Sick leave due to back pain in a cohort of young workers

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ABSTRACT

Purpose: Evidence on risk factors for sick leave from prospective studies in work settings is limited. Furthermore, most available studies focused on workers with substantial low back disorders. These studies consistently report that physical work factors constitute a hindrance to work. However, it remains unclear whether the same risk factors are relevant in workers with less severe conditions or in early phases of the development of back pain. Therefore, this article aims to study risk factors for the occurrence of sick leave due to low back pain (LBP) among young workers with no or a modest history of back pain.

Methods: Participants were 716 young healthcare or distribution workers with no or minimal antecedents of LBP in the year before inclusion. We investigated the role of potential physical, psychosocial and individual risk factors at baseline on the occurrence of sick leave due to LBP one year later. To this purpose, we used Cox regression with a constant risk period.

Results: Six percent (95%CI: 4.1-7.6) of the workers reported sick leave one year later; they accounted for 12% of the sick leave days independent of cause. A non-stimulating psychosocial work environment turned out to be the strongest risk factor for sick leave due to LBP (RR 6.08; 95%CI: 1.42 - 26.07). Physical factors were not predictive.

Conclusions: In the early phases of back pain and in less severe conditions, the main benefit of interventions lies in targeting the organisation and design of jobs to create a challenging professional environment.

Key words

low back pain, sick leave, psychosocial work environment, prospective, young workers

INTRODUCTION

Back pain is a major health and economic problem in Western industrialized societies. It is a primary reason for health care use and work inability, and leads to substantial costs for society and industry. Cost-of-illness studies of back pain in the Netherlands, Sweden and the U.K. have concluded that the main burden imposed by back pain is related to production loss attributable to work absenteeism. These costs supersede the health care costs [Ekman et al. 2005; Van Tulder et al. 1995; Maniadakis and Gray 2000].

In contrast to knowledge about risk factors for low back pain (LBP), knowledge about risk factors for sick leave from back disorders remains unsatisfactory [Alexanderson and Norlund 2004]. First, the number of prospective studies is limited and the resulting evidence on the role of physical, psychosocial and individual factors is unclear. Many researchers assumed that a focus upon risk factors for the development of LBP would automatically prevent subsequent sick leave. Recent evidence has shown that this assumption may not be valid. It seems that different sets of factors may have to be addressed in the prevention of LBP and in the prevention of sick leave [Ijzelenberg et al. 2004; Gheldof et al. 2005; Ijzelenberg and Burdorf 2005]. Therefore there has been a call for longitudinal studies focusing on sick leave [SBU 2004]. Second, almost all studies have focused on study populations with a considerable proportion of workers with a history of LBP. The magnitude of and the risk factors for back-related sick leave in individuals with no or limited antecedents of LBP are largely unknown.

Some evidence exists on factors that predict the *duration* of sick leave in workers in the beginning of a LBP-related sick leave episode, i.e. radiating pain, high levels of disability and social dysfunction, social isolation, being an older female, and receiving a high level of compensation. With regard to work-related factors, patients with low back pain at the highest risk for long term absence are workers doing heavy physical work. For the psychosocial factors, however, the evidence remains inconclusive. In spite of well known effects of history of low back pain on recurrences of back pain, history of LBP does not influence the duration of sick leave due to LBP [Steenstra et al 2005]. History of LBP was reported as prognostic for a more frequent drop

out from work by Wasiak and co-workers [Wasiak et al. 2004]. Similarly, musculoskeletal pain and combinations of pain predicted sickness absence spells among municipal workers during a three-year follow-up study [Kääriä et al 2012]. Apart from the effect of previous pain, the evidence of the respective roles of physical, psychosocial and individual risk factors on the *frequency* of sick leave remains inconclusive.

In Belgium, the compulsory social health insurance covers the entire population and is organised by sickness funds. When an employee starts sickness absence, he/she send a medical certificate of the treating physician to the employer who pays the first 2-4 weeks of work incapacity. If work incapacity continues, the patient applies for a social security benefit by sending another medical certificate to the medical adviser of the sickness fund. Claim assessment, follow-up evaluation and the decision about benefit entitlement are done by the medical adviser. There is no time limit for coverage [Du Bois et al. 2008].

Furthermore, every employer is obliged by law to organize occupational health care for the employee. Most employers hire the services of an external occupational health care service. A few large companies have an internal occupational health care service. The main role of the occupational physician is to prevent occupational diseases and accidents. The occupational physician is hardly involved in the sick leave process. It is only recently that employees on sick leave have been legally entitled to contact the occupational physician to discuss return to work options [Tiedtke D et al. 2012].

In a sample of young workers with no or a modest history of back pain, we aimed

(1) To describe the occurrence, the duration, and the frequency of sick leave due to LBP,
(2) To investigate the effect of work-related and individual factors on the occurrence of sick leave due to LBP, and
(3) To assess the impact of each identified risk factor on the occurrence of sick leave among the workers exposed to one of these factors and among the entire study population.

