

Musculoskeletal disorders: where we are, and where we could be

Introduction

Work-related musculoskeletal disorders (MSD), how to prevent them, and how to halt the spread, have been on the agenda for years, but the prevention plans worked out have not stopped the epidemic growing and invading all sectors.

MSD may be seen as the cause of pain and suffering by some, or lost efficiency and productivity by others, but the general consensus – of workers, employers and authorities – is that something must be done about this disastrous growth: action is needed to halt this suffering and these losses. We must curb this negative trend¹ that affects all sectors and all European Union (EU) countries, new, old and future members alike.

The worst-case scenario is that MSD could undermine the economic development of the EU and its competitiveness on world markets!

The forces are there to be joined, consultation processes are in hand, but the will to get to the root of the problem and really get a grip on its major causes in the workplace seems lacking.

What follows, therefore, is an attempted survey, or rather analysis of why the system has failed, leading on to avenues of exploration for reversing the trend; for that, I shall first (re)define the concept, then, consider the updated figures, give a critical description of the European mix of preventive measures, to show finally how the system has failed.

Object, scope and definitions

MSD cover a wide variety of phenomena and experiences (discomfort, disorders, pain). They are not accidents, but injuries² to joints, muscles, ligaments, tendons, peripheral vessels or nerves. These injuries are mainly associated with effort, movements, postures and vibrations, but also with work organisation and psychosocial factors. They bear different names according to the body part affected or the presumed pathomechanics of the injury.

A wide range of acronyms and terms are used to give a unified name to syndromes that are work-related, and appear at different sites of the human musculoskeletal system. This terminology relates either to the presumed cause of the syndrome (repetition, build-up), or the location of the injury, and so has a shifting content unsuited to preventive measures.

The frequency, speed and acceleration of movements, external forces, prolonged static load, extreme postures or hand-arm and whole-body vibrations, are risk factors classically associated with MSD.

Where MSD are described by cause, they are referred to as RSI (Repetitive Strain Injury) or WRULD (Work-Related Upper Limb Disorders), etc.

When described by symptoms, they are named according to the kind of body tissue affected:

- muscles: neck strain, myalgia, myositis, acute lower back pain;
- tendons: tendinitis, epicondylitis, de Quervain's disease, trigger finger;
- joints: acute painful shoulder or frozen shoulder, bursitis, back pain, acute lower back pain, neck pain;
- blood vessels: Raynaud's syndrome (white finger);
- nerves: carpal tunnel syndrome, thoracic outlet syndrome, sciatica.

MSD covers all symptoms involving the musculoskeletal system (back, upper and lower³ limbs) with, in this case, a work-related cause. Eliminating or reducing these injuries means tackling MSD risk factors. The injuries may be to the musculoskeletal system, but that interacts with all the other systems that enable it to function, including the central nervous system that controls and integrates the emotions and outward signs of stress.

An approach to MSD by anatomical zone – upper or lower limbs, regions of the back, thoracic or pelvic girdle – is misguided⁴, and neither desirable nor relevant because, while the anatomical approach usefully describes the body, it is of no use in describing the body at work since, *by definition*, it then functions in a whole-body way: none of its individual parts are separated from the body entity (except in the event of amputation or dissection, which are outside the scope of this article!); the brain, central and peripheral nervous systems control and feel all that affects the “physical” body, not as an independent entity, but in interaction with the *whole work environment* including its organisational and psychosocial aspects.

Only a *systemic approach* can give insights into the synergy between the body subsystems (anatomical, physiological, psychological, etc.) and the continuous

¹ A trend being a broad change over time.

² Diminished range of movement, swelling, numbness or tingling, loss of sensitivity.

³ Often overlooked (see below).

⁴ Because of the risk of failure of any proposed measure, as is borne out by the MSD statistics.

adjustment of body parameters to environmental parameters: these adjustments (conscious, semi-automatic or unconscious) are what maintain the human body's homeostasis.

It is always risky to upset this delicate "body balance" with short-sighted oversimplified approaches that over-segment the approach to MSD: that is undoubtedly one reason why prevention in this area has failed.

Epidemiology

The number of MSD sufferers is growing in all industrialised countries (USA, EU, Asia, etc.). The most recent Dublin Foundation research⁵ indicates that European workers have not escaped the trend (see box).

