

Can you dig it?

The Ergonomics of Gardening

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Gardening is fun, it's great exercise, and you can do it for your entire life! Also, gardening and yard work are a part of healthy, active living. Heavy yard work like raking and carrying leaves improves endurance and strength, while other gardening activities can help increase and maintain flexibility. Gardeners consume a greater variety of vegetables more frequently than non-gardeners, which is also a healthy practice.¹ Farmers, who make this type of activity a career, have lower morbidity and mortality rates than the general working population, especially for cardiovascular disease and mental illness.²

The best part of gardening is that the benefits are not all in the body; they're also in the mind! Horticultural therapy is devoted to helping people heal physically and emotionally through gardening while working outside in the sunshine and fresh air, and with other people. Gardening can be an escape from the pressures of a job or other responsibilities.¹

Anyone who gardens will agree that it can be extremely hard work unless you limit yourself to a few potted plants on the deck. There are both traumatic and repetitive strain injuries (RSI) that can doom your gardening fun if you aren't aware and careful. Every gardener should read Barbara Pearlman's book, Gardener's Fitness: Weeding Out the Aches & Pains.³ It's a quick read and full of excellent advice on every aspect of gardening.

Traumatic Injuries

Traumatic injuries occur much less frequently than RSI, but they are often more critical. Most of the traumatic injuries experienced while gardening are due to improper use of power equipment and tools. More than 400,000 outdoor garden tool-related injuries are treated in emergency rooms each year.⁴ While these tools can reduce the risk of RSI by eliminating tasks requiring repetitive motions, such as sawing and digging holes, they increase risk of potential tool misuse and carelessness.

Repetitive Strain Injuries

Unfortunately data regarding RSI in gardeners is lacking. However, we can learn from the farming and agriculture industry research. Up to 40% of farm workers throughout the world experience RSI symptoms including strains of the hands, wrists, arms, shoulders, or neck.⁵ A study collecting data from matched populations of farmers and non-farmers found that farmers report significantly more RSI in the hands, forearms, low back, and hips than did the non-farmers.² They also reported more nocturnal problems. We can extrapolate that the common

gardener is at risk for similar strains on the body. This is confirmed by articles written by chiropractors and other experts in the field.^{6,7,9}

There are several large differences between weekend gardeners and career farmers, nursery staff, and landscapers. First, those of us who occasionally garden probably spend most of the week in sedentary jobs. Then we expect our bodies to perform the strenuous physical tasks associated with gardening one or two days a week. Secondly, we do not garden for eight or more hours per day. We have the freedom to limit the time we spend at each gardening task (even though we tend to forget this fact!).

Injury Prevention

People generally think that if they just had the right tools they would have no pain, whether they are sitting at a computer or doing a hobby. While it is true that the wrong tools will stress your muscles, probably 75% of the pain we suffer is due to our habits and attitude. In gardening, we often face very large, physically demanding tasks and set impossible deadlines to tackle them. Gardeners plunge into these tasks with great enthusiasm and unconditioned bodies. Then they return to work on Monday morning in excruciating pain. But this does not have to happen!

Traumatic Injury Prevention

These are some safety tips that may spare you from becoming a gardening casualty:

- *Back injury.* Back injuries are both traumatic and repetitive. Traumatic back injuries are usually caused by heaving lifting. Therefore, avoid lifting heavy objects by yourself. Get someone to help you lift and move them, and/or load and unload them into a wheelbarrow or garden cart.⁶ If you do move a heavy item by yourself, slide it off a bench or tailgate. While lifting, keep the item as close to your body as possible, carry it in front of you, and keep your spine straight. Alternatively, if possible, roll the item to its destination or onto a piece of tarp and drag it.
- *Ankle sprains.* Wear correct footwear for the job. Do not dig in sandals or soft shoes. Be aware of uneven ground, slippery surfaces, and obstacles.⁶
- *Cuts and wounds.* Wear heavy gloves, long pants, and a long-sleeved shirt to avoid scratches, cuts and punctures. Have a **tetanus** vaccination every 10 years. The bacteria that causes tetanus lives in soil and animal feces, and enters the body through open wounds. The bacteria is tough to kill with the usual antiseptics that treat wounds, people do not have a natural immunity to it, and it thrives in the absence of oxygen.¹¹
- *Fractures.* To avoid tripping, put equipment out of the way after using it. Use appropriate stepladders, position them correctly, and tie them off properly to avoid unbalanced falls. Wear a harness when pruning trees.⁶
- *Concussion.* Keep your tools tidy to avoid getting knocked on the head from standing on a hoe. Wear a hard hat if you climb trees.⁶

