

Cleaners and musculoskeletal disorders

Cleaners work in all industry sectors and workplaces, from hotels to hospitals and factories to farms. They work inside and outdoors, including in public areas. Often working at night or in the early morning, sometimes alone, cleaners are found in every setting and the work they do is essential.¹

Cleaners may either be employed directly, working in their employer's premises, or they may work in a location run by a third party. They may be employed by public services, private enterprises, or they may be self-employed. Cleaners may also be employed by a contractor, working at several locations over the course of a week. Contract, or industrial, cleaning is a multi-million Euro industry employing millions of workers across Europe.

Most cleaners are women and work part time. A significant proportion of workers come from ethnic minorities². Staff turnover is generally high, caused by a high level of temporary work and short fixed-term contracts³. Although these employment patterns can cause difficulties, harm to cleaning workers can and must be prevented.

About this E-Fact

Cleaners are best defined by task rather than as a sector or group. Common tasks are surface cleaning – mopping, dusting, vacuuming, polishing floors and work surfaces – and routine housekeeping. While cleaning work can include tasks such as window and street cleaning, the focus of this E-Fact is on the prevention of harm to paid workers carrying out general cleaning.

The aim of this E-Fact is to inform workers, their supervisors and employers, and occupational safety and health (OSH) professionals in the professional cleaning sector, about work-related musculoskeletal disorders (MSDs). It identifies the risk factors that cleaners can face in the course of their work and provides advice on the practical steps that can be taken to prevent or reduce the risks that cleaners face.

What are work-related musculoskeletal disorders?

Cleaning activities can be physically demanding and should be done without exposing workers to the risks of accidental injury or work-related ill health. Numerous investigations have shown, however, that cleaners are at risk of developing MSDs of the back, neck, shoulders, elbows, hands and lower limbs as a result of their work.

MSDs are impairments of bodily structures such as muscles, joints, tendons, ligaments, nerves, bones and the localised blood circulation system, that are



Cleaners and musculoskeletal disorders

caused or aggravated primarily by work and by the effects of the immediate environment in which work is carried out.

They can affect any part of the body. **Low back pain** is a major work-related disorder in almost all physically demanding jobs. It can be defined as chronic or acute pain in the lumbar or buttock area (sometimes called lumbago), or in the upper leg region (sometimes called sciatica). Low back pain may arise from muscular or ligamentous strain, deterioration of the joints or discs of the spine, or from pressure on the nerve roots within the spine. Muscle strain is probably the most common cause of back pain⁴. Lifting and carrying heavy loads is a major cause, but pushing and pulling or the need to adopt awkward flexed or twisted body postures for long periods are also risk factors.

Other parts of the body and limbs can be affected. **Neck and upper limb disorders** result from impairments of bodily structures such as a tendon, nerve, muscle, joint, bursa or the localised blood circulation system, that arise principally from the performance of work and the effects of the immediate environment where the work is carried out. They include a wide range of inflammatory and degenerative conditions such as shoulder injuries caused by prolonged work with hands above head height or wrist injuries caused by repetitive work. Symptoms include pain and/or reduced ability to function normally. This can affect any region of the neck, shoulders, upper arms, elbows, forearms, wrists, and hand.

Disorders of the lower limbs are also found. "Housemaid's knee" was one of the first occupational diseases to be identified and was associated with tasks performed while kneeling by household cleaners. Even today, some cleaning tasks require long periods spent standing still, which can cause varicose veins in legs.

Some MSDs exhibit well-defined signs and symptoms:

- tendonitis – an inflammation and soreness of a tendon resulting from repeated movement of a joint;
- carpal tunnel syndrome – damage to a nerve running through the wrist and into the hand from repeated bending of the wrist while holding tools tightly or by constantly pressing the wrist against a hard object;
- vibration white finger – numbness and tingling of the fingers, especially in cold weather, resulting from changes to the nerves and blood vessels of the hand caused by use of vibrating hand tools;
- thoracic outlet syndrome – reduced blood flow in the shoulder and arm caused by working above head height or by carrying heavy loads in the hands with the arms hanging straight down.



