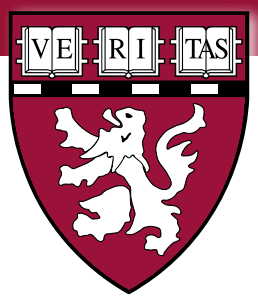

A HARVARD MEDICAL SCHOOL
SPECIAL HEALTH REPORT

Stretching

35 stretches to improve flexibility and reduce pain

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STRETCHING
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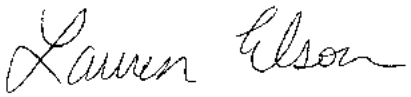
Dear Reader,

Whether you're craning your neck to see cars in the lane behind you, working on your golf swing, lifting a laundry basket, or trying to ease muscle kinks sparked by hours behind a desk, stiff muscles can pose a problem. Virtually every activity you do relies on ease of motion.

Stretching can help in numerous ways. It can often relieve back pain, stiff necks, and sore knees when tight muscles are to blame. It can counteract too much sitting whether you're doing it for work or a pleasurable activity, like reading a good book, knitting, making jewelry, or binge-watching your favorite series or sports on TV. If you're a runner, a tennis player, a golfer, a hiker, or a biker, the right stretching program may set you on a path toward better performance. And as you age, stretching can help keep you active and flexible, making it easier to accomplish innumerable everyday tasks involving walking, climbing stairs, or reaching. Equally important, it may also help you prevent life-altering falls, since flexibility and a good range of motion can improve your balance.

This report debunks some long-held myths. For example, contrary to popular belief, you should not do static stretches (in which you adopt and hold a position) before you exercise. Rather, you should do these when your muscles are warmed up—ideally at the end of your workout. Surprisingly, rather than readying muscles for sports, static stretches do not improve athletic performance, but can actually undercut strength and power, possibly by affecting the ability of your muscles to store and swiftly release energy. Another type of stretching, called dynamic stretching, is a better choice before your workout, as you will see in this report. Dynamic stretching (in which you are gently moving to stretch muscles and loosen up joints) is a great warm-up that increases the flow of blood and oxygen to muscles.

Whether you're an armchair athlete or a sports enthusiast, we've designed a variety of stretching routines to meet your needs. You can do them daily for 10 to 20 minutes to reap optimal results, or just two or three times a week to make progress. Before you plunge in, please check our safety tips. Then, get started. You have only your stiffness to lose.



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Stretching: The basics

For all too many Americans, stretching is an afterthought in their physical fitness routines—maybe never even making it onto the to-do list, despite the fact that people's bodies become less flexible as the years roll by. Or, if individuals do stretch, they often don't stretch all their muscle groups properly. They may even stretch in ways that could cause injury.

There is actually much more to know about stretching than you might imagine. This chapter examines the rationale for stretching, describes the major types of stretches, explains basic guidelines for stretching, and delves into the anatomy of a stretch. In later chapters, you'll find information about stretching to improve sports performance and to ease certain types of pain. And, of course, you'll find our stretching routines, along with instructions for each stretch.

Whether you're hoping to relieve stiffness or improve sports performance, our routines can help. And there's no need to wrestle your body into positions worthy of Cirque du Soleil. While some poses designed for deep stretching require practice and patience, you'll find most of our stretches simple to do and, as a bonus, quite relaxing.

Stretching is a safe activity for healthy adults, and the exercises we've chosen for this report are designed for people at all levels of ability. If your health is compromised, however—perhaps by heart disease, diabetes, or joint or back problems—please read the chapter "Safety first" (page 7) to determine your best course of action before jumping in.

Like taffy, muscles stretch better when they're warmed up. Therefore, the best time to do static stretches, like this standing quadriceps stretch, is during or after a workout, not before.

Why should you stretch?

Stretching is useful at any age to increase your range of motion, keep muscles limber, improve posture and balance, and help prevent falls. For example, overly tight hamstrings (the three large muscles at the back of your thighs) and hip flexors (the muscles at the top front of your thighs) can hamper basic movements like walking and running. When these muscles are tight—a common result of too much sitting—you're not able to fully extend your leg and straighten your knee, so your stride may be shortened and less powerful. Inflexible hamstrings have also been implicated in chronic low back pain, because they change the tilt of the pelvis, placing more pressure on the joints in the lower back. And for anyone who plays sports or works out, tight muscles may contribute to muscle strains, knee pain, and diminished performance because the muscles aren't able to fully extend.

As you work your way up and down the body, many more examples come to mind. Tight ankle and calf muscles may turn a trip into a tumble. Tight arm and side muscles may interfere with any task or sport involving reaching. Tight neck muscles make it hard to look behind you. Being inflexible can even affect your posture. For example, tight chest muscles can pull your shoulders forward, giving you a hunched silhouette instead of a longer, slimmer looking one.

As you age, stretching becomes even more important. Your joints become less flexible over time. Inflexibility puts a crimp in daily activities, making it harder to walk, raise your arms overhead, or turn your head while backing up the car. It undermines balance, too, which can cause life-altering falls. Our stretches can help with all these problems.

Types of stretches

Most of us have been doing stretches all our lives without thinking too much about them, so you may be surprised to learn that there are actually multiple types of stretches. In this report, you'll find routines featuring static stretches, plus dynamic stretches that can act as a warm-up for sports. These types of stretches provide the simplest, safest route to flexibility for most people.

Static stretches

Static stretches, the most familiar type, involve adopting and holding a position that stretches a muscle or group of muscles. Static stretches can be active or passive, though passive stretches are by far the most common.

A passive static stretch uses some form of assistance to hold the muscle that is being stretched in place. For example, you can use gravity (standing while touching your toes), your body weight (see "Kneeling hip flexor stretch," page 30), your arms (see "Seated shoulder stretch" or "Seated triceps stretch," both on page 34), a strap (see "Floor stretches using a strap," page 32), or a partner (see "Proprioceptive neuromuscular facilitation," page 4). Most of the stretches in this report are passive static stretches.

The other type of static stretch is an active stretch, in which the muscle being stretched is relaxed while the opposing muscle or muscles—rather than some external force—work to hold the position. For example, if you did the hamstring stretch on page 32 without a band, it would be an active static stretch. Your quadriceps and hip flexor muscles in the front of your thigh would be working to keep your leg raised as your hamstrings in the back of your thigh relax and stretch.

You do not need to know the difference between active and passive stretches to do them. The important thing is simply realizing that you should hold steady,

Beyond stretching

Flexibility exercises are just one component of a healthy exercise plan. Aerobic exercise and strength training are also important, for a whole host of reasons. Regular exercise lowers your risk for early death, heart disease, stroke, type 2 diabetes, high blood pressure, high cholesterol, colon and breast cancers, and many other health problems. What's more, it eases depression and boosts mood, takes a load off aching hips and knees by strengthening supportive muscles, and helps prevent falls that can undermine independence in older adults.

The Physical Activity Guidelines for Americans from the U.S. Department of Health and Human Services recommend the following:

- Two-and-one-half hours (150 minutes) of moderate-intensity aerobic activity (walking, biking, swimming, etc.) per week. If you prefer vigorous aerobic exercise, you can reduce the total to one-and-one-quarter hours (75 minutes) per week—or substitute an equivalent mix of the two. (Ten minutes of vigorous activity equals roughly 20 minutes of moderate activity.) Spread your aerobic exercise across the week, if possible, so that you're performing it at least three days a week. During moderate-intensity activity, such as a brisk walk, you are able to talk, but not sing; during vigorous-intensity activity, such as running, you can say only a few words without catching your breath. It's fine to split workouts into short chunks of time (10 to 15 minutes) spread throughout the day—in fact, it's healthier than being sedentary for hours at a time (see "Calling all desk jockeys, techies, and hobbyists," page 12).
- In addition, you should do resistance exercises (using weights or resistance bands) for all major muscle groups two or three times a week, allowing 48 hours between sessions so that your muscles can recover.
- Finally, for older adults at risk for falling, the guidelines recommend balance exercises, yoga, or tai chi.

