TASK FORCE 9: PREVENTION OF MUSCULOSKELETAL DISORDERS

Co-Chairs: Barbara Grieffahn, IFADO, Germany (grieffahn@ifado.de), Evelyn Kortum, WHO (kortummagote@who.int)

The musculoskeletal disorders are one of the main occupational health problems in both the old and new economies. Development of ergonomics, adoption of good and safe work practices and health promotion are in a key role when finding solutions to prevention of musculoskeletal disorders.

Course on ergonomics and the prevention of musculoskeletal disorders at the workplace

Chia Sin Eng, WHO Collaborating Centres in Occupational Health, Singapore (cfcse@nus.edu.sg)
Nguyen Viet Dong, Centre for Occupational Health and Environment, Ministry of Industry, Viet Nam (tytslaodongon@hn.vnn.vn)

Keywords: ergonomics, work process, musculoskeletal problems, practical recommendations.

The course was conducted on 17-19 November 2003 at Ho Chi Min City, Vietnam with the following objectives for the participants:

1. Identify ergonomic risk factors at the workplace
2. Learn the use of ergonomic evaluation tools e.g. NIOSH lifting equation
3. Understand the principles and practice of design and control of risk factors

A total of 28 participants consisting of doctors, health professionals and nurses from different industries in Vietnam attended the course.

The course objectives were achieved. We are working with excellent counterparts from the Centre for Occupational Health and Environment in Vietnam. Our Vietnamese counterparts are involving their partners from the different provinces in the project, which extends the impact of the project to the wider community. We are working with the same senior level of staff from the agency, as well as their trainers. These people have participated in the training, and are already involved in some training roles.

Publication: Prevention of MSDs

Matthias Jäger (mjaege@ifado.de), Barbara Grieffahn (grieffahn@arb-phys.uni-dortmund.de), Institute for Occupational Physiology at the University of Dortmund, Germany
Gustav Caffier (caffier.gustav@baua.bund.de), Falk Liebers (liebers.falk@baua.bund.de), Alwin Luttmann, Ulf Steinberg, Federal Institute for Occupational, Berlin, Germany

Keywords: Musculoskeletal diseases, prevention and control, workplace, risk factors

Target group: employers, supervisors and occupational health trainers

Disorders of the musculoskeletal system represent a main cause for absence from occupational work. Musculoskeletal disorders lead to considerable costs for the public health system. Specific disorders of the musculoskeletal system may relate to different body regions and occupational work. For example, disorders in the lower back are often correlated to lifting and carrying of loads or to the application of vibration. Upper-limb disorders (at fingers, hands, wrists, arms, elbows, shoulders, neck) may result from repetitive or long-lasting static force exertion or may be intensified by such activities. The severity of these disorders may vary between occasional aches or pain to exactly diagnosed specific diseases. Occurrence of pain may be interpreted as the result of a reversible acute overloading or may be a pre-symptom for the beginning of a serious disease.

The purpose of this document for the prevention of musculoskeletal disorders is to inform about risk factors and to influence actions of employers and the behaviour of workers in such a way that risks of physical loadings, dangerous to health or unnecessarily fatiguing, are avoided or diminished.

It is intended that this booklet be used by employers, supervisors and occupational health trainers to help them recognise risks that may lead to musculoskeletal disorders, as well to design work itself and the work environment in a way which is safe for the employee. The brochure has now been published in English French and Spanish. http://www.who.int/occupational_health/publications/muscsdisorders.

Project end date: January 2004
Annual ergonomics workshop for occupational health professionals
Center for Occupational and Environmental Health, School of Public Health, University of California at Los Angeles (UCLA), USA - Victor Liu, California State University at Northridge, USA (vliu@ucla.edu) with the Center for Scientific Research and Postgraduate Education at Ensenada, Mexico.

Keywords: ergonomics, workshop, training, Spanish
Target group: occupational health professionals, industrial hygiene specialists, human resource personnel, operations managers
The purpose of the project is to promote occupational safety and ergonomics in the maquiladora industry in Baja California, Mexico.
This annual, one-day workshop serves to disseminate occupational safety and ergonomics information within the maquiladora industry in Mexico by training health professionals and other responsible personnel. The instruction includes tools to identify, solve and systematically prevent the occurrence of work related musculoskeletal disorders (WRMD) due to ergonomic factors. Participants are trained in evaluating and monitoring WRMD in order to increase productivity and reduce absenteeism. The workshop is supported by the Fogarty Center training grant at UCLA. The third workshop has just been conducted; the next one is anticipated in 2004.
Products are slide presentations from the workshop compiled on CD.

