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Prevention of occupational back disorders — An intervention study

by Gustav Wickström, MD¹

During the last 20 years the understanding of the causes of back disorders has deepened considerably. Even though consensus is still lacking among scholars in this field, many consider mechanical factors the principal causes of low-back disorders. The biomechanics of the lumbar spine are, however, very complex. The occurrence of back disorders seems to increase with the growing mechanization of industry. Thus the mechanical factors behind low-back disorders are far more complicated than heavy lifting or carrying as such.

In industrial societies, few back disorders are caused by infections, rheumatological diseases, or tumors. Most of the disorders are consequences of unfavorable mechanical loading or lack of loading, combined with psychosocial factors. Most acute low-back disorders are directly caused by mechanical factors, while psychosocial factors are of considerable importance in the development of chronic back disorders.

Even if, today, the causes of, or risk factors for, low-back disorders are only partially known, there is already enough knowledge for attempts to be made to try to reduce their occurrence. To establish the possible favorable effects of preventive measures, more intervention studies, and especially thorough studies, are needed. The meaning of "low-back disorder" must be defined, and all its potential causes in the populations under study determined. A decision must be made as to which factors should receive the attention of preventive measures and which factors should be monitored only as background variables. In addition, it must be decided how the base-line occurrence of low-back disorders and risk factors should be determined.

After all these decisions have been made in principle, a check must be made of how well they can be put into practice. Through investigations of how to reduce the occurrence of low-back disorders through preventive measures at the workplace, several practical limits will be set by both management and unions. In addition, many things which are unforeseen even for management and unions will take place during a study which continues for several years. Let me describe how the Turku Regional Institute of Occupational Health started an ambitious intervention study and how things look now that it is half completed.

Study design

In planning an intervention study of this kind, the following two central questions have to be answered in the very beginning: (i) should all known risk factors be attacked or only chosen ones, and (ii) how far can the results obtained be generalized?

After many discussions, we decided to try to affect all the risk factors we could possibly reach, except the psychosocial ones. This restriction was due both to the unwillingness of the unions to accept penetration into psychosocial questions in a study aimed at the prevention of occupational low-back disorders and to the fact that we thus were able to concentrate our resources primarily on ergonomic and physiological factors.

After debating whether to try to affect the organization of work, workplace design, manner of working, knowledge of and attitude toward back disorders, and the preparedness to keep fit through exercise programs, we decided to include all these factors. The rationale behind this decision was our awareness of the number of factors involved in the appearance of low-back disorders, due to which we considered it very uncertain whether we would be able to achieve any measurable effect by applying only one or a few approaches. To the workers, this fragmentation would have given a feeling of being used in an investigation rather than of being effectively assisted in diminishing the occurrence of back disorders. As no thorough intervention studies have thus far indisputably shown the beneficial effects of preventive measures at the workplace, even a clear answer to this question would be a considerable step forward. Different preventive measures have anyway been taken in the different companies and departments under study, and therefore — at least in principle — we should have an opportunity to evaluate the relative effectiveness of various approaches.

With respect to the question of generalization of the results, we chose to concentrate on three occupations in one company and two occupations in another. In this way we obtained large groups with homogeneous occupational exposure to back loads. This procedure permits statistical analysis of the results of the intervention measures in these groups, while the question of generalization to the whole company, the type of company, the branch of industry, and industry as such will remain a question for discussion.

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Choice of target companies and populations

To be able to analyze our results by statistical methods, we decided to carry out the study at workplaces where we could find large groups of people doing the same tasks. As we also had to consider age and sex, we decided to restrict the population under study to one sex (male) and carry out physical examinations of the back only in one age category (35–44 years).

We approached one of the biggest workplaces in Turku, a shipyard with 3 500 employees, to ask whether the company was interested in participating in our study and whether they had large groups of workers exposed to similar back loads. The company agreed to cooperate, as sick leaves due to musculoskeletal disease were very common and the initiation of some program to reduce their occurrence had already been considered. One white-collar (work planner) and two blue-collar (welder, plumber) occupations were chosen for intensive study.

The other company invited, a factory producing ventilation equipment for paper machines with 700 employees, was also willing to participate in the study. One white-collar (planner) and one blue-collar (plater) occupation were chosen for intensive study.

One reason for the readiness of the first two companies invited to join the study was probably the trust their management and unions had in the investigators. Both companies were familiar with our institute, with which they had been cooperating in various matters for many years. The management of both companies considered it favorable to develop cooperation with reliable specialists from outside. The fact that the Finnish Work Environment Fund diverted USD 200 000 to the study as one part of a large program to reduce musculoskeletal disorders at work gave it status on the national level. The direct cost to the companies was calculated at USD 50 000 and was primarily due to workhours lost through participation in the various phases of the study.

Determination of the base line

The first phase of the study consisted of determining the base-line values, both for the occurrence of low-back disorders and for loads on the low-back at work. The determination of the occurrence of low-back disorders consisted of establishing the occurrence of low back symptoms in questionnaires and interviews and establishing the occurrence of reduced musculoskeletal function in physical tests. In addition, the annual incidences of workdays lost because of disease/musculoskeletal disease/back disease were calculated by occupation, sex, and age for two separate years.

The determination of the total work load consisted of an AET (Arbeitswissenschaftliche Erhebungsverfahren zur Tätigkeitsanalyse) evaluation of both the physical and the psychological load in the five occu-

pations chosen. Every work task in each occupation was registered on video long enough to permit biomechanical calculation of all typical loads. The electrical activity (electromyography) of the lumbar part of the erector spinae muscle was registered concomitantly with the video registration. A questionnaire study clarified the time spent on the various work tasks of each occupation, as well as the subjective evaluation of the most demanding tasks for the back. Opinions on the occupational causes of low-back disorders and views on what had been done and what could be done to reduce the risks were also gathered by questionnaire.

Some of the base-line results could be analyzed fast enough to serve as a basis for the planning of intervention actions, while other results have not yet been analyzed and will be available only for comparisons between the situation before and after the intervention phase.

Intervention

The determination of the base-line values was made by research workers from the Institute. On the basis of the experience of Professor Saari's group in preventing occupational accidents, it was considered of crucial importance to involve the staff of the company in determining what risks could be acted upon in practice and how to do this. We thus asked the companies to appoint a working group for each occupation under study and to allow these groups to convene for at least 2 h a month during the fall of 1987 and the spring of 1988. Each group consists of a department engineer (as chairman), a foreman, and two representatives of the workers.

The appointed groups started their work with varying degrees of apprehension, as this kind of task was not familiar to them. Now, all groups are actively working and have produced longer or shorter lists of things to be acted upon. The following step — that of practically acting upon these risk factors — will be the most difficult of all. However, some practical measures have already been taken, and we are confident that still more will be taken, even if big changes will take place only at times when they are feasible also from the productivity point of view.

Follow-up

According to present plans, the intervention phase will be completed by June this year. Thereafter, we will follow the occurrence of low-back symptoms by questionnaire and the incidence of sickness absenteeism due to low-back disease or injury from company registers for three years. We will also evaluate the occupational back loads again to see if any measurable changes have taken place.