MATERIALS AND METHODS

1. Subjects and methods

The BelCoBack Study (Belgian Cohort Study on Low Back Pain) is a prospective study. Methods have been described in detail before [Van Nieuwenhuyse et al. 2006]. In summary, in 2000 and 2001 participants were recruited among the employees of four healthcare institutions and two distribution companies throughout Belgium and baseline measurements were obtained. Employment in either sector is associated with elevated risks for LBP. However, the choice of these two sectors (and not for example the construction sector) was practical: the collaboration partner IDEWE, as an important occupational health service, recruited the participants among the employees of their clients, many of which are active in the health care and distribution sectors. The recruitment took place as a result of the annual medical examination by the occupational health physician. In Belgium, such an examination is obliged by law for workers exposed to occupational risks [Royal Decree May 28th 2003]. To minimise dropout, only workers with a tenured position or equivalent were included. Furthermore, to reduce the influence of age and of prior episodes of LBP, participants had to be no older than 30 years at the time of intake and had to have been free of episodes of LBP of seven or more consecutive days during the twelve months before intake in the study. Of 1672 eligible employees, 1200 (72%) agreed to participate. However, during a first contact, 159 were excluded because they did not meet the last inclusion criterion, leaving a sample of 1041 workers. Of those 1041 workers, 972 (93%) completed the questionnaire at baseline.

One year later (2001-'02), participants were requested again to fill in a questionnaire. Of the 972 workers who responded at baseline, 800 (82%) returned the questionnaire. Questionnaires at baseline and at follow-up were distributed within the companies by the research assistants. The majority of workers filled in the questionnaire at home and sent it back to the research assistants. In case of non-response, two reminders were sent.

For the longitudinal analyses described in this paper, a cohort was identified of 851 employees with a minimal experience of at least two months in their function at intake. An interval of at least two months was considered sufficient to appreciate the work constraints in a function.

The questionnaire at one year of follow-up was available for 716 of these 851 workers (response of 84%, loss to follow-up of 16%).

The study protocol was approved by the local commission for medical ethics, and an informed consent was given by all included employees before their participation in the study.

2. Data collection

Questionnaires at baseline. At baseline, self-reported questionnaires were used to register factors that may be related to low back disorders, *i.e.* (i) physical load at work and during leisure time, (ii) psychosocial work characteristics and (iii) individual variables.

Questions on current physical workload [Somville and Mairiaux 2003] addressed (1) the duration of working in awkward postures, (2) the duration of exposure to whole body vibration, (3) the intensity and, where indicated, the frequency of manual materials handling such as lifting, carrying, pushing, or pulling of loads, (4) static work postures (that is, standing and sitting for long periods) and (5) ability to change posture regularly. Duration, frequency, and intensity were rated on three or four point ordinal scales. Furthermore, we addressed the seniority in the current function and the working schedule (percentage of employment, day or night duty). Additional questions on (at least weekly) sporting activities, engagement in construction and embellishment work at home, and on motor vehicle driving outside the work (km/year) served to assess the physical load during leisure time.

Psychosocial work characteristics were evaluated with the 43-item Job Content Questionnaire [Karasek and Theorell 1990]. The different items were measured on four point Likert scales, ranging from “completely disagree” to “completely agree”, yielding a sum score for each dimension. Based on the Demand-Control-Support model of Karasek and Theorell, the following dimensions were taken into account: skill discretion (six items), decision authority (three items), psychological job demands (five items), supervisor and co-worker support (four items each), job insecurity (five items), and job dissatisfaction (five items). For the analyses, the psychosocial work characteristics were categorised into tertiles.

Individual variables included (1) age, sex, language, and educational level as demographic factors, (2) smoking behaviour, body mass index, perceived general health and complaints of the neck, back, upper or lower limbs in the year before inclusion as health related factors, and (3) pain related fear, catastrophising about pain, negative affectivity, and somatisation as psychological factors. The questionnaire on individual and health related factors was derived from the standardised Nordic Questionnaires for the analysis of musculoskeletal symptoms [Kuorinka et al. 1987]. For the assessment of psychological concepts, we used the Modified Tampa Scale of Kinesiophobia [Vlaeyen and Crombez 1998], the Pain Catastrophizing Scale [Sullivan et al. 1995], the Positive Affectivity Negative Affectivity Scales [Watson et al. 1988], and an adapted version (29 items) of the Psychosomatic Symptom Checklist [Van Dixhoorn and Duivenvoorden 1985], respectively. All items were scored on four or five point Likert scales and for each concept a total score was calculated. For the analyses, these scores were split up into tertiles. Body mass index (BMI) was categorized as BMI <20, BMI 20-<25 (normal), BMI 25-<30 (overweight), and BMI ≥30 (obese). Language was collected since a previous study in Belgium has shown that back injuries with a longer sick leave were more prominent in the French-speaking part of the country compared to the Flemish speaking communities. As such, language may represent subtle cultural language-linked factors and/or regional differences in economic climate that play a role in the sick leaving process [Mazina D et al. 2012].

