Ergonomic Aspects of Behavior Prevention

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The Social Cost of Back Problems

Back pain is one of the leading ailments in the clinical statistics of our industrialized society. Acute and chronic back problems cost the German economy DM 50 billion annually, primarily because salaries and wages have to be paid for 60 million missed days of work per year (Grigelat, 1994). Eighty percent (80%) of the Western population suffers at least temporarily from complaints of this kind. Every fifth patient seen by a general practitioner and every third patient seen by an orthopedist seeks out a physician because of back problems.

Abrupt lifting of loads while twisting and/or tilting to the side is the most frequent work-related cause of back problems.

Health insurance company statistics show that disorders of the musculo-skeletal system lead to long absences and substantial business and social costs.

One sick day costs DM 600.00 – 800.00 (including all non-wage labor costs), depending on the level of training of the employee in question. In cases of acute lumbago, the costs quickly mount to as much as DM 8000.00 per employee for approx. ten days of sick leave.

Furthermore, when one bears in mind that it is generally impossible to replace employees during this absence, this inevitably results in an additional workload / manpower deficit for the remaining employees.

Reducing Strain through Ergonomically Sound Sequences of Motion

Our industrialized society and the associated progress have led human beings to change their lifestyles and environments. Especially where movement is concerned, ever more sophisticated methods have been found to "protect" human beings from movement. The strain on the musculature has undergone a pronounced change from the dynamic, active form to the static, passive form. The strain on muscles was reduced in both the work and private spheres by a very wide variety of aids.

Workplace injury prevention enables us to bring about changes in behavior and conditions. Frequently, circumstances in the workplace force employees to carry out physiologically unsound work sequences.

If one observes the workplaces critically, when evaluating back pain – primarily in the lumbar region – one must consider:
- how and
- in what form
the employees can be trained to minimize the existing strain.

On the basis of medical/ergonomic knowledge, it is possible to optimize sequences of motion with judicious use of physical strength and technical aids.

The following points must be observed:
- working height
- working seat
- gripping and motion area
- range of optimum muscle strength
- rules for "proper lifting and carrying"
- reduction of monotony
- division of work
- noise and vibration
- space and work climate
Risk Factors
Increased incidence of back pain is blamed on the following risk factors:
- heavy labor
- poor posture / forced posture
- lateral tilting and torsion of the spinal column
- abrupt lifting
- monotonous work routines

Each of the risk factors listed can lead, over a period of years, to impairment of health depending on:
- age
- gender
- body size and weight
- conditioning
- prior injuries

This consideration does not take the factors psyche, work climate, and current job market situation into account.

Legal Bases
When one considers the legal obligation of all those who are responsible for industrial safety and, in particular, the employer ("... protect employees from injury in the workplace..."), one must regrettably conclude that very little is done in the way of prevention in many sectors of industry. The Berufskrankheitenverordnung ("German Ordinance on Occupational Disease"), which has been cited frequently in the past few months – represents only part of the legal obligations. The requirement for prevention can be derived from, among others, the following statutes:

German Civil Code § 618 Employer’s Duty to Provide Social and Medical Assistance
- Arbeitssicherheitsgesetz ("German Industrial Safety Act") § 3
- Gesundheitsreformgesetz ("German Health Care Reform Act") § 20
- Berufskrankheitenverordnung ("German Ordinance on Occupational Disease")
- Ordinance on "Women Aboard Vehicles" § 11...

Industrial Back Training
"Industrial" back training differs from "normal" back training, which is now offered by many studios, health insurance companies, and physical therapists. Unless one takes the structures within a business operation into account, the work routines that are typical for a certain business, the work climate and the specific ergonomic outline conditions, then, in my opinion, back training is doomed to failure.

Carrying out a "normal" back training program – divorced from the needs of the employees and the local circumstances – not only poses problems for the trainer, but also offers only low effectiveness for the employees. The trainer will be measured by the extent to which the training program applies to everyday business operations.

Industrial back training requires clear goals that have been adapted to the needs of the business in question.
Business Structures
If one wants to propose a back training program to a business successfully, one should first gain some insight into the structures within the business. Every business has its own problems and "peculiarities" which outsiders should observe. In my opinion, the primary contact person should be the company's occupational physician. If no physician is available as a contact person, then the trainer should contact the following departments:
- top management
- works council
- work safety
- special departments that are to be supported
- company health insurance fund

Implementation
As a rule, the affected executives should be sensitized to the issue within the framework of a presentation before the start of industrial back training. The following points, however, must be clarified beforehand:
- objectives of training
- target group
- size of group
- duration of program
- costs
- efficiency monitoring
When it comes to monitoring efficiency, monitoring on-site by "co-trainers" is especially helpful. Co-trainers are long-time employees, with the status of foremen and "athletic ambitions", who undergo more intensive training. Advantage:

Foreman status, on-site monitoring of efficiency (practically oriented), co-trainers serve as examples.