European workers reporting (%):

■ Back pain	33 %
■ Overall fatigue	23 %
■ Muscular pain in:	
- neck and shoulders	23 %
- upper limbs	13 %
- lower limbs	12 %

Among the potentially causal agents of MSD*, European workers exposed to (%):

■ Painful or tiring positions	47 % (for > 25% of working time) 28 % (permanently)
■ Repeated movements (arms and hands)	31 %
■ Stress	28 %
■ Vibrations	24 % (for > 25% of working time) 10 % (permanently)

* Although limiting it to these factors would be misconceived because, for example, poor lighting, exposure to cold (meat or fish cutting), etc., put the workers concerned at greater than average risk of contracting MSD.

Source: Paoli, P., Merllié, D., *Third European Survey of Working Conditions 2000*, Dublin, European Foundation for the Improvement of Living and Working Conditions, 2001.

Furthermore, MSD account for approximately 15% of the cost of work-related accidents and occupational diseases. A study⁶ done in France, commissioned by ANACT from ISEOR⁷, estimates the hidden costs of MSD as being 10 to 30 times higher than their visible costs in high prevalence workplaces (companies with over 500 employees in the engines and electronics industries), working out to between 6 800 and 11 200 euros per person affected a year from high absence rates and productivity losses (about 7%).

Why should there be this rise in MSD when measures are in place to prevent them? As well as unsuit-

ability of the existing means and inadequate implementation (considered below), it is known that some categories of workers and some sectors have been more exposed to MSD.

Risk sectors:

- agriculture, fishing and forestry;
- extractive and manufacturing industries;
- construction;
- wholesale and retail trade, maintenance;
- hotels and restaurants.

Highest-risk occupations:

- tailors;
- construction workers (bricklayers, tilers and carpenters);
- meat, fish, etc., cutting trades;
- packers, dockers, warehousemen (loading and unloading);
- secretaries and keyboard workers.

But the world of work has changed, and new patterns of work organization have emerged:

1. just-in-time work organization and lean production, zero delay, storage and defect, and job enlargement (e.g., customer-facing duties);
2. modern, computerized work methods, using data comms, with continuous performance assessment;
3. current forms of "human resource"⁸ management focused on non-standard employment (temporary, work week exclusive of meal periods, flexitime), sales reps with laptops enabling remote control of their sales performances, etc.

Amongst other things, these new patterns of work organization lead to increased stress, unpredictable work schedules, non-standard and/or insecure working patterns, deterioration of workplace human relations worsened by a work-life imbalance, working in unsuitable physical postures due to increased interfacing with a screen, mouse, keyboard or other input device, and, finally, the development of MSD among workers who previously had no incidence of it.

The system has failed - but why?

As shown in the table (see p. 24), there is a substantial mix of European preventive provision made up of Framework Directive 89/391 and individual directives, as well as standards and a series of other instruments (guidance, etc.) that supplement or fill out the directives.

It is clear that this mix is not working at all for MSD: not only has it not brought them down, but each fresh study adds new disastrous findings to mar the European statistics.

One reason for this is that the mix of directives, standards and other instruments is not in a coherent

⁵ <http://www.fr.eurofound.eu.int/publications/files/EF0121EN.pdf>.

⁶ <http://www.eurofound.eu.int/ewco/2004/02/FR0402NU03.htm>.

⁷ ANACT: National agency for the improvement of working conditions. ISEOR: Institute for socio-economic research in organisational management.

⁸ A curious expression giving humans a non-human attribute, "resource" characterising the economic (temporary and hence depletable) nature of a good.

The lineup of European preventive instruments

The main battery of legislation that applies to MSD consists of the following directives:

■ Framework Directive	89/391/EEC	■ Work equipment	89/655/EEC
■ Screen equipment	90/270/EEC	■ PPE	89/656/EEC
■ Manual handling of loads	90/269/EEC	■ Machinery	98/37/EC
■ Physical agents (vibrations)	2002/44/EC	■ Working time	93/104/EC
■ Workplace	89/654/EEC	■ Equal treatment	2000/78/EC

These directives are supplemented by a series of instruments, like the European EN standards, which fill out the details or enable them to be implemented.