Questionnaires at one year of follow up. One year later, participants completed another questionnaire. At that moment, workers were asked, among others, if they had stayed at home because of low back complaints since the start of the study about 12 months ago (yes/no). The occurrence of sick leave due to LBP after one year of follow-up, i.e. the outcome for this article, was thus registered as the proportion of workers who stayed home because of LBP in the first year of follow-up. Sick leave was defined as any absence from work however short. If 'yes', participants were asked to further detail the number of sick leave spells ("how many times") and the total duration of sick leave ("how many days in total") [Kuorinka et al. 1987; Von Korff et al. 1992]. As described, all sick leaves from work in Belgium have to be medically certified and are then compensated.

3. Analytic methods

Univariate analyses were performed by means of Chi-square or Fisher Exact tests (categorical variables) and Mann Whitney U or unpaired T-tests (continuous variables). For the multivariate analyses, we opted for a Cox-regression with a constant period of risk for all subjects in order to obtain relative risk estimates rather than odds ratios, which would result from logistic regression [Thompson et al. 1998]. Age and gender were included as confounders, irrespective of their relation with LBP. Variables that met the 10% level of significance in the univariate analyses were considered for inclusion in the multivariate analyses. We calculated correlation coefficients among these variables as an approximate manner to detect possible multicollinearity. In the final multivariate models, backward selection was used retaining variables with a P value less than 0.05. Analyses were conducted with the SPSS package (version 18). In a last step, we calculated the attributable fraction among the exposed workers ($AF_{exposed}$) as well as the population attributable fraction among the entire study population (PAF_{total}) for those variables that were found to constitute risk factors. The $AF_{exposed}$ estimates the fraction of exposed cases that would not have occurred if exposure had not occurred. The PAF_{total} estimates the fraction of all cases that would not have occurred if exposure had not occurred [Rothman and Greenland 1998].

RESULTS

1. Descriptive statistics

Risk factors

The study characteristics for the 716 participants are given in Table 1. The Table is structured as follows: (i) physical load at work and during leisure time, (ii) psychosocial work characteristics and (iii) individual variables. This last group of variables includes demographic, health-related and psychological factors. Psychosocial work characteristics and psychological factors have been categorized into tertiles. Categorical variables are given in Table 1a and continuous variables in Table 1b.

Out of the 716 workers, 64% were employed in the health care sector and 36% in the distribution sector and 61% were women. We registered a median age of 26 years (interquartile range of 5 years) and a median seniority in the current function of 3 years (interquartile range of 4 years). 88% had a full time employment.

The majority of the participants reported either higher education of non-university level (37%) or higher secondary/professional education (40%). Although we had tried to limit previous antecedents of back pain by including only workers free of episodes of LBP lasting seven consecutive days or more in the year before inclusion, 48% of the participants reported pain of the lower or upper back in the 12 months before inclusion. More specifically, 10% reported some pain in the upper back and 43% reported some LBP (but not lasting seven consecutive days or more) in the 12 months before inclusion. 38 workers (5%) interrupted their normal activities at home, outside the home or at work because of LBP in the year before inclusion; the median number of days of these interruptions was 4.5 days with an interquartile range between 2 and 7 days. In this young population aged 30 years or younger, 47% rated their health as ‘very good’; the remaining 53% gave a rating of ‘moderate to fair’.

Study outcome

After one year of follow-up, 42 (6%, 95%CI: 4 - 8) of the 716 workers reported sick leave from work due to LBP. There was no significant difference between men and women (Table 2). Although only 42 workers reported back-related sick leave, sick leave due to LBP was substantial with a median duration of 10 days (interquartile range between 5 and 21 days). Notably, 35 (84%) of the 42 workers took sick leave as a single episode. Collectively, LBP-related sick leave accounted for 696 days or 12% of all the sick leave days in the population of 716 workers.

2. Risk factors for the occurrence of sick leave due to LBP

Univariate analyses

Results of univariate analyses are presented in Table 3a (categorical variables) and 3b (continuous variables). With regard to the physical load, two factors were significantly related to back-related sick leave in the following year, *i.e.* motor vehicle driving outside work (Mann-Whitney U test, P=0.018) and driving vehicles or machines at work. For the latter, a moderately elevated risk was observed for driving up to six hours a day (RR 2.54, 95%CI 1.27-5.08), but there was no evidence for a clear dose-response relationship. None of the variables concerning awkward working postures, manual materials handling, or static work postures were predictive. As to the psychosocial work load, one dimension of the Karasek model turned out to be predictive for sick leave in the following year, *i.e.* a lack of 'possibilities to develop skills'. Three- to four-fold elevated risks were observed for workers who reported low (RR 3.86, 95%CI 1.36-10.99) or moderate (RR 3.06, 95%CI 1.01-9.35) 'possibilities to develop skills' at work in comparison to their colleagues who indicated high possibilities at baseline. Three individual factors were related to the occurrence of sick leave in the following year: (1) general health perceived as moderate to fair (RR 2.82, 95%CI 1.40-5.56), (2) obesity defined as a BMI of 30 or higher (RR 2.94, 95% CI 1.29-6.67) and (3) complaints of the upper limbs in the year before inclusion (RR 2.20, 95%CI

1.19-4.07). None of the psychological variables predicted sick leave (neither as categorical nor as continuous variables).

