

Hazards and risks leading to work-related neck and upper limb disorders (WRULDs)

Summary

Work-related neck and upper limb disorders (WRULDs) are the commonest occupational diseases in Europe. They affect the neck, shoulders, arms, hands, wrists and fingers, causing pain, discomfort, numbness and tingling sensations. Other symptoms, which can be exacerbated by cold or the use of vibrating tools, include swelling in the joints, decreased mobility or grip strength, and a change in skin colour of the hands or fingers. WRULDs usually develop gradually, the cumulative effect of many, apparently moderate applications of force, repeated over an extended period. The result is muscle fatigue, which can injure the soft tissue of the neck, shoulders and upper limbs. The main risk factors include heavy loads, awkward and static posture, repetitive movement and too few periods of rest. If sufficient time for rest is allowed, the body will recover and may even grow stronger. A poor working environment can also increase the risk of workers developing WRULDs. For example, excessive cold can make the hands feel numb, making it hard to grip and requiring more force to be applied. Psychosocial factors also have a part to play: workers who perform monotonous jobs or who are given incentives to work faster have a higher risk of developing WRULDs. At the very latest, risk assessment and prevention programmes must start as soon as any symptoms are reported. But, for those workers who are at greater risk of developing WRULDs, measures should be taken before any warning signs are observed.

What are WRULDs?

Work-related neck and upper limb disorders (WRULDs) are impairments of the bodily structure — including tendons, ligaments, nerves, muscles, joints, bones and the localised blood circulation system — that are caused primarily by work and the effects of the working environment. They affect the neck, shoulders, and upper limbs (arms, hands, wrists and fingers) and can cause pain, discomfort, numbness and tingling sensations. Sufferers may also experience swelling in the joints, decreased mobility or grip strength, and a change in skin colour of the hands or fingers. These symptoms can be exacerbated by cold or by the use of hand-held vibrating tools.

WRULDs are sometimes called 'sprains or strains', Repetition Strain Injuries (RSIs) or Cumulative Trauma Disorders (CTDs). You may also hear them described by the medical terms such as tenosynovitis or carpal tunnel syndrome.



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Symptoms may take weeks, months or in some cases years to develop. So, once workers report them, action must be taken without delay. A better option, however, would be to try to stop the symptoms developing in the first place. A programme of risk assessment followed by appropriate workplace action would reduce the chance workers at higher risk developing WRULDs.

What are the consequences of WRULDs for workers and employers?

WRULDs are the commonest form of occupational disease in Europe, accounting for more than 45% of all occupational diseasesⁱ. As well as the symptoms described above, workers must deal with a reduction in their ability to work, a potential loss of earnings and possible limitations in their home life or leisure activities. Employers must bear the costs of sickness absence, lower productivity and the possibility of paying compensation to workers forced to retire through ill health. Further, the state will have to support the person who is unable to work.

How are WRULDs caused?

Physical work requires the application of force either to move objects or to keep them steady in the correct position. When work is done with the hands, various sets of muscles in the neck, shoulder, arms and hands contract to hold the joints of the upper limb in position to move objects manually. The greater the force required, the more the muscle forces are sustained in the body parts involved in performing the activity.

WRULDs are caused by the effects of many repeated, apparently moderate applications of force, sustained over an extended period. These loads do not appear to cause immediate injury, but can result in muscle fatigue and lead to microscopic injuries in the soft tissue structures of the neck and upper limbs. If sufficient time for rest is allowed, the body will recover and may grow stronger (this is the goal of training or rehabilitation). If there is not enough recovery time, or if force must be sustained for too long, WRULDs can develop.

ⁱ Eurostat, *Work and Health in the EU: A Statistical Portrait*, Office for Official Publications of the European Communities, Luxembourg, 2004.



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What factors increase the risk of a worker developing WRULDs?

Main risk factors:

- force applications that result in high mechanical loads on the neck, shoulders and upper limbs (see Figure 1 below);
- awkward postures that deviate from the resting (neutral) postures of joints, such as arms continuously held above head height or gripping with bent wrists. The more posture deviates from the resting position, the more the muscles have to contract to produce the force that is needed to perform work, and the higher the mechanical load that must be sustained by the body;
- repetitive movements where a similar motion pattern is performed over and over again without stopping, especially if this involves the same joint and muscle groups;
- prolonged work without the opportunity for recovery that leads to fatigue (see Figure 2 below);
- sharp edges on tools, machines or furniture that press into the fleshy tissues and cause distortion and injury.