Cleaners and musculoskeletal disorders

Many other disorders, however, are less well defined and involve pain, discomfort, numbness and tingling sensations throughout the areas affected such as the neck shoulders, upper limbs, low back or legs. These types are sometimes called non-specific MSDs. Often they cannot be diagnosed easily, but they can lead to physical impairment and even disability.

How do MSDs occur?

Acute episodes of pain and/or impairment may arise from one single excessive overload or assault; for example, the direct impact of heavy mechanical loads can rupture soft tissues or break bones.

More often, however, MSDs result from the effects of many repeated, apparently moderate loads that are endured over an extended period. These loads may not appear to cause (immediate) injury but, if they are imposed regularly over many months or years, they can cause deterioration of muscles and other bodily structures that lead to microscopic injuries in the tissues.

When doing physical work, providing sufficient time to rest is allowed between successive exposures, the body will grow stronger. (This is the goal of physical training or rehabilitation.) If, however, insufficient time is allowed to recover from the consequences of fatigue, or if the loading is sustained for too long, MSDs can result. Therefore, there are two primary risk factors at work:

- the magnitude of the loading: the amount of physical effort applied including the weights that are handled or the forces to be opposed
- the exposure period: the length and frequency of the physical activity leading to the fatigue and need for recovery.

MSDs and the organisation of cleaning work

Organisations often demand cleaning work to be done outside regular working hours to minimise the disruption caused. As a result, professional cleaning is often a part-time job. One study found that while three-quarters of cleaners worked four or five days a week, nearly seven out of 10 worked fewer than six hours a day. However, 20% of cleaners do extra paid work in addition to their cleaning work⁵. These variable working times of cleaners make it difficult to apply the generally accepted limits for physical work loads that are based on a working week of five days, each of 7½ to 8 hours.

Tasks carried out by cleaners

A Dutch report⁶ looked at the work carried out by cleaners and their exposure to MSD risk factors. It found that more than 20% of cleaners report having to lift, pull, push or carry heavy loads of more than 25kg in their work. They have to do their jobs in a range of working postures, with one study revealing that 14% of cleaners suffer from exposure to many high-risk



Cleaners and musculoskeletal disorders

factors for MSDs. These include: walking; standing; working when stooped, squatted, or kneeling; and working with the arms above shoulder or below knee level.

The following risk factors for particular sub-sectors have been identified:

- **interiors (cleaning inside buildings):** long periods walking, working with a flexed or twisted body. Static work loads hardly ever occur;
- **public transport:** working face down and with a flexed upper body; twisted body, neck or head; static work loads;
- **industrial (cleaning in a processing environment):** workers suffer from uncomfortable working postures in general; sitting for long periods of time; walking for relatively little time each day⁷.

Between 54 and 79% of all cleaners report having to make frequent or continuous repetitive movements, and more than half reported always having to be physically active with the whole body. Male workers reported having to use high forces in their work frequently, and are more likely to work with vibrating hand tools than women.

How widespread are MSDs in cleaning?

In a survey of interiors cleaners, 74% reported experiencing muscular aches, pains and discomfort in the last year. Medical advice for these aches and pains had been sought by 52% of those affected⁸. The main body areas of concern were low back (46%), neck (33%), knees (24%), right shoulder (23%) and right wrist/hand (22%).

French researchers found certain jobs were linked to a greatly increased risk of osteoarthritis in the knees, hips and hands; the workers found to be most at risk were female cleaners, women in the clothing industry, male masons and other construction workers, and male and female agriculture workers⁹.

Why should action be taken?

Preventing MSDs benefits all:

- The worker remains in work and so maintains his income and health. Absence of back or other pain and less fatigue from easier work-loads increases the general well-being of the worker
- The employer benefits – a fit and healthy worker works better, and is less likely to be absent. Investing in new ergonomic tools carries a cost, but can equally deliver benefits to offset these costs. For example, applying membrane cleaning reduces or removes the need to purchase chemical cleaners, and cleaning processes requiring less strain tend to deliver productivity gains
- The state benefits as it does not have to pay health care or benefits to cleaners who are no longer able to work



Cleaners and musculoskeletal disorders

What are the risk factors for MSDs in cleaning?