Multivariate analyses

The following variables, associated with a P value of ≤ 0.10 in univariate analyses, were considered for inclusion in multivariate analyses: the physical factors (a1) motor vehicle driving outside the work (Mann Whitney U test, P=0.018), (a2) driving vehicles or machines at work (Chi-square test, P=0.024), and (a3) inability to change posture regularly (Chi-square test, P=0.076); the psychosocial work characteristic (b1) possibilities to develop skills (Chi-square test, P=0.023); and the individual variables (c1) perceived general health (Chi-square test, P=0.002), (c2) complaints of the upper limbs in the year before inclusion (Chi-square test, P=0.011), (c3) body mass index (Chi-square test, P=0.021), and (c4) education (Chi-square test, P=0.061). Age and gender were included as epidemiological confounders, although they were not significantly related to back-related sick leave (Mann Whitney U test, P=0.307 and Chi-square test, P=0.153, respectively).

Multivariate analyses were based on backward selection. We constructed a model for each comprehensive combination of unrelated variables significant at P≤ 0.10 in univariate analyses. In Table 4, we show the results of a model with unrelated variables. In case of interrelationships, the most significant variable was included in this model. This model showed a strong and significant relationship between a lack of 'possibilities to develop skills' at work and subsequent sick leave for LBP in the following year. In contrast with colleagues who reported high 'possibilities to develop skills' at baseline, workers with moderate and especially low 'possibilities to develop skills' showed a five- (RR 5.01, 95%CI: 1.10-22.88), respectively six-(RR 6.08, 95%CI: 1.42 – 26.07) times higher risk on sick leave due LBP one year later. Furthermore, the risk ratio for obese workers as opposed to workers with a normal BMI was 3.41 (95%CI: 1.37 – 8.48).

Attributable fractions

Table 4 presents the proportion of LBP-related sick leave that can be attributed to the risk factors identified among exposed workers [$AF_{exposed}$] and among the entire study population [PAF_{total}]. From these data, it follows that a lack of 'possibilities to develop skills' is responsible for a proportion of LBP-related sick leave comparable to that of 'obesity', which constitutes a factor that cannot be changed by workplace interventions.

DISCUSSION

1. Principal findings of the study

This study aimed at investigating the development of sick leave due to LBP in a population of young workers with no or a modest history of back complaints. We have shown that only a small proportion of workers listed sick because of LBP and that the decision to report sick was influenced to a great extent by a poor psychosocial work environment. Once workers were at home, they failed to return to work for quite a long time.

More specifically, it was low 'possibilities to develop skills' that turned out to be the most important occupational risk factor for back-related sick leave. This finding may suggest that back-related sick leave is mainly taken by workers who lack professional challenges. The perceived lack of professional challenges may have led to a lower threshold to take sick leave.

Moreover, low 'possibilities to develop skills' was responsible for a proportion of LBP-related sick leave comparable to that of 'obesity', which constitute a factor that cannot be changed by workplace interventions. Thus, the influence of the environment is important and exists in job organization and design to create a challenging professional environment.

2. Strengths and weaknesses

The main strength of the BelCoBack Study is its prospective design, respecting the temporal relationship between cause and consequence. Furthermore, the study took a different scope by focusing on young workers with no or a modest history of back pain. This choice allowed studying more accurately the development of back pain [Van Nieuwenhuyse et al. 2006; Van Nieuwenhuyse et al. 2004] and sick leave. With respect to the multi-factorial nature of LBP, several categories of variables were included: physical, psychosocial and individual.

Sick leave was registered by self-reported questionnaires because systematic company records on (cause-specific) absenteeism are not available to the occupational health physician in

Belgium. The majority of studies have found acceptable validity for self-reports [Stapelfeldt et al 2012]. However, a Dutch study in blue collar workers reported low sensitivity of self-reports (55%) to detect frequency of spells [Van Poppel et al. 2002]. In our study, the taking of sick leave (yes/no), and, if 'yes, the number of spells and the number of sickness absence days, were questioned one year after the intake. The reason was practical: examinations in the BelCoBack Study were organized in relation with the annual medical examination by the occupational health physician to limit the extra load of the study for the companies. No diary methods in between were used. The recall period of one year is long and may have led to some underreporting. More specifically, for duration of sickness absence, there is evidence that shorter recall periods could increase the precision of self-reporting with an optimum recall period of no longer than 2-3 months [Severens et al. 2000].

Furthermore, both the potential predictors and the outcome were reported by the workers themselves. Therefore, we cannot exclude common-source bias, i.e. bias due to collection from information from only one source that may lead to correlated reports of predictors and effects and thus false positive results [Dionne S et al. 2002]. It may be advisable in future studies to evaluate whether the self-reported lack of possibilities to develop skills, as important determinant, can be validated by assessments from supervisors or human resources personnel.