- *Poisons.* Be extremely cautious with chemical use. Read the labels and follow the instructions. Make sure all containers are labeled and kept in a safe place away from animals and children. When spraying toxic substances, stand upwind of the spray and use a respirator with an appropriate filter (not just a dust mask). Better yet, avoid the use of toxic chemicals and start gardening organically! Also be aware of natural toxins, such as Digitalis (foxglove), oleander, and larkspur.⁶
- *Legionnaires disease.* One form of the Legionellosis bacteria lives in soils and compost, so it is important to avoid breathing the dust from bags of potting mix, planting mix, soil, and compost.^{12,13} This is a potentially deadly infection with flu-like symptoms of fever, chills, cough, muscle aches, headaches, tiredness, loss of appetite, and/or occasionally diarrhea and vomiting. Occurrences of this disease are usually related to water sources contaminated with the bacteria such as cooling towers, air conditioning systems, whirlpools, room humidifiers, and ponds.¹³
- *Sunburn and dehydration.* Wear sunscreen and a wide-brimmed hat to protect your skin from the sun. Avoid dehydration by carrying a bottle of water with you while you garden.¹⁴

Power tool safety:¹

- Walk around the area where you will be working and remove any objects (e.g., rocks, metal, glass, or wire) that could damage equipment or cause injuries if caught and thrown by equipment, such as lawnmowers.
- Keep children away from power equipment. Children move quickly and are attracted to power equipment activity.
- Be sure that safety devices on the equipment are in place and functioning properly before starting work.
- Unplug electric tools and disconnect spark plug wires on gasoline-powered tools before making adjustments or clearing jams near moving parts.
- Handle gas carefully. Never fill gasoline tanks while equipment is operating or when equipment is still hot. Wipe up spills. Store gas in an approved container away from the house. Finally, never smoke or use any type of flame around gasoline.
- Never let young children operate power garden equipment. Teenagers should only be allowed to operate outdoor power equipment if they possess adequate strength and maturity to do so safely. A responsible adult should supervise them.
- Never work with electric power tools in wet or damp conditions.
- Be sure that extension cords are in good condition and are the proper size for the electrical current capacity of the tool.
- Use a ground fault circuit interrupter (GFCI). GFCIs come in four varieties, including one that can be used as part of an extension cord and another that can be wired into your home's electrical system.
- Ask that people approach you from the front while you are using power equipment so as not to startle you.
- Hire a professional to do a job that requires equipment you are not confident using. If you do decide to do the job yourself, know how to operate the equipment safely and correctly.

Repetitive Strain Injury Prevention

The most important rule in repetitive strain injury (RSI) prevention is to **never work through pain**. If your shoulder aches even before you start your pruning job, you should either postpone the task until your shoulder is better or ask for help. You will aggravate your painful forearms if you choose to pull weeds, and you will hurt your sore back even more if you lift anything.

RSI is a serious disorder for which there is no cure. You will develop chronic pain if you push yourself beyond your limits. It is very discouraging to not be able to make your garden look as good as you want it to, but it is even more frustrating when you cannot do anything because you are in too much pain. Therefore, listen to your body. Stop doing what hurts.

Keep your body conditioned, practice healthy habits, and use the right tools so you can be a senior gardener! It's better to change your approach now and still be able to dig at 80, right?

Conditioning

Even if you are used to a regular program of exercise, gardening requires strength and flexibility. If you don't train with gardening in mind, you will likely discover muscles you never knew you had!

Barbara Pearlman explains and diagrams numerous exercises you can perform on a regular basis to strengthen your body in preparation for gardening in her excellent book, Gardener's Fitness: Weeding Out the Aches & Pains.³

Please do not participate in any strengthening exercises if you already are experiencing pain from injury!

