

Prevention of Low Back Complaints

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1.0 SUMMARY

The MERGO project (Man and ERGOnomics) is part of the Physical Load Covenant and is aimed at giving ergonomics a more prominent place in the Royal Netherlands Army (RNLA) operating processes.

The physical load of military personnel in general may be reduced by taking into account ergonomic aspects in the materiel selection process. The provision of information is also an essential instrument in drawing more attention to the prevention of back complaints. The nature of the message is that pre-employment medical assessments are not valid in this respect. Also, training of the back muscles is not the manner to prevent low back injuries. It is important to give this message to doctors, physical therapists and commanders. The mindset has to be changed. Long and extended operations are only possible if the physical strain is reduced. Three examples are given of specific projects that could reduce the physical exertion and change the rules and mindset of military medical personnel and commanders.

2.0 SOME STATISTICS ON THE OCCURRENCE OF BACK COMPLAINTS WITHIN THE RNLA

Of the complaints of both military and civilian personnel referred to the military occupational physician, 40% are related to the attitudinal and locomotor apparatus.

The majority (25%) of these complaints are related to the lower back, followed by knee and lower leg complaints (17%); 70% of the back complaints reported to the military occupational physician have an unclear aetiology. We refer to this category of complaints as 'non-specific back pain'. Of the remaining 30% the cause can be determined with reasonable certainty, such as a herniated intervertebral disc.

In short, back complaints are among the most frequent diagnoses made by military physicians and therefore present a major threat in respect of health to the deployability of RNLA personnel.

In principle, anyone can develop back complaints. Nevertheless, people in jobs characterised by manual labour, such as lifting and carrying heavy equipment, are more at risk than others. This is also true of rather a large number of military and civilian positions within the RNLA.

3.0 WHAT ACTIONS DOES THE RNLA TAKE TO CONTROL BACK COMPLAINTS?

Naturally, the RNLA takes back complaints seriously, as well as other health problems posed by physical strain.

In April 2002, the Commander-in-Chief of the RNLA signed the Physical Load Covenant for the Defence Sector. The main aim of the covenant is to take curative and preventive measures aimed at reducing job-related physical strain on Defence personnel. Measures can be taken in various ways and at different levels.

At the source; that is, measures aimed at reducing physical strain at the source, for instance by developing lightweight equipment.

At the organisational level. These measures can be achieved by effecting a more conducive balance between work and rest periods.

At the technological level. These measures can be achieved by developing or procuring (technical) aids.

Awareness and behavioural measures. These can be achieved by providing information and issuing guidelines, for instance in the field of responsible lifting and healthy work postures.

The last level, that of awareness and behaviour, is different from the other levels in that employees are encouraged to treat their own body carefully and responsibly.

The manual handling of heavy loads always has been and always will be inextricably linked with the work carried out by the RNLA, whether in operational circumstances or not. The covenant requires the provision of specific information on lifting. The 'Lifting Tactics' working group has been set up for the purpose of developing and implementing this information campaign across the RNLA.

The information to personnel of the Directorate of Materiel of the RNLA, both the staff and the personnel on the ground, is tailored to indicating what damage can be done to the spinal column and what consequences this may have. Personnel are also called upon to pause and think before moving heavy objects.

This essential message also led to the choice of the 'Good thinking!' logo.

The essential message conveyed in the information campaign is the following:

The intervertebral discs in the spinal column, which absorb the forces generated in moving loads, cannot be conditioned.

In other words, either the spinal column can sustain these forces, or it is damaged.

One of the measures specified in the covenant, in addition to the introduction of as many aids as possible, is the provision of appropriate information on how to deal with heavy loads which need to be moved for operational reasons. In the event that, despite all measures taken, loads do need to be moved manually, this is to be reduced to an absolute minimum.

The aim of the programme is to heighten people's awareness of health damage risks, specifically back complaints, posed by the manual handling of loads and to minimise these risks as much as possible.

4.0 FRACTURES OF THE LUMBAR VERTEBRAL ENDPLATE IN THE AETIOLOGY OF LOW BACK PAIN

In recent studies it has been hypothesised that in a large number of cases of non-specific low back pain the primary cause of the pain is a fracture of the vertebral endplate caused by compression forces.