Due to the composition of the study population and the short follow-up, only 42 workers took sick leave because of LBP. As the number of sick days in these workers was substantial, it would have been interesting to analyse risk factors for the duration of sick leave. However, this was not possible due to lack of power.

3. Comparison with the literature

Only a limited number of studies have investigated physical and psychosocial characteristics as risk factors for the occurrence of sick leave due to LBP in a prospective way [Smedley et al. 1997; Hemingway et al. 1997; Wickstrom and Pentti 1998; Hoogendoorn et al. 2002; Tubach et al. 2002; Elders et al. 2003; van den Heuvel et al. 2004; Ijzelenberg et al. 2005; Bergstrom et al. 2007; Alexopoulos et al. 2008].

Our results are in line with those of two studies that have also focused on workers with limited back antecedents. In a Swedish follow-up study, Bergstrom and co-workers [Bergstrom et al. 2007] showed only one occupational factor to be predictive for sick-listing due to back or neck pain at the 18-month follow-up, *i.e.* 'few positive challenges at work'. One third of the initial cohort reported no back or neck pain in the year previous to baseline. Workers who indicated that the work was not meaningful or challenging and that their skills and knowledge were not useful at work had twice as high sick-listing as workers with the highest positive challenges (15% vs. 7%). Similarly, in a cohort study among British nurses**,** Smedley and colleagues [Smedley et al. 1997] found psychosocial factors, *i.e.* 'low mood', and not physical factors, to be predictive for sick leave due to LBP during follow-up. Lack of control, which reflects both skill discretion and decision authority, was also related to sick leave in a British follow-up study of office workers [Hemingway et al. 1997]. However, it has to be noted that the physical workload in office workers is negligible and therefore quite different from that of our population. Other studies have shown the important role of a good psychosocial working environment also for sick leaves in general [Duijts et al. 2007], which may suggest that it is not specific for workers with LBP.

The majority of cohort studies have included workers regardless of LBP history. In populations with LBP complaints, both physical and psychosocial workloads play a primary role in back-related sick leave. On the whole, the influence of the physical work environment seems more important than that of the psychosocial work environment, and in extreme occupations, *i.e.* populations with high disability rates at baseline and enormous physical loads (15000kg/day) such as scaffolders [Elders et al. 2003], the effect of physical load has been shown to dominate all other effects. The most likely explanation is that, in workers with a history of back pain, the high physical workload constitutes a hindrance to continue work.

In our population of young workers with no or limited antecedents of back pain, it was a poor psychosocial work environment that showed to be associated with future sick leave due to back pain, and may thus have led to a lower threshold to take sick leave.

4. Conclusion to health professionals and policy makers

Physical work factors have been recognised for a long time as risk factors for LBP itself. Although literature about work-related risk factors for back-related sick leave is scarce, it is intuitively accepted that the same factors are also important for back-related sick leave. We reveal a more nuanced reality. In populations with LBP complaints, physical workload indeed plays a primary role in back-related sick leave. However, in workers with no or only limited LBP complaints at baseline, the physical workload does not appear to be the predominant reason for taking sick leave. Nevertheless, sick leave was substantial in this population and turned out to be associated mainly with a non-stimulating psychosocial work environment. Because the psychosocial work environment can be modified, this finding represents a potentially reversible cause of sick leave.

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COMPETING INTEREST STATEMENT

The authors declare that they have no conflict of interest.

ETHICS APPROVAL

The study protocol was approved by the Commission for Medical Ethics appointed by the College of Physicians n°117 at the External Service for Prevention and Protection at Work IDEWE, Leuven, Belgium. A written, informed consent was given by all included employees prior to their participation in the study.

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Table 1a : Categorical characteristics of the study population (n=716)

Variable		n	%
CURRENT PHYSICAL LOAD			
Professional			
Bent and twisted position	No	448	63.5
	≤ 2 hours/day	181	25.7
	> 2 hours/day	76	10.8
Driving vehicles or machines	No	408	57.8
	≤ 6 hours/day	141	19.9
	>6 hours/day	158	22.3
Pushing or pulling of loads	No	324	45.7
	<1 time/hour	201	28.3
	≥1 time/hour	184	26.0
Lifting or carrying of loads	No	123	17.5
	≤10kg	84	11.9
	>10kg, ≤25 kg, ≤12 times an hour	122	17.4
	>10kg, ≤25 kg, >12 times an hour	50	7.1
	>25kg, ≤12 times an hour	311	44.3
	>25kg, >12 times an hour	13	1.8
Sitting for long periods	Yes	138	19.4
Standing for long periods	Yes	182	25.9
Ability to change posture regularly	No	90	12.7
Working schedule	Night duty	185	26.2
	Day duty	522	73.8
Percentage of employment	More than 75%	626	88.3
Extra-professional			
Sporting activities at least weekly	No	326	45.7
Embellishment works at home	Yes	418	59.7
Construction works at home	Yes	145	21.9
PSYCHOSOCIAL WORK LOAD			
Possibilities to develop skills	Low (≤32)	197	28.2
	Moderate (>32 - ≤36)	195	27.9
	High (>36)	307	43.9
Decision authority	Low (≤28)	137	19.5
	Moderate (>28 - ≤36)	301	43.0
	High (>36)	263	37.5
Psychological job demands	Low (≤30)	269	40.0
	Moderate (>30 - ≤34)	200	29.7
	High (>34)	204	30.3
Supervisor support	Low (≤11)	138	20.1
	Moderate (>11 - ≤12)	207	30.2
	High (>12)	340	49.7
Co-worker support	Low (≤12)	156	22.9
	Moderate (>12 - ≤13)	76	11.2
	High (>13)	448	65.9
Job insecurity	Low (≤8)	246	35.9
	Moderate (>8 - ≤10)	250	36.5
	High (>10)	189	27.6
Job dissatisfaction	Low (≤9)	301	44.2
	Moderate (>9 - ≤11)	221	32.5
	High (>11)	159	23.3

