

# Chapter 4: Home Improvement

The cost of building materials has risen 200% in 10 years. The cost of remodeling has doubled to \$250 per square foot. No wonder many of us *do-it-yourself* when it comes to home improvement projects.

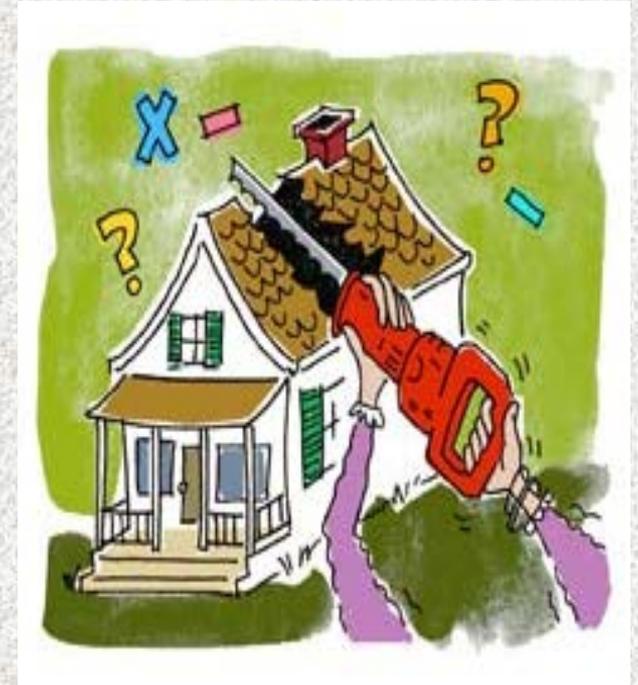
After a 40-hour workweek, are you really up for ...

- Scrubbing, sanding and painting 18 doors and the dust and vapors that go with it?
- Hanging 14 cabinet doors with hinges that involves 168 hand movements?
- Groveling on your knees wielding a razor sharp knife and inhaling dizzying fumes to lay floor tiles?

Most home improvement projects expose you to postures and motions, forces and vibrations unlike anything you experience in an office environment.

*“is do-it-yourself actually doing-you-in?”*

Check out some user-friendly tools and techniques to solve this conundrum.



# Home Improvement

## The *Ergonomic Risk Factors*

- Excessive forward trunk bending when working at floor level
- Excessive pressure on the knee joints when kneeling on floors
- Awkward hand/wrist postures due to tool handle size, shape or design
- Forceful lifting, carrying and placing of heavy loads
- Awkward arm, neck, shoulders and back when reaching too high, too low or too far forward
- High impact and forceful motions like hammering
- Vibration exposure using power tools



*Using saws, cutting tools and working from ladders present safety issues too!*

# Home Improvement

## *Essential Tips & Tools*

### **Painting, Sanding & Wallpapering**

- Always wear a vapor/dust mask and protective eyewear when sanding, scraping and spray painting
- Select paint brushes/rollers that fit your hand and have good grips
- Use a brush or roller size appropriate for the scale of the project – saves time and materials
- Don't hold the paint can in your hand- use a shelf or support to hold it
- Don't bend or twist as you paint...get close to and face the target
- For high or overhead work (ceiling), make sure you have safe footing (ladder/scaffold) and long handled extension tools
- Use a portable table to stage materials as you work to minimize bending



# Set Up a Work Bench for Painting

*...to elevate materials and minimize bending*



Whether you're working indoors or outdoors, set up a work bench so you're not constantly bending to reach your paint or tools.

You also won't step in or knock over the paint can or tray... **how many of us have done that?#!**

# Select the Right Painting Tools

*...too minimize repetition and awkward postures*



Painting a large surface area with a brush requires 5 times more strokes and greater time holding awkward postures than when using a paint roller.



For large surfaces and all overhead work, a paint roller with an extension pole is probably your best bet.



If the painting project is a big one, considering renting a paint sprayer to minimize repetition and awkward postures

\*\*Check out the new plastic no drip roller cradles

# Select the Right Ladder for the Job

*...to avoid overextended and unsafe postures*



This step ladder is obviously not tall enough for her to reach the ceiling trim without standing on the top which is a safety no-no.