A good exercise program builds slowly and safely on your current level of fitness. If you're a beginner, don't despair. Work up to these goals gradually. And if you're wondering how to shoehorn all of this into a busy life, you'll be glad to learn that some forms of activity fulfill two or more requirements at once. Yoga, for example, counts as resistance exercise, balance training, and stretching. (See "Resources," page 40, to learn more about yoga).

as the word "static" implies. The longer you hold one of these stretches, the deeper you can stretch into it. You should not bounce.

Ballistic stretches

Many people try to go deeper into a stretch by adopting a stretch position, then bouncing to quickly extend muscle length and range of motion. Stretches like these are called ballistic stretches. They trigger the stretch reflex: resistance prompted by specialized nerves, forcing a lengthening muscle to contract. Although they may be valuable for athletes, who must perform quick, powerful actions, ballistic stretches often go beyond an individual's normal range of motion and can injure muscles, if the movements are not carefully controlled. Therefore, we do not recommend them and do not include any examples in this Special Health Report.

Dynamic stretches

Dynamic stretches also involve movement but do not carry the same risk of injury as ballistic stretches. Dynamic stretches typically take specific muscles and joints through their normal range of motion, from one position to another, to loosen up the joints and stretch the muscles. The action is smooth and controlled, not bouncy and jerky like ballistic stretches, and it often mimics a sports motion, such as a golf swing.

While static stretches should not be performed before exercising, dynamic stretches like those in this report (see the Special Section, beginning on page 16) help warm up the body, pumping more blood and oxygen to the muscles to help prepare them for a workout. In contrast to static stretches, they generally involve multiple muscle groups from various parts of the body rather than a single muscle group. Because they can help loosen you up before working out, some people refer to them as dynamic warm-ups.

While not technically a type of stretching, foam rolling may be another way to help ease tight muscles. It improves flexibility by loosening up fascia, the thin sheath of tissue surrounding a muscle.

Active isolated stretches

Active isolated stretching is usually performed in reps and sets, just as strength exercises are (see "What do the terms in the instructions mean?" on page 15). Instead of holding a stretch for 30 to 60 seconds, you hold it for only two seconds, slowly release it, and repeat several times. The idea is that each time you resume the stretch you are able to stretch a little farther than the time before. This technique has not been studied as much as the others so the jury is still out on its efficacy. But if the thought of performing stretches in reps increases the likelihood that you'll stretch, then give it a try.

Proprioceptive neuromuscular facilitation

Proprioceptive neuromuscular facilitation, or PNF, is favored by some exercise and rehabilitation experts, who believe it enhances range of motion more than other approaches to stretching. But unlike static stretches, which can be done safely by anyone, PNF is best done with a partner and requires advanced training.

PNF takes a two-step approach. It starts with isometric contraction of the muscle that opposes the one you want to stretch. (To do an isometric contraction, you press against an immovable object, like a partner, so that the muscle activates without lengthening or shortening.) Then you follow with a passive static stretch of the target muscle, usually applied by a partner who focuses on moving a joint through its range of motion. Because PNF stretches are generally done with a partner and require expertise to perform safely, we recommend that anyone interested in learning these stretches should work one-on-one with an experienced trainer or physical therapist.

Foam rolling

While not technically a type of stretching, foam rolling may be another way to improve flexibility by loosening up fascia, the thin sheath of tissue surrounding each of your muscles. Foam rolling is a form of self-myofascial release (SMR), in which you loosen fascia by rolling parts of your body over a cylindrical piece of high-density foam. (Tennis or lacrosse balls can also be used for this purpose.)

Early research suggests that foam rolling may be an effective strategy for countering the loss of elasticity in muscles over time. In a 2015 review of 14 studies, SMR with a foam roller or hand roller (think of using a rolling pin on your muscles) was found to increase joint range of motion in the short term. And unlike static stretching, it does not appear to impair performance if done before a workout or competition. It may even help to ease post-exercise muscle soreness. But more research is needed to confirm these findings.

In the meantime, it's important to note that this type of routine may not be right for everyone. It requires a good amount of strength to hold yourself in the correct position. And the more weight you put on the roller, the more intense the sensation will be. It may be unpleasant or even painful for some people. If you'd like more information on foam rolling, the American Council on Exercise (www.acefitness.org) is a good resource.

How often—and how much—should you stretch?

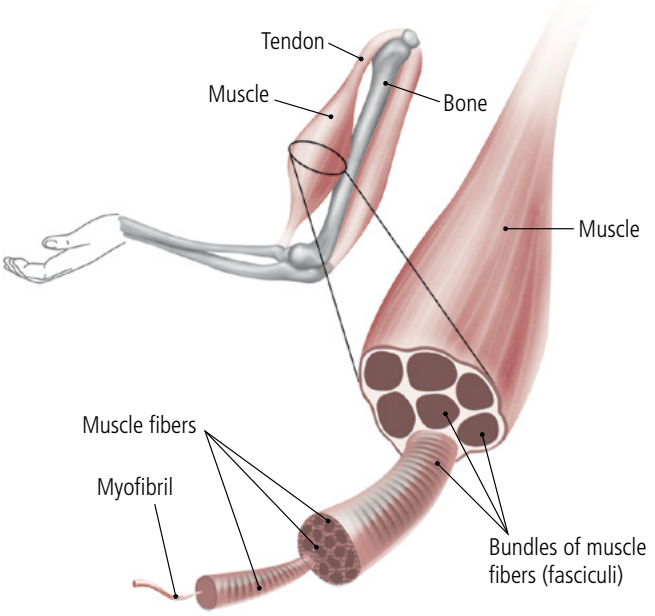
How often should you stretch? How long should you hold a stretch? And how many repetitions (reps) of each stretch should you do? A panel of experts convened by the American College of Sports Medicine (ACSM) reviewed a wide range of studies. While stretching has been studied much less rigorously than other forms of exercise—and therefore the science is not as strong—the panel reached these conclusions:

- Healthy adults should do flexibility exercises (stretches, yoga, or tai chi) for all major muscle-tendon groups—neck, shoulders, chest, trunk, lower back, hips, legs, and ankles—at least two to three times a week.
- For optimal results, spend a total of 60 seconds on each stretching exercise. So, if you can hold a particular stretch for 15 seconds, repeating it three more times would be optimal. If you can hold the stretch for 20 seconds, two more repetitions would suffice. See also "Six questions (and answers) about stretching exercises," page 14.

The anatomy of a stretch

Stretching enhances flexibility by increasing your range of motion—that is, the extent to which you can move a joint in various directions as measured in the degrees of a circle. Basic boundary lines for your range of motion are set by the inner workings of the joints involved and by muscle tension, which can be affected by scarring or even your habitual posture (passive fac-

Figure 1: An in-depth look at muscle



Your muscles are tethered to bone by cords of tissue known as tendons. If you could look inside your muscles, you would find that they are composed of small bundles of muscle fibers, surrounded by connective tissue. One muscle may have 10,000 to more than a million muscle fibers. In turn, each muscle fiber consists of hundreds to thousands of tiny, interlocking strands called myofibrils. Each myofibril is composed of even smaller units called sarcomeres (not shown), which are composed of still smaller myofilaments (not shown). When you stretch, sarcomeres lengthen, creating less overlap between the myofilaments. This allows the muscle to lengthen.

tors), or by involuntary muscle spasms or purposeful muscle contractions (active factors).