European ergonomics standards (EN)

General design principles	EN 614-1, EN 614-2, EN ISO 6385, EN ISO 13407, ENV 26385
Safety of machinery	EN 457, EN 547-1, EN 547-2, EN 547-3, EN 563, EN 574, EN 614-1, EN 641-2, EN 842, EN 894-1, EN 894-2, EN 894-3, prEN 894-4, EN 981, EN 1005-1, EN 1005-2, EN 1005-3, prEN 1005-4, prEN 1005-5, EN 13861, prEN 14386, EN ISO 14738
Physical environment	• Noise/speech : EN ISO 9921 • Climate : EN 563, EN ISO 7726, EN ISO 7730, prEN ISO 7933, prEN ISO 8996, EN ISO 9241-6, EN ISO 9886, EN ISO 9920, EN ISO 10551, ENV ISO 11079, EN ISO 11399, EN 12515, EN ISO 12894, EN 13202, EN ISO 13731, prEN ISO 13732-1, prEN ISO 13732-3, prEN ISO 14505-1, prEN ISO 14505-2, EN ISO 27243, EN 28996
Physical work load	EN 1005-1, EN 1005-2, EN 1005-3, prEN 1005-4, prEN 1005-5
Mental work load	EN 614-2, EN 9241-2, EN ISO 10075-1, EN ISO 10075-2, EN ISO 10075-3
Workplace and equipment design	• General: EN ISO 9241-5, EN ISO 9241-6, EN ISO 11064-1, EN ISO 11064-2, EN ISO 11064-3, EN ISO 11064-4, prEN ISO 11064-6, prEN 14386 • Anthropometry : EN 547-1, EN 547-2, EN 547-3, EN ISO 7250, EN ISO 14738, EN ISO 15535, EN ISO 15536-1, EN ISO 15537, prEN ISO 20685
Visual information, VDTs and software	• General : EN ISO 9241-1, EN ISO 9241-2, EN ISO 9241-3, EN ISO 9241-4, EN ISO 9241-5, EN ISO 9241-6, EN ISO 9241-7, EN ISO 9241-8, EN ISO 9241-9, EN ISO 13406-1, EN ISO 13406-2 • Software : EN ISO 9241-10, EN ISO 9241-11, EN ISO 9241-12, EN ISO 9241-13, EN ISO 9241-14, EN ISO 9241-15, EN ISO 9241-16, EN ISO 9241-17, EN ISO 13407, EN ISO 14915-1, EN ISO 14915-2, EN ISO 14915-3, prEN ISO 23973
Displays and controls	EN ISO 9241-4
Personal protective equipment	prEN 13921-1, prEN 13921-3, prEN 13921-4, prEN 13921-6

Source: FEES list (Federation of European Ergonomics Societies), www.fees-network.org
See also the European Committee for Standardisation (CEN) site: www.cenorm.be

⁹ For instance, the directives are based on criteria that are neither described nor specified.

form or one that is conducive to enforcement: it is a tangled, complex and disparate jumble (with no systematic linkages or references back) demanding specific skills⁹ – in particular risk assessment and analysis, biomechanics and ergonomics – and abilities to extract the essentials (from the lineup of measures) that many companies, like SMEs for example, just do not have.

It is argued by some that the existing legislation and its supplementing standards are more than adequate, if not too much, but also - for this latter reason - that they are poorly applied... The subtext here is that simply helping to spread them, make them more “usable”, and increase their application will stem the rising MSD epidemic!

What needs improving in existing Community legislation and other instruments^a

Failings and lack of clarity in the directives concerning the human body at work which forms an indissociable whole whose different systems work in synergy:

- upper limbs^b: hands, wrists, elbows, shoulders;
- lower limbs: feet, ankles, knees and hips are not directly dealt with, they are not specifically referred to, but slips, trips and falls, as well as many sudden strains that are passed onto the trunk are due to direct stresses from these, resulting in acute lower back pain and other accidents;
- nervous system: mental, sensory and emotional workload are sources of work-related stress.

Characteristics of movements, postures, forces and interfaces that potentially cause MSD but are not systematically addressed:

- movements: range, precision, repetition, pace, and length of exposure;
- extreme postures and deviations;
- forces generated and static muscle work;
- interfaces: protection of contact zones (hands, elbows, knees).

Psychosocial^c and organisational factors that are missing^d from the existing directives, when the causal agents of work-related stress (stressors)^e are involved in the development of MSD or potentiate it when added to biomechanical disorders.

