

Avoiding Injury While Using Tools: Tool use and planning the project



By Tamara Mitchell

Once you have selected the appropriately designed tools for your project, there is still a lot to consider to avoid serious injury. This is the “user” part of the job. In many cases, you need to think creatively to modify the task to make the job less stressful.¹ Hand and power tool use can cause injury not only to the fingers, hands, and arms, but also to the neck, back, and shoulders.² (Please refer to the first two articles for information on [Good Tool Design](#) and [Selecting the Right Tool](#) for the job.)

There are several major reasons why muscle, tendon and ligament overuse occurs when doing home improvement projects. First, people who sit all week are not typically in shape to do many of the manual labor tasks required. Muscle fatigue can set in quickly; long before the task is done. If you work through muscle fatigue and continue with the project, muscle soreness the next few days is highly likely and overuse injury is a definite possibility.

Secondly, many home improvement tasks require strenuous use of the hands and forearms; the same muscles and tendons that have been used all week on the job. This means that the muscles and tendons don't get a chance to heal on the weekend. Instead, they are overused. On Monday, when back at work, hands, arms and backs start out fatigued. “The job” gets blamed for problems that are cumulative.

Thirdly, people often don't think through a project or a task to determine the least stressful way to accomplish it. It is often a matter of just picking up a tool and getting started. But making simple adjustments to the position of your body, how you schedule the project, even how you hold a tool, can make a huge difference in how you feel at the end of the day or the end of a job. Sometimes awkward postures cannot be avoided, such as many plumbing or electrical tasks. In these cases, it is even more important to take breaks and pace yourself to avoid permanent damage to your body.

In this article, you will learn how to modify your projects to reduce risk of injury. The most important injury prevention principle is to respect feelings of discomfort or pain. Do not work through pain, even though the task is not done. Your body is less likely to recover from an injury if you do not treat your initial discomfort. It is also very important to change positions, stretch to ease stiff muscles, take short breaks, or change tasks.²

Standing or sitting in the same position can cause stress to the spine as well as muscle fatigue and pain. Finally, when using tools, do your best to avoid:

- awkward postures
- force
- contact stress
- cold
- vibration

Tool Use

Awkward postures

Awkward postures include:^{1,3}

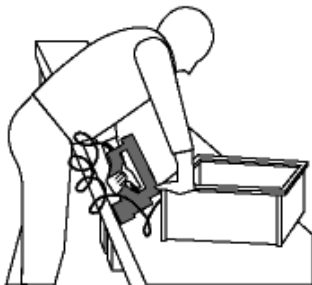
- Prolonged positions
- Using a poorly designed tool
- Holding a tool in an awkward way including using bent or rotated wrists
- Repetitive movements
- Excessive force
- Pressure or stress on soft tissues such as the palms of the hands or fingers (contact stress)
- Environmental conditions such as heat, cold, loud noise, and poor visibility
- Vibration

Body positioning affects the ability to apply force to a hand tool and to complete a job without injury. For example, you are able to apply more force when your arms are close to your body rather than extended away, and your dominant hand is stronger than your non-preferred hand.⁴

To avoid awkward postures and to decrease stress on the body:

1) Become aware of your posture while working.

- It is best to maintain the natural curve of the spine whenever possible: keep your shoulders relaxed and even with hips, ears in line with shoulders, chin tucked slightly inward, and pelvis shifted forward to allow hips to align with ankles.
- When doing tasks that require the body to be in a strange position, counteract the stressful posture by stretching in the opposite direction.



2) Move the work toward you, use clamps, and rotate or move work to a comfortable height to avoid unnecessary stress.



3) Avoid twisting and bending motions that exert pressure on the spine's discs.² Rearrange the work, or find a way to rest in a comfortable position while working in an awkward position.

4) Position your work directly in front of your body and close enough to avoid reaching.² Clear clutter that is in the way.

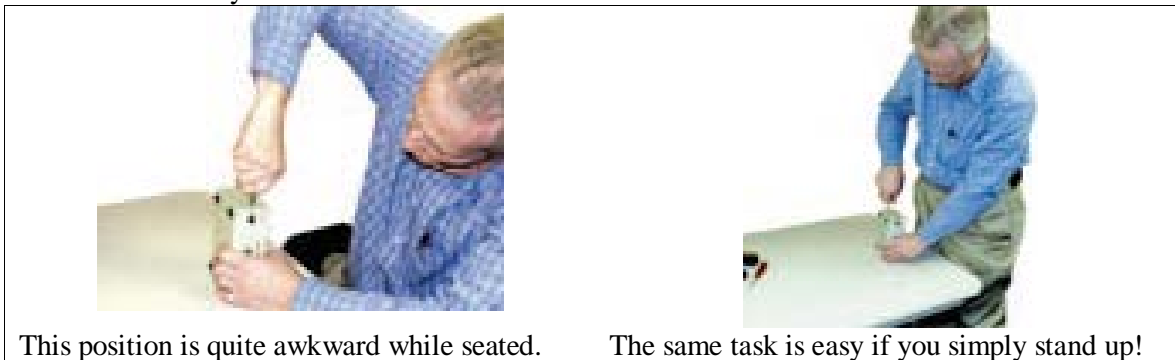


Move the work or yourself so you don't have to reach!



