

Whole-body Vibration

Texas Workers' Compensation Commission
Workers' Health and Safety Division
Safety Education and Training Programs

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Goal

This program informs drivers of the potentially damaging effects of vibration on the body while sitting in a moving vehicle.

Objectives

After reading this safety training program, employees will be able to explain the causes of whole-body vibration and describe methods to reduce vibration exposure.

Introduction

Have you ever tightened your grip on the steering wheel, dashboard or seat anticipating the next pothole or next obstacle? Over a prolonged period of time, this type of exposure takes a toll on the body. Occupations that require driving long distances or operating heavy equipment expose workers daily to low-frequency vibrations generally less than 100 Hz. Exposure to these vibrations can cause serious physical problems ranging from chronic back pain to nerve damage.

Research on truck drivers and heavy equipment operators indicates that intense, long-term whole-body vibration increases risk to the spine.

Whole-body vibration is caused by twisted sitting postures combined with vibration. The combination increases stress and load on the neck, shoulder and low back. To compensate for the discomfort from vibration, drivers should change their position. However, if the assumed position is incorrect, the stress may be increased.

Whole-Body Vibration Exposure

As vibration is transmitted to the body, the effect of the vibration can be amplified by factors such as body posture, type of seating and the frequency of the vibration. Individual human body parts have their own resonant frequencies. This is why after a long drive we continue to feel as if we are still moving after the vehicle has stopped. Vibration from engines can agitate the body to the point of causing micro fractures in the vertebrae, disc protrusion, nerve damage and acute low back pain.

Short-term exposure vibration causes only small physiological effects such as a slight degree of hyperventilation and increases in the heart rate. Vibration also causes increased muscle tension from voluntary and involuntary muscle contraction. Muscles become tense to dampen the vibration. Examples of this type of



tension would be having your foot fall asleep while pressing the accelerator pedal or experiencing a tingling sensation in your hands from gripping a steering wheel too tightly.

Low-frequency vibrations of moderate intensity can induce sleep. Higher frequencies have the opposite effect. Vision can also become blurred because of the movement of the image on the retina.

Vibration is also traumatic to the spine. Intervertebral discs serve as “shock absorbers” and become susceptible to injury over prolonged periods. Dr. David Wilder of the Iowa Spine Research Center, a leading researcher in whole-body vibration, says: “This is the ultimate cumulative trauma with repetitive loading. If you have chronic pain in the back or tingling down your legs, you should be concerned”. Dr. Wilder also has found that prolonged exposure to whole-body vibration can lead to bulging or herniated discs.

With advancements in transportation, we often travel longer distances at faster speeds. Whole-body vibration research is now focusing on determining the vibration and exposure levels that initiate physical and mechanical changes in the body. The results of current research could provide helpful guidelines for vehicle manufacturers.

Exposure Determination

To determine possible whole-body exposure to workers, ask the following questions:

Is the worker exposed to whole-body vibration while sitting in a vehicle?

Does motion and/or vibration cause the worker to hold on to the steering wheel or another support for stability while standing or sitting?

Does the worker complain of pain, discomfort or fatigue in the back, buttocks or feet because of jolts or vibration?

Does the worker bounce when the vehicle is in operation?

Is the worker in an awkward position?

Is the seat on the vehicle properly secured and maintained?

Control Measures

If your workers are exposed to whole-body vibration, engineer the problem out by installing newly designed seats and suspension systems. If that is not practical, the next best thing is to institute work practice controls to reduce or minimize the vibration.

To control the amount of whole-body vibration, the following work practices and administrative controls can be implemented:

- Reduce travel speed to reduce vibration levels;
- Require rest breaks to avoid constant continued exposure. (Refer to Safety Training Program, Staying Alert and Fit to Drive);
- Obtain information on equipment vibration and recommended maintenance schedules from the vendor;
- Minimize the vibration created between floor ramps and vehicles by maintaining ramps and dock levelers;
- Improve vehicle suspension and use vibration isolation or dampening for seating to reduce vibration transmission; and
- When appropriate, workers should incline the backrest up to 10 degrees and use lumbar support.

Summary

Whole-body vibration most often affects occupations that require prolonged driving. Research shows that continuous exposure to vibration can be detrimental to the body. Any intervention such as isolating the driver, using lumbar support and armrests or repairing roads can help reduce whole-body vibration. The key is to take action by eliminating or reducing the exposure to whole-body vibration.

Review

1. Whole-body vibration is caused by twisted sitting postures combined with the type vehicle you are driving.
 - a. True
 - b. False
2. Some of the types of injuries a person can get when exposed to whole-body vibration are:
 - a. Acute low back pain
 - b. Micro fractures of the discs
 - c. Loss of hearing
 - d. Both a and b

3. Some of the methods that reduce vibration exposure are:
 - a. More rest breaks
 - b. Improve vehicle suspension
 - c. Reduce travel speed
 - d. All of the above
4. The key to reducing whole-body vibration is to take action by reducing or eliminating the exposure to whole-body vibration.
 - a. True
 - b. False
5. Some of the questions to ask to determine exposure to whole-body vibration are:
 - a. Is the worker in an awkward position?
 - b. Has the worker had enough sleep?
 - c. Is the seat on the vehicle properly secured and maintained?
 - d. Both a and c

Answers:

1. b (false) – should be twisting sitting postures combined with vibration
2. d
3. d
4. b
5. d

Resources

The Texas Workers' Compensation Commission (TWCC) Resource Center offers a workers' health and safety video tape library. Call (512) 804-4620 for more information or visit our web site at www.twcc.state.tx.us.

Disclaimer: Information contained in this training program is considered accurate at time of publication.



Safety Violations Hotline
1-800-452-9595

safetyhotline@twcc.state.tx.us