To understand the elements that go into a stretch, it helps to know how joints, tendons, ligaments, muscles, and bones work collectively:

- Joints are the junctions that link bones together. The architecture of each joint—whether it acts as a hinge, pivot, or ball-in-socket—helps dictate the directions of movement allowed.
- Tendons are flexible cords of strong tissue that tether muscles to bones. The Achilles tendon, a thick cord that fastens the two calf muscles to the heel bone, is one well-known example.
- Ligaments are tough, fibrous bands of tissue that bind bone to bone—or bone to cartilage—at a joint, allowing a safe range of movement. An example is the anterior cruciate ligament (ACL), one of five ligaments that collectively control knee movements. The ACL is responsible for keeping the knee joint from rotating too far or allowing your shin to move out in front of your thigh. As many sports enthusiasts know, some to their sorrow, the ACL is often injured in sports like soccer and skiing that demand forceful actions involving quick stops or turns.

When you stretch, you're targeting muscles and tendons rather than ligaments. Ligaments are not intended to be elastic. An overly stretchy ligament wouldn't provide the stability and support needed to help enforce a safe range of movement. And if overextended, ligaments may be sprained or torn. Muscle-tendon units, however, do have elastic properties that allow them to stretch, although not infinitely, of course—they can be strained or torn, too.

How a stretch starts (and stops)

Imagine that you could examine skeletal muscle as if peering through a microscope at increasing levels of magnification. First, you'd notice strands of tissue created by bundles of cells known as muscle fibers (see Figure 1, page 5). A single muscle fiber comprises similarly bundled filaments called myofibrils. Myofibrils can contract, relax, and lengthen. Each myofibril is built from tinier units called sarcomeres, which in turn are made up of overlapping thin and thick myofilaments.

Every move you make begins when lightning-quick electrical signals skip down nerve pathways to a muscle and flip a cellular switch that releases calcium, signaling a particular muscle or group of muscles to contract. This prompts myofilaments to glide across each other, forcefully shortening sarcomeres.

So, just what happens when you deliberately try to stretch a muscle? Sarcomeres lengthen, creating less overlap in those sliding myofilaments. This allows some muscle fibers to lengthen, too. When sarcomeres reach their limits, the tension on the muscle is transmitted to the tendon, which also elongates.

Specialized nerves called proprioceptors assist in stretches by relaying information about joint angle, movement, and changes in muscle tension. Muscle spindles (also known as stretch receptors) are a type of proprioceptor sited near the ends of muscles. As a muscle stretches, so do its muscle spindles. This trips off reflexive resistance to the stretch that compels the lengthening muscle to contract. Known as the stretch reflex, that action helps block injuries that could be caused by stretching too far, too quickly. A sudden stretch triggers a more powerful muscle contraction than a slow stretch. If you try to quickly touch your toes, you may not be able to do it, but if you reach toward your toes as far as is comfortable, then hang for 15 to 30 seconds, your muscles will slowly lengthen, enabling you to get closer to your target. When you hold a stretch, the muscle gets used to this position, and the frantic signals that are initially released by the muscle spindles begin to diminish.

When tension in a stretched muscle reaches the attached tendon, a second type of proprioceptor, the golgi tendon organ, transmits signals to the spine that set off a lengthening reaction. This suppresses the stretch reflex contraction and causes the muscle to relax. Aside from physically lengthening the muscle, many experts note that the act of stretching boosts tolerance for moving to an end range of motion in a joint. This helps account for why you notice a difference when you perform a stretch like the "Seated neck rotation" (see page 36) several times in one session. You'll notice you're able to turn farther with each repetition. The apparent gain from one session wouldn't be lasting, however.

Safety first

While it's tempting to skip right to the stretches, it's best to think about safety first. Read this chapter to decide whether you should check with a doctor before doing the stretches in this report. If you've recently had surgery, for example, you may need to limit the types of stretches you do.

Even if you have no health issues that limit your ability to stretch, you should read our "Six tips for safe stretches" (see page 9). These will help you make the best flexibility gains possible, while reducing your risk of injuries.

When to check with a doctor

Should you check with a doctor before starting a stretching program? If you are normally active, stretches should not pose a problem. But it's best to check in with a doctor first if any of the following conditions applies:

- **You've had recent surgery.** Depending on the type, extent, and location of the surgery, you may need to limit stretching of the involved area until the soft tissues are healed. Ask your surgeon if there are any stretches or other activities that you should avoid or modify temporarily.
- **You've been experiencing significant pain.** While stretches may help decrease soreness, you might find them difficult to carry out if you have sharp pain. Check with a medical professional before starting your program.
- **You have a chronic or unstable health condition,** such as heart disease, breathing problems, high blood pressure, or diabetes.

The Get Active Questionnaire, a tool developed by the Canadian Society for Exercise Physiology, can help you determine whether you should talk to your doctor before embarking on, or ramping up, any fitness or flexibility program. You can find it at www.health.harvard.edu/GAQ. The form covers people of all ages.

If you do need to speak to a doctor, bring, fax, or email descriptions of the stretches you plan to do and ask if you can safely undertake these. Your doctor may feel this is fine, or might wish to modify certain stretches or suggest substitutions. If necessary, your doctor can refer you to a physiatrist, a physical therapist, or another specialist for evaluation. Alternatively, he or she may recommend that you work out under the supervision of an experienced personal trainer or other professional.

Warning signs

Generally speaking, stretching is a safe activity. However, there are some warning signs that you should never ignore during or after any form of physical activity. Stop exercising and call a doctor or 911 right away if you experience any of the following:

- upper-body discomfort, including chest pain, aching, burning, tightness, or a feeling of uncomfortable fullness
- wheezing or shortness of breath that takes longer than five minutes to go away
- faintness or loss of consciousness
- sudden, sharp, or intense pain in bones or joints
- in hot, humid weather, signs of overheating, such as headache, dizziness, nausea, faintness, cramps, or palpitations.

These warning signs pertain to any kind of exercise, including strength training and aerobic exercise.

Persistent or intense muscle pain that starts during a workout or right afterward, or muscle soreness that lasts more than one to two weeks, also merits a call to your doctor. (This is in contrast to normal muscle soreness, which starts 12 to 48 hours after a workout and gradually improves.) You should also call your doctor if the routine you've been doing for a while without discomfort starts to cause you pain.

A team approach

If you need to tailor our stretches to your needs, various health or fitness professionals can help. Here is a brief description of the skills offered by, and training required of, the different types of experts.

Physiatrists, also known as physical medicine and rehabilitation physicians, are board-certified medical doctors who specialize in treating nerve, muscle, and bone conditions. They are among the sports medicine specialists who can diagnose and treat conditions and injuries that affect how you move, such as back problems, knee or shoulder injuries, debilitating arthritis or obesity, and stroke. After developing a comprehensive plan of treatment, a physiatrist might provide injections or medications, if needed, and work with a physical therapist to design physical treatment plans. A physiatrist can tailor a program of exercises and stretches to enhance recovery after surgery or an injury, or help you work out despite pain or limited movement. He or she can also tell you whether certain types of flexibility exercises will be helpful or harmful given your specific health history.

