

Avoiding Injury While Using Tools: Selecting the Right Tool



By Tamara Mitchell

It is important to use a tool that is designed for the particular task. “Tool junkies” can go nuts buying lots of tools for specific jobs, and it is nice to have a variety. However, spending money on a top quality multi-purpose tool for general tasks is probably the most economical way to solve everyday problems. If you have one big job that could be made a whole lot easier with a specific tool, it makes sense to get invest in a specialized tool because it will reduce overall fatigue as well as wear and tear on your wrists and hands that accumulate to cause Cumulative Trauma Disorder (CTD).

Power tools vs. non-powered hand tools

How does a person decide whether to use a power tool or a non-powered hand tool? Frequent and repetitive use of non-powered hand tools increases the risk of CTD.^{1,2} Replacing hand tools with power tools transfers the repetitive motions, the twisting actions, the forces, and the power required to a tool that simply requires being held in position.² In some cases, however, holding a large heavy tool that may require adjustments and bit or blade changes for a few simple tasks might cause more strain and risk than simply picking up a hand tool and getting the job done quickly and easily. There are other instances where a large power tool will simply not fit into a tight space or at a particular angle. In those cases, clearly, the use of hand tools is the most appropriate or the only choice.

In some cases there are many different tools on the market that can accomplish a difficult, time-consuming, or distasteful task. Removing exterior paint from a house that has many layers of chipped, flaking, and/or blistering paint is one of these jobs. There are hundreds of hand tools, scrapers, power grinders, drill attachments, heat guns, etc. that are marketed and it is baffling to know what to use. In addition to the strain on hands, arms, and shoulders, breathing the fumes or dust from old lead-based paints, sawdust and chips, and dangers of handling this equipment at the top of a tall ladder can add many other health hazards. Sometimes the only way to find out what will work best is to buy a few tools and try them, but it is also possible to search the internet for product reviews and professional testers who try various products to accomplish a job. In the case of paint stripping, ThisOldHouse.com had an article on many approaches and they found a non-toxic liquid stripping compound that worked like a charm.³ They also found an infrared heater that did an excellent job of stripping paint.³ In fact, the paint stripping compound mentioned in the article is no longer available, but there are similar products available. Neither of these solutions may be in the budget, but the point is, it is possible to get some ideas of easier ways to accomplish a task by taking some time to research it first!

Non-powered hand tools

Before picking up a tool, take a moment to evaluate the task. Shown below are two examples of selecting the right screwdriver. It is best to have a variety of tools at hand so that you can select the most appropriate tool for the current application. Not having choices may mean you either have to stop working to go get another tool or you will use a tool which causes hand or wrist

strain. Let's face it, we are not likely to stop working on a job just because we need a different screwdriver, so just pack a variety of sizes and lengths in your tool box!

	
<p style="text-align: center;">Pinch grip</p> <p>Using too small a tool in a tight space like this requires a pinch grip that means you have much less power to do the job and it requires more force and strain on your hands.</p>	<p style="text-align: center;">Power grip</p> <p>The same job, using a longer tool means you can use the power of your whole hand and arm rather than just your fingers. The job becomes quite easy with the right tool!</p>
	
<p style="text-align: center;">Long-handle tool</p> <p>In this case where space is limited, using a long-handled tool requires the wrist to bend at an awkward angle.</p>	<p style="text-align: center;">Short-handle tool</p> <p>For this job, a short-handled tool is a better choice. The whole hand can reach into the space with the wrist straight, grasping the tool handle with the hand and turning with less strain and greater force.</p>

Illustrations and information courtesy of Ref. 4

Power Tools

Cordless vs. corded is a matter of personal choice. From the stand point of ergonomics, cordless probably has a bit of an edge because the tools are lighter weight and there is no drag or pull from the cord. The difference is probably small, so the decision about cordless vs. corded is generally based on the task to be performed.

With a cord, there is always a constant supply of power that never runs out and in most cases, these tools are more powerful.⁵ With cordless tools, power decreases as they use up energy so it is necessary to keep a supply of charged batteries on hand, and the batteries cost quite a bit of money.⁵ It is interesting to note that, while Lithium-ion batteries provide a lot more energy overall, Nickel Cadmium (Ni-CD) and Nickel Metal Hydride (Ni-MH) batteries maintain a fairly constant charge until they are close to being discharged, while Lithium Ion (Li-ION) batteries have a gradual and steady decline in power over time until the end when they quickly die.⁶ So, although Li-Ion tools are a great breakthrough in terms of longevity, speed of charging, and weight, they do sacrifice overall power.

