



Whole-body vibration: ca

Dr Wilf Archer with a guide to the injuries and illnesses related to this complaint



In a previous issue we looked at the vibration damage that can be caused to hands and fingers from using powered-hand tools. The problem is that hand-arm vibration damage is fairly well-known. It tends to get media attention and it is fairly easy to control because there is a direct link between the damage caused and the source equipment.

However, what tends to be forgotten is that simple things like operating a dumper truck, riding in a van or driving a fork lift truck can cause fatigue, insomnia, headaches and shakiness with symptoms similar to those that many people experience after a long car or boat trip.

After daily exposure over a number of years, these same whole-body vibrations can result in a number of health disorders affecting your entire body including permanent harm to internal organs, muscles, joints and bone structure.

We know that vibrating hand tools interfere with blood circulation (vascular effects) and nerves signals (neurological effects), thereby causing a tingling sensation, loss of feeling, numbness, and a characteristic blanching or whitening of the affected parts of the hand-arm system known as “white finger”.

Identify and manage

And when we start to show these signs then we can have a fair idea where to look for the cause. The symptoms of whole-body vibration are not so readily recognisable and are often mistaken for other unrelated conditions and ailments. The health outcomes are non-specific and can be difficult and extremely expensive to identify, manage and control.

These factors should not detract from the fact that employees, and in particular professional drivers, can suffer debilitating ill health effects from whole-body vibration exposure.

The onus is on the employer to know the vibration exposure that their workforce is exposed too, including the magnitude of vibration, distribution of the motion within the body, and the frequency, direction and duration.

Health effects

While there is a shortage of conclusive evidence to provide a definite close-effect relationship between whole-body vibration and injury or health damage, we can, from the limited scientific studies, subjective data, biodynamic models and our knowledge of the physical properties of the human body, establish

some of the likely health effects:

- **spinal column disease and complaints** are perhaps the most common diseases associated with the long-term exposure to whole-body vibration, where the back is especially sensitive to the 4-12Hz vibration range
- **digestive system diseases** are often observed in persons exposed to whole-body vibration over a long period of time. This is associated with the resonance movement of the stomach at frequencies between 4 and 5Hz
- **and cardiovascular system effects** resulting from prolonged exposure to whole-body vibration at frequencies below 20Hz. These result in hyperventilation, increased heart rate, oxygen intake, pulmonary ventilation and respiratory rate.

The vibrational energy waves, much the same as noise, are transferred from the energy source – a hand tool or vehicle – into the body of the exposed operator. This is then transmitted through the body tissues, organs and skeletal systems of the individual before it is dampened and dissipated.

Fortunately the human body can tolerate certain levels of vibrational energy but when exposed over a long period of time it begins to deteriorate and fail causing a disruption in the body’s natural processes and systems. The health effects experienced by employees vary considerably and factors such as situation, age, lifestyle (smokers), posture, ergonomic design and resonance all have an influence on the ill health effects of the vibration exposure.

Each part of the human body has its own natural frequency of vibration. The extent to which the human body is affected depends on the vibration frequency to which it is exposed.

This resonant response to the vibration will cause symptoms ranging from simple motion sickness to severe discomfort, organ failure or tissue degeneration.

Lower back pain

The most pronounced and common effect is lower back pain. This can be linked to the vibration acting on the musculo-skeletal system of the body, causing the degeneration of the small cartilage (intervertebral) discs, allowing tissues and nerves to be strained and pinched leading to various back and neck problems. Long periods of sitting while the spinal column is

uses, effects and cures

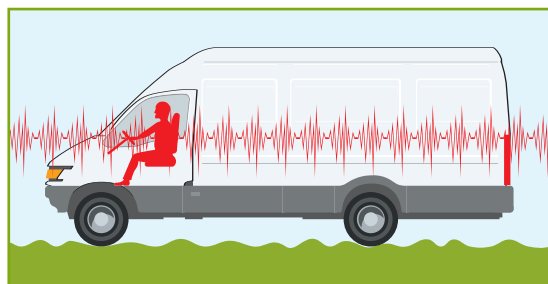
being aggravated by vibration exposure causes the nutrients needed for growth and repair to diffuse outwards. This causes irreparable damage at a cellular level and wear and reduced healing of discs and vertebra within the spinal column.

Muscle fatigue also occurs as the muscles try to react to the vibrational energy to maintain balance and protect and support the spinal column. But these are often too slow as the muscular and nervous system cannot react fast enough to the shocks and loads being applied to the body.

Other health effects that have been associated with whole-body vibration and especially the driving environment are haemorrhoids, high blood pressure, kidney disorders and even impotence – and other adverse reproductive effects in men and women.

Control

Vibration is a complex hazard that does not have one control measure that will solve all problems. However, it is not always necessary to spend great sums of money on evaluation of vibration exposures, when a good risk assessment exercise is carried out taking into account factors such as exposure periods, worker complaints and symptoms, medical records and ergonomic principles and design at the



Vibration levels running through a truck.

workplace or on the vehicle.

If a driver or worker has a genuine complaint – a forklift driver with lower back pain – then something should be done to try and rectify this.

The money could be spent on control measures and include possible solutions such as “air-ride” suspended seats, suspended cabs, maintaining vehicle suspension systems, and inflating tyres to their proper pressure.

Seats with arm rests, lumbar support, an adjustable seat back and an adjustable seat pan are also useful for correcting driving surfaces to reduce vibration at the source. All it takes is a true holistic approach using sound occupational health and safety principles.

Left: The tolerance limits of the body to vibration in a lorry cab.

Below: How the bottom of the back is affected by vibration.