Physical therapists (PTs) help people with health conditions or injuries affecting muscles, joints, bones, or nerves by providing hands-on treatment and individualized exercise programs to restore movement in painful or debilitating conditions, or after an injury. Their expertise can be valuable, for instance, if you have suffered a lingering sprain or are recovering from a hip replacement or heart attack. Some PTs specialize in sports medicine, orthopedics, cardiopulmonary rehabilitation, geriatrics, or other areas. After receiving a bachelor's degree, PTs must graduate from an accredited physical therapy program. Most accredited programs in the United States offer doctoral degrees. Additionally, physical therapists must pass a national exam given by the Federation of State Boards of Physical Therapy and be licensed by their state. Specialists complete advanced training and additional national exams to become board-certified.

Physical therapy assistants provide physical therapy under the supervision of a licensed PT. They must complete a two-year associate's degree and pass a national exam. In most states, they must also be licensed.

Personal trainers are fitness specialists who can help ensure that you're doing stretches and exercises properly. While encouraging and motivating you, they can fine-tune your form. Personal trainers teach new skills, change up routines to beat boredom, and safely push you to the next level.

No national licensing requirements exist for personal trainers, although the National Commission for Certifying Agencies sets standards for the accrediting fitness organizations that train them. Two well-respected organizations that offer certification and programs of study for personal trainers are the American College of

Simple yoga breathing

Yoga breathing, or pranayama, is relaxing and meditative. Try practicing this beginner technique. You can also apply it while holding yoga poses or other stretches, like the ones in this report.

1. Sit or lie down comfortably, resting your hands below your navel.
2. Tune in to the way you breathe. Inhale and exhale naturally through your nose for a few minutes, noticing the slight rise and fall of your hands. Consider the way the air feels as it enters and exits your nostrils.
3. Start to silently count each inhalation (one, two, three…) and exhalation (one, two, three…) as you breathe in and out.
4. Gradually make each exhalation twice as long as each inhalation. Focus on breathing slowly and smoothly, humming each time you exhale. The slight vibration is very soothing.

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Sports Medicine (ACSM) and the American Council on Exercise (ACE); others include the National Council on Strength and Fitness (NCSF), the National Strength and Conditioning Association (NSCA), and the National Academy of Sports Medicine (NASM). All fitness organizations have different requirements for training and expertise.

Some trainers specialize in working with particular populations—for example, athletes or older adults—and may have taken courses and possibly certifying exams in those areas. Look for someone with training that will meet your needs.

Physical therapists help people with health conditions or injuries affecting muscles, joints, bones, or nerves by providing hands-on treatment.

Six tips for safe stretches

Everyone—with medical conditions or not—should use these tips to help protect muscles and joints while ensuring flexibility gains.

1. Warm up first. Much like taffy, muscles stretch more easily when warm. Our dynamic stretches can act as a warm-up for static stretches, or you can do static stretches after sports, exercise, or even marching in place with arms swinging for five minutes or dancing to a few songs. Moist heat packs or a warm shower are effective first steps, too.

2. Feel no pain. Stretch only to the point of mild tension, never to the point of pain. If a stretch hurts, stop immediately! Reset your position carefully after checking the instructions, then try again. With time and practice, your flexibility will improve.

3. Pay attention to posture and good form. Posture counts whether you're sitting, standing, or moving (see "Calling all desk jockeys, techies, and hobbyists," page 12). Good form translates to better gains in flexibility and less likelihood of injury when stretching tight muscles. Photos of stretches tell only part of the story, so read instructions carefully to get form right.

4. Focus on the muscle being stretched. You'll notice that one side of your body often is tighter than the other. Work on balancing this over time.

5. Breathe. Breathe comfortably while stretching, or use yoga breathing (see "Simple yoga breathing," page 8). Whatever you do, don't hold your breath while you are holding a stretch.

6. Practice often. You'll make the best gains if you stretch frequently—daily, or on as many days of the week as possible. At the very least, aim to do stretches two or three times a week.

Stretching to ease pain

Arthritis, stiff backs, and sore knees are three common problems that can sap joy from life. But stretching can help, when tight muscles are to blame. Doctors and physical therapists often prescribe stretching as part of a treatment plan to help maintain or reclaim abilities and ease discomfort.

Even if you don't have a medical condition, you may be suffering from tight muscles that keep you from feeling your best. They can pull your body off-kilter, and long hours spent at a desk—or staring down at tablet screens—may cause pain, too. This chapter touches on posture tips and ergonomics, as well.

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Poor posture may strain or aggravate muscles, nerves, tendons, ligaments, and spinal discs. Over time, poor posture chips away at the range of motion in your joints and can lead to pain. Stretching helps.

Arthritis

When movement is painful, it's natural to limit it. Yet if you keep an arthritic joint bent rather than moving it through its range of motion, you allow muscles to stiffen in that position. Over time, the muscles actually shorten, curtailing range of motion and prompting other problems.

For example, arthritis pain and decreasing flexibility make walking harder and may throw off your gait and balance, leading to falls. If you walk less, you burn off fewer calories, too, and weight may creep up, placing ever-greater stress on hip and knee joints. This can actually worsen arthritis and its consequent pain. And of course, you sacrifice the health benefits of regular walking, including improved cardiovascular, bone, and mental health.

Nipping a cycle like this in the bud is one potential benefit of a stretching program for people who have osteoarthritis, a degenerative joint disease that affects almost 27 million Americans. Osteoarthritis of the hip or knee, for example, responds well to activities performed in a heated pool, such as stretching and aerobics. (Check with the Arthritis Foundation to see if exercise classes in heated pools and geared to people with arthritis are available in your area. See "Resources," page 40.)

Stretches can also help improve the range of motion in damaged joints in people with rheumatoid arthritis, a chronic inflammatory disease.

If you have arthritis, get advice from your doctor about the right combination of activities, weight loss, medication, and assistive devices, such as canes or walkers designed to take weight off affected joints. Stretching to ease stiffness—along with resistance exercises to build or maintain strength in muscles that support key joints—are likely to be high on the list. (See "Stretches for overall flexibility," page 20, and "Stretches for desk jockeys, techies, and hobbyists," page 21, for examples of stretches that may be helpful.)

These tips can help make your stretching routine easier:

Warm up thoroughly. You may need extra warm-up time. Try a slow, gentle version of our dynamic

stretches (see page 18). Most of these exercises can be done in a chair, if necessary. A hot shower or bath, a heated pool, or even warm compresses or a heating pad can also warm up stiff joints before you stretch.

Stretch during your least painful time of day. While morning is a popular time to exercise, it may not work for you if you experience a lot of pain or stiffness at that time of day. Choosing a window of time after you've been moving or after pain relievers take effect can help make stretching easier.

Adapt stretches. Use pillows or rolled towels to help you work within a comfortable range of motion. For example, placing small pillows next to your shoulders for the "Floor chest stretch" (page 27) supports your arms if you are not able to bring them all the way to the floor. A strap can also help you to modify stretches (see "Floor stretches using a strap," page 32). Choose seated stretches, if necessary.

Expect some discomfort. While we encourage everyone to stretch only to the point of mild tension, not pain, some discomfort is to be expected with arthritis. Try the two-hour rule: if discomfort following stretches or other activities lasts longer than two hours, or is more severe than your usual pain, step your routine down. Try doing fewer reps and holding stretches for less time. As stretching becomes easier, gradually step it up again.

Back pain

A lack of flexibility in key muscles is one source of back pain. Two well-known culprits are tight hip flexors (a muscle group at the front and top of the thigh that helps you raise your knee and bend at the hip) and tight hamstrings (three strong muscles at the back of the thigh that help you bend your knee and extend your leg behind you). For example, the psoas (a hip flexor that attaches to the spine) is sometimes at fault in low back pain.