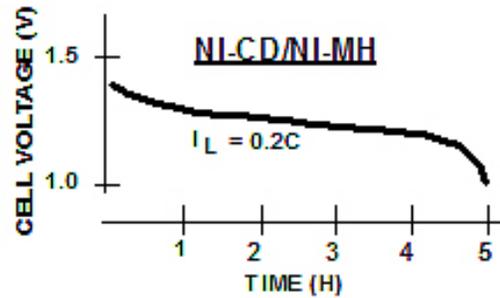
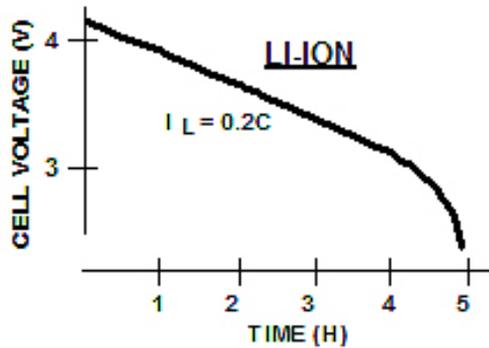


Illustration courtesy of Reference 6

Cordless tools are generally lighter weight, they can be used any place rather than requiring an outlet, and the batteries are often exchangeable with many other tools made by the same manufacturer, so when you buy a combination kit, you can save money.^{5,7,8} There is always a danger of damaging a cord or plug when using a corded tool, which can put the tool out of commission until repaired, and trip hazards exist with extension cords.⁸

Overall, it is important to weigh the options when purchasing or selecting a corded or cordless tool. For simple home improvement projects, a cordless tool is generally a good choice. For projects that will require hours of use and lots of power, a corded tool is often best.

Drill Options

The power drill is the most-used tool in almost everyone's arsenal of power tools. With most power tools, there are various options available, but nothing like the options available for the drill/driver/impact driver/hammer drill. It can be baffling, so here is a quick overview of these tools in determining which tool is right for your job.

Drill drivers have all of the features of a regular drill *and* they have a torque clutch.⁹ A numbered ring just behind the chuck can be adjusted to vary the maximum amount of torque that is delivered to the screwdriver tip.⁹ The highest setting is appropriate for drilling tasks and it gives you the most power. For screw driving, the torque should be set to just the amount that allows you to drive the



screw, then the clutch starts slipping and you hear a gravelly sound. The clutch should be set to the lightest setting required to just drive the screw to the proper depth and then the clutch will start slipping to prevent stripping the screw head and overdriving the screw too deep. Also, when the screw is fully tightened or if the drill hits an obstruction, the drill jerks to a stop, causing strain on your wrists and hands. Most drill/drivers also have a high or low setting switch on the

top of the drill. The high setting gives you high speed, but the lower power setting is generally good when drilling holes or driving screws in soft wood or with a pilot hole.¹⁰ The low setting rotates slower, but gives you maximum power such as when driving large screws into hard surfaces.¹⁰ In addition, most drill drivers have variable speed switches on the trigger, so it is possible to vary the speed of rotation by depressing the trigger part of the way or fully.¹⁰

Our recommendation is to spend a little more money to buy a drill driver. Buying a tool with a keyless chuck is also a big advantage in saving time and strain on wrists and hands.¹⁰ Most drill drivers have keyless chucks these days, but there are still manufacturers offering keyed chucks.

For small to regular-sized jobs, this drill/driver has a lot to offer and is a good example of bending the tool rather than your wrist. It is larger and much more powerful than a cordless screwdriver with a lot more to offer. The compact head can rotate and lock to five different positions 0° to 90°, electronic torque control, quick change ¼ " chuck, variable speed trigger allowing the use of multiple fingers, 12 V Lithium Ion battery, and weighing only 2.2 lb. For some jobs, it may not have enough power (80 in. Lbs.), but it can handle most things except possibly more demanding hole drilling with large spade bits or loosening bolts. This tool doesn't have a light and obviously it doesn't have a level because of the adjustability of the head which may be disadvantages in some situations.

