

Project Title: Research Network on Detection and Prevention of Injuries due to Occupational Vibration Exposures (Vibration Injury Network)

Contract No. BMH4-CT98-3251.

Contract period: 1st April 1998 and ended on 31st March 2001.

Project co-ordinator: Institute of Sound and Vibration Research, University of Southampton, UK.

Participants: Nine participants from eight European countries – see Table 1.

Funding: Total allowable costs 420 kEuro.

Abstract:

The main objective of the Vibration Injury Network was to advance methods for the detection and prevention of injury due to vibration exposures at work. This is being achieved through:

1. Development of common methods for health surveillance, including the development of improved methods for the detection and diagnosis of disorders.

Standardised guides and questionnaires have been prepared for the surveillance of workers exposed to either hand-transmitted vibration or whole-body vibration. Test methods used in different laboratories to detect sensorineural symptoms of the hand-arm vibration syndrome have been compared. This assists cross-calibration of data from different instruments so as to facilitate standardisation across Europe. An international workshop was held to exchange information on the diagnosis of disorders from hand-transmitted vibration.

2. Establishment of dose-response relationships between vibration exposures and injury, through collaborative epidemiological research.

Protocols have been developed for multi-national epidemiological studies of injuries caused by exposure to hand-transmitted vibration and whole-body vibration as a foundation for future epidemiological work. Computerised databases have been developed to store data from common epidemiological studies that are being planned.

3. Investigation of the interaction between vibration and other environmental, ergonomic and individual factors, through collaborative laboratory experiments.

Collaborative experimental studies were performed on the acute effects of hand-transmitted vibration on the peripheral neurological and vascular systems with the aim of recommending improvements to the methods for evaluating hand-transmitted vibration exposures adopted in International Standard ISO 5349 and the European Standard ENV 25349.

An international workshop on modelling of biodynamic responses of the spine was organised to exchange information on current models, experimental data for the verification of models, and their application. Databases have been established for the sharing of experimental results.

4. Improvement of methods for preventing disorders, including consideration of current standard methods for hazard surveillance and for testing the protection provided by gloves and seats.

Two databases containing vibration data measured on hand-tools and off-road vehicles have been extended and made available on the Internet in the English language. These provide a resource for the estimation of vibration exposures of workers, and for reducing exposures by the selection of tools with lower vibration magnitudes.

Two informative booklets are being published for employers of workers exposed to hand-transmitted vibration and whole-body vibration. These documents are based on guidelines provided by the network partners, and are intended to provide information appropriate for most European countries. International Conferences were organised on Hand-Arm Vibration in 1998 (Umea, Sweden) and Whole-body Vibration in 2000 (Siena, Italy).

Project related publications and presentations jointly authored by participants:

Anon. (2001) Hand-Arm Vibration Syndrome - The hand in danger. Published by Institut National De Recherche et de Sécurité, Nancy, France.

Anon. (2001) Drivers of Vibrating Mobile Machinery - The spine in danger. Published by Institut National De Recherche et de Sécurité, Nancy, France.

Bovenzi M, Hulshof CTJ (1999) An updated review of epidemiologic studies on the relationship between exposure to whole-body vibration and low back pain (1986-1997). *Int Arch Occup Environ Health*, **72**, 351-365.

Bovenzi M, Lindsell CJ, Griffin MJ (2000) Acute vascular response to the frequency of vibration transmitted to the hand. *Occupational & Environmental Medicine*, **57**, 422-430.

Bovenzi M, Lindsell CJ, Griffin MJ (2001) Response of finger circulation to energy equivalent combinations of magnitude and duration of vibration. *Occupational & Environmental Medicine*, **58**, 185-193.

Bovenzi M, Pinto I, Stacchini N (2000) Low back pain in port machinery operators. *Extended abstracts of the 2nd International Conference on Whole-Body Vibration Injuries*, Siena, Italy, 7-9 November, 49-50. Submitted for publication in *Journal of Sound and Vibration*.

Griffin MJ, Bovenzi M (2001) The diagnosis of disorders caused by hand-transmitted vibration: Southampton Workshop 2000. *Int Arch Occup Environ Health*, supplement, in press.

Griffin MJ, Bovenzi M, Nelson CM (2001) A consideration of dose-response relationships for vibration-induced white finger. Paper to be presented at X2001 – *Exposure Assessment in Epidemiology and Practice*, Göteborg, Sweden, 10-13 June.

Hulshof CTJ, Bovenzi M, Magnusson ML, Pope MH, Verbeek JHAM, Lundström R (2001) Vibration Injury Network: development of a protocol for a multi-centre study on whole-body vibration and low back pain. Paper to be presented at the Fourth International Scientific Conference on Prevention of Work-Related Musculoskeletal Disorders (Premus 2001) Amsterdam, 30 September – 4 October.

Lenzuni P, Lundström R, Burström I (2001) Frequency and magnitude functional dependence of absorbed power resulting from vibration transmitted to the hand and arm. *Abstracts of the 9th International Conference on Hand-Arm Vibration*, Nancy, France, 5-8 June.