Much more rarely, an overly tight piriformis (a deep muscle in the buttocks) and a neighboring muscle called the quadratus lumborum, sometimes in conjunction with other gluteal muscles, compress or irritate the sciatic nerve, which threads between them. Known as piriformis syndrome, this prompts sciatica, a constellation of symptoms like pain, numbness, weakness, or tingling that may be felt from the lower back down to the back of the leg or foot.

Whether stretches will ease your low back pain depends on the cause of the pain. While muscle or bone conditions—for example, muscle tightness or spasms, or osteoarthritis—are most often the tinder that feeds flare-ups, back pain sometimes stems from injuries of the spinal discs or an illness, such as a urinary tract infection or appendicitis. Thus, proper treatment varies widely. If you find yourself afflicted by back pain, start by calling your doctor for advice on whether stretches are likely to help or hurt the underlying problem triggering your pain.

Stretching combined with strength exercises may also help prevent low back pain. Researchers divided 563 healthy office workers into two groups, one that performed stretches and strength exercises, while the other did no exercise. More than twice as many people in the no-exercise group reported suffering from low back pain during the yearlong study compared with the stretching group. See "Stretches to relieve sore backs," page 21, for stretches targeting tight muscles that often contribute to back pain.

Knee pain

Sore knees can make climbing stairs difficult and knock sports entirely off your list of enjoyable activities. Even an evening stroll in the nicest weather may not seem like fun. Although arthritis may be one contributing factor, tight muscles and tendons frequently play into knee pain. Often, the problem is a muscle imbalance prompted by insufficient strength or flexibility in one or more of these muscle groups: the quadriceps (the quartet of large muscles at the front of the thigh), the hamstrings (the trio of large muscles at the back of the thigh), and the calf muscles (a duo known as the gastrocnemius and soleus). The iliotibial (IT) band is another potential troublemaker. This thick cord of connective tissue extends from your hip bone down the outside of the thigh to the shin bone. When you bend a knee, the IT band slides over the outside knob of the thighbone. If it becomes inflamed, the outside

Continued on page 13

Calling all desk jockeys, techies, and hobbyists: Easy ways to ease neck and shoulder pain

Any task that encourages you to sit in one position for long hours—perhaps staring at a computer screen, speaking on a handheld phone, or scrapbooking—can wreak havoc on posture. Even enjoyable hours whiled away with an e-reader or a computer tablet may have that effect—and worse. A study from the Harvard T.H. Chan School of Public Health, Brigham and Women's Hospital, and Microsoft showed that holding a tablet too low in your lap can force the small, interlocking bones at the top of the spine (the cervical vertebrae) and the neck muscles into an unnatural position, which may strain or aggravate muscles, nerves, tendons, ligaments, and spinal discs. Over time, poor posture chips away at the range of motion in your joints and can lead to pain.

How can you limit the damage? Stretches for the neck and shoulders are one way (see "Stretches for desk jockeys, techies, and hobbyists," page 21, and "Dynamic stretches," page 18). Here are some others.

Apply ergonomics to your work space

Ergonomics is the science of designing and arranging things, usually in a workplace setting, to reduce physical stress and minimize risk of injury to a person in a particular environment. For example, you might adjust or choose a different desk chair to fit your body better and reduce low back strain. Following are some general guidelines.

If you use a laptop or desktop computer:

- Choose a chair with good lumbar support, or place a pillow against the small of your back.
- Position the top of your monitor just below eye level. That helps whether you use a desktop or a laptop, notes Dr. Jack Dennerlein, principal investigator of the tablet study and an adjunct professor of ergonomics and safety at the Harvard T.H. Chan School of Public Health. Whenever possible, use an external keyboard with a laptop, not the keyboard that's built in, because the monitor and the keyboard are too close together for good ergonomics.
- Sit up straight with your head level, not bent forward.
- Keep your shoulders relaxed and your elbows close to your body.
- Keep hands, wrists, forearms, and thighs parallel to the floor.

If you use a handheld phone:

- Avoid propping the phone between your head and shoulder.
- If you use a phone frequently, consider investing in a comfortable, hands-free headset. Depending on your needs, you can choose one equipped for Bluetooth or designed for use with cordless phones, landlines, or computers.

If you use an e-reader, iPad, or tablet:

- Buy a case that allows you to prop the device at a comfortable viewing angle, one that doesn't require you to bend your neck and tilt your head very much.
- Take a break every 15 minutes. "Usually we tell people they should change their position every 15 minutes," says Dr. Dennerlein. "Just change your hands, shift your weight. Stand up or sit down."

Practice posture checks

Pause occasionally during the day to take a mental snapshot of how your body is posed. Is your back curved? Shoulders hunched? Head bent downward? Chin jutting forward or head slumped toward one shoulder? Legs crossed, hiking one hip higher than the other? These things can lead to stiff, sore muscles. A 2015 study found that when you use a tablet on your lap, your neck muscles work three to five times harder than if you were looking straight ahead.

Practicing good posture pays many dividends. To get into the habit, you needn't walk around balancing a book on your head. Simply doing posture checks a few times a day can help. If possible, look in the mirror when doing a posture check until you get the hang of it. Whether you're standing or sitting, proper posture means

- chin parallel to the floor
- chest lifted
- shoulders even (roll them up, back, and down to help achieve this)
- arms at your sides, elbows relaxed and even with each other
- abdominal muscles pulled in
- hips even
- knees even and pointing straight ahead
- feet pointing straight ahead
- body weight evenly distributed on both feet when standing (feet flat on the floor when sitting).

Take breaks

Occasional laps around the water cooler—the real one, not the virtual one—can help by shifting your position, allowing tense muscles to move and flex. Take the opportunity to march in place or do dynamic stretches (page 18) or our "Stretches for desk jockeys, techies, and hobbyists" (page 21).

Aside from easing kinks in your neck and loosening tight chest and back muscles, spending fewer hours parked in one place is shown to have definite health advantages. That's because extended periods of sitting contribute to heightened risks for heart disease, stroke, and type 2 diabetes. Sedentary habits inflate risk for an early death, too. In a 2016 review of 16 studies, mortality rates were up to 59% higher in people who sat for more than eight hours a day, compared with those who logged less than four hours. Even as little as three hours of daily TV watching was found to increase mortality.

Continued from page 11

of your knee hurts. In older people, IT band syndrome usually occurs when a bad back or joint problem has thrown off gait. Runners who suddenly boost mileage and soccer players, cyclists, or skiers who overdo it are vulnerable, too. Failure to warm up properly, a tight IT band, or unequal leg lengths are other factors that may play a role.

Front-and-center knee pain that crops up during and after physical activities, or even after prolonged bouts of sitting, may be a sign of patellofemoral pain syndrome. Sports that require you to repeatedly put weight on a bent knee (such as running or basketball) can spark this problem. One underlying factor is muscle tightness and imbalance: tight hamstrings, calves, and hip muscles increase pressure between the kneecap and thighbone, while three muscles of the quadriceps pull the kneecap to the outside. If the innermost quadriceps muscle is relatively weak, or if the three outer ones are relatively tight, the kneecap may track improperly, rubbing every time the knee is bent.

If you do have knee pain, get advice from your doctor about the right combination of activities and treatments, which will depend on the problem diagnosed. Often, a well-rounded stretching routine will help relieve sore, stiff knees (see "Stretches to relieve sore knees," page 21, and the tips under "Arthritis," page 10). Backing off from aggravating activities for a while may be advisable. Your doctor or a physical therapist may also recommend doing exercises to strengthen the muscles that support the knee, and may also suggest losing weight if you are overweight. Well-padded shoes with arch supports or orthotic inserts might be helpful, as may medication to ease pain and limit inflammation (especially if you have arthritis). In some cases, if conservative treatment has not restored comfortable movement, you could need bracing or injections. If that doesn't work, knee replacement may be a possibility.

