

# HOW DOES THE SCIENTIFIC LITERATURE SUPPORT THE EXACT RISK LIMITS FOR WORK-RELATED NECK AND UPPER LIMB DISORDERS?

Esa-Pekka Takala

Finnish Institute of Occupational Health, Helsinki, Finland

[esa-pekka.takala@ttl.fi](mailto:esa-pekka.takala@ttl.fi)

Several work-related factors have been shown to increase the risk of musculoskeletal disorders of the neck and upper limbs. The singular studies have usually measured few risk factors. The aim of this study was to construct a multidimensional matrix of the data in singular studies showing the risk of the disorders on different levels and combinations of the exposures. Systematic data collection identified about 300 references to be further analyzed. For the distal upper limb, 15 studies reported risk-factors that can be handled with quantitative assessment methods. For the neck and shoulder quantitative estimates of exposures could be found in 16 papers. Due to the insufficient data a multidimensional matrix combining the risk limits of individual factors cannot be constructed by the current status of the scientific knowledge.

## Introduction

Forceful manual actions, repeated movements, deviated and sustained postures, vibration, local compressing pressure, and cold have been identified to be causal factors for the neck and upper limb disorders. These items have been well documented in hundreds of epidemiological studies. The singular studies have, however, been designed to assess a limited number of risk-factors and on the level that will get a great contrast between the exposed and non-exposed groups. For preventive actions, information is needed about the risk when the risk factors coexist and on different levels of exposures.

*Objective.* The aim of this study was to construct a multidimensional matrix of data in the singular studies showing the risk of the disorders on different levels and combinations of the exposures. It is obvious that there are no scientific data of risk for all levels of exposures. However, the values of empty cells in the matrix can be estimated from the data in the neighbor cells by interpolation if the number of the empty cells is not too large.

## METHODS

Good systematic literature studies have been done in the past decade. There are two milestones of good quality reviews: The NIOSH review (Bernard 1997) and the study performed by the National Research Council (2001). These documents conclude that the factors mentioned before are risk-factors (except that the literature data is insufficient for the local pressure and cold). In addition to the long known physical factors the role of psychosocial factors as risk-factors is stressed in the later review. Several other reviews support these conclusions.

### Data collection for the literature search

First, the original studies reported in the two reviews were collected. The MEDLINE database was searched by using words HAND, WRIST, FOREARM, ELBOW, SHOULDER and NECK and by combining these words with WORKPLACE or OCCUPATIONAL. Additional data was identified from the articles related to the first searches. The abstracts of the gained results (about 300 references

published before June 2002) were scanned in order to concentrate on the most suitable references. Finally the original publications were reviewed.

## RESULTS

The methods of assessment of the work-load varied widely in the studies. Usually the occurrence of the risk factors were assessed on a very rough quantitative level like with the job title or 'yes' / 'no' questions. Most studies identified physical factors in work to be associated with neck or upper limb disorders.

For the distal upper limb, 15 studies reported risk-factors that can be handled with quantitative assessment methods. In 8 studies a score or index was formed from several items in order to have a general assessment of risk factors.

For the neck and shoulder quantitative estimates of exposures could be found in 16 papers. Two of them used indices combining several items.

## DISCUSSION AND CONCLUSIONS

The data of epidemiological studies give good qualitative and some quantitative figures for the increased risk. The preliminary aim was to combine these figures in a form of a matrix indicating the risk on different levels of coexisting factors. Due to the insufficient data this kind of matrix cannot be constructed by the current status of the scientific knowledge. The reason for this conclusion is two-fold: First, the number of studies is low and in most of them only one risk factor has been measured on two or three levels. For a combination of two risk factors on 3 levels of exposure measures a total of 9 equivalent figures of risk are needed; for three risk-factors  $3*3*3$  or 27 values, etc. Secondly, the study designs and populations have been different and therefore the measures of risk (Risk Ratio (RR) or Odds Ratio (OR)) cannot be regarded as absolute or equivalent figures.

Therefore it is not possible to rank the risk estimates of different studies; we cannot say that a  $RR=4$  in one study is greater than  $RR=2$  in another study.

## ACKNOWLEDGEMENTS

This study was partly supported by the European Commission (project MIRTH - G1R D-CT-2001-00574).

## REFERENCES

- Bernard, B.P. (editor). 1997. A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back. Cincinnati, OH: U.S. Department of health and human services.
- National Research Council and Institute of Medicine. 2001. Musculoskeletal disorders and the workplace: Low back and upper extremities. Panel on musculoskeletal disorders and the workplace. Commission on behavioral and social sciences and education. Washington, DC: National Academy Press.