

Vibration Injury Prevention

Fact Sheet: An ergonomic workplace approach

HS23-005A (11-23)

What is ergonomics?

Ergonomics is the process of finding ways to help people work more efficiently and injury-free in their environment.

About 7.2 million workers in the United States are exposed to vibrations in the workplace that can lead to long-term health issues.¹ Regular exposure to vibrations, whether from large machinery or small vibrating tools, can cause serious problems such as muscle and bone disorders, circulation issues, and nerve damage.



Types of vibration exposures

Vibration exposures are usually divided into two or three major groups depending on the job:

1. Whole-body vibrations.

Whole-body vibrations (or head-to-toe vibrations) can lead to injuries for those who work in the following industries:

- **Construction and mining.** Operating heavy machinery such as bulldozers, excavators, and dump trucks.
- **Agriculture.** Using farm vehicles such as tractors, combine harvesters, and other vibrating equipment.

- **Transportation.**

Driving trucks, buses, forklifts, or operating heavy machinery.

- **Manufacturing.**

Operating vibrating tools such as jackhammers, riveters, and pneumatic drills.

- **Aviation.**

Piloting helicopters or aircraft with high vibration levels.

2. Hand-arm vibrations.

Hand-arm vibrations (or localized vibration exposure) can affect people who regularly use vibrating hand tools. Workers affected often perform tasks in the following industries:

- **Construction and manufacturing.** Using handheld power tools like grinders, sanders, and carpet strippers.

¹ 7.2 million was obtained by combining an estimate of 1.2 million US workers exposed to hand-arm vibrations as reported by the National Institute for Occupational Safety and Health (NIOSH), "Vibration Syndrome." (<https://www.cdc.gov/niosh/docs/83-110/default.html>) and 6 million US workers exposed to whole-body vibrations as reported by Kristine Krajnak, a NIOSH research biologist cited by Morrison, K.W., (2009, October 1), "Whole-Body Vibration," Safety and Health Magazine, (<https://www.safetyandhealthmagazine.com/articles/whole-body-vibration-2#:~:text=In%20the%20United%20States%2C%20an,a%20research%20biologist%20with%20NIOSH.>). Both accessed November 4, 2023.

- **Automotive and engineering.**
Operating vibrating machinery such as impact wrenches and pneumatic hammers.
- **Landscaping and gardening.**
Using vibrating equipment like chainsaws, hedge trimmers, and lawnmowers.

3. Crossover exposures.

In some jobs, there are situations where workers can be exposed to both whole-body vibrations and hand-arm vibrations daily. This can happen when using certain hand tools, like chipping hammers, concrete saws, or plate compactors. In these cases, when the worker holds the tool away from the body, it causes hand-arm vibrations. If the worker lets the tool rest against the body to try to reduce the vibration, it causes whole-body vibrations.

Health effects of vibration

Vibration-caused health conditions progress slowly. In the beginning, it usually starts as pain. As the vibration exposure continues, the pain may develop into an injury or disease.

Whole-body vibration health effects

Whole-body vibrations can cause fatigue, stomach problems, headache, loss of balance, and shakiness shortly after or during exposure. After daily exposure over several years, whole-body vibrations can affect the entire body and result in a number of health disorders. [Studies](#) of bus and truck drivers found that occupational exposure to whole-body vibrations contributes to the following health effects:

- **Musculoskeletal disorders.**
Whole-body vibrations can lead to back pain, spinal injuries, and joint problems.

- **Circulatory Issues.**
Whole-body vibrations can affect blood circulation, leading to reduced grip strength and increased risk of cardiovascular diseases.
- **Digestive problems.**
Whole-body vibrations can cause digestive disorders, including stomach ulcers and irritable bowel syndrome.

Hand-arm vibration health effects

Hand-arm vibration health effects are gradual and worsen over time. It may take a few months to several years for symptoms such as the following to appear:

- **Hand-arm vibration syndrome (HAVS).**
Hand-arm vibrations can cause changes in tendons, muscles, bones, and joints, and can affect the nervous system. Collectively, these effects are known as HAVS. Workers affected by HAVS commonly report:
 - o Whitening or blanching of one or more fingers, especially when exposed to cold. (See [vibration-induced white finger](#) and occupational [Raynaud's phenomenon](#).)