Musculoskeletal disorders in Motor Company Workers
Jung-Wan Koo, Catholic Industrial Medical Centres, Korea (jwkoo@catholic.ac.kr)
Keywords: musculoskeletal disorder, motor company
Target group: workers in the manufacturing industry
The aim is to evaluate musculoskeletal disorders in motor company workers. The project will be held in a motor company located in Bupyeong, South Korea. The musculoskeletal disorders will be evaluated by questionnaires and work survey and diagnostic tools. Criteria of the musculo-skeletal disorders are being prepared and the paper is being reviewed.

Joint efforts to produce publications on prevention of MSDs to end users in the developing countries
Gábor Galgóczy, National Institute of Occupational Health, Hungary (galgoczy@fjokk.hu)
Keywords: information about causes, diagnostic guidelines, reporting of occupational MSD, statistics of occupational diseases, prevention
Target group: occupational health physicians and nurses, rheumatologists, orthopaedists, health statisticians, health decision-makers
Project start date: January 2002
A publication has been compiled on the musculo-skeletal diseases caused by hand-arm vibration syndrome. We intend to expand this into a comprehensive methodological guide on occupation MSDs. The modification of the first draft has been in preparation since 2002; deadline: 31 October 2003.
The draft methodological guide is to be submitted to the relevant professional colleges; deadline: 31 December 2003.
Incorporation of the recommendations of the professional colleagues; deadline: 30 June 2004.
Translation of the methodological guide into English; deadline: 31 October 2004.
Project start date: January 2002
Project end date: December 2004

Musculo-skeletal Disorders among seafarers and port workers
Phd. Lobenko A., Phd. Ignatiev A, State Enterprise Scientific Research, Institute of Maritime Medicine, Odessa, Ukraine (zvs@paco.net)

*Keywords:* musculo-skeletal disorders, osteoporosis, maritime and port workers, vibration; calcium deficit

*Target group:* occupational health physician, orthopaedists, and health statisticians.

The purpose of this project is to identify factors that cause osteoporosis at work and develop protection measures. Objectives of the project are epidemiological studies of musculo-skeletal disorders related to professional hazards of seafarers and port workers.

Morbidity caused by musculo-skeletal disorders increased twice during the last three years and takes the second place in the structure of invalidity after circulatory diseases. Invalidity of the working population caused by osteochondrosis increased by 20%. Fractures as a result of trauma increased by 25%. The percent of morbidity of musculo-skeletal diseases was more frequent where the level of vibration and noise was higher. Medical examination of workers showed that bone fractures were caused by osteoporosis and osteopenia. The laboratory data testified a correlation with calcium deficit.

We propose to continue medical examination of workers whose activity connects with high level of vibration.

We plan to study morbidity and invalidity of maritime and port workers (500 people), the condition of bone tissue by ultrasound densitometry, laboratory tests, and to develop prophylactic measures and recommendations. The first stage comprises monitoring of bone effects in workers exposed to vibration and the establishment of criteria for assessment of specific occupational risks of musculo-skeletal disorders. The second stage involves early determination of musculo-skeletal disorders, the proposition of prophylactic measures for workers exposed to vibration; the determination of standards with regard to vibration exposure limits. The third stage will produce the results of research activities which will be delivered through publications in medical journals, monographs and guidelines. Training programmes for medical personnel have been organised.

**Duration of the activity:** 2003-2006.

---

**Publication on MSDs**

Bernd Cugier, Federal Institute of Occupational Safety and Health (FIOSH), Germany (cugier.bernd@baua.bund.de)

As an activity of the FIOSH, a combined programme was developed in May 2002 aimed at the assessment of stress and strain in manual material handling and their relations to musculoskeletal disorders. The programme consists of two parts: Risk Assessment and Health Assessment. In the part Risk Assessment a method is described to calculate the risk of manual handling tasks by means of "key indicators" such as frequency or duration of lifting, load weight, body posture, and restricted working conditions. The "Key Indicator Method" is recommended for application according to the Load Handling Ordinance in Germany. In the part Health Assessment a multi-step inventory for diagnostics of musculoskeletal disorders in the occupational medical practice is given. It was developed by orthopaedic physicians in cooperation with the FIOSH. The combined programme is published on the web-site of FIOSH (www.baua.de/prax/index.htm) available in German only. There is also a simple PC programme for calculating the risk score.

