

It's a fact...

Proper use of powered hand tools
can make your work safer and easier.

Powered hand tools allow heavier work to be performed with greater speed and efficiency. However, as with regular hand tools, the improper design and use of powered hand tools can contribute to work-related musculoskeletal system disorders (WMSDs).

Whether the tools are powered by electricity, gas, compressed air, or explosive charges, a number of factors affect the performance and health of tool users.



Select the right tool for the job—straight handles can help improve shoulder and wrist position.

Static Muscle Loading

Problem: Static muscle loading, particularly of the forearm, causes fatigue and reduced productivity with possible muscle soreness. A tool that weighs 10 to 15 pounds, such as a power grinder or sander, cannot be held in a horizontal position for more than a few minutes without extreme forearm discomfort, fatigue, possible muscle soreness, and reduced productivity.

Solutions: Static muscle loading can be avoided.

- ◆ Make sure that frequently used or continuously held tools are as light as possible, preferably under 2 pounds.
- ◆ Suspend heavier tools overhead using a counter balance (e.g., retractor linkage).
- ◆ Align the tool's center of gravity with the center of the grasping hand to align the tool with minimal effort.

Awkward Postures

Problem: Awkward postures of the shoulder, elbow, and wrist are caused by the interface between the tool and the workstation, rather than the tool use alone. Awkward wrist postures, such as those where the wrist is hyperflexed or extended, stretch the underlying tendons and blood vessels over the rigid carpal bones or wrist ligament.

Solutions: Awkward postures are caused by a mismatch between the job and the tool, increasing the risk of WMSDs.

- ◆ Rotate the work piece 90 degrees to the horizontal, allowing you to maintain a straight wrist.
- ◆ Substitute a tool with an in-line handle for a tool with a pistol grip so you can maintain your wrist in a neutral position.
- ◆ Place the tool on an adjustable jig, allowing the tool to be positioned so that you can maintain your wrist in a near-neutral position.

Pressure Exerted on the Palm and Fingers

Problem: Pressure exerted on the palm and fingers may be greater for powered tools than for hand tools. Powered tools are usually heavier than hand tools, requiring a more forceful grip to maintain control of the tool. Powered tools tend to vibrate during operation, causing the user to grip more forcefully to maintain control of the tool. Also, powered tool triggers are normally located in the handle and operated by the index finger. If poorly designed, a condition known as stenosing tenosynovitis, or “trigger finger,” can result. This occurs when a tool is so large that the last segment of the index finger must be used to depress the trigger, while the middle segment remains straight.

Solutions: Pressure exerted on the palm and fingers can be lessened by using tools with the proper handle shape and size.

- ◆ Hand grips should be cylindrical in shape with no sharp edges.
- ◆ Handles should be at least 4 inches long. If used with gloves, the handles should be about a half inch longer.
- ◆ To avoid the condition known as “trigger finger,” use powered hand tools designed with triggering mechanisms that are large enough for activation by two or three fingers.

Vibration

Problem: Vibration of powered hand tools, such as chain saws, pneumatic drills, grinding tools, and chipping hammers, can cause vascular spasm—or a constriction of blood vessels in the fingers, which then appear white or pale. Vascular constriction may lead to numbness and swelling of hand tissue, with a loss of grip strength. Vibration-induced white finger, also known as VWF or “Raynaud’s phenomenon,” and hand-arm vibration syndrome (HAVS) causes tingling, numbness, or pain that can be brought on or intensified by exposure to cold.



Vibrating tools can lead to wrist, shoulder, and back problems.

Solutions: There are preventive actions that can be taken to reduce the impact of vibration.

- ◆ Reduce the number of hours or days vibrating tools are used.
- ◆ Arrange tasks to alternate use of vibrating and nonvibrating tools.
- ◆ Schedule tool maintenance so tools remain sharp, lubricated, and properly tuned.
- ◆ Select tools that perform satisfactorily with the least vibration. Ask tool manufacturers to furnish vibration and frequency data on their tools.
- ◆ Use anti-vibration equipment, clothing, and hand gear.
 - Use gloves with vibration-damping materials in the palms and fingers.
 - Use tools with vibration-damping handles.
 - Use anti-vibration isolators or damping techniques on tools (e.g., anti-vibration handle wrap).
- ◆ Keep hands warm and dry.
- ◆ Avoid using tobacco or stimulant drugs that may restrict blood flow to the skin by as much as 40 percent.
- ◆ Maintain a neutral posture so muscle fatigue is reduced and blood flow is increased.

Finding Out More



Fact Sheet 2: You should know about work-related musculoskeletal disorders.

Fact Sheet 3: You should know about carpal tunnel syndrome.



This fact sheet is a product of the DoD Ergonomics Working Group, was adapted from their June 2000 publication, *Preventing Work-Related Musculoskeletal Disorders in the Workplace*, and supersedes USACHPPM Fact Sheet 88-005-1299.

Written for both supervisors and workers, the fact sheet provides basic information on ergonomics. For more information, visit the working group's Web site at <http://chppm-www.apgea.army.mil/ergowg/product.htm>.