Cleaning is demanding and labour intensive. The tasks that cleaners undertake involve exposure to many of the main risk factors for musculoskeletal disorders:

- awkward postures such as reaching or stooping
- high application of forces such as wringing actions or controlling equipment
- repetitive movements and insufficient rest periods (all sub-sectors)
- lifting and carrying loads (industrial cleaning)
- static work loads (high-pressure spraying or overhead cleaning)
- working in constricting space (public transport)
- poor ergonomics design of the shape, size, adjustment and angle of equipment handles.

Poor work organisation combined with strenuous work can contribute to the development of MSDs in cleaners. Risk factors include:

- high work speed and intensity
- lack of control over work and breaks
- high workload and time pressure
- poor work schedules
- poor or no training
- little appreciation of cleaning work
- fear of making mistakes
- high job turnover in cleaning
- limited career development.

In unhygienic situations, or when the dirt is hazardous, cleaners wear gloves. Gloves, however, can make the hands hot and uncomfortable. They can also reduce the wearer's effective grip strength and hasten the onset of fatigue.

Vibration from poorly designed or maintained equipment can contribute to hand-arm vibration syndrome, tingling, numbness or white fingers from reduced blood flow.

When using work equipment, such as vacuum cleaners and floor buffers, which are often used by cleaners on a daily basis, the main issues of concern for users were found to be:

- lifting, pushing, pulling and carrying machines
- vibration from machines
- unsuitable handle shape, size and angle
- inadequate machine maintenance
- difficulty with handle adjustment.



Cleaners and musculoskeletal disorders

Using mops with short handles, wringing out mops and emptying buckets into high level sinks are just some of the inappropriate working practices that lead to backache and strains.

Prevention of MSDs in cleaning work

Musculoskeletal disorders can be prevented in cleaning workers through effective safety and health management. A European approach to tackling MSDs has been set out as follows¹⁰:

- Avoid MSD risks
- Evaluate the risks that cannot be avoided
- Tackle the risks at source
- Adapt the work to the individual
- Adapt to changing technology
- Replace what is dangerous with what is safe or less dangerous
- Develop a coherent overall prevention policy, addressing the whole load on the body
- Give collective protective measures priority over individual protective measures
- Give appropriate instructions to workers.

And, to keep workers with MSDs in work:

- Provide rehabilitation
- Reintegrate workers that suffer or have suffered from MSDs back into work

When evaluating the risks that cannot be avoided, the risks from all tasks should be assessed. The assessment should take into consideration the loads lifted and carried, postures adopted, the speed at which work is completed, the condition and suitability of the work equipment, the work environment and individual capacity such as gender or age to ensure the safety and wellbeing of cleaners.

Whether the risks of MSDs arise from the manual handling of cleaning equipment, the vibrations of buffing machines, poor postures associated with equipment design, regular use of personal protective equipment or involve young persons or new or expectant mothers, the need for risk assessment and the avoidance of risk remain central to prevention.

Selection of work equipment for cleaners

Investigations into the demands of cleaning tasks have highlighted inadequacies in the design of commonly used cleaning equipment that result in the worker adopting extreme, static or constrained postures, repetitive movements and using high force levels¹¹. Problems with mopping systems, buffing machines and vacuum machines were identified and an equipment purchasing checklist was developed.



Cleaners and musculoskeletal disorders

Problems found with mopping systems included:

- unsuitable mop heights
- uncomfortable grip design
- high pressures needed to squeeze mops
- heavy, unstable buckets.

Problems found with buffing machines included:

- excessive machine height, weight and vibration
- poor grip, trigger and lever design
- awkward location of controls, combined with high activation pressures.

Problems found with vacuum machines included:

- poor grip design
- lack of safety/power indication displays
- flex management difficulties.