**Funding is in place. The project will be completed by December 2005.**

---

**Completing guidelines for the prevention of MSD as a basis for questionnaires to interested CCs to assess the load of the musculoskeletal system and to prevent MSD**

Barbara Grieffahn, Institute for Occupational Physiology at the University of Dortmund (IFADO), Germany (grieffahn@ifado.de)

*Keywords:* MSD, Guideline, Questionnaire, Computer-based assessment of musculoskeletal load

*Target groups:* decision-makers at various levels (employers, Departments of Health and Labour, Trade Unions)

The purpose of the project is to determine the situation of MSD in various countries (where Collaborating Centres exist) and to provide a computer-based tool for the assessment and prevention of MSD.

Guidelines have been prepared in close cooperation of IFADO and the Federal Institute of Occupational Safety and Health (FIOSH) Berlin, Germany. They outline the significance of MSD as a main cause for absence from work and for high costs for public health. Health problems occur, in particular, if the mechanical workload is higher than the load-bearing capacity of the musculoskeletal system, irrespective of its components (bones, tendons, ligaments, muscles, etc.). Apart from mechanically induced strain effecting
the locomotor organs directly, psychosocial factors such as time pressure, low job decision latitude or insufficient social support can augment the risk by elevated muscle tension and by effecting motoric coordination. Reducing the mechanical load on the musculoskeletal system during the performance of occupational work is an adequate preventive measure. Major risk factors are high force resulting from lifting, pushing, or pulling heavy objects, high repetition frequency or long-term force execution, unfavourable posture, static muscle forces or working on or with vibrating machinery. Effective measures for the reduction of forces acting within or on the skeletal and muscular structures consider occupying a favourable posture next to a reduction of load weight.

FIOSH Berlin, Germany is collaborating on the project.

**Questionnaires on musculoskeletal disorders related with accidents at work**

Kenneth R. Laughery (laugher@ruf.rice.edu), (Chair, IEA STP Committee) IEA STP-TC MSD, with STP and IDC Committees

*Keywords:* musculoskeletal disorders, ergonomics, accidents at work, occupational safety and health management systems

*Target group:* occupational safety and health personnel concerned with the prevention of musculoskeletal disorders and related accidents and instructors in relevant educational and training institutions

The objective of this project is to develop action-oriented questionnaires on musculoskeletal disorders related with accidents at work for their use by occupational safety and health personnel. The project is undertaken as an international activity of the IEA STP-TC Musculoskeletal Disorders. The project aims to examine current conditions of work and the working environment in different industrial settings and develop practical questionnaires on existing musculoskeletal disorders and necessary preventive measures. The questionnaire items are compiled on the basis of field experiences in various countries. The outcome of the project are tested by members of TC MSD and presented for use as guidance materials in occupational safety and health management systems. The project also aims at publishing positive experiences in the prevention of musculoskeletal disorders and related accidents.

**Survey on musculoskeletal disorders in Vietnam**

Le Van Trung, National Institute of Occupational and Environmental Health, WHO Collaborating Center on Occupational Health, Vietnam (letrung@hn.vnn.vn)

*Keywords:* musculoskeletal disorders, ergonomics

The objectives of this project are the investigation on the occurrence of musculoskeletal disorders (MDs) in selected occupations in Vietnam, analysis in terms of causal factors, and suggestions of ergonomic interventions. Funds have been secured by WHO.

**Inventory of other materials related to prevention of MSDs**

Barbara Griefahn, Institute for Occupational Physiological at the University of Dortmund (IfaDo), Germany (griefahn@ifado.de)

The project is funded in-house.

The goal is to develop predictive models for the MSD related to manual material handling and due to whole-body-vibrations as well as hand-arm-vibrations. The project will be completed by November 2004.

**Evaluation of exposure and detection of health effects**

Jana Hlávková, Centre of Industrial Hygiene and Occupational diseases, National Institute of Public Health, Czech Republic (jhlav@suzu.cz)

*Keywords:* Musculoskeletal disorders, long-term overloading, small muscles, occupational diseases, and surface electromyography

*Target group:* Selected employees working under conditions that cause local-muscular overload. The selection of monitored persons will be made on the basis of an analysis of reported occupational diseases.

This project is aimed at evaluating the causal connection between working conditions and the onset of musculo-skeletal diseases, particularly those caused by long-term excessive load. It is known that various factors are responsible for the development of MSD. For the purpose of prevention it is essential to be
acquainted with the significance and ratio of individual factors related to these diseases. We have therefore concentrated on assessing the influence and relative significance of individual occupational factors related to local muscular load. The aim is to reveal their significance in the onset of individual types of occupational diseases caused by excessive unilateral load, confirm the viability of currently used values and create criteria for assessment of individual occupational diseases.