Magnusson M, Pope M, Lundström R, Hulshof C, Bovenzi M, VerBeek J (2000) Guidelines for whole-body vibration health surveillance. *Extended abstracts of the 2nd International Conference on Whole-Body Vibration Injuries*, Siena, Italy, 7-9 November, 49-50. Submitted for publication in *Journal of Sound and Vibration*.

Pinto I, Stacchini N, Bovenzi M, Paddan GS, Griffin MJ (2001) Protection effectiveness of anti-vibration gloves: field evaluation and laboratory performance assessment. *Abstracts of the 9th International Conference on Hand-Arm Vibration*, Nancy, France, 5-8 June.

Seidel H, Griffin MJ (2001) Modelling the response of the spinal system to whole-body vibration and repeated shock. *Clinical Biomechanics*, **16** Suppl 1, s3-s7.

Whitehouse D, Lundström R, Griffin MJ (2001) Comparison of vibrotactile and thermal thresholds with two different measurement systems. *Abstracts of the 9th International Conference on Hand-Arm Vibration*, Nancy, France, 5-8 June.

Deliverables for exploitation:

A computerised battery of test instruments and the diagnostics database developed by ISVR has been made commercially available. A new version of the controlling software is being developed to include an electronic version of the health surveillance questionnaire for hand-transmitted vibration as well as other improvements made within the scope of the Vibration Injury Network.

Two databases containing vibration data measured on hand-tools and off-road vehicles have been made available on the internet at <http://umetech.niwl.se>. The databases contain CE declared values as well as measurements made during normal operation at work sites.

A database of biodynamic data has been initiated for the sharing of experimental results between European laboratories involved in biodynamic modelling work. Microsoft ACCESS and MATLAB functions allow the archiving of biodynamic data in a common format, with full supporting information on pre-processing and experimental conditions.

Two informative booklets have been published for employers of workers exposed to hand-transmitted vibration and whole-body vibration. These documents are based on guidelines developed within the network, and are intended to provide information appropriate for most European countries.

The Vibration Injury Network information is being made available on <http://www.human-vibration.com>.

Table 1. Contact information for the nine participants in the Vibration Injury Network

No.	Short name, country	Task Leader for	Main contact and postal address	Telephone, Fax and Email
1.	ISVR , U.K.	WP1H	Professor Michael Griffin, Human Factors Research Unit, Institute of Sound and Vibration Research, University of Southampton, Southampton SO17 1BJ.	Tel. +44 23 8059 2277 Fax: +44 23 8059 2927 E-mail mjpg@isvr.soton.ac.uk
2.	FIOOSH , Germany	WP3W	Dr Helmut Seidel, Federal Institute for Occupational Safety and Health, D-10317 Berlin, Noeldnerstr. 40-42.	Tel. +49 30 515 48430 Fax +49 30 515 48770 E-mail h-seidel@gmx.de
3.	Coronel , The Netherlands	WP2W	Dr Carel Hulshof, Coronel Institute, Academic Medical Center (K-0-68), University of Amsterdam, PO 22660, 1100DD Amsterdam.	Tel. +31 20 566 5333 Fax +31 20 697 7161 E-mail c.t.hulshof@amc.uva.nl
4.	HYTR , Belgium	WP2H	Professor Jacques Malchaire, Université Catholique de Louvain, Unité hygiène et physiologie du travail, Clos Chapelle aux Champs 3038, B-1200 Bruxelles.	Tel. +32 2 764 3229 Fax +32 2 764 3954 E-mail malchaire@hytr.ucl.ac.be
5.	INRS , France	WP4H	Dr Manu Donati, Institut National de Recherche et de Sécurité, Service MAV, Avenue de Bourgogne, F-54501 Vandoeuvre.	Tel. +33 3 8350 2049 Fax +33 3 8350 2186 E-mail donati@inrs.fr
6.	ISPESL , Italy	WP4W	Dr Paolo Lenzuni National Institute for Prevention & Safety at the Workplace Department of Florence Via G. La Pira 17 50121 Firenze.	Tel. +39 (0)55 289681 Fax +39 (0)55 210882 E-mail paolo_lenzuni@hotmail.com
7.	NIWL , Sweden	WP1W	Professor Ronnie Lundström, Arbetslivsinstitutet (National Institute for Working Life), Technical Risk Factors, P.O. Box 7654, S-907 13 Umeå	Tel. +46 90 176024 Fax +46 90 176116 E-mail ronnie.lundstrom@niwl.se
8.	Patras , Greece		Professor Constantinos Goudas, Studium of Mechanics, University of Patras, Campus el Rio, Patras.	Tel. +30 61 997534 Fax +30 61 997913 E-mail stud-mec@otenet.gr
9.	Trieste , Italy	WP3H	Professor Massimo Bovenzi, Department of Public Health Services, Clinical Unit of Occupational Medicine, Trieste General Hospital, University of Trieste, Via della Pietà 19, I-34129 Trieste.	Tel. +39 40 3992313 Fax +39 40 368199 E-mail bovenzi@univ.trieste.it