- *Back.* For low back strength and flexibility, work on strengthening core muscles, especially all of the abdominals. There are many excellent strength and stretching exercises to work on your abdominals, extensor muscles, hip flexors, and hamstrings.
- *Arms and shoulders.* Activities in the garden require lifting, reaching overhead, and digging with a trowel that can result in strain injuries if muscles are weak. To prevent this, strengthen them and increase your flexibility by working on your biceps, triceps, chest, rotator cuff and forearm muscles. *Do not do push-ups if your wrists hurt.*
- *Hand.* The hands are used extensively in gardening. Unfortunately, hand strengthening exercises to increase grip strength consist of gripping and squeezing. These exercises are not advisable for people who are experiencing any hand, wrist, or forearm pain. Therefore, do not do the recommended hand strengthening exercises in the Pearlman book if you have any hand, wrist or forearm pain. Focus on the stretches that will relax and lengthen these muscles and increase flexibility in these generally rigid body parts.

- *Knees.* Your knees are stressed when you squat or push a cart uphill. Strengthening and lengthening the quadriceps is important. There are several exercises to do before, during, and after gardening that will help you strengthen your quadriceps, release hamstring tension, and work on your calves and groin.³
- ✓ *Warm-up and cool-down* is as important in gardening as it is for any sport. Before gardening, go for a brisk walk around the block to get your heart pumping and circulation going.
- ✓ *Stretch.* Current research has shown that stretching before athletic activities does not prevent injuries and can actually damage muscles if done quickly.^{16,17,18} We recommend that you include similar motions that you will be doing in your gardening activity during your warm-up. Start with small movements and gradually increase to full range of motion.
- ✓ To avoid fatigue, stretch throughout the day as you are working. Stretch again at the end of the day, paying special attention to muscles you've used a lot.^{18,10,19,20} Slowly perform each stretch five times. There is a page of gardening stretches from well-known author Bob Anderson at the end of this article. Print it out and post it in your tool shed!¹⁹ Dr. Gail Dubinsky also has some great yoga stretches you can do while gardening.²³

Economy of Movement and Form

Unlike sports, nobody ever teaches you proper form in the garden. People just get out there and start digging without thinking much about the right or wrong way to dig. By learning a bit about body mechanics, you will not only save yourself pain and strain, but also your movements will be more economical, so you don't waste energy.

Bending and Lifting.^{3,10}

- When you lift heavy objects, squat and bend your knees, using your powerful thigh and buttock muscles, not your back muscles. When you bend over with your knees locked, you're actually picking up 50% of your body weight in addition to the weight of the object you're lifting. Bending your knees puts far less pressure on your back.
- Keep the object close to your body and center of gravity. This will cause much less strain on your back and will allow you to keep your arms close to your body and comfortably bent.
- Stand upright when working at ground level or when using long-handled gardening tools such as hoes, spades and rakes.
- Contract your abdominal muscles when bending over to lift something heavy.
- Keep your feet apart rather than close together.
- Garden in raised beds if possible. Move close to the object you are working on.

*Carrying.*³

- Use larger arm muscles rather than pinch-gripping heavy objects (like pots) with your hands. Hold them from underneath with your whole hand and keep the load close to your body.

- Use two hands for a balanced load, if possible. If not possible, trade off between your arms so that you don't pull your body out of alignment, which stresses both the back and hips.
- Make more trips with lighter loads.
- Test the load before you carry it. If you need help, make sure you get it!
- Drop the load immediately if you find it's too heavy.

*Reaching.*³

- Work below shoulder level whenever possible to avoid strain on your back and shoulders. Use a ladder to bring yourself up to the level you are working.
- When you have to work above shoulder level, work for no more than five minutes. Holding your arms up and looking up causes tremendous strain on your neck.
- Take a break to stretch your neck and back muscles and perform another activity for a few minutes before returning to over head work.
- Use both arms whenever possible.



Ground Work.^{3,21}

- Never over reach. Move to the job and keep moving to be close to your work.
- Keep your elbows partially bent, especially when doing resistive activities requiring elbow strength.
- Avoid twisting the forearms back and forth repeatedly. Consider using a weeding tool.
- Keep your forearms in a neutral position (i.e. thumbs up).
- Always face your work without twisting.
- Keep your wrists in a neutral position (i.e., handshake position). Avoid deviating your wrists up, down and sideways. This is especially important when working against resistance.
- Hold objects with a light grasp for a short period of time. Avoid a tight, sustained grasp.