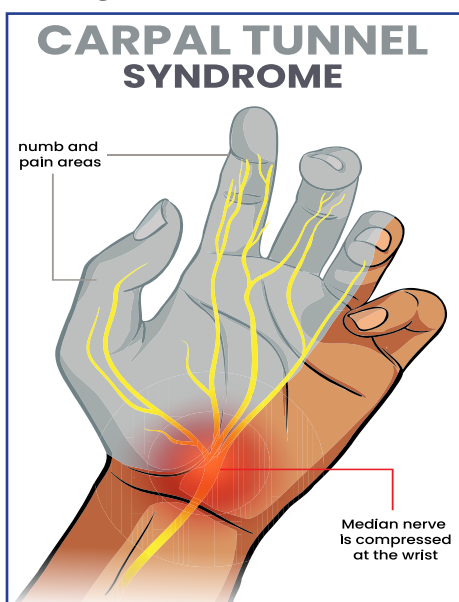


Among the many injuries that can be caused by vibrations are nerve and circulatory damage resulting in Raynaud's phenomenon, or "white finger" .

- o Tingling, numbness, and reduced movement in the fingers.
- o Loss of touch.
- o Pain and cold sensations between periodic white finger attacks.
- o Loss of grip strength.
- o Bone cysts in fingers and wrists.

- **Carpal Tunnel Syndrome.**

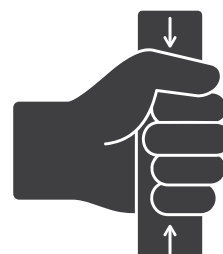
Exposure to hand-arm vibrations can damage the median nerve, which runs from the forearm to the hand through a narrow passageway in the wrist called the carpal tunnel. It can occur when hand-arm vibrations compress or squeeze the median nerve. It can lead to pain, numbness, tingling, and weakness in the hand and fingers.



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Preventing vibration injuries

Proper engineering and administrative controls, training, protective gear, and health monitoring can help ensure a safe and healthy work environment.

- **Engineering controls.**

The following engineering controls can protect and isolate workers from whole-body vibration hazards:

- o Maintain and inspect machinery regularly to decrease vibration levels.
- o Add vibration-dampening materials or improve the balance of the equipment to help reduce vibration levels.
- o Design workstations and equipment with ergonomics in mind to reduce the risk of vibration.
- o Use low-vibration tools and equipment.
- o Install anti-vibration handles and grips on tools.
- o Maintain and calibrate tools regularly to minimize vibration levels.
- o Automate processes to minimize the need for manual handling of vibrating tools or equipment.

- **Administrative controls.**

Administrative controls change the way people work to reduce their exposure to hazards. These examples can protect employees from vibration injuries:

- o Rotate workers between tasks to minimize their exposure to vibrations.

- o Provide regular breaks to allow workers to rest and recover from vibration exposure.
- o Monitor and assess vibration levels in the workplace to identify areas of concern and make needed changes.
- **Training.**
Provide comprehensive training on the risks of vibration exposure including:
 - o The signs and symptoms of vibration-related injuries, proper tool usage, and ergonomic techniques.
 - o Techniques to minimize vibration transmission to the body.
 - o Proper body positioning, grip, and posture to reduce the impact of vibrations on the body.
 - o Ways to promptly report any vibration-related symptoms.
- **Personal Protective Equipment.**
Ensure employees have the gear needed to protect themselves. Employees should:
 - o Use anti-vibration gloves, seats, and suspension systems to absorb vibrations.

- o Have access to safety goggles, ear protection, and respiratory protection, depending on the nature of the work and the hazards.

- **Health Monitoring.**

Implementing regular health monitoring programs to screen and assess the health of workers exposed to vibrations can prevent injuries. Include:

- o Periodic medical assessments to identify early signs of vibration-related injuries.
- o Encourage the prompt reporting of symptoms or discomfort related to vibration exposure.
- o Follow-up with medical care and treatment to workers who develop vibration-related injuries or symptoms.

Preventing vibration injuries is crucial for maintaining a safe and healthy work environment. By implementing these procedures, employers can significantly reduce the risk of whole-body vibration and hand-arm vibration injuries. Prioritizing ergonomics in the workplace not only protects workers' health but also enhances productivity, overall job satisfaction, and a company's bottom line.



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