This ladder is tall enough to reach but is placed at a wide angle which increases the likelihood of it sliding out from under him. When working at excessive heights, you should always have someone to spot and assist you.



This guy has the right idea for painting a tall ceiling. He rented some scaffolding for a week which was cheaper than purchasing a good ladder. Scaffolding is safer and far more efficient to work from than a ladder.

Michelangelo used a scaffold for painting the ceiling of the Sistine Chapel. They say, he often ate and slept on it to keep the project on track...**that's efficiency!**



# Select Paint Brushes that Fit You and the Job *...to minimize grip forces and repetition*



Select the right brush size to fit the surface area you need to cover. The larger the brush you can work with, the fewer strokes necessary.



Paint brush handles are usually contoured nicely to fit most hand sizes and there's often a few different sizes to select from.

A smaller hand might just require a smaller brush size, while a very large hand might require applying a foam pipe sleeve available in most hardware stores.

# Select Good Paint Rollers

*...to reduce forceful hand and arms motions*



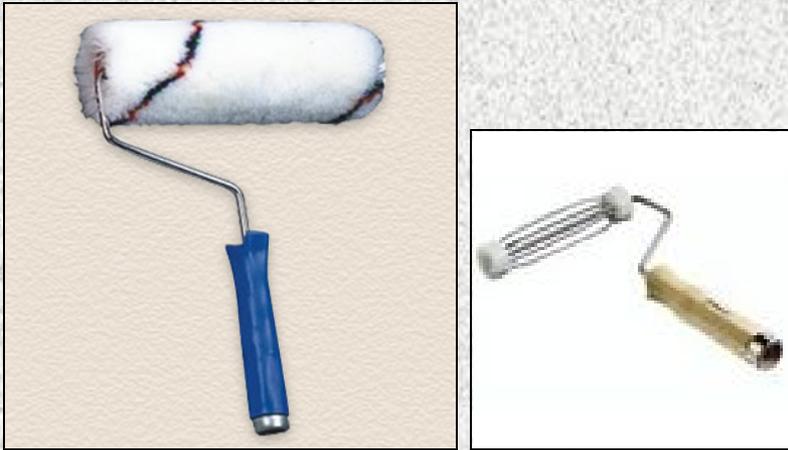
Notice how he must elevate his arms to reach the ceiling and what an awkward hand grip he has on the roller handle. Also notice how much rearward back and neck bending is involved when painting overhead.

You can make a neck pillow with a rolled towel with ties at each end that you can strap to your belt like wearing suspenders



This person has an adjustable roller handle to easily reach the ceiling, a good hand grip to stabilize the roller and reduce grip forces. He also has a neck pillow that's tied down at his waist so when he bends back the pillow supports his head/neck..

# Select Paint Rollers that Fit You and the Job *...to minimize grip forces and repetition*



In general, most rollers have nice grip characteristics in terms of handle size and contours.



Unfortunately, most long handled rollers are usually just equipped with a narrow broom handle with poor grip characteristics. This can be a problem because of the greater torque forces on the hands and shoulders when working at a distance forward or overhead.

# Select Paint Rollers that Fit You and the Job *...to minimize grip forces and repetition*



If you're going to be doing a large painting project that involves high walls or ceilings, it would be wise to look for a roller with a handle grip as shown at left...ideally, adjustable in length.

Check with your paint dealer to see if they carry foam or rubber handle grips to convert a standard broom handle into something like this. And check to see if they have longer handles or extensions to reach the heights you'll be working at. If not, your best bet is to apply a foam pipe sleeve to increase the handle diameter.



*A good grip and the right length  
can reduce your hand forces and the torque  
forces on the arms and shoulders by 30 %*

# Use Safety Glasses or Goggles

*...for avoiding eye injuries*



Goggles and a vapor mask are essential when sanding and spray painting.

When sanding or painting, particularly overhead, it's essential to wear safety glasses to minimize getting dust, debris or chemicals in your eyes.