Stand on stool or ladder to avoid reaching overhead.

- 5) Keep your arms below shoulder level when possible. A simple change in position can make a huge difference. Go up a rung or two on the ladder to avoid reaching overhead with heavy tools.



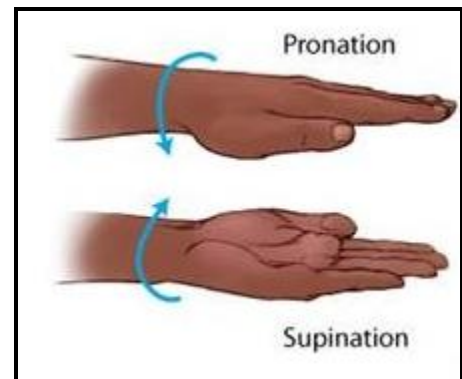
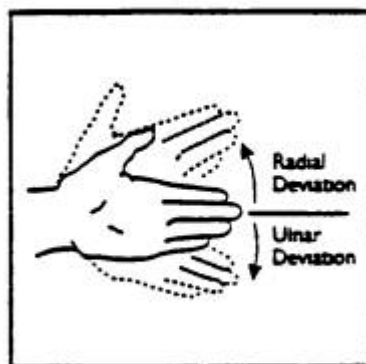
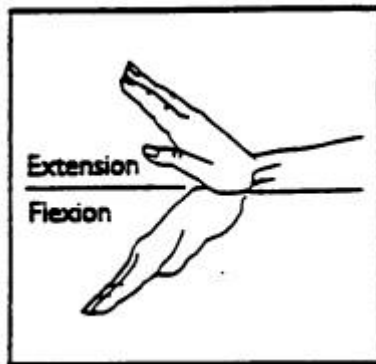
This position is quite awkward while seated.

The same task is easy if you simply stand up!

- 7) Install anti-fatigue mats for standing tasks and move around periodically.² Avoid standing still in one place.