The checklist below emphasises the need for the equipment buyer to consider the particular requirements of the workforce, the tasks undertaken and the work environment – for example, the location of taps, storage facilities, access, and floor surface materials – before equipment purchase. Workers who will be using the equipment should be involved in its selection to ensure that the dimensions suit all members of the workforce, and that it is appropriate for the tasks.ⁱ

ⁱ Further help may be available in your Member State. For example, the Dutch social partners in professional cleaning have developed ergonomic criteria for use by purchasers. See <http://zowerkjeprattiger.nl>



Cleaners and musculoskeletal disorders

Questions when purchasing cleaning equipment

- Is the equipment of an acceptable weight, a suitable height and easy to move by the full range of those employed?
- Are all controls/levers easy to reach and comfortable to operate (for left and right handed workers)?
- Is it possible to grip the machine easily – acceptable hand span 45–55 mm – and are the forces required to operate triggers, controls and levers acceptable - less than 10 N?
- Does the equipment provide feedback to the user when an action is completed; for example, click when a disc is attached correctly?
- Is there perceptible vibration from the equipment?
- Are safety lights and displays provided on the equipment?
- Is flex management acceptable; for example, outriggers that hold flex away from handle?
- Is the equipment suitable for the work environment; for example, stairs, lifts, ramps, access, size of rooms, restricted spaces?
- Have you consulted your cleaning workforce and considered providing a range of equipment that will accommodate all potential users?

Work organisation measures to reduce MSDs

- **Work schedules:** it is important for the supervisor/manager to identify the varying levels of work demand when planning how and when tasks are conducted, and to consider fluctuations in workload during the day, week, month or semester. Information should be provided to help workers understand the value of taking breaks and how to recognise fatigue and other MSD symptoms.
- **Teamwork:** group work reduces the amount of time the cleaner spends working alone. In addition, working in a team allows individuals to increase their levels of responsibility at work, giving an opportunity to develop personal and occupational skills. It also encourages greater communication and a better social support network at the workplace.
- **Job extension:** consideration should be given to extending the cleaners' role to enrich job content; for example, the integration of cleaning and care work. It is crucial that cleaning is regarded as essential work and that cleaners receive positive feedback, guidance and help from their supervisors and co-workers. This is likely to improve their motivation and job satisfaction.
- **Communication/social support:** it is important for supervisors and managers to talk to their staff and allow them a forum to contribute and participate in decisions about their job; consultation with staff prior to workplace/equipment change is vital for the success of that the change. Initiatives to reduce musculoskeletal risks are more likely to be successful



Cleaners and musculoskeletal disorders

if they involve workers and their representatives working together with managers and supervisors.

- **Reporting system for musculoskeletal ill health:** a system should be in place for the early reporting and monitoring of musculoskeletal ill health so that remedial action can be taken.
- **Training:** occupational programmes to improve skills and knowledge through training and qualifications should be available. Almost all cleaners claim they have no opportunity to develop their career. General health and safety training will increase the awareness of risks and good practice. Further, training on all machines and equipment used is essential to improve postures adopted and the degree of exertion required for effective control; scheduling skills are necessary if team working is introduced.
- **Equipment maintenance:** a maintenance programme should be in place that instigates regular scheduled inspections to ensure that all equipment is in good working condition, broken or old equipment is reconditioned, repaired or replaced promptly, and that vibration characteristics of poorly maintained machines are rectified.

Measures to control the risk of developing MSDs

Since changes in the working environment are often unfeasible, the following point-by-point options for controlling risk focuses on administrative measures such as education and other information, good housekeeping, reduction of use of hazardous chemicals, avoidance of exposure and personal protection. They are drawn from a guide produced for the European cleaners by the social partners in the cleaning sector¹²

- Administrative measures include rotating cleaning jobs to reduce the effects of monotonous work and adjusting unfavorable working hours and activities with a high physical workload or significant environmental exposures. Tasks could be distributed between workers.
- The responsibilities for protecting the health and safety of cleaning workers should be agreed on by the contract cleaners' employer, property owners, and facility managers, and implemented¹³.
- A training programme including written information and education (person-to-person training or videos within courses or workshops) can be used to improve workers' awareness of hazards and knowledge of simple ways to reduce risks.
- In certain situations adjustable tools can be used to avoid bending.
- Carts may be used to move cleaning tools and products from one place to another to reduce the musculoskeletal load.
- Secure ladders should always be used to reach higher objects rather than chairs or other furniture.
- Membrane cleaning instead of water-based cleaning will lead to lower physical work loads (see below).



