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FOLLOW-UP STUDY INTO THE ETIOLOGIC AND PROGNOSTIC DETERMINANTS OF WORK-RELATED BACK PAIN

SYNTHESIS

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Introduction: context and aims of the project

Low back pain is a frequently occurring problem and accounts for about 15 to 20% of all sick leave days in the working population. Work-related back disorders thus have enormous human and financial costs. In the literature, individual factors, physical workload and psychosocial workload have consistently been associated with back disorders.

Although much research has already been carried out, researchers still point to the low methodological quality of many of these studies, in particular their cross-sectional and retrospective nature.

Because the Belgian situation of occupational medical surveillance offered a logistic opportunity to initiate a follow-up study, a prospective study has been set up in several health care institutions and industrial enterprises. In addition to the recording of the incidence of back pain (and of its consequences such as sick leave, chronic back pain), also physical and psychosocial exposure factors have been recorded.

Materials and methods

The selection of workers into the study population was spread over a one year period. At present, participants have been followed up for 2 years, but due to time constraints only data after 1 year have been analysed.

The main objective was to assess the predictive value of person-related factors, physical and psychosocial occupational exposure, psychosomatic complaints and clinical abnormalities of the back on the incidence of low back pain and on its characteristics like recurrency, severity, duration, localization, origin, frequency and duration of sick leave, therapeutic and occupational consequences. This has been done through a longitudinal follow-up of the variables.

After extensive literature review, different questionnaires have been selected according to their international comparability and validity. Questionnaire-based information about the physical workload has been validated by ergonomic observation following a standardized protocol. In order to keep the questionnaires as short as possible, only specific changes in outcome variables and determinants have been asked for at the follow-up moments.
For inclusion in the study, employees undergoing their yearly medical examination could not be older than 30 years. In case they were recently recruited, they had to have a perspective on a steady job. In addition, employees could not have experienced a consecutive period of back pain, which lasted for seven days or longer during the past year.
Variables were measured using a self-administered questionnaire and a standardized clinical examination of the back. At the follow-up moments, a similar questionnaire was completed in which mainly the changes in the baseline variables were investigated.
Moreover, ergonomic observations were carried out in a sample of study subjects to assess more accurately the exposure to physical workload.
Depending on the type of variables, associations between the outcome variables and determinants had to be calculated. By use of multivariate statistical methods, confounders had to be controlled for. Because the aim of the study was mainly prediction, only descriptive statistics have been calculated at baseline.

Results
1672 employees were contacted for inclusion in the study. Of them, 1200 were willing to participate. However, 159 workers needed to be excluded because they had suffered from low back pain during a continuous period of 7 days or more in the year before baseline measurement. Finally, 972 of 1041 workers returned their questionnaire at baseline, Of them 63% were women, and the mean age was 26 years. Out of these 972 workers, a sample of 152 workers was observed during 4 periods of 30 minutes randomly distributed along the shift.
From the 972 employees who completed the questionnaire at baseline, 800 also completed the questionnaire after one year of follow-up. The lost to follow-up included those who quitted their job as well as workers who did no longer wanted to participate.
The incidence risk of low back pain for a continuous period of 7 days or more in the first year of follow-up was 13%. There was no significant difference between men and women nor between Dutch and French speaking workers. Low back pain was present almost permanently in 15% and recurrent in 47%. More than one third of the participants attributed their low back pain to their job.
The following characteristics significantly increased the probability of developing low back pain: poorer perceived general health, history of low back pain and interruption of activities because of low back pain, musculoskeletal co-morbidity, sickness absence and medical care seeking in the year before inclusion. For the work-related physical variables in the current job, moderately elevated risks were observed for workers who did not have the opportunity to change posture regularly, for bent and rotated positions for more than 2 hours, for participants who perceived the loads they had to handle as too heavy or the frequency of handling as too high, for lifting or transportation of loads of more than 25 kg more than 12 times an hour, for pushing or pulling for once or more an hour and for the perception of hard work.
The only predictive psychological variable turned out to be pain related fear and for psychosocial work factors only skill discretion (the variety of skills people can use in their job).
The following variables were significantly related to sick leave for low back pain: poorer general health, obesity and morbid obesity, interruption of activities because of low back pain, musculoskeletal co-morbidity, having children, sickness absence and medical care seeking in the year before inclusion.
For the physical variables, statistical associations were found for driving a vehicle or engine less than 2 hours/day and exposure to whole-body vibration during leisure time.
Two psychosocial work characteristics were significantly related to sick leave: lower psychological demands and lower possibilities to develop skills.