# Home Improvement

## *Essential Tips & Tools*

### Hammering / Nailing

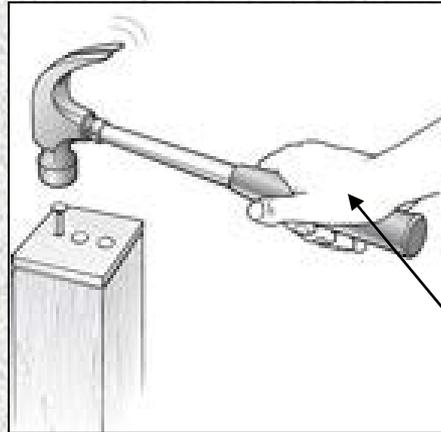
- Look for a hammer that
  - fits your hand size / strength and feels balanced
  - has good handle grip with textured or rubberized surface
  - is weighted to the type of work you are doing- ask your hardware person!

Be wary of hammers with too much curve in the handle; they can be good for work below the waist but can contort the wrist when hammering above the waist.

- Use open tip gloves to make it easier to handle nails.
- To reduce impact forces and vibration, use anti-impact gloves or wrap the handle with anti-vibration tape
- If it's a long term project, consider a hammer with a tuning fork handle to significantly reduce impact force and vibration to the hands- *Craftsman* brand at \$20
- If it's a one time, big job, think about renting a nail or stapler gun
- Always wear safety glasses when hammering, nailing, drilling or sanding



# The Problem with Hammers and Hammering



## NOT GOOD

- Wrist is bent back
- Wrist rotated/twisted
- Applying impact force

A conventional straight handled hammer requires that you bend your wrist back and sideways while applying high impact forces ...a bad combo.



# Hammers with Good Grip and Handle Designs *...to minimize force, awkward postures and hand forces*



***Look...*** this 20 degree angle in handle design significantly reduces wrist deviation (sideward bending), wrist extension (bent back) and the resulting wear and tear on your hands.

# Hammers with Good Grips and Handle Designs

*...to minimize grip force, awkward postures and impact*



Hammer with anti-shock rubber handle to improve grip and minimize stress on hand and wrist.



Craftsman hammer

Hammer with tuning fork handle to minimize impact forces and associated stress and slight handle curve to improve hand postures.



A nice straight wrist grip using the hammer

# Home Improvement

## *Essential Tips & Tools*



### **Flooring**

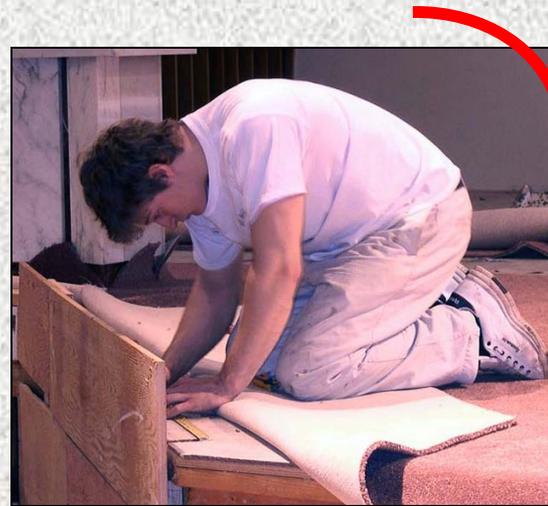
- If you're laying carpet, vinyl or wood flooring, tiles or refinishing floors, your best investment will be knee pads
- Sharp cutting tools are essential for carpet and vinyl
- Since you'll be on your knees most of the time, a small dolly can be efficient for moving tools and materials around with you – try a child's wagon
- Talk to your hardware store rep about the latest and safest methods and tools for adhering the materials you are using

# Flooring Projects

*...protect your knees and back!*



These guys are rolling out carpet doing a little too much bending. They should be bending at the knees or on their knees with pads.



Thank goodness he is resting on two thicknesses of carpet! Working in this position for any prolonged length of time is not good.

# Flooring with good back curvature ...but what tools are missing here!



He's laying carpet in a diagonal Half-kneeling position to minimize trunk bending... *however he should also be wearing knee pads!*



He's sanding and finishing wood floors using most of the right stuff:

- Diagonal half-kneeling to minimize trunk bending
- Knee pads to minimize pressure
- Mask to minimize inhalation of dust/vapors

*But safety glasses to protect his eyes would also be a plus when sanding.*

# Flooring, Decking or Paving Projects *...protect your knees with padding*



Light-duty foam kneepads for a few \$ are adequate for short-term projects



High density rubber kneepads for long-term projects at \$20 are a good investment.