Six questions (and answers) about stretching exercises

Before launching into a new activity, it's common to have some questions. Below are answers to six frequently asked questions about stretching.

1 How often do I need to stretch?

As with all types of exercise, you need to engage in stretching regularly to reap lasting benefits. If you stretch only occasionally, the effects are short-lived. One study found that the greatest increase in hamstring length occurred right after the stretch and began to diminish within 15 seconds, though there was a noticeable effect for up to 24 hours. A daily regimen will deliver the greatest gains, but typically, you can expect lasting improvement in flexibility if you stretch at least two or three times a week.

2 How long do I need to hold a static stretch?

Although opinion varies on this, the ACSM recommends holding a static stretch for 10 to 30 seconds. Research suggests the biggest change in muscle length takes place between 15 and 30 seconds.

How long you hold a static stretch helps dictate how many repetitions (reps) of the stretch you should do. The ACSM says 60 seconds of cumulative time per static stretch is optimal and recommends doing two to four reps to achieve this total time. So, if you can hold a particular stretch for 15 seconds, repeat it three more times. If you can hold the stretch for 30 seconds, one more rep would suffice.

3 Will stretching ward off or ease muscle soreness after exercise or sports?

Muscles taxed by physical activities often feel sore during the next day or two. This is normal. It's called delayed-onset muscle soreness. Usually it peaks 24 to 48 hours after a workout before gradually easing, then disappears entirely in another day or so. (By contrast, sudden, sharp, or long-lasting pain is not normal and should prompt you to call a doctor.)

Can stretching help reduce this soreness? A review of studies found that those who engaged in post-exercise stretching rated their discomfort a day after exercise at half a point lower, on average, on a 100-point scale than those who hadn't stretched. A large-scale study in the review showed an average four-point dip in soreness over one week for those who stretched before or after exercise. All in all, that's not a difference most of us would notice.

4 Can stretching help heal sports injuries?

After an injury, stretching may be recommended to lengthen tight muscles, gradually increase

Most of our stretches require no equipment, but a few call for a chair, mat, pillows, or strap. For the "Full-body stretch with strap" (see page 33), you can use a small towel, a belt, or even a dog's leash.

range of motion, or align collagen fibers to help a muscle heal properly. A doctor or physical therapist should assess the problem and prescribe the right blend of stretches, strength exercises, and other therapies, as needed.

5 What equipment will I need?

Most of our stretches require no equipment at all, which makes them very easy to do at your desk, home, or gym. For some of the stretches, however, you may want to use some easily found items:

- **Chair.** For most seated stretches, use a sturdy chair that won't tip over easily. A plain wooden dining chair without arms or heavy padding works well. Do not use a desk chair with wheels!
- **Counter.** While none of our stretches requires a counter, you may find it handy to hold on to one—or to the edge of a desk or back of a chair—for balance.
- **Mat.** Choose a padded, nonslip mat for floor stretches. Thick carpet, towels, or a blanket will be fine in a pinch.
- **Pillows.** A pillow or rolled towel can help you limit movement in certain stretches (for example, "Child's pose three ways," page 28, and "Full-body stretch with strap," page 33). This may be more comfortable for you and can make the stretch easier to do.
- **Stretch strap.** Choose a cotton or nylon strap of six feet or longer to help you position your body during certain stretches, such as the "Hamstring stretch with strap" on page 32. A strap with a D-ring or buckle fastener on one end allows you to put a loop around a foot or leg and grasp the other end of the strap, rather than holding two ends of the strap. Straps with built-in loops are another option. You can buy either at a sporting goods store. Some stretches, such as the "Full-body stretch with strap" (page 33) need only a small strap. You can use a towel, the belt of a bathrobe, or even your dog's leash if a strap is not available.

6 What do the terms in the instructions mean?

The instructions for our stretching exercises include certain terminology that may be unfamiliar to you.

- **Repetitions (reps).** Each rep is a single complete movement for one stretch. Do only as many reps as you can manage with good form. When this becomes easier, add another rep (up to the number specified) or hold the stretch longer (up to 30 seconds).
- **Hold.** Hold tells you the number of seconds to pause while maintaining a stretch: 10 to 30 seconds is recommended.
- **Starting position.** This describes how to position your body before starting the movement required for the stretch.
- **Movement.** This explains how to perform one complete repetition correctly.
- **Tips and techniques.** We offer a few pointers to help you maintain good form and reap the greatest gains from the stretch.
- **Neutral.** Keeping the body in a neutral position is important for good form during some stretches. "Neutral posture" requires you to keep your chin parallel to the floor; your shoulders, hips, and knees at even heights; and your knees and feet pointing straight ahead. "Neutral alignment" means keeping your body in a straight line from head to toe except for the slight natural curves of the spine—that is, the spine isn't flexed or arched to overemphasize the natural curve of the lower back.

Warming up for sports with dynamic stretches

When done correctly, a warm-up enhances sports performance by helping you limber up and get blood flowing to your muscles. How best to align the stars in your favor? Current evidence suggests that the type of stretches you do and when you do them can help—or hurt.

Runners, for example, have long been known for warming up before sprints or marathons with a string of static hamstring and quadriceps stretches. New thinking advises skipping pre-sport static stretches, which have been shown to undercut performance in activities that require running, jumping, and other explosive movements, possibly by affecting the ability of the muscle to store and swiftly release energy. A 2013 meta-analysis of more than 100 studies on different types of athletes showed that doing static stretches before sports cut muscle strength by roughly 5% and explosive power by 2%. That's not a huge difference, but it's enough to affect performance. In a 2017 study, people who performed static stretches immediately before doing resistance training executed fewer reps during their workouts than those who did no stretching before working out, possibly because their muscle fibers were fatigued and may not have contracted as efficiently. And over the course of 10 weeks, the no-stretching group built more muscle than the stretching group, probably due to the fact that the no-stretching group lifted more weight—yet another reason to save static stretching until after your workout. Proprioceptive neuromuscular facilitation stretching had a similar effect, according to a separate weight-lifting study.

How long you hold a static stretch and how many repetitions you do might make a difference, as well. For instance, researchers measuring a vertical jump in one study learned that four repetitions of static stretches held for 15 seconds before the jump didn't dampen performance. However, six reps did. Other research shows greater impairments in performance when static stretches are held for longer durations, such as 60 seconds or more. Only additional, rigorous studies can confirm this and teach us more about which sports might be affected and exactly what to do.

In the meantime, it seems apparent that holding static stretches multiple times for 30 seconds won't help your game. In fact, it's particularly detrimental to the hamstrings before a run, or to calves before trying to jump. Instead, try warming up muscles and bringing joints through a range of motion with dynamic movements, including dynamic stretches. You can follow this warm-up with a brief static stretch, held for less than 30 seconds, to increase blood flow in select muscles.

Generally speaking, it's best to do static stretches after exercise or

Shallow side lunges (in the photo above and on page 18) are one of a series of dynamic stretches that can help you warm up for exercise.

at a separate time entirely. If your goal is to increase muscle length and enhance overall flexibility, do a full static stretch routine after your workout. See our table of stretches tailored to different sports on page 22.

Warming the muscles, "waking" the nerves

A burgeoning field of research suggests neuromuscular training may have a role to play in sports that require jumps, quick stops, and sudden shifts in direction, such as basketball, soccer, and skiing. Typically, this training amounts to a pregame warm-up involving stretching, strengthening, and balance exercises, plus drills designed to enhance agility and reinforce good form when stopping short, changing direction, and landing. The movement patterns chosen for neuromuscular training echo those used in a particular sport to facilitate coordination—or, as some trainers put it, movements that "wake up" the nerves and brain.