Directive 90/269/EEC on the manual handling of loads which:

- lists some movements but omits others;
- ignores the dynamic aspects of the task (picking up and putting down an object along a trajectory) which induces locomotor movements;

- completely omits high-risk handling operations of patients and animals.

VDU Directive 90/270/EEC ignores factors that lead to unsuitable postures, causing neck pain, acute lower back pain, and the prevention of muscle pain by damage to muscle fibres subjected to stresses from very low physical loads or even no physical load but a cognitive, social or sensory load accompanied by stressors (work on PCs, in particular)^f.

Singular vagueness of vocabulary and failure to define the criteria used when there is a common vocabulary published in the *Official Journal*^g:

- some directives (VDU, Manual Handling, Work Equipment) refer to "ergonomic principles" but provide no criteria for them;
- but these same directives neither define the fundamental concepts necessary to manage "repetition", "weight" or "force exerted" risks, nor indicate how to measure them.

^a A more comprehensive reasoned study can be found on our Website: www.etui-rehs.org/hesa > Main topics > MSD.

^b The Manual Handling Directive refers neither to hands or fingers: it is incomplete.

^c Buckle, P., Devereux, J., et al., *The role of work stress and psychological factors in the development of musculoskeletal disorders*, Health & Safety Executive, 2004. Downloadable from: www.hse.gov.uk/research/rrhtm/rr273.htm

^d Work organization, psychosocial load, skill discretion/decision authority, social support, face interaction with customers and the public must be taken into account.

^e For more details, see the European framework agreement on work-related stress signed in 2004 by the social partners. See: www.etui-rehs.org/hesa > Main topics > Stress at work.

^f Known as the *Cinderella effect*.

^g Issues of ergonomics, repetition, etc., are dealt with in a series of European standards, drawn up by CEN under mandates from the EU, in particular under Machinery Directive 98/37.

We seriously challenge this claim because – while they are admittedly under-used – it is equally clear that the existing tools are completely unfitted to putting a stop to both the MSD epidemic and its trend.

This is because it is now scientifically established that MSD result from exposures to mechanical factors, and that while reducing biomechanical risks can improve the situation, it is not enough in and of itself to eliminate MSD.

From a review of the epidemiological literature¹⁰, Paulien R. Bongers (TNO Work & Employment, Netherlands) concludes that high work-related stress and off-workplace stress reactions are consistently associated with all upper extremity problems.

In a recent article¹¹, Valerie Woods (Robens Centre for Health Ergonomics, University of Surrey, GB)

makes the finding from an examination of 52 studies, that there is good evidence for an association between poor social support (supportive colleagues, good communication, satisfactory work relationships, help with difficulties, support away from the workplace) and the emergence of MSD, and that, when returning to work after a sickness absence, social support is part of a coping strategy¹²; employers must take steps to improve health at work through sound management and organisational practises.

Grant D. Huang¹³ led a study of United States marines suffering from MSD. The authors concluded that reducing musculoskeletal morbidities meant looking at biomechanical factors and specific work organization factors, especially time pressure, together.

The contemporary ergonomics approach argues clearly for an integrated, systemic approach, and

¹⁰ Bongers, P.R., et al., Are psychosocial factors, risk factors for symptoms and signs of the shoulder, elbow or hand/wrist? *American Journal of Industrial Medicine*, 41:315 - 342, 2002.

¹¹ Woods, V., Work-related musculoskeletal health and social support, *Occupational Medicine*, 55:177 - 189, 2005.

¹² The mix of cognitive, emotional and behavioural efforts an individual makes to control or withstand internal or external strains that undermine or exceed their resources or abilities to adjust to a situation.

¹³ Huang, Grant D., Individual and combined impacts of biomechanical and work organization factors in work-related musculoskeletal symptoms, *American Journal of Industrial Medicine*, 43:495-506, 2003.

against any fragmentation of risk factors which dooms any preventive approach to failure.

This is why existing Community legislation and its supplementing standards absolutely must be corrected and filled out¹⁴ (see box p. 25).

How to stem the growth of MSD in Europe?

The main aim is still to tackle the primary causes of MSD. That, indeed, is what Framework Directive 89/391/EEC lays down with the principle of eliminating or at least reducing the risk, which is the basis of our take on the issue, and the preventive approach.

