* 354:581–585
3. Borg K, Hensing G, Alexanderson K (2001) Predictive factors for disability pension - an 11-year follow up of young persons on sick leave due to neck, shoulder, or back diagnoses. *Scand J Public Health* 29:104–112
4. Borghouts JA, Koes BW, Vondeling H, et al. (1999) Cost-of-illness of neck pain in The Netherlands in 1996. *Pain* 80:629–636
5. Cote P, Cassidy JD, Carroll LJ, et al. (2004) The annual incidence and course of neck pain in the general population: a population-based cohort study. *Pain* 112:267–273
6. Florwall Muller CF, Monrad T, Biering-Sorensen F, et al. (1999) The influence of previous low back trouble, general health, and working conditions on future sick-listing because of low back trouble. A 15-year follow-up study of risk

- indicators for self-reported sick-listing caused by low back trouble. *Spine* 24:1562–1570
7. Fransen M, Woodward M, Norton R, et al. (2002) Risk factors associated with the transition from acute to chronic occupational back pain. *Spine* 27:92–98
 8. van der Giezen AM, Bouter LM, Nijhuis FJ (2000) Prediction of return-to-work of low back pain patients sicklisted for 3–4 months. *Pain* 87:285–294
 9. Goldberg D, Williams P (1988) A user's guide to the general health questionnaire. NFER-NELSON, Windsor
 10. Grooten WJ, Wiktorin C, Norrman L, et al. (2004) Seeking care for neck/shoulder pain: a prospective study of work-related risk factors in a healthy population. *J Occup Environ Med* 46:138–146
 11. Hansson EK, Hansson TH (2005) The costs for persons sick-listed more than one month because of low back or neck problems. A two-year prospective study of Swedish patients. *Eur Spine J* 14:337–345
 12. Hansson T, Jensen I (2004) Swedish Council on Technology Assessment in Health Care (SBU). Chapter 6. Sickness absence due to back and neck disorders. *Scand J Public Health Suppl* 63:109–151
 13. Hensing G (2004) Swedish Council on Technology Assessment in Health Care (SBU). Chapter 4. Methodological aspects in sickness-absence research. *Scand J Public Health Suppl* 63:44–48
 14. Hurwitz EL, Morgenstern H (1999) The effect of comorbidity on care seeking for back problems in the United States. *Ann Epidemiol* 9:262–270
 15. IJzelenberg W, Burdorf A (2004) Impact of musculoskeletal co-morbidity of neck and upper extremities on healthcare utilisation and sickness absence for low back pain. *Occup Environ Med* 61:806–810
 16. Kecklund G, Åkerstedt T (1992) The psychometric properties of the Karolinska Sleep Questionnaire. *J Sleep Res* 1(suppl):133
 17. Nachemson A, Waddell G, Norlund A (2000) Epidemiology of neck and low back pain. In: Nachemson A, Jonsson E (eds) Neck and back pain: the scientific evidence of causes, diagnosis and treatment. Lippincott, Williams & Wilkins, Philadelphia pp 165–187
 18. National Social Insurance Board (2003) Vad kostar sjuk-skrivningarna inom olika yrken? RFV redovisar 2003:5 [Swedish]. National Social Insurance Board, Stockholm
 19. National Social Insurance Board (2004) Vad kostar sjukdomarna för kvinnor och män? RFV redovisar 2004:5 [Swedish]. National Social Insurance Board, Stockholm
 20. Nordin M, Hiebert R, Pietrek M, et al. (2002) Association of comorbidity and outcome in episodes of nonspecific low back pain in occupational populations. *J Occup Environ Med* 44:677–684
 21. Pernold G, Mortimer M, Wiktorin C, et al. (2005) Neck/shoulder disorders in a general population. Natural course and influence of physical exercise: a 5-year follow-up. *Spine* 30:E363–E368
 22. Picavet HS, Schouten JS (2003) Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC(3)-study. *Pain* 102:167–178
 23. van Poppel MN, de Vet HC, Koes BW, et al. (2002) Measuring sick leave: a comparison of self-reported data on sick leave and data from company records. *Occup Med (Lond)* 52:485–490
 24. Seferlis T, Nemeth G, Carlsson AM, et al. (1999) Acute low-back-pain patients exhibit a fourfold increase in sick leave for other disorders: a case-control study. *J Spinal Disord* 12:280–286
 25. Severens JL, Mulder J, Laheij RJ, et al. (2000) Precision and accuracy in measuring absence from work as a basis for calculating productivity costs in The Netherlands. *Soc Sci Med* 51:243–249
 26. Theorell T, Ahlberg-Hulten G, Sigala F, et al. (1990) A psychosocial and biomedical comparison between men in six contrasting service occupations. *Work Stress* 4:51–63
 27. Theorell T, Konarski-Svensson JK, Ahlmen J, et al. (1991) The role of paid work in Swedish chronic dialysis patients—a nation-wide survey: paid work and dialysis. *J Intern Med* 230:501–509
 28. Tornqvist EW, Kilbom A, Vingard E, et al. (2001) The influence on seeking care because of neck and shoulder disorders from work-related exposures. *Epidemiology* 12:537–545
 29. van Tulder MW, Koes BW, Bouter LM (1995) A cost-of-illness study of back pain in The Netherlands. *Pain* 62:233–240
 30. Waddell G (1998) The back pain revolution. Churchill Livingstone, London
 31. Waldenstrom M, Theorell T, Ahlberg G, et al. (2002) Assessment of psychological and social current working conditions in epidemiological studies: experiences from the MUSIC-Norrtälje study. *Scand J Public Health* 30:94–102
 32. Vingard E, Alexanderson K, Norlund A (2004) Swedish Council on Technology Assessment in Health Care (SBU). Chapter 9. Consequences of being on sick leave. *Scand J Public Health Suppl* 63:207–215
 33. Vingard E, Alfredsson L, Hagberg M, et al. (2000) To what extent do current and past physical and psychosocial occupational factors explain care-seeking for low back pain in a working population? Results from the Musculoskeletal Intervention Center-Norrtälje Study. *Spine* 25:493–500
 34. Von Korf M, Ormel J, Keefe FJ, et al. (1992) Grading the severity of chronic pain. *Pain* 50:133–149