- Squat with your heels on the ground.
- Keep your back relatively straight, feet apart about a foot and toes pointed outward.
- If you can't squat with your heels on the ground, kneel, or semi-squat (i.e., one leg squatting with heel on ground and the other leg kneeling.) Or even better, use a garden stool or bench.



Illustrations courtesy of the Indiana Hand Center²⁴

Other things to remember about movement and form: ^{1,3}

- Schedule jobs when it's easier to do them. Moist earth is easier to dig in than dry, compact earth or soggy, saturated earth. Do something else if conditions aren't right! Work in the shade; don't force yourself to work in the sun on a hot day.
- Keep tools close at hand.
- Alternate tasks that require heavy or repetitive movement with tasks that are easier to do.

Treatment

Did you overdo it after all of these warnings? If you are simply tired, there is nothing better than a warm bath to relax tired muscles.^{3,9} Pearlman³ suggests taking a quick shower to get rid of most of the dirt, sweat, and grime, then drawing a bath to relax in. She has some great bathtub stretches to help your muscles relax as you soak out the fatigue of the day.

If you think you injured yourself, stop working immediately! Use ice and over-the-counter anti-inflammatories to facilitate healing. Apply a cold pack to the sore muscle group once an hour for 10-15 minutes during the first 48 hours.²⁰ After 48 hours, use a heat pack rather than ice.^{7,20} Do not garden using that body part again until all soreness is gone.

We highly recommend that you make time to do some stretches throughout your gardening time and afterward. The best DVD we've found is by Dr. Gail Dubinsky called "Yoga for Gardeners".²³ It targets every body part and is a great, gentle yoga video even for non-gardeners.

Tools


Purchasing tools for any hobby is a challenge because there always seems to be another or better tool that is important to have. You can become bankrupt by buying too many tools! Follow these recommendations for buying and using gardening tools.





- *Use the correct tool for the job.* Don't use a mattock when you need to be using a pickaxe. Don't use a trowel when you should be using a spade. Big jobs require that you use more of

your body and your larger, stronger muscles. Don't be lazy; walk to the shed to get the right tool!

- *Buy tools that fit you and your needs.* Know your body's weak points and focus on getting the best tools to save that body part first. As with office equipment, gardening tools sold as "ergonomic" are only good if they fit YOU. So before you buy, try out the tool in the store.³ Tools such as hoes and rakes should have long enough handles so you can stand upright to use them.^{19,22} Tools should be well-balanced and as light weight as possible.³ Hand-held tools should fit your hand comfortably. They should be easy to use, have wide handles, and a padded or thick grip.²¹
- *Keep tools sharp and in good shape.* Sharp spades and trowels reduce the amount of effort needed to dig. Use a metal file or whetstone to sharpen the edges when they become dull. If they are really dull, use a grinding wheel. Clean and dry all tools after use. Plunge tools up and down in a bucket filled with builder's sand and motor oil to clean and oil them. Oil unfinished wood handles with linseed oil to keep them from splintering, and sand and refinish them when they become rough.³

There are thousands of digging tools on the market, but here are a few that may help save your wrist, arm, elbow, and/or back. Determine the correct grip size for handles by doing the "OK" test. Make the okay sign using the thumb and index finger and then measure the inside diameter of the "O" formed by the thumb and index finger. This measurement indicates the optimum grip diameter of a hand tool (it is generally about 1.5"). If the grip is not the right size, customization of the tool may be necessary.

<p>Clint's Dandy Diggers Dig weeds from a standing position and get the whole root!</p> <p>www.clintsdandydigger.com</p>	
<p>Foam Tubing Hand tools with cushion grips may provide improved tool comfort.</p> <p>North Coast Medical http://www.beabletodo.com Colored tubing, various sizes: SKU: NC35012, NC35013, NC35014 and NC35015 Cylindrical foam: SKU: NC35005</p>	