A 2012 review of studies in *BMC Medicine* found that consistently applying such strategies for three months or more reduced lower-limb injuries in young, amateur, and female athletes and in military recruits of both genders. According to a recent review and meta-analysis of nine studies, a specially designed neuromuscular warm-up program for soccer players reduced risk of injury by 20% to 50%. This type of training has also been shown to reduce the risk of knee injuries in females, who are more likely to suffer from this type of injury for a variety of reasons, including their anatomy.

While this research is exciting, it's not clear if the benefits of these programs depend on the movements chosen (some of which could easily trip up less agile athletes and older adults), or the simple act of warming up well.

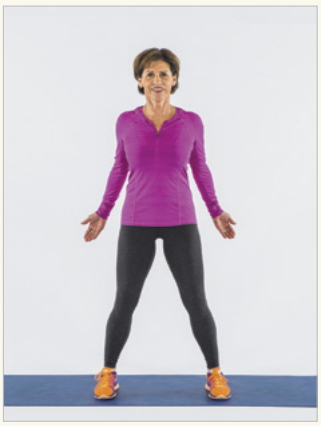
A dynamic stretch warm-up

Unlike many neuromuscular training programs for athletes, our dynamic stretch routine is

Continued on page 19

Dynamic stretches

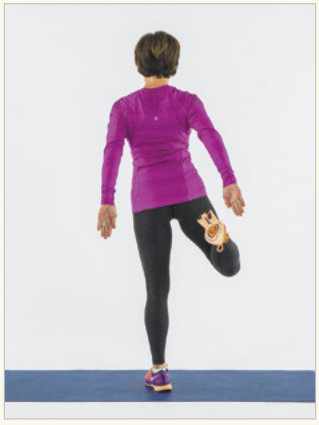
This routine will help you limber up for any sport and can serve as a warm-up. To see the complete sequence, go to www.health.harvard.edu/dynamic-stretches.

1. Shoulder rolls
Stand up straight with your feet hip-width apart and arms at your sides. Roll your shoulders up, back, and down. Your thumbs point forward as you start the move. Palms point forward, elbows slightly bent, as you finish each shoulder roll.


2. Overhead reach
Stand up straight with your feet hip-width apart. Reach toward the ceiling with your right arm, while shifting your weight from your right foot to your left foot and tapping the toes of the right foot. Repeat on the left.

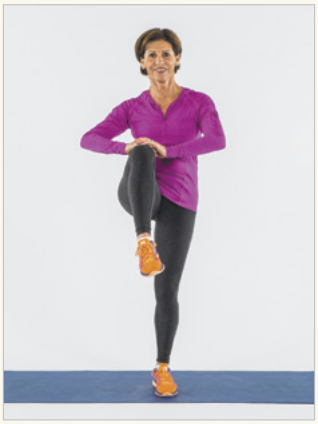

3. Torso rotation with a reach
Stand up straight with your feet hip-width apart. Reach toward the left wall with your right arm and then the right wall with your left arm, while shifting your weight with each change of direction. Tap your toes with each shift.

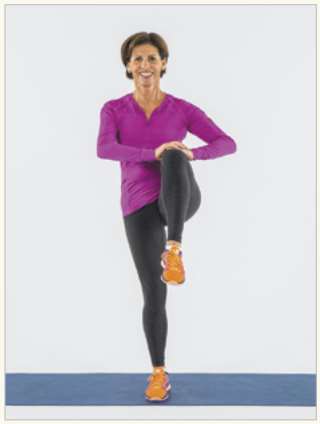



4. Hamstring curls
Stand up straight with your feet hip-width apart. Alternately bend your right knee and then your left, bringing your right foot and then your left foot toward your buttocks. Press your arms backward as you do so.

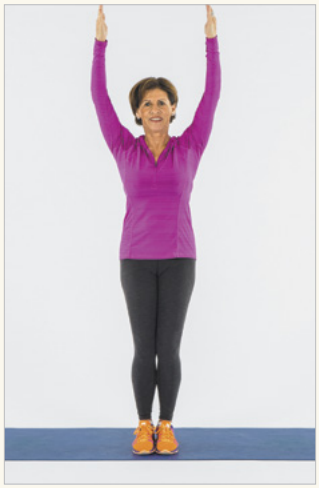
5. Shallow side lunges
Stand up straight with your feet in a wide stance, toes pointing forward. Alternate shallow side lunges to the right and the left, hinging forward at the hip and bringing both hands to your upper thigh on the lunge.


Dynamic stretches *continued*





6. Knee lifts
Stand up straight with your feet together. Lift your right knee and then your left knee, touching both hands to the knee being lifted. For a more challenging dynamic stretch, lift your knee high enough to grasp the top of your shin with your hands and pull your leg gently in toward your body, then release it.



7. Arm sweeps
Stand up straight with your feet together. As you inhale, sweep your arms out to the sides and up toward the ceiling. As you exhale, sweep your arms down to your sides.

Continued from page 17

designed for the widest possible audience. It moves your body in three ways: forward and backward, side to side, and through rotations. Our aim is to loosen up joints to increase your range of motion and warm up tissues throughout the body, which helps cells to get the oxygen and energy demanded by any athletic endeavor.

Common sense, as well as research, suggests a long, overly tiring warm-up routine saps strength you'll need for athletic performance. That's why our routine (see "Dynamic stretches," page 18) is short and simple.

Here's what to do:

- Perform each of the first six dynamic stretches 10 to 20 times, followed by four arm sweeps. During each dynamic stretch, go from smaller movements to larger movements, to gradually increase range of motion.
- Repeat this sequence of dynamic stretches for about five to eight minutes, rolling each stretch into the next one. Start over again as needed to fill the time you've allotted.
- If desired, you can add a sports-specific move to the routine: for example, a golf or tennis swing, or a series of shallow to deeper jump squats to ready the body for basketball. If you do this, go slowly and deliberately through the first few reps, then pick up your pace, always focusing on correct form.
- If you have trouble with balance, you can put one hand on the back of a chair or a counter. It's even possible to do most of these movements while seated.

Once you're warmed up, it's time to play sports.

Static stretches

In the following pages, you'll find 35 static stretches, arranged according to whether you do them on the floor, in a chair, or standing. You may wish to follow each routine individually, in that order, or you may want to mix and match.

On this page and the next, you'll find four routines that are adapted to specific needs. The first one is a good, all-purpose routine for everyone. The next three are specially designed for people with low back pain, sore knees, or stiffness from too much sitting or computer work.

After those four routines, you'll find a chart that shows the best stretches for improving your game in a number of sports: running (or walking), golf, tennis, skiing, swimming, and biking (see "Stretching to improve sports performance," below right).

Four stretching routines

In these four routines, we've tried to target the stretches that are best for certain situations. However, you may need to tailor them further to suit your needs. If so, here are some tips:

- Some stretches will be easier or harder for you, so you may want to increase or decrease the challenge. To increase it, try substituting a harder option (do a standing hamstring stretch, for example, instead of a seated one). To make the stretch easier, add a pillow or rolled towel or use a strap.
- If doing the routine in a single session takes too much time or energy, break it into two sessions (morning and evening, say, or alternating half-sessions two days in a row).
- If you just want to switch things up for the sake of variety, substitute an equivalent floor, seated, or standing stretch. For example, if the routine suggests the "Floor pretzel" (page 25), you can substitute the "Seated pretzel" (page 37). If it suggests the "Hamstring stretch with strap" (page 32), you could choose instead the "Seated hamstring stretch" (page 36) or "Standing hamstring stretch" (page 39).