Table 1a (ct'd): Categorical characteristics of the study population (n=716)

Variable		n	%
INDIVIDUAL VARIABLES			
Gender	Women	433	60.5
Language	Dutch-speaking	504	70.4
	French-speaking	212	29.6
Education	Higher university	41	5.8
	Higher non-university	263	37.0
	Higher secondary/professional	281	39.5
	No diploma – primary school– lower secondary/professional	126	17.7
Smoking	Never smoked	430	61.1
	Ex-smoker	88	12.5
	Current smoker	186	26.4
Body mass index BMI (kg/m^2)	Normal (≥20 - <25)	379	56.4
	Underweight (<20)	110	16.4
	Overweight (≥25 - <30)	132	19.6
	Obese (≥30)	51	7.6
Perceived general health	Very good	339	47.4
	Moderate to fair	376	52.6
In the 12 months before inclusion:			
Complaints of the neck	Yes	194	27.1
Complaints of the back	Yes	345	48.2
Complaints of the upper limbs	Yes	134	18.7
Complaints of the lower limbs	Yes	180	25.1
Pain-related fear	Low (≤35)	240	33.6
	Moderate (>35 - ≤41)	238	33.4
	High (>41)	235	33.0
Catastrophizing of pain	Low (≤10)	237	33.2
	Moderate (>10 - ≤17)	249	35.0
	High (>18)	227	31.8
Somatisation	Low (≤16)	240	33.6
	Moderate (>16 - ≤20)	240	33.6
	High (>20)	235	32.8
Negative affectivity	Low (≤47)	288	40.2
	Moderate (>47 - ≤58)	202	28.3
	High (>58)	225	31.5

Table 1b : Continuous characteristics of the study population (n=716)

Variable	Mean	Median	SD*	IQR**
CURRENT PHYSICAL LOAD				
Seniority in the current function (years)	3.6	3.0	2.7	1.0 - 5.0
Motor vehicle driving outside the work (km/year)	18 674.0	15 000.0	22 624.0	10 000.0 – 25 000.0
INDIVIDUAL VARIABLES				
Age (years)	26.2	26.0	2.7	24 - 29

*SD = Standard deviation of the mean
**IQR = Interquartile Range

Table 2 **Occurrence of sick leave due to LBP after one year of follow-up**

	n	Sick leave due to LBP at follow up		
		n	%	95%CI
Study population	716	42	5.9	(4.1 - 7.6)
Men	283	21	7.4	(4.4 - 10.5)
Women	433	21	4.9	(2.8 - 6.9)

Table 3a **Categorical risk factors for the occurrence of sick leave due to low back pain after one year of follow-up (SL_{LBP} at t1) in univariate analyses.**

Variable at baseline			SL_{LBP} at t1				
		n	n	%	*P value	RR	95% CI
CURRENT PHYSICAL LOAD							
Professional							
Bent and twisted position	No	448	23	5.1	0.173	1.00	
	≤2 hours/day	179	11	6.1		1.20	(0.60 ; 2.40)
	>2 hours/day	75	8	10.7		2.08	(0.97 ; 4.46)
Driving vehicles or machines at work	No	406	16	3.9	**0.024**	1.00	
	≤6 hours/day	140	14	10.0		**2.54**	**(1.27 – 5.08)**
	>6 hours/day	158	11	7.0		1.77	(0.84 – 3.72)
Pushing or pulling of loads	No	324	15	4.6	0.389	1.00	
	< 1 time/hour	200	15	7.5		1.62	(0.81 ; 3.25)
	≥1 time/hour	182	11	6.0		1.31	(0.61 ; 2.79)
Lifting or carrying of loads	No	123	5	4.1	0.127	1.00	
	≤10kg	84	7	8.3		2.05	(0.67 ; 6.25)
	>10kg, ≤25 kg, ≤12 times an hour	121	10	8.3		2.03	(0.72 ; 5.78)
	>10kg, ≤25 kg, >12 times an hour	50	4	8.0		1.97	(0.55 ; 7.04)
	>25kg, ≤12 times an hour	310	13	4.2		1.03	(0.38 ; 2.83)
	>25kg, >12 times an hour	12	2	16.7		4.10	(0.89 ; 18.87)
Sitting for long periods	No	570	36	6.3	0.224	1.00	
	Yes	138	5	3.6		0.57	(0.23 – 1.43)
Standing for long periods	No	521	31	6.0	0.858	1.00	
	Yes	179	10	5.6		0.94	(0.47 – 1.88)
Ability to change posture	Yes	617	33	5.3	0.076	1.00	
Regularly	No	89	9	10.1		1.89	(0.94 – 3.82)