Trainers should exploit the potential of photographic and video documentation for teaching purposes, also within the framework of "negative examples". Since employees draw little benefit from posters and/or technical literature, at PIRELLI (Höchst), issuing small, wipe-clean MEMORY CARDS has proven successful. These present, in an easily understandable manner, the essential facts about "Proper Lifting and Carrying" (Figs. 1, 2).

Practical tips
• There are no panaceas
• Every weight has its own problems
• Bend the back as little as possible
• Squat before lifting
• Do not jerk when lifting
• Avoid twisting the torso
• Always lift with both arms at the same time
• Use all technical aids
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Fig. 1: Memory card for proper lifting and carrying

Incorrect sequence of motion
- Intervertebral load
- Front-edge loading
- Pain
- Even loading
- Correct bodily posture
- Correct bodily posture

Fig. 2: Memory card for correct lifting and carrying

Training concept
- Consciousness-raising and brief training with executives
- Training of foremen
- Training of new hires (before they assume their normal posts)
- Training of vocational trainees

Rules
1. There are no panaceas.
2. Every piece of baggage presents unique problems
3. Lift slowly (Fig. 3)
4. Check the weight (Fig. 4)
5. Manipulate the load close to the body (Fig. 5)
6. Avoid twisting the upper body
7. Bend your back as little as possible (Fig. 6)
8. Squat down when lifting (use your leg muscles) (Fig. 7)
9. Always lift with both arms (Fig. 8)
10. Never jerk when lifting.
11. If in doubt, get help from colleagues.
12. Use technical aids (Fig. 9)
13. Always look for a secure grip.

Fig. 3: Lift slowly
Fig. 4: Check the weight
Fig. 5: Manipulate loads close to your body

Drilling
Cutting

Fig. 6: Bend your back as little as possible.

Fig. 7: Use your leg muscles.
Fig. 8: Always lift with both arms.
Fig. 9: Use technical aids.

When the above rules are observed, "tipping" of the vertebrae is avoided and the intervertebral discs, back muscles, and thoracic girdle are subject to less loading. The actual work of lifting is done by the leg muscles. The arms serve primarily to hold the load.

The training is supplemented with relaxation exercises, combined with loosening exercises and bodybuilding.
Technical Aids
As long as there are still industrial jobs in which loading and stress cannot be reduced through ergonomic workplace design, employees must be enrolled in training programs and all the possibilities afforded by technical aids must be used.

When it comes to heavy lifting and carrying, the use of back supports must be considered individually. When used by properly instructed users, in combination with back training, they are, in my opinion, very promising. Experiences in the US since 1984 have appeared in various publications. Various studies are currently underway in the Federal Republic of Germany (e.g., FAG, Frankfurt Airport with n=300) with the objective of efficiency monitoring.

The objectives in doing this are:
- healthy employees
- humane work
- reduction of loading
- reduction of strain
- reduction of absences (depends on workplace)
- compulsion to use "correct" posture
- fewer workers with reduced performance

Preliminary results
- promotes proper sequence of motion
- provides flexible support for the back
- serves as a means of prevention
- increases intraabdominal pressure (Krämer, Bochum)
- has an important psychological effect
- physiological warming protection as secondary effect

Expectations of the studies should not be set too high, since some weak points in all studies conducted until now could not be eliminated. These are:
- varying groups
- age differences
- differences in weight and size
- differences in muscular situation
- differences in nationality
- preexisting ailments
- non-work activities
- sports activities

Despite these weak points, the positive resonance of employees should be taken into account by testing back belts individually. Nevertheless, the statements made by Bunch (US, 1993) hold true:

*Back belts are not needed, if employees understand and use lumbar stabilization techniques during material handling.*

*Black Belts will not reduce the occurrence of back injuries unless used properly.*
Summary
Industrial back training must become a permanent part of an industrial health concept. Only expert
back trainers with a knowledge of ergonomics will be taken seriously as consultants by top
management and employees. Qualified training is currently available only through a few associations
(Forum Gesunder Rücken, BdR, etc.).

Back training can be only one tile in the mosaic of an overall prevention concept that requires
interdisciplinary participation by all responsible persons from various departments.

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