To deliver that aim, it is vital to plug the loopholes identified, spell out the terms and concepts used so as to make them usable at the workplace (especially in small and very small workplaces), to systematically lay down and spell out the criteria to be used in MSD risk assessments.

The Framework Directive and individual directives contain mechanisms that cannot be consistently and proactively applied to the potential causes of work-related MSD; it is essential to come up with a powerful Community tool for the prevention of MSD.

If it is to be valid and not repeat past mistakes, this tool must incorporate a number of aspects, including:

- Interdisciplinary approaches, where there is systematic interaction between the different disciplines of health and safety at work, management and organisation (as opposed to jealously guarded personal domains lined up side-by-side).
- A participatory approach combined with mechanisms that not just enable but actively stimulate and promote it in the firm.
- A feedback of workers' and firms' experience.
- Harmonization of rules and methods for assessing:
 - workload:
 - physical
 - mental and sensory (mental activity and processing)
 - social (face-to-face work with customers, patients, offenders)
 - work environment:
 - climate, noise
 - toxic agents, dust
 - wearing of Personal Protective Equipment
 - working capacity:
 - when working
 - following an incident, accident or on-demand to ensure that working capacity matches the job requirements
- Education and training for all those involved:
 - employers and supervisors;
 - workers and their representatives;
 - occupational health and safety service ancillaries and experts;

- OSH inspectors.

- Static work and its characteristics: what is meant by it, when does work change from being static to dynamic, how to avoid the drawbacks, etc.?
- Repetitive movements, including where loads are slight or negligible.
- Improving the vocabulary used: it must be precise, and clearly understood when used by all parties concerned in the firm (without having to buy in consultancy, which it is well-known will not be done in 90% of cases!).
- Defining the criteria used, for example:
 - heavy: what weight? in what circumstances?
 - frequent: how many times per minute?
 - correct handling: what movement, what posture, how many people, what path, what mechanical or human help?
 - good posture: preservation of normal lumbar curvature of the spine?
 - large: what volume?
 - bending of the trunk: how many degrees in what direction (bending, twisting or leaning)?
 - environment: what criteria should apply to the reference factors in the Annex to the Manual Handling Directive (air temperature, air velocity, relative humidity)? - which are silent where the task and clothing worn are not known - in order to integrate these factors in known models.
- Standardisation of the criteria for occupational diseases, to allow comparison of figures and strategies applied across the EU.

Conclusion

MSD have for years been the main complaint suffered by workers. They are the cause of growing distress, affect all categories of worker on a large scale, and cause significant, and probably under-estimated, losses to business. The efforts made and preventive instruments implemented have not worked: MSD-related complaints, distress and sickness absences are soaring.

Petty reforms of the "guidance to good practises" type cannot be expected to - and will not! - deliver a worthwhile result. The battle against the many causal factors of MSD is a big one: getting a grip on this scourge will mean getting concerted action going across the board - workers, employers and their respective representatives, the authorities (EU and governments), prevention and occupational health experts (ergonomists, industrial psychologists and doctors).

That clearly demands more than good will - it means leveraging financial and human resources, and skills. But these are investments that will yield results only in the medium or long term. Skipping this effort or trying to ignore the epidemic and hoping it will go away when the effects are to be seen every day, is just to brush a ticking time bomb under the carpet.

¹⁴ Not forgetting the gender dimension, as most work damaging to the musculoskeletal system is done by women (who also often have to do double duty, which adds an extra set of musculoskeletal stressors).

The Framework Directive requires dynamic risk management; its principles – elimination or reduction of risks, and appropriate steps by reference to available knowledge and technical means – must be applied without limitation to MSD risks; because we are dealing with the human body at work rather than a mechanical risk, the problem must be addressed holistically; here *holistically*, means “all actors” as well as “whole body”, including the characteristics, mechanisms and physical, psychological, physiological and social reactions of the body in a work situation.

No such tool presently exists to supplement the Framework Directive; it is more than imperative that one should be designed, disseminated and implemented. The need then will be to monitor its practical implementation and effects, and improve it in order to deliver the objectives - turning the tide of MSD, and taking the work forward until this 20th and 21st century plague is defeated. ■

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Health and Safety Department (formerly TUTB) publications on ergonomics and MSD



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