Cleaners and musculoskeletal disorders

- Improved ergonomically designed tools and equipment should be introduced.
- High-pressure spraying and blasting tools: using these tools results in a combined static and dynamic work load, vibration and noise. Working times should be limited. Good ergonomic design of equipment will reduce sprains and strains.
- Cleaning with water-fed extension poles: these are mainly used for cleaning windows but can also be used for surface cleaning. Workers do not have to carry and place ladders and do not need to climb them. At the end of the poles a brush is fed with demineralised water. This easily dissolves dirt from polished surfaces such as glass, ceramic tiles, or painted metal or wood. The demineralised water dries without leaving smears on the surface, so "shammying" is unnecessary. The poles are sold in lengths of up to 13 metres. Therefore working at heights when using the poles can lead to the biomechanical load on the neck increasing. This can greatly increase the risk of MSDs. Limiting the number of working hours cleaners carry out this task during the day is an effective way of controlling the risk.

Membrane cleaning

Membrane cleaning is based on microfibre technology. It was introduced so cleaning could be done with less physical effort and without chemicals. After being successfully used as dishcloths, the system is now also in use for floor cleaning. Positive effects have been reported, such as the need to use less physical effort and a reduced risk of accidents caused by slipping. The suppliers of cleaning devices claim that a better standard of cleaning results from the use of microfibres. With traditional mops the dirt tends to get spread, whereas the dirt readily adheres to the microfibres and so is removed.

Implementation of membrane cleaning is not as easy as it may initially appear. A well organised and maintained professional cleaning regime is important, including washing out the microfibre cloths and patches. When using mops this is also important, but it can easily be neglected. The fact that no chemicals are used may give the wrong impression that the resulting cleaning is poor: one does not smell chemicals and for many people the smell of soap is a traditional reassuring indication of cleanliness.

A UK survey of cleaning work¹⁴ also identified simple actions that can be taken.

- Prolonged flexed postures were adopted when making beds. The bed clothing comprised blankets and sheets. Therefore, duvets were used



Cleaners and musculoskeletal disorders

instead to reduce the amount of time cleaners spent working in a poor posture.

- High levels of exertion when mopping, caused by the use of ineffective detergents in a hard water area, were reported by cleaners at a hospital trust. Therefore it was decided that cleaners would use only simple detergents for mopping. This reduced the amount of effort the cleaner had to exert to clean the floor and also resulted in cleaner floors.
- Cleaners complained of pain, discomfort and fatigue after working on the night cleaning shift. It was found that peak workloads at night meant the cleaners on this shift had more work to do. Work schedules were evened out to ensure some cleaners were not under pressure to perform more work. When people have to work too fast, good work practices tend to be set aside, putting the cleaner at risk.
- Cleaners reported difficulty when moving and lifting buckets of water, and back pain and fatigue after mopping. The buckets might have been too large or overfilled, while metal buckets were heavy to lift and carry. Buckets should be only partly filled with water to reduce the load and they should be made easier to move by providing plastic buckets with wheels for mopping floors.
- Excessive stretching and reaching was required to clean high areas. The correct equipment for high cleaning was provided such as a stepladder to hang curtains and a long-handled tool to dust. This reduced the amount of time the cleaner spent reaching overhead.
- Cleaners experienced difficulty in moving heavy buffing and vacuuming machines at the workplace. Lighter machines were tested, staff were consulted and this led to suitable equipment being bought.