Currently, data are being accumulated, analyzed and evaluated. The project is progressing according to schedule and currently data are being accumulated, analyzed and evaluated.

The project is scheduled to be completed by 2005 and funding is in place. The planned outcomes include establishing physiological criteria for the acknowledgement of MSD as an occupational disease, and elaborating the principles of prevention and intervention in MSD due to heavy physical work. The calendar is as follows: 2002 – 2004 for accumulating dates, continuous analysis and evaluation; and 2005 for final analysis and evaluation. The project is being run in close collaboration with all Authorities of Public Health nation-wide (regional and district).

Project end date: January 1991
Project end date: Continuing

Preparation of teacher’s guide and fact sheet within the area of occupational exposure to vibration
Lage Burström, National Institute for Working Life, Sweden (lage.burstrom@arbetslivsinstitutet.se)

Keywords: vibration, whole-body, hand-arm, occupational, guide

Target group: The Teacher’s Guide is targeted towards persons involved in the education of individuals who are either exposed to occupational vibration, need to manage environments where workers come into contact with vibration, or need to deal with various health effects of vibration. The target group is people located in developing and industrializing nations.

The purpose is to produce two documents, one teacher’s guide (40-80 pages) and one fact sheet (4-5 pages) within the area of occupational exposure to vibration. A draft outline of the teacher’s guide for the area of hand-arm vibration is under preparation and will be reviewed during the beginning of next year. The guide covering whole body vibration will be ready for review during 2003 as well as the fact sheet. Feedback on draft of the manuscripts is provided from WHO Collaborating Centres in Bulgaria, Ukraine, Chile, Czech Republic, Hungary and Thailand.

Project start date: February 2002
Project end date: June 2005

Application and validation of a biomechanical model for manual material handling
Matthias Jäger, Institute for Occupational Physiology at Dortmund University (IFADo), Germany (mjaege@ifado.de)

Keywords: model, spine, manual material handling

Target group: Professional Associations, Physicians specialised in Occupational Health and Preventive Medicine

The purpose of the project: Prognosis of long-term low-back effects based on actual workload at the workplace.

The biomechanical model 'The Dortmund' allows the estimation of the load on the lumbar spine caused by the common types of manual material handling. This model will be applied in the field, in cooperation with several partners (multi-disciplinary and multi-center study), in order to quantify cumulative lumbar load for the occupational life of persons with diverse degenerative lumbar diseases. The aim is to validate a dose model, which is in use for workers compensation in Germany ('The Mainz-Dortmund Dose Model'), that enables the prediction of the long-term effects on the spine.

Product: prediction model. Funding: in place

Project start date: October 2002
Completion date: March 2006

Prediction of vibration induced forces by means of a biomechanical model
Martin Fritz, e-mail: fritz@ifado.de, Institute for Occupational Physiology at Dortmund University (IfADo), Dortmund, Federal Republic of Germany

Keywords: Model, spine, whole-body vibrations

Target group: Professional Associations, Physicians specialised in Occupational Health and Preventive Medicine

The purpose of the project is to establish a prognosis of long-term effects based on actual stress at the workplace. Vibration-induced disorders of the spine are acknowledged as occupational diseases and under defined conditions accordingly compensated. This project aims at the development of a mathematical biomechanical model that estimates the forces in the spine and the long-term outcome caused by whole-body vibrations.

Product: Prediction model Completion date: 2006 Funding: in place
Project end date: 2006

Ergonomic guidance for the prevention of MSDs

David Caple, davidcaple@pacific.net.au Chair, International Ergonomics Association (IEA), International Development (ID) Committee, Melbourne, Australia

Keywords: ergonomics, guidelines, MSD, prevention

Target Group: workers, union representatives, employers, students, OHS practitioners

Purpose of project: The IEA to assist the ILO in drafting a Guidance Note on ergonomics with specific focus on the prevention of MSD.

The ILO has identified the high incidence of sprain and strain injuries amongst workers. In 2003, the ILO funded the IEA to conduct an extensive review on MSD injury prevention approaches taken by Governments and other agencies. It also included an overview of the MSD ergonomics research to identify the key risk factors to be addressed in the Guidance Note. This was completed in early 2004.

In 2005, it is proposed that the IEA Technical Committee on MSD will work cooperatively with the ILO in developing the Guidance Note.

Names of other Centres collaborating on the Project: International Labor Organistaion Safe Work program, Geneva

Product: An ILO Guidance Note on ergonomics.

Project start date: December 2003

Project end date: (month/year): December 2005