1 Stretches for overall flexibility

This is a great combination of stretches designed to ease tight muscles throughout your body and help you gradually work toward a full range of motion in your joints. If you have arthritis, you may need to modify these stretches (see our tips under "Arthritis" on page 10). Do these stretches daily, if possible—or at least two or three times a week. Over time, you'll notice real gains in flexibility and how easily you move around.

1. Single knee pull (page 24)
2. Floor pretzel (page 25)
3. Double knee torso rotation (page 26)
4. Child's pose three ways (page 28)
5. Cat-cow (page 29)
6. Downward dog (page 29)
7. Kneeling hip flexor stretch (page 30)
8. Full-body stretch with strap (page 33)
9. Side stretch with strap (page 33)
10. Seated chest stretch (page 35)

Stretching to improve sports performance

Our sports stretches are designed to help you limber up the right muscle sets for the activities you love (see Table 1, page 22). Remember to do a dynamic stretch warm-up (see "Dynamic stretches," page 18) before you exercise, to warm up muscles and wake

2 Stretches to relieve sore backs

Aimed at loosening up tight muscles that often play a role in back pain, these stretches should be helpful for anyone who experiences occasional stiffness or backaches. Please read the sections on safety (see "Safety first," page 7) and back pain (see page 11) to decide if you should talk to your doctor before starting. If you have acute pain, check with your doctor before doing any exercise. Aim to do these stretches daily, if possible, or at least two to three times a week. For variety, you may substitute the "Stretches for overall flexibility" (see page 20) on one or two of those days.

1. Floor chest stretch (page 27)
2. Knees to chest (page 24)
3. Floor pretzel (page 25)
4. Double knee torso rotation (page 26)
5. Kneeling hip flexor stretch (page 30)
6. Hamstring stretch with strap (page 32)
7. Full-body stretch with strap (page 33)
8. Side stretch with strap (page 33)
9. Cobra (page 27)*
10. Cat-cow (page 29)*

** These stretches are good for occasional stiffness. If you have back pain, check with your doctor before doing these.*

up nerves by using movement patterns employed in particular sports. Then do the static stretch routines after your activity, or at another time in your day, if you're concerned about top sports performance. It's fine to break your stretch routine into two sessions (morning and evening, say, or an alternating half-session every day), as long as you warm up your muscles first. Practice your chosen routine at least three to four times each week.

3 Stretches to relieve sore knees

When tight muscles are causing sore knees, these stretches can help you feel less like the Tin Woodman after a rusting rain. Please read the sections on safety (see "Safety first," page 7) and knee pain (see page 11) to decide if you should talk to your doctor before starting. Aim to do this routine daily, if possible, or at least two to three times a week. For variety, you may substitute the "Stretches for overall flexibility" (see page 20) on one or two of those days.

1. Single knee pull (page 24)
2. Floor pretzel (page 25)
3. Single knee rotation (page 25)
4. Side-lying quadriceps stretch (page 30)
5. Kneeling hip flexor stretch (page 30)
6. Hamstring stretch with strap (page 32)
7. Inner thigh stretch with strap (page 32)
8. Outer thigh stretch with strap (page 33)

4 Stretches for desk jockeys, techies, and hobbyists

This routine is perfect anytime you want to relieve discomfort that stems from too many hours in one position. It provides an excellent way to move toward better posture, too, especially if you're spending a bit too much time hunched over a computer keyboard, a craft table, or a workbench.

1. Seated overhead stretch (page 35)
2. Seated chest stretch (page 35)
3. Seated wrist stretch (page 35)
4. Seated ear-to-shoulder stretch (page 36)
5. Seated pretzel (page 37)
6. Seated rotation (page 37)
7. Standing quadriceps stretch (page 39)
8. Standing hamstring stretch (page 39)
9. Kneeling hip flexor stretch (page 30)

Table 1: Stretches for different sports

FLOOR WORKOUT	RACQUET SPORTS	GOLF	WALKING OR RUNNING	SWIMMING	BIKING	SKIING
Knees to chest (page 24)		✓	✓			
Single knee pull (page 24)					✓	
Floor pretzel (page 25)	✓	✓	✓		✓	✓
Single knee rotation (page 25)	✓		✓		✓	✓
Double knee torso rotation (page 26)		✓				
Butterfly (page 26)		✓	✓		✓	
Floor chest stretch (page 27)	✓	✓		✓		
Cobra (page 27)				✓	✓	
Child's pose three ways (page 28)				✓		
Cat-cow (page 29)	✓	✓	✓			
Downward dog (page 29)	✓					✓
Side-lying quadriceps stretch (page 30)				✓		✓
Kneeling hip flexor stretch (page 30)	✓	✓	✓	✓	✓	✓
Torso rotation on all fours (page 31)	✓					

STRAP WORKOUT	RACQUET SPORTS	GOLF	WALKING OR RUNNING	SWIMMING	BIKING	SKIING
Hamstring stretch with strap (page 32)				✓		
Inner thigh stretch with strap (page 32)	✓					✓
Outer thigh stretch with strap (page 33)	✓					✓
Full-body stretch with strap (page 33)				✓		
Side stretch with strap (page 33)		✓				

SEATED WORKOUT	RACQUET SPORTS	GOLF	WALKING OR RUNNING	SWIMMING	BIKING	SKIING
Seated shoulder stretch (page 34)						
Seated triceps stretch (page 34)						
Seated overhead stretch (page 35)						
Seated chest stretch (page 35)						
Seated wrist stretch (page 35)						
Seated hamstring stretch (page 36)						
Seated ear-to-shoulder stretch (page 36)						
Seated neck rotation (page 36)						
Seated pretzel (page 37)						
Seated inner thigh stretch (page 37)						
Seated rotation (page 37)						

STANDING WORKOUT	RACQUET SPORTS	GOLF	WALKING OR RUNNING	SWIMMING	BIKING	SKIING
Calf stretch (page 38)						
Soleus stretch (page 38)						
Standing chest and shoulder stretch (page 39)						
Standing quadriceps stretch (page 39)						
Standing hamstring stretch (page 39)						

Floor stretches

These 14 floor stretches are best performed on a cushioned mat, although a thick carpet or towels will do. If you find it difficult to lie on the floor, many of these stretches can be done while sitting on a chair. As you do the stretches, remember these points:

- Stretch to the point of mild tension, not pain.
- When holding the stretch, remain as still as possible, without bouncing.
- Breathe comfortably unless otherwise noted.

1 | Knees to chest

Primarily stretches the low back

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your legs extended on the floor. Relax your shoulders against the floor.

Movement: Slowly bend your knees. Grasp the backs of your thighs, and gently pull your knees in toward your chest. Feel the stretch in your back. Hold. Return to the starting position.

Tips and techniques:

- Keep your head on the floor and your neck relaxed.
- You can bring your knees in one at a time to get into position if raising both at the same time is too difficult.
- For a more challenging stretch, raise your head off of the floor, bring your chin toward your chest, and hold.

2 | Single knee pull

Primarily stretches the low back, buttocks, and front of the hip

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your legs extended on the floor. Relax your shoulders against the floor.

Movement: Bend your right knee. Grasp the back of your thigh and pull your knee in toward your chest. Flex your left foot and press the thigh and calf of that leg down toward the floor to feel a stretch in the front of your left hip and top of your left thigh. Hold. Return to the starting position and repeat with the other leg. This is one rep.

Tips and techniques:

- Keep your head on the floor and your neck relaxed.
- Keep the foot of your bent leg relaxed.