These activities increase the risk of developing WRULDs in the neck and shoulders:

- postures that require the weight of the body parts and objects to be held, such as
 - o working with elevated arms and holding heavy objects
 - o working with the head either bent or rotated postures (for example, using a microscope; turning the head to the side);
- prolonged work in static postures (for example, office work at computer workstations);
- repeated elevations of the arms or turning the head to the side.

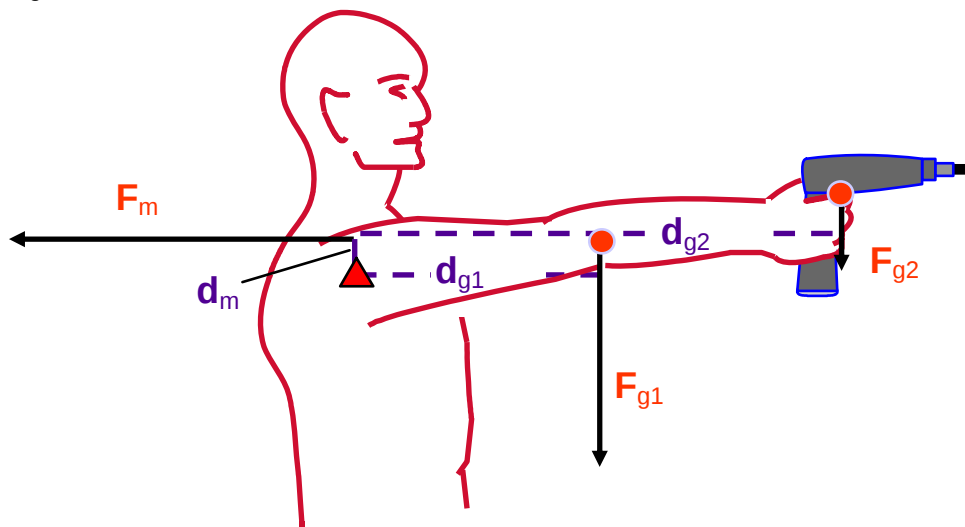
These activities increase the risk of developing WRULDs in the elbow, wrist and hands:

- use of high muscular force to handle objects, such as
 - o high gripping force
 - o grasping with a large grip or pinch grip;
- working with the wrists in deviated postures, towards either the little finger or thumb, are hazardous;
- repeating the same wrist movements;
- sharp edges pressing on the wrists or hands.



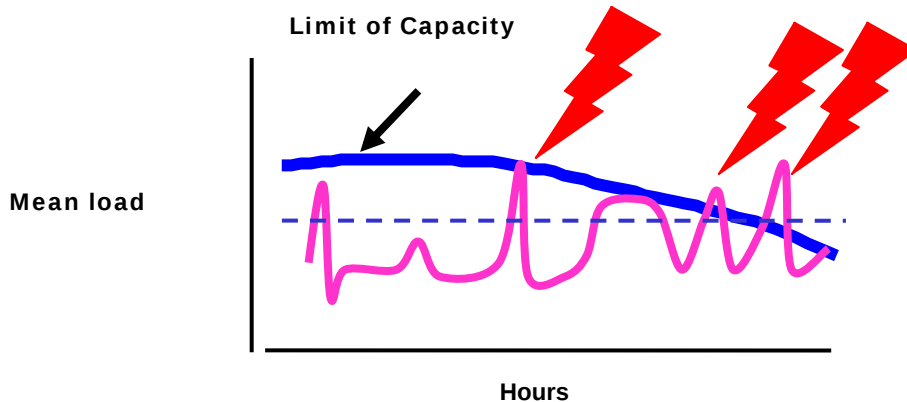
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Figure 1 shows the bones as the lever arms, the joints as the hinge points, and the muscles producing the force at one end of the lever.