<p>Long-handled tools Many hoes can strain your back, neck, and shoulders if you are taller because they require you to work in a stooped position.^{13,15} Use a tool that is long enough to avoid this stressful posture.</p> <p>Walt Nicke's Garden Talk http://www.gardentalk.com</p> <p>A.M. Leonard http://www.amleo.com</p>	
<p>Smaller tools for smaller hands Smaller hands require smaller tools. These bypass pruners are designed for people with small hands or arthritis. They have a non-slip cushioned grip and are made from fully heat-treated forged Coronium steel alloy. They will cut up to 1/2" diameter stems.</p> <p>www.tomboytools.com</p>	
<p>Fiskars PowerGear Loppers Lightweight and powerful. These will cut through branches up to 2" thick with ease!</p> <p>Kmart www.kmart.com</p> <p>Ace Hardware Outlet www.acehardwareoutlet.com</p>	
<p>Easy to operate watering nozzles Look for watering nozzles that avoid continuous squeezing, especially ones that use just one finger. Pistol-grip style nozzles are good, especially if they lock into the "on" position to avoid continuous squeezing. This nozzle may seem old-fashioned, but all you have to do is twist to turn on/off and adjust the spray from fine mist to full stream. The rubber grip allows for easy adjustment with wet hands.</p> <p>A.M. Leonard</p>	

More tools and gear:

- A garden cart or wheelbarrow is essential for moving tools, plants, and bags of planting mix.
- Knee pads or cushioning of some type will minimize the stress of kneeling and will protect your knees from the rocks and roots that dig into your bones.

Gardening Philosophy: Pacing and Scheduling Tasks

The tomatoes are suddenly all ripe, the basil has gone to bloom, and 1,000 bulbs just arrived in the mail. Each of these tasks will require hours of work...more time than you have this weekend. Panic sets in. You decide the bulbs can wait until next weekend and you'll can all of the tomatoes and make pesto from the basil. Then next weekend, you'll prepare the beds, dig the holes, and plant the bulbs.

But wait! Instead of looking at these activities as huge chores to get out of the way, why not do it the easy way? Get out in the morning and plant a few bulbs while the day is still cool, pick the ripest tomatoes, pull up two or three of the basil plants, and trim the blooms off the rest of the basil. Break up your day and do a little of each thing. And the next three weekends, do a little bit of each again. Give some tomatoes and fresh basil to some friends rather than letting them rot or killing your hands peeling, chopping, and seeding.

Gardening should be a joy, not a chore. Your garden can be that special, wonderful place for recovering your bearings, not losing them. "Getting it done" should not be the objective because gardening is always a work in progress. If you feel rushed and anxious to get it all done, you will attempt to complete more than you can comfortably manage. You will miss the pleasures of the moment. You will also miss the signals your body is sending you (e.g., an ache in the elbow or strain in the back).³

Tips for staying healthy and sane while gardening:^{1, 8,9,10,19}

- Spread the work out over several days or weeks.
- Alternate tasks.
- Start slowly and take frequent breaks.
- Change position frequently.
- Don't work until you wilt.
- Stay hydrated. Drink more water than you think you need.
- Stand up and stretch frequently.

Smelling the Roses

One of the best things about gardening is that, as opposed to other sports and fitness activities, you have something to show for your efforts (besides a conditioned body)! But sometimes it's difficult not to get overwhelmed when you see all the work that needs to be done.

Here are some steps Pearlman suggests to meditate in your garden and appreciate it in the present moment³. Praise yourself for creating the beauty that surrounds you. You deserve it!

- Bring your awareness to your senses one at a time.
- *Look* at all that surrounds you as if you were viewing your garden for the very first time. Stroll and take note of the colors, textures, and shapes.
- *Smell* all of the delicate florals, the pungent smell of pine or herbs, the rich smell of the soil.
- *Listen* to all of the sounds as if you are hearing them for the first time: birds, rustling leaves in the trees, water trickling in a fountain or brook.
- *Touch* an occasional petal or leaf, feel the breeze and sun on your skin, and feel your muscles relax more and more.

Just for fun, you can create your own garden on your computer screen by going to this page:
http://www.procreo.jp/labo/flower_garden.swf

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This article and all of our articles are intended for your information and education. We are not experts in the diagnosis and treatment of specific medical or mental problems. When dealing with a severe problem, please consult your healthcare or mental health professional and research the alternatives available for your particular diagnosis prior to embarking on a treatment plan. You are ultimately responsible for your health and treatment!

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