Table 3a (ct'd) **Categorical risk factors for the occurrence of sick leave due to low back pain after one year of follow-up (SL_{LBP} at t1) in univariate analyses.**

Variable at baseline			SL_{LBP} at t1				
		n	n	%	*P value	RR	95% CI
Working schedule	Night duty	185	9	4.9	0.576	1.00	
	Day duty	519	31	6.0		1.23	(0.60 – 2.53)
Percentage of employment	More than 75%	624	37	5.9	1.000	1.00	
	75% or less	82	5	6.1		0.97	(0.39 – 2.40)
Extra-professional							
Sporting activities at least weekly	Yes	386	20	5.2	0.371	1.00	
	No	325	22	6.8		1.31	(0.73 – 2.35)
Embellishment works at home	No	281	12	4.3	0.171	1.00	
	Yes	416	28	6.7		1.58	(0.82 – 3.05)
Construction works at home	No	514	31	6.0	0.583	1.00	
	Yes	145	7	4.8		0.80	(0.36 – 1.78)
PSYCHOSOCIAL WORK LOAD							
Possiblities to develop skills	High	197	4	2.0	**0.023**	1.00	
	Moderate	193	12	6.2		**3.06**	**(1.01 ; 9.35)**
	Low	306	24	7.8		**3.86**	**(1.36 ; 10.99)**
Decision authority	Low	137	9	6.6	0.888	1.00	
	Moderate	301	18	6.0		0.91	(0.42 ; 1.98)
	High	260	14	5.4		0.82	(0.36 ; 1.85)
Psychological job demands	Low	268	21	7.8	0.101	1.00	
	Moderate	200	8	4.0		0.51	(0.23 ; 1.13)
	High	202	8	4.0		0.51	(0.23 ; 1.12)

Table 3a (ct'd) **Categorical risk factors for the occurrence of sick leave due to low back pain after one year of follow-up (SL_{LBP} at t1) in univariate analyses.**

Variable at baseline			SL_{LBP} at t1				
		n	n	%	*P value	RR	95% CI
Supervisor support	Low	137	4	2.9	0.227	1.00	
	Moderate	206	15	7.3		2.49	(0.85 ; 7.35)
	High	339	21	6.2		2.12	(0.74 ; 6.06)
Coworker support	Low	156	7	4.5	0.510	1.00	
	Moderate	75	3	4.0		0.89	(0.24 ; 3.36)
	High	446	29	6.5		1.45	(0.65 ; 3.24)
Job insecurity	Low	245	10	4.1	0.378	1.00	
	Moderate	249	16	6.4		1.57	(0.73 ; 3.40)
	High	188	13	6.9		1.69	(0.76 ; 3.77)
Job dissatisfaction	Low	300	18	6.0	0.230	1.00	
	Moderate	221	9	4.1		0.68	(0.31 ; 1.48)
	High	157	13	8.3		1.38	(0.69 ; 2.74)
INDIVIDUAL VARIABLES							
Gender	Men	282	21	7.4	0.153	1.00	
	Women	431	21	4.9		0.65	(0.36 ; 1.18)
Language	Dutch-speaking	502	28	5.6	0.584	1.00	
	French-speaking	211	14	6.6		1.19	(0.64 ; 2.21)
Smoking	Never smoked	430	21	4.9	0.296	1.00	
	Ex-smoker	88	7	8.0		1.63	(0.71 ; 3.72)
	Current smoker	183	14	7.7		1.57	(0.81 ; 3.01)

Table 3a (ct'd) **Categorical risk factors for the occurrence of sick leave due to low back pain after one year of follow-up (SL_{LBP} at t1) in univariate analyses.**