Bosch PS10BN



Impact drivers have an internal hammer that assists in tightening and loosening tasks and prevents the twisting of the hands and wrists under a heavy load.¹¹ In fact, they have up to three times the twisting force or torque of conventional drills. They are lighter and smaller (12-14.4v), so are less fatiguing than conventional drills, but they are also slower, may require special bits, and are extremely noisy.^{9,11} If you have a lot of tightening and loosening tasks to perform consider using an impact driver to save your hands and wrists, but please wear hearing protection.

Hammer drills are somewhat like impact drivers, but they are specialized for drilling into masonry.^{12,13} They have a jackhammer-type of action that drives the drill bit into the hard surface.^{12,13} The hammer mode can be turned off so that it can be used as a normal drill/driver, but they are heavier and are recommended only for those who expect to be drilling a lot of masonry surfaces.^{12,13}

Cordless screwdrivers

Most cordless screwdrivers are adjustable to operate at either straight or right angles, which permits work in tight spaces where a regular drill won't fit. Unfortunately only a few cordless screwdrivers have a torque control. This can cause overdriving screws and that puts torque on the wrists and hands.¹⁴ Consider the Bosch drill/driver discussed above which is much more versatile, can fit into tight spaces, has torque control, and is generally a more practical tool than a simply power screwdriver.

Power Tools

When purchasing power tools, the things people generally look for is *power* to do the job and, for cordless power tools, *length of charge* and *speed of recharging*. The evolution of more user-friendly tools is being facilitated by users who are paying more attention to how tools feel in their hands and how they feel once they have finished using them.¹⁵ Tool manufacturers have maximized run times and durability, so advances in comfort and ergonomics will distinguish them from competitors.¹⁵

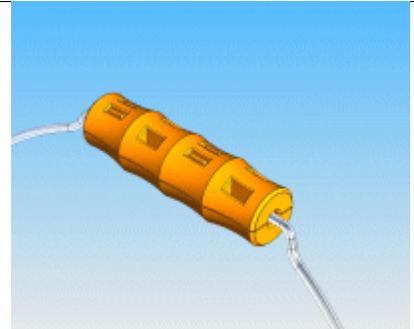
Unfortunately, horsepower and run time are very important features for most users, so tool design is not the primary consideration. Consequently, users will develop work-arounds for poorly designed tools that increase the risk of injury.¹⁵ For example, instead of using an uncomfortable tool handle, users may grip the tool by the motor housing, which is not how it was designed to be used.¹⁵

When purchasing a power tool, try different models and manufacturers to find the one that is the most comfortable and that minimizes vibration.

We do not want to diminish the importance of horsepower and run time, but they do not have to be sacrificed for good tool design. Using an underpowered tool and/or one that doesn't hold its charge long enough to complete a task causes frustration and additional strains. For instance, using an underpowered drill increases the amount of time needed to complete the task. The user will use more force as the frustration level increases. However, a high-powered tool will require greater force to control, even though it may get the job done faster.¹⁶ If the tool is overpowered for your strength, you need to find the right tradeoff so you can get the job done easily without fighting the tool.¹⁶

Other things to make the job less hazardous, painful, etc.

Snappy Grip are contoured handles that come in two pieces, but snap onto any wire handle to distribute the weight more evenly and allow a much more comfortable grip.
Available from www.Snappygrip.com
Sample 2/packs available free (\$2.00 shipping)



Quick change chucks and bits can save a lot of hassle and strain when you are drilling holes, then driving screws. If you happen to have two drill/drivers, you can load one with the drill bit and the other with the screwdriver bit, but with this quick-change chuck, you can make the swap easily without constantly torquing your wrists and taking the time to tighten, loosen, and adjust the chuck in your drill/driver. A strong magnet holds the bits or drills in place.
Snappy 1/4" Quick Change Drill Bit Adapter
Available on eBay.com from Bowerstool **\$14.**



And, of course, that means you will need to purchase the quick change drill bits to work with the magnetic chuck, but it is a small price to pay for all the time, aggravation, and strain in constantly changing drill bits and drivers.
Available on eBay for about \$25.



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