The arrows show the magnitude and direction of the forces. The shoulder muscles hold the arm extended. Holding an object of 1kg in the hand (F_{g2}) with a long lever arm (d_{g2}) will increase the muscle force needed up to about 50 kg. For a 2 kg weight in an extended hand, the shoulder muscles have to contract with a force of about 70 kg — that is, as if they were holding the whole weight of the body! The way to reduce these forces on muscles is to keep the lever arms short — i.e. by keeping the load close to the body.

Figure 2 shows that if the individual's capacity is limited and as the reserve becomes reduced, there is an increased risk that peak loads can injure the person.



The worker will tire during long spells of work, and sufficient rest periods are required to allow recovery. Fatigue reduces the capacity of the body. If the rest periods are too short, there is a greater risk that peak loads will lead to injuries. If there is insufficient recovery time, it is possible that loads that are acceptable at the beginning of shift may cause overloading after several hours work. The rate of fatigue increases with prolonged shifts.



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Further risk factors associated with the development of WRULDs

Work environment:

- poor workspace layout can result in the adoption of stressful working postures and the need to apply force when reaching to full stretch;
- physical climate (temperature, air speed, humidity). The temperature of the workplace affects the body's muscles: excessive heat increases overall fatigue and produces sweat which makes it hard to hold tools, requiring more force to be applied; excessive cold can make the hands feel numb, making it hard to grip and requiring more force;
- poor lighting can create glare or shadows, and these may require workers to move into awkward positions to see what they are doing clearly;
- high levels of noise may cause the body to tense, resulting in static body postures and the more rapid onset of fatigue;
- hand-held vibrating equipment may cause blood circulation changes resulting in numbness, tingling or loss of sensation, and the need to use more force when gripping.

Individual variation:

- the physical capacities of workers can vary dependent upon their body build, age, and the level of physical development. Previous injuries may have reduced the capacity of the body and made it more vulnerable to impairment even after recovery;
- workers' lack of experience or familiarity with the job can increase their exposure to overload. (Although appropriate, job-related training may help workers to reduce their exposure by enabling workers to use a better technique, or by taking short breaks and changing their posture more often);
- ill-fitting clothing or personal protective equipment can restrict postures and may increase the force applications necessary to do the work.

Psychosocial factors and work organisation:

- affect how workers feel about their job, such as the way the work is organised, who does which job, how jobs are done, how fast and for how long;
- workers who perform monotonous jobs that involve only a few, similar tasks or that have incentives or quotas to encourage a faster work rate have a higher risk of developing WRULDs;
- excessive work demands, limited control by the worker over what they do, limited opportunities for social interaction, or little support from their managers, supervisors and other workers can all increase the risk of developing WRULDs.



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These factors are thought to result from stress that induces biomechanical and physiological changes.

Interactions

All of the above factors may act on their own or in combination to increase the risk of workers developing WRULDs. Research shows that the risk is greater if several apply; for example, the risk of WRULDs increases with repeated hand movements if there is need for a high gripping force at the same time.

Relevant European legislation

European legislation has been introduced that places responsibilities on employers to ensure that the risks of workers suffering from WRULDs are minimised. The most important European directives are:

- Directive 89/391/EEC — the 'framework' directive — that sets out the basic requirements for workplaces;
- Directive 90/270/EEC, which provides the minimum safety and health requirements for work with computer workstations and equipment. Employers are obliged to:
 - o analyse workstations
 - o evaluate safety and health conditions
 - o remedy any risks to eyesight, physical problems and problems of mental stress;
- Directive 90/269/EEC, which provides the minimum health and safety requirements for the manual handling of loads, and offers protection for workers against the risk of shoulder injuries as well as the lower back. Employers should use appropriate means to:
 - o avoid the need for manual handling of loads by workers
 - o take the appropriate organisational measures to reduce the risk if manual handling cannot be avoided
 - o ensure that workers receive adequate information on the weight of a load, the centre of gravity or the heaviest side when a package is unevenly loaded
 - o ensure proper training and precise information on how to handle loads correctly.

The requirements of other European Directives, standards and guidelines, together with the provisions of individual Member States, may also be relevant to preventing WRULDs.