Four findings during the physical examination were statistically related to low back pain: pain provoked in lateral flexion, buttock pain at manual palpation, pain elicited in passive back extension, and a higher range of passive back extension. However, this last item was not measured reliably.
On the basis of ergonomic observations, comparing for each variable the 25% most exposed workers to the 25 % less exposed, an increased risk of developing a low back pain (LBP) episode was associated with the exposure to postures with the trunk bended more than 20° forward. This risk remained significant when this postural constraint was associated to the handling of a load. Moreover, a significant risk for trunk rotation was also observed. It is worth noting that the results suggested a protective effect of sitting position. However, exposure to whole body vibration and manual handlings of loads showed no effect on the occurrence of LBP.

Discussion and conclusions
Based on univariate analysis, low back pain was predicted mainly by health-related and work-related physical factors. We did find evidence that working with the trunk in awkward postures and the impossibility to change posture regularly, manual materials handling and heavy work, predict low back pain. For prolonged sitting and standing, there was no evidence. These results are in agreement with the literature. In contrast with other studies, whole-body vibration was not related to low back pain in our study. Although many psychosocial work characteristics were assessed, only lower possibilities to develop skills was found to be significantly associated. Of the psychological variables, fear of movement or injury turned out to be important.
Mainly health-related variables were predictive for sick leave. Statistical associations were also found for lower possibilities to develop skills and for lower psychological job demands. The association between sick leave and exposure to whole-body vibration has not been observed in former epidemiological studies.
Although some pain provocation tests of the clinical back examination were associated with low back pain one year later, pain reported the day of examination and reported before examination was more significant than these clinical predictors. Even in a population with only minor antecedents of low back pain, an anamnesis of low back pain seems more important for screening subjects at risk for future back pain than physical examinations. Since the prevalence of findings was very low, the value of physical examinations as screening tool in occupational medicine seems questionable.
The ergonomic observations confirm the literature findings with regard to bending and twisting postures but not for the other risk factors. Whole body vibration exposure had no effect on LBP outcome but this may be due to the fact that only a few cohort workers were exposed for long periods. The non significant results of manual handling were not expected. This could be ascribed to a possible underestimation of the actual load handling frequency in some tasks with very frequent handling, because of observation protocol limitations.
In order to interpret the observed protective effect associated with sitting position, it must be underlined that the exposure assessment methodology did not allow to measure a continuous duration in the sitting position but only a cumulative exposure to this variable.

<u>General limitations</u>
Some general limitations of the study have to be stressed when interpreting our findings. These limitations relate especially to selection bias, observation bias and confounding.
First, our sample is not representative for the working population as a whole and even not for the young health care neither for the young distribution workers. Within the inclusion criteria, selection was avoided in the sampling procedure but due to practical and logistic constraints no real random sampling could be performed. Moreover, as in every occupational population, the healthy worker bias plays a role. Extrapolation of these results thus should be performed with caution.

Observation bias could occur on numerous occasions and its effect has been discussed: at the exposure assessment, in the recall of back pain or the reporting of other characteristics, in the observer variation in clinical back abnormalities etc.
Confounding will be dealt with in multivariate analyses but due to time constraint, only univariate results have been presented.

Relevance of the results

A large amount of new information became available through this study. The prospective nature of the study design, the ergonomic validation of the exposure data, the choice of a young, relatively painfree study population, and the inclusion of psychological variables make this study unique. Despite many research, until today risk factors and their impact still remain debated. This is partially due to the complexity of the problem, and partially to the weaknesses of many studies.
Our study can be an asset to this problem, and companies are expected to benefit from the results. Indeed, these should help occupational health professionals to direct preventive efforts more precisely.

Valorisation of the results

Several participants have presented or are preparing publications, lectures or other presentations, presenting the epidemiologic, ergonomic and psychological but also multidisciplinary results and recommendations. These will be addressed to the scientific and professional communities as well as to the lay public.
As a matter of fact, results per company will be reported to each participating company, and the practical consequences for preventive policy will be discussed.
Due to project limitations, the analysis of the data after two years of follow-up will have to be performed after discontinuation of the financing or with new funds to be pursued. Expected results however can be very important for the implementation of preventive measures. For example, the determinants of sick leave, recurrence and chronicity of pain, and the interaction between physical, psychosocial and psychological characteristics still have to be analysed in a multivariate way.
In the future, one could also monitor specific subgroups within this cohort (e.g. chronic or recurrent low back pain sufferers) and perform more sensitive analyses taking into account changes over time in the predictive factors.
Low back pain constitutes a large, expensive and complex multifactorial problem. Identification of specific modifiable factors causally associated, constitutes the key to an effective prevention and intervention policy. Socioeconomic implications of a more directed preventive policy could be large and intervention studies have to be set up to assess the real cost-effectiveness of this prevention.

Recommendations

Due to the time limitation of the project, and taking into account that important specific analyses still have to be performed (see higher), recommendations at this stage can only be vague. At any rate, the physical work load again turns out to be an important determinant of low back pain and lowering this load as much as possible seems imperative. However, the interplay with important psychosocial and psychological factors remains to be analysed and thus could modulate and straighten recommendations for prevention in the future.