The European legal framework and MSDs

European directives transposed into all Member States makes employers responsible for minimising risks to workers' safety and health. This includes protecting workers from MSDs and protecting workers such as cleaners who may be part-time workers or in temporary contracts. The following directives are of particular relevanceⁱⁱ:

- 89/391/EEC - the "framework directive" - defines provisions and general guidelines to encourage the improvement of good working conditions and this directive is the legal basis for national law in all EU Member States. This general directive does not relate directly to MSDs, however, it does oblige employers to take the necessary measures to safeguard workers' safety and health in every aspect of their work;
- 89/655/EEC and 89/656/EEC. These directives cover the suitability of work equipment and personal protective equipment, which affects the

ⁱⁱ Access to all EU legislation, including the directives referred to here in all official languages can be found at: <http://eur-lex.europa.eu>



Cleaners and musculoskeletal disorders

- risk of MSDs. All personal protective equipment must take account of ergonomic requirements and the worker's state of health, and it must fit the wearer correctly after any necessary adjustment.
- 90/269/EEC describes employers' obligations concerning the manual handling of loads when there is a risk of back injury and within which gender issues and the protection of young people in the workplace can be addressed.
 - 93/104/EC concerns the organisation of working time. Factors such as repetitive work, monotonous work and fatigue can increase the risk of MSDs. Requirements are set out in this directive relating to breaks, weekly rest, annual leave, night work, shift work and work patterns.
 - 98/37/EC deals with machinery, whose design must take into account ergonomic principles so that the discomfort, fatigue and psychological stress of the operator are reduced to a minimum. Ergonomic principles must also be applied to control devices, personal protective equipment and driving seats. Machinery must be so designed that risks resulting from vibration are reduced to a minimum. The directive also includes important information on protection against mechanical hazards such as the risk of break-up during operation.
 - 2002/44/EC sets out exposure limits and values for hand-arm and whole-body vibration. Employers must assess the risks, avoid or reduce exposure, and inform and train their workers in minimising vibration risks. The directive also sets out requirements concerning the monitoring of workers' health.
 - 2006/42/EC deals with machinery, interchangeable equipment, safety components, lifting accessories, chains, ropes and webbing, removable mechanical transmission devices and partly completed machinery. It also covers essential health and safety requirements relating to the design and construction of machinery.

Further information

- European Agency for Safety and Health at Work,
 - *Accident prevention in practice* ISBN 92-95007-34-4, 2001, <http://osha.europa.eu/publications/reports/103/>
 - E-fact 11 - European legal requirements relating to work-related musculoskeletal disorders (MSDs), 2007, <http://osha.europa.eu/publications/e-facts/efact11>
 - E-fact 14 - Hazards and risks associated with manual handling in the workplace, 2007, <http://osha.europa.eu/publications/e-facts/efact14>
 - E-fact 15 - Work - related musculoskeletal disorders (MSDs) and the pace of work, 2007, <http://osha.europa.eu/publications/e-facts/efact15>



Cleaners and musculoskeletal disorders

- E-fact 16 - Hazards and risks leading to work-related neck and upper limb disorders (WRULDs), 2007 <http://osha.europa.eu/publications/e-facts/efact16>
- E-fact 9 - Work-related musculoskeletal disorders (MSDs): an introduction, 2007, <http://osha.europa.eu/publications/e-facts/efact09>
- Factsheet 71 - Introduction to work-related musculoskeletal disorders, 2007, <http://osha.europa.eu/publications/factsheets/71>
- Factsheet 72 - Work-related neck and upper limb disorders, 2007, <http://osha.europa.eu/publications/factsheets/72>
- Factsheet 73 - Hazards and risks associated with manual handling of loads in the workplace, 2007, <http://osha.europa.eu/publications/factsheets/73>
- *Healthy Workplace Initiative checklist on cleaning* http://hwi.osha.europa.eu/ra_tools_checklists/service_sector/checklist_cleaning
- Health & Safety Executive
 - *Manual handling – solutions you can handle*, HSG115 ISBN 0 7176 0693.
 - *Caring for Cleaners: Guidance and case studies on how to prevent musculoskeletal disorders* 2003 HSG234 ISBN0 7176 2682 2 HSE books, Sudbury Suffolk.
- International Labour Organization, 'International hazard datasheets on occupation – cleaner (industrial premises)', <http://www.ilo.org/public/english/protection/safework/cis/products/hdo/htm/cleaner.htm>
- Kelly, V. & Devereux, J.J. (2005). 'Legal issues in work-related musculoskeletal disorders: A European perspective from the UK'. In Noy I & Karwowaski W, (Eds.): *Handbook of human factors in litigation*, Chapter 10. Boca Raton: CRC Press.)
- Zock, J.P. *World at work: Cleaners.*, Respiratory and Environmental Health Research Unit, Municipal Institute of Medical Research (IMIM), Dr Aiguader 80, E-08003 Barcelona, Spain, http://oem.bmj.com/cgi/content/extract/62/8/581?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&author1=J.+P.+Zock&andorexactfulltext=and&searchid=1141987770705_480&FIRSTINDEX=0&sortspec=relevance&resourcetype=1&journalcode=oemed