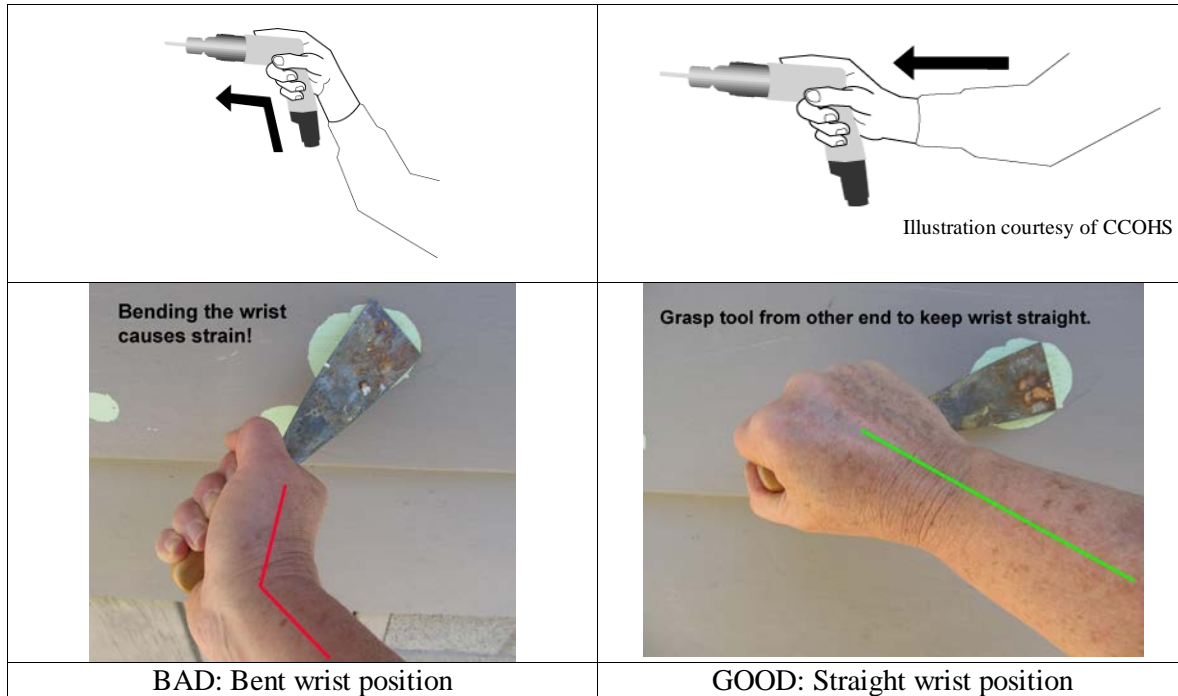
Awkward wrist positions

The “handshake” is a neutral wrist position where the wrist is not extended or flexed, deviated to the left or right, and the arm is not pronated inward or outward. Research is conflicting as to what wrist position provides the greatest strength, but in general, deviation in any direction more than a few degrees should be avoided.^{5,6}



To avoid awkward wrist positions and to decrease stress on the body:

- 1) Tilt an object to avoid bending the wrist, or stand on a stool or ladder to reposition your body.¹
- 2) Use tools with bent handles; bend the tool, not the wrist.
- 3) Change how you hold a tool if it is requiring you to bend your wrist in any direction and a bent tool is not available or appropriate.



- 4) Use light weight tools whenever possible.¹
- 5) Use both hands instead of one to lift.²
- 6) Keep elbows low and slightly bent when using heavy tools.¹

Force

Using unnecessary force to complete a job increases the risk of injury. To decrease force:

- Use the longest tool for best leverage.¹ Excessive movement of any type can stress the spine, neck or back.¹
- Use a vise or clamp to grip or stabilize an object instead of holding it with your hand.¹ For example, use vice-grips rather than pliers when gripping is required.¹

Contact stresses. We've already covered contact stress as it applies to short tool handles pressing into the palm of the hand, but it also refers to pressure from other sources such as resting the arms on the edge of a counter while working or kneeling to work. Either position the work so that it is at a different height or use a kneeling pad or knee pads in the case of kneeling. There are usually ways to avoid contact stresses which can result in bruising, reduction to circulation, restricting movement of tendons, and pressing on nerves. Be aware and avoid contact stresses!



Picture courtesy of www.improvementscatalogue.com

Cold

Excessive cold can affect manual dexterity and circulation.¹ To minimize the impact of cold, change work location, wear gloves and warm clothing, or use a space-heater.¹ When working outdoors, portable propane heaters are a comfortable heat source in extreme weather.



Picture courtesy of www.MrHeater.com

Vibration

Power tools that transmit vibration into the operator's arm and hand or leg and foot can cause serious injury, such as Raynaud's Phenomenon. Symptoms include aching in the affected tissues, tingling sensations, and numbness and whiteness in the fingers or extremities due to restricted circulation. This disorder is discussed in detail in our article on Nerve and Circulation Problems, http://working-well.org/articles/pdf/rsi_related.pdf. Vibrations from percussive tools such as riveting tools, grinders, pneumatic hammers and chain saws can affect the whole body.¹ As we discussed in the article on [Tool Design](#), choose tools that have been designed to dampen vibration, but also limit exposure to vibration by taking frequent breaks and limiting the time spent using vibrating tools. Share the job with other people so one person is not exposed to too much vibration. If this isn't possible, schedule the job over a period of days rather than doing a marathon session that can permanently damage your body. Vibration not only directly damages tissues and causes muscle contractions, it resonates various frequencies throughout the body that results in further damage.⁷

Job design and work pacing

For jobs requiring the use of vibrating tools, awkward positions, repetition, or force, take lots of breaks, have multiple people trade off using the tool, and limit the duration of the task each day.¹

One of the biggest problems of weekend warriors is the limitation of time. It's common to block out one weekend to tackle a big project and then to prepare for it (for example, asking for help from others). Therefore, there appears to be no option other than completing the task. Typically there is no plan for pacing work or dealing with fatigue. Unfortunately it only takes one or two hours for muscle fatigue to develop, but the commitment to continue over rides the symptoms of overuse (i.e., aching, burning, soreness, stiffness and, in the worse case, pain). A serious injury results when people push themselves beyond their limits.

Be realistic at the outset of the project:

- 1) Break up the project into smaller steps to be accomplished over a longer period (i.e., several weekends).
- 2) Underestimate your capabilities and you'll probably still find a big job is bigger than you expected! By designing the project so you don't expect to accomplish everything all at once, you can stop when your body says it's done.
- 3) Prepare to wrap things up so they'll be livable in temporary mode until you can return to the task. Even working one hour on the project each day after coming home from work is a good option that keeps things moving forward without straining yourself on a weekend marathon.
- 4) Ask a friend or two to help you and later you can help them with a big project. It makes life easier and friendlier for everyone!

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