Clinical studies have shown that in many low back pain patients damage of the vertebral bodies and or the intervertebral disc is present.

In vitro studies reveal that the most likely type of failure of this anterior part of the spine is a fracture of the endplate as a result of compression. The high incidence of non-specific low back pain concurs with the likelihood of compression fractures of the endplate to occur in everyday life.

Furthermore, epidemiological findings and the natural history of low back pain appear to be in line with the proposed hypothesis. The mechanisms of pain in the low back are both inflammatory and mechanical.

The nucleus pulposus of the intervertebral disc is kept isolated from the body's immune system. When the disc is disrupted this isolation is broken and the proteoglycans in the nucleus cause the body to mount an inflammatory response to seal off what it sees as a foreign invader. When the nuclear material reaches the outer third of the anulus the inflammatory response causes pain to be transmitted from the pain nerves in this area. The mechanical problem occurs when the functional capabilities of the disc anulus are lost. The anulus fibrosis is made up of tough connective tissue that must withstand the incredible forces of compression and rotation found in the spine. Much of the disc is weakened by a marauding nucleus pulposus destroying collagen fibres. The mechanical forces translate to the remaining fibres and overwhelm the disc's ability to function normally. The excessive strain transmitted to the highly innervated outer 1/3 of the disc wall results in a mechanical signal of pain, with normal disc compression and rotation. The mechanical force that causes stress fractures of the endplate is the person's own muscle force.

This implies that strong lumbar muscles do not prevent low back injuries. The nature of the message is that pre-employment medical assessments are not valid in this respect. Also, training of the back muscles is not the way to prevent low back injuries. It is important to give this message to doctors, physical therapists and commanders. The mindset has to be changed. Long and extended operations are only possible if the physical strain is reduced. Three examples are given of specific projects that could reduce the physical strain and change the rules and mindset of military medical personnel and commanders.

5.0 INFANTRY

In September 2002 we studied all the operational physical tasks of infantrymen of the 11 Airmobile Brigade. One of the main heavy tasks of infantrymen is load carriage. The NIOSH guidelines only specify the maximum loads when lifting materials. There are no guidelines for the maximum weight resting on the shoulders while carrying loads. One of the main conclusions of the report is the suggestion that the maximum load of a backpack should be 43 kg for strong people. One third of the load can rest on the shoulders, two thirds of the load must be carried on the hips. Therefore we recommended that the maximum weight on the shoulders should be limited to $43:3 = 14$ kg for strong people.

6.0 MEDICAL PERSONNEL

The stretchers used by the RNLA have a very limited space between handles and canvas. A previous study into the physical load as experienced by military personnel working in an ambulance company revealed that unfavourable body postures were adopted while lifting and positioning the stretchers. Several types of stretcher-handle extensions were tested. A significant improvement in body posture, number of wrong steps in a simulated minefield, maximum heart rate and comfort was found using handle extensions. Also a significant improvement in terms of perceived exertion, local discomfort experienced and carriage comfort was found using the adapted handle shape. Based on the results of this study, the use of the extensible stretcher handles with adapted handle shape is the preferred configuration. The adjustable handle extension is the most flexible system. Besides the fact that the extensions are always available, it is possible to adapt the length of the handle to the individual situation.



Figure 1: Stretcher-Handle Extensions.

In addition to the technical modification, a lifting protocol is suggested when four people are available. All four people lift the stretcher with the patient with two hands (two at the end, two sideways). Then one medic turns around and finally two people carry the patient. Putting the stretcher down is also done by four people. At the end of 2005 all stretchers of the RNLA will have been modified.

7.0 BUILDING BAILEY BRIDGES MANUALLY

The parts of a Bailey bridge are too heavy to lift manually. Also, when parts are lifted by several people this does not reduce the high risk of low back injuries. We suggested that the manual building of Bailey bridges be prohibited. A test which involved building a Bailey bridge with machinery rather than manually was very successful. Therefore, this year all the heavy construction machinery of the RNLA will be equipped with cranes.

These measures are a few examples, as a result of the Physical Load Covenant, of ways to reduce health problems posed by physical strain. Much still has to be done. If we can reduce the physical load, then the level of requirements for people wanting to join the military can be lowered. To what extent long and extended operations can be performed has not yet been established scientifically to a sufficient degree.