See the Agency's website for more information on the European legislation relating to protection of workers: <http://osha.europa.eu/legislation>



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What can be done to prevent WRULDs?

The approach incorporated within the above legislation is based upon an assessment of the hazards and risks in the workplace. Employers are required to evaluate risks to safety and health within their workplaces and then to improve the standards of safety and health for workers and others who may be at risk of harm. This process is called a risk assessment and covers the range of factors identified above that are known to increase the risk of developing WRULDs.

Risk assessment

There are several models for carrying out a risk assessment. This is one step-by-step approach.

1. Look for the hazards

Think about the work that is done and identify all hazards and their combinations that may cause or increase the risk of WRULDs.

2. Decide who may be harmed and how

Think about everyone who may be at risk. Specific attention pay to those workers at higher risk. Talk to the workers and their supervisors. Involve them in the risk assessment process and tell them what you are doing to reduce risk.

3. Evaluate the risks and decide on action

Consider how exposure to the identified risk factors may lead to the development of WRULDs:

- can the hazard be removed completely?
- can the risk be controlled?
- can protective measures be taken to protect the whole workforce?
- is personal protective equipment needed to protect the worker from a risk that cannot be controlled adequately by collective preventive measures?

4. Take action

After completing the risk assessment, a list of the preventive measures should be made in order of priority, and then action should be taken with the involvement of the workers and their representatives. Action should be focused on preventive measures to stop the injury or ill health occurring in the first place, but consideration should also be given to measures that would minimise the seriousness of any injury sustained.

Workers should receive appropriate information, education and training. Any hazards and risks discovered should be documented, together with the groups that suffer most and the kind of injury sustained. Information should



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be provided about the measures to improve health and safety in the workplace and about how to avoid specific hazards and risks.

When considering preventive actions, a wide range of possible changes should be considered:

- workplace — for example, can the layout be improved to avoid workers performing tasks requiring high force applications in awkward, static working postures?
- work equipment — for example, are tools ergonomically designed? Can powered tools be used to reduce the force required for a task? But will the use of such tools increase exposure to hand or arm vibration?
- worker — they must be trained to increase their awareness of ergonomic factors and to recognise and avoid unsafe working conditions. Furthermore, workers must be convinced why it is important to pay attention to prevention and what happens if this is neglected. They should also be made aware of the benefits of adopting good practices and work methods in terms of reduced suffering and no lost wages;
- work task — one of the most important requirements is to reduce the physical demands of the job by decreasing the levels of force, repetition, awkward postures and/or vibration. This often necessitates the use of new tools or working methods;
- work management — for example, by planning the work better or implementing safe systems of work. It may be possible to reallocate tasks between workers to reduce repeated motions, forceful hand exertions, and prolonged bending and twisting;
- at the organisational level, practical solutions include developing appropriate work/rest ratios to reduce fatigue, organising breaks and rotating jobs. At the corporate level, a safety culture should be promoted to gain higher top-level commitment and involvement in identifying and controlling WRULDs risk factors, and to improve safety and surveillance measures.

5. Review the findings

When a significant change is made to the work methods, it is important to check that no new hazards are created in the process.



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Conclusions

A considerable amount of information exists about the causes and prevention of WRULDs. This has resulted in the provision of good practice guidelines, which enable risk factors to be identified, risk assessments to be made and workplace action taken to reduce the prevalence of these disorders.

In the light of the gradual onset of WRULDs, it is essential that risk assessment and prevention programmes start as soon as any initial symptoms or warning signs are reported. It is also essential, however, that proactive measures are taken for those groups of workers who can be identified as being at greater risk. A number of techniques for the assessment of exposure to WRULDs can be used to evaluate existing workplaces or those at the design and development stageⁱⁱ.

Taking quick action can bring benefits in terms of reduced suffering for workers, and cuts in the costs of treatment and work absence for employers. It can also improve workplace productivity.

For further information about WRULDs, see:

http://osha.europa.eu/good_practice/risks/msd/

ⁱⁱ David GC, 'Ergonomic methods for assessing exposure to risk factors for work-related musculoskeletal disorders', *Occup Med* (Lond) 55(3): 190-199, 2005.