Variable at baseline			SL_{LBP} at t1				
		n	n	%	*P value	RR	95% CI
Education	Higher university	41	3	7.3	0.061	1.00	
	Higher non-university	263	8	3.0		0.42	(0.11 ; 1.50)
	Higher secondary/professional	279	18	6.5		0.88	(0.27 ; 2.87)
	No diploma – primary school – lower secondary/professional	125	12	9.6		1.31	(0.39 ; 4.42)
Body mass index (kg/m^2)	Normal (≥20 - <25)	378	18	4.8	**0.021**	1.00	
	Underweight (<20)	109	3	2.8		0.58	(0.17 ; 1.93)
	Overweight (≥25 - <30)	132	10	7.6		1.59	(0.75 ; 3.36)
	Obese (≥30)	50	7	14.0		**2.94**	**(1.29 ; 6.67)**
Perceived general health	Very good	339	10	2.9	**0.002**	1.00	
	Moderate to fair	373	31	8.3		**2.82**	**(1.40 ; 5.65)**
In the 12 months before inclusion:							
Complaints of the neck	No	520	33	6.3	0.396	1.00	
	Yes	193	9	4.7		0.73	(0.36 ; 1.51)
Complaints of the back	No	369	19	5.1	0.384	1.00	
	Yes	344	23	6.7		1.30	(0.72 ; 2.34)
Complaints of the upper limbs	No	581	28	4.8	**0.011**	1.00	
	Yes	132	14	10.6		**2.20**	**(1.19 ; 4.07)**
Complaints of the lower limbs	No	535	32	6.0	0.858	1.00	
	Yes	178	10	5.6		0.94	(0.47 ; 1.87)
Pain-related fear	Low	240	12	5.0	0.538	1.00	
	Moderate	237	13	5.5		1.10	(0.51 ; 2.35)
	High	233	17	7.3		1.46	(0.71 ; 2.99)

Table 3a (ct'd) **Categorical risk factors for the occurrence of sick leave due to low back pain after one year of follow-up (SL_{LBP} at t1) in univariate analyses.**

Variable at baseline			SL_{LBP} at t1				
		n	n	%	*P value	RR	95% CI
Catastrophizing of pain	Low	235	12	5.1	0.463	1.00	
	Moderate	249	13	5.2		1.02	(0.48 ; 2.19)
	High	226	17	7.5		1.47	(0.72 ; 3.01)
Somatisation	Low	239	17	7.1	0.616	1.00	
	Moderate	240	13	5.4		0.76	(0.38 ; 1.53)
	High	233	12	5.2		0.72	(0.35 ; 1.48)
Negative affectivity	Low	287	22	7.7	0.213	1.00	
	Moderate	202	8	4.0		0.52	(0.23 ; 1.14)
	High	223	12	5.4		0.70	(0.36 ; 1.39)

RR = relative risk/ 95%CI = 95% confidence interval/ *P value calculated with Chi-square tests or Fisher Exact tests

Table 3b **Continuous risk factors for the occurrence of sick leave due to low back pain after one year of follow-up (SL_{LBP} at t1) in univariate analyses.**

Variable at baseline	n	SL_{LBP} at t1 Median (Q1-Q3)	n	No SL_{LBP} at t1 Median (Q1-Q3)	P value*
CURRENT PHYSICAL LOAD					
Professional					
Seniority in the current function (years)	41	3 (2 -6)	657	3 (1 -5)	0.188
Extra-professional					
Motor vehicle driving outside the work (km/year)	39	20 000 (12 000 – 30 000)	560	15 000 (10 000 – 25 000)	**0.018**
INDIVIDUAL VARIABLES					
Age (years)	42	27 (25 – 29)	661	26 (24-29)	0.307

* P value calculated with Mann Whitney U tests

Table 4 **Risk factors for the occurrence of sick leave due to low back pain after one year of follow-up (SL_{LBP} at t1).**

		SL_{LBP} at t1		UNIVARIATE ANALYSES[1]			MULTIVARIATE ANALYSES[2]			AF exposed		PAF total	
Variable at baseline	**n**	**n**	**%**	**P value**	**RR**	**95%CI**	**P value**	**RR**	**95%CI**	**AF**	**95%CI**	**PAF**	**95%CI**
PSYCHOSOCIAL WORKLOAD													
Possibilities to develop skills				**0.005**			**0.008**						
High	154	2	1.3		1.00			1.00					
Moderate	151	10	6.6		5.10	(1.12 – 23.27)		**5.01**	**(1.10 – 22.88)**	0.80	(0.10 – 0.96)	0.22	(0.07 – 0.60)
Low	234	20	8.5		**6.58**	**(1.54 – 28.16)**		**6.08**	**(1.42 – 26.07)**	0.84	(0.30 – 0.96)	0.31	(0.04 – 0.69)
INDIVIDUAL VARIABLES													
Body mass index				**0.019**			**0.030**						
Normal	307	14	4.6		1.00			1.00					
Underweight	82	2	2.4		0.54	(0.12 – 2.35)		0.52	(0.12 – 2.27)				
Overweight	110	9	8.2		1.79	(0.77 – 4.15)		1.74	(0.75 – 4.04)				
Obese	40	7	17.5		**3.84**	**(1.55 – 9.51)**		**3.41**	**(1.37 – 8.48)**	0.71	(0.27 – 0.88)	0.30	(0.06 – 0.58)

RR = relative risk/ 95%CI = 95% confidence interval/ $AF_{exposed}$ = attributable fraction among the exposed workers/ PAF_{total} = total attributable fraction for the entire study population

[1]Cox-regression

[2]Cox-regression, backward selection, P_{in}=0.10, P_{out}=0.05

Results from the model with no missing values [n=539] for gender, age, body mass index, complaints of the upper limbs in the year before inclusion, perceived general health, inability to change posture regularly, motor vehicle driving outside the work, and possibilities to develop skills.