A portable foam kneepad, carpet samples or even a rolled towel can help.

# Home Improvement

## *Essential Tips & Tools*



### **General Hand Tasks/Tools**

- Make sure saw and cutting blades and drill bits are sharp to minimize force
- Keep tools that have moving parts in good working condition and well lubricated
- Select tools that fit your hand size, strength and feel well balanced
- Use pliers and grips that have “slip jaw” features that are self gripping to reduce your grip and hand force
- Use pliers, grips and scissors that have spring loaded returns
- Use electric or battery powered screw drivers to avoid torque
- Use wrenches with ratchet features to reduce repetitive twisting
- Look for Teflon coated hand saw blades and designs with 2-way teeth that cut in both directions - they can be twice as fast and cut repetition in half

# Select Good Grips and Handle Designs *...to minimize grip forces*

Slip jaw wrench  
- self lock gripping



Traction tape applied  
to wrench handle



Large handle  
cutting knife



T handle screw driver  
or Allen wrench



Easy grip pliers  
with rubber handles

Each of these tools includes handle designs or features to improve your grip and minimize your hand forces.

Look for similar features on any new tool you purchase so you can do the job with less wear and tear on your body.

# Select Good Grips and Handle Designs *...to minimize grip forces*



Anti-vibration tape  
applied to saw handle



Fore and aft handle grips to minimize grip force and improve your precision. Many of these tools also include trigger locks so you don't have to hold your finger depressed all the time.

# Wear the Right Kind of Gloves for the Job

*...to protect, minimize shock, improve your grip*



Standard duty leather and cloth gloves can protect you from splinters, cuts and abrasions.



Heavy duty rubber gloves can protect you from volatile chemicals.



Open-tip gloves can protect and improve your grip while still allowing you to handle fine objects like nails and screws

# Use Gloves to Reduce Impact and Vibration *...when using saws, drills, hammers and nailers*



Closed tip gloves for drilling, sawing and jacks



Anti-vibration and impact gloves are shown to be effective in reducing muscle /tendon and nerve dysfunction.

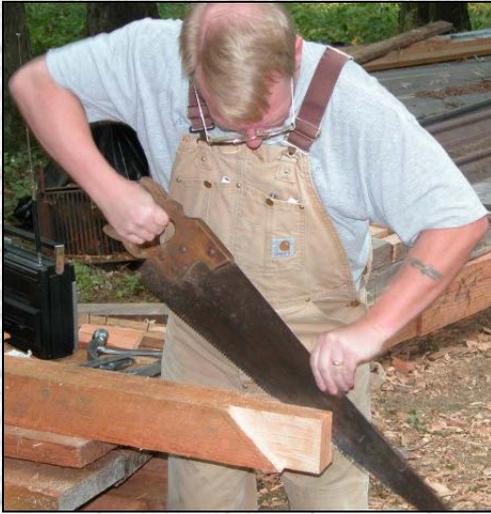
Chase and Thor are among the best brands of those studied.

Open tip for gloves gripping hammers, nailers and wrenches



# Use Power Tools Versus Manual Ones

*...to minimize repetition and awkward postures*



While manual tools do come in handy for special tasks, they can require some pretty awkward postures and motions.



In contrast, power tools reduce repetition, the use of force and awkward postures ...or at least the exposure time of holding awkward postures. Plus, they're faster and far more efficient!

# Use Smart Tools- Manual or Powered *...to minimize repetition and awkward postures*



These are conventional manual saws with 2-way teeth which means you get double the cutting action with each stroke to reduce repetition and forceful motions.



This saw has the same flexible cutting capability as a conventional manual saw but it's electric which minimizes the repetition, awkward postures and forceful motions involved.

# Work at the Right Height

*...waist level to minimize trunk bending*

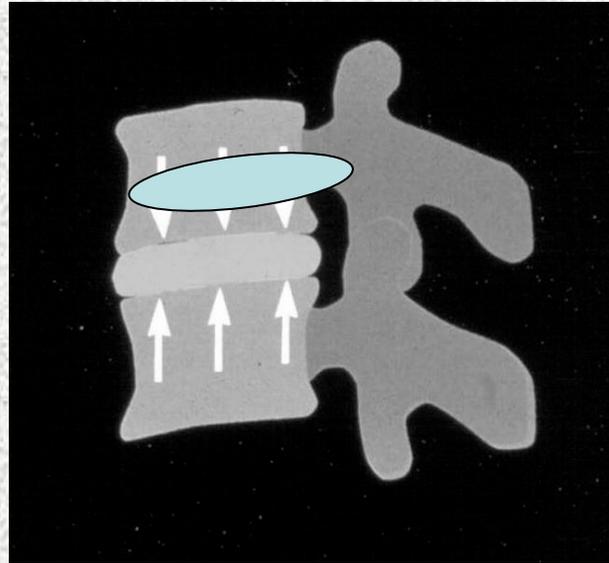


Use saw horses



Use garbage cans

*The 1<sup>st</sup> step in every Home Improvement project that involves carpentry, should be to set up a work bench so you can work at waist level to minimize bending your trunk/low back. You can use anything from stacked milk crates to fancy adjustable stands to get yourself working off the floor.*



While this fellow is using the saw below waist height, he lowers his body in space by flexing at his knees and hips, keeping his back relatively straight. The pressures on the discs in his spine (lozenges filled with fluid) are fairly even and that's **GOOD!** It's all in the technique.

# Select a Good Work Bench

*...to minimize bending your trunk*



Folding aluminum bench



Folding work bench with crank height adjustment



Saw horse kits- apply brackets to 2x4 studs to create bench base. This kit even includes a hanging work caddy so you can place your tools above the floor.



Folding plastic saw horses. Use an old door or sheet of plywood for the bench top.

Avoid bending your back when working low  
*...bend your knees/hips or use diagonal squat!*



Incorrect positions

Correct position

# Avoid elevating your arms when working overhead...*use a step stool or ladder!*



While using a drill high overhead, she must elevate her arms, bend her head back and arch her low back. Is there a better way?.....



YES - She realized how tiring and stressful that posture was....

She's gone outside to retrieve the ladder that will allow her to work more comfortably at the higher height.

# Always Have a Secure Footing for the Task!



Whether you're hanging a fixture or just changing a light bulb, always have a stable and secure footing to avoid any chance of falling when working above the floor level

- 40 % of all non-fatal accidents at home are the result of falls
- 46% of all accidental deaths at home involve falls from heights
- 60 % of these accidents involve the use/misuse of a ladder

# Use the Right Tool for Working at Any Height *...to avoid falls and serious injuries*



Step stool with handle for working a few feet above floor level



Step ladder with safety handle for working several feet above floor level



Mobile, portable step stool for working a few feet above floor level

Got gloves,  
safety glasses,  
knee pads and  
a dust mask?

If so, you're  
ready to get to  
work on your Home  
Improvement project!



# Where to find more information

## Resources- ergonomics and safety guidelines

[www.agrabilityproject.org](http://www.agrabilityproject.org)- selecting ergonomic hand tools

[www.usernomics.com](http://www.usernomics.com)- ergonomic tips for home improvement

[www.working-well.org](http://www.working-well.org)- ergonomic guide for home improvement

[www.chiropractic.on.ca](http://www.chiropractic.on.ca)- tips for home improvement projects

## Sources- tools with good ergonomic features

[www.fiskars.com](http://www.fiskars.com)- ergonomic hand tools

[www.craftsman.com](http://www.craftsman.com)- hand tools and tuning fork hammer

[www.mainstsupply.com](http://www.mainstsupply.com)- ergonomic hand tools

[www.oxo.com](http://www.oxo.com)- ergonomic hand tools

[www.smithandhawaken.com](http://www.smithandhawaken.com)- ergonomic hammers and tools

[www.ebuild.com](http://www.ebuild.com)- power tools

[www.goodgrips.com](http://www.goodgrips.com)- ergonomic hand tools

[www.chaseergo.com](http://www.chaseergo.com)- anti-vibration gloves

[www.biocurve.com](http://www.biocurve.com)- ergonomic hammers and hand tools

\*\*Also check out hardware stores like Home Depot, Lowes, Sears, OSH and ACE. If they don't stock the tool you're looking for, they can usually order it for you.