References

¹ European Federation of Cleaning Industries, *The Cleaning Industry in Europe*, An EFCI Survey Edition 2006 (Data 2003) <http://www.feni.be>

² European Federation of Cleaning Industries, *The Cleaning Industry in Europe*, An EFCI Survey Edition 2006 (Data 2003) <http://www.feni.be>



Cleaners and musculoskeletal disorders

- ³ Mormont, M., *Institutional representativeness of trade unions and employers' organisations in the industrial cleaning sector*, Université Catholique de Louvain, Institut des Sciences du Travail, Project number VC/2003/0451, 146 pp.
http://www.trav.ucl.ac.be/recherche/pdf%202002/2001%2012%20LPS_final.pdf
- ⁴ Bernard, B.P., editor, *Musculoskeletal disorders and workplace factors. A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back* (1997), National Institute for Occupational Safety and Health (NIOSH), Cincinnati (OH).
- ⁵ ORBIS, *Zero assessment workloads in the professional cleaning and window cleaning sector* (in Dutch: *Nulmeting arbeidsbelasting Schoonmaak en glazenwassersbranche*), Amsterdam, the Netherlands, 2004.
- ⁶ ORBIS, *Zero assessment workloads in the professional cleaning and window cleaning sector* (in Dutch: *Nulmeting arbeidsbelasting Schoonmaak en glazenwassersbranche*), Amsterdam, the Netherlands, 2004.
- ⁷ ORBIS, *Zero assessment workloads in the professional cleaning and window cleaning sector* (in Dutch: *Nulmeting arbeidsbelasting Schoonmaak en glazenwassersbranche*), Amsterdam, the Netherlands, 2004.
- ⁸ Woods, V., Buckle, P., 'Musculoskeletal ill health amongst cleaners and recommendations for work organisational change', *International Journal of Industrial Ergonomics* 36, 61-72, 2006.
- ⁹ Rossignol, M. et al., 'Primary osteoarthritis of hip, knee, and hand in relation to occupational exposure', *Occupational and Environmental Medicine*, 62:772-777, 2005.
- ¹⁰ European Agency for Safety and Health at Work, *FACTS 71 Introduction to work-related musculoskeletal disorders*, 2007
<http://osha.europa.eu/publications/factsheets/71>
- ¹¹ Woods, V., Buckle, P., 'An investigation into the design and use of workplace cleaning equipment'. *International Journal of Industrial Ergonomics* 35, 247-266, 2005.
- ¹² *Health and safety in the office cleaning sector*, copies can be downloaded in English, French, Dutch and Spanish at http://www.union-network.org/UNISite/Sectors/Property_Services/Cleaning/CleaningManual.htm 2002
- ¹³ Health and Safety for Cleaning Contractors in NSW,
<http://www.workcover.nsw.gov.au/Publications/OHS/SafetyGuides/CleaningGuidelines.htm>
- ¹⁴ Woods, V., Buckle, P., and Haisman, M., 1999 *Musculoskeletal Health of Cleaners*. HSE. Contract research report
http://www.hse.gov.uk/research/crr_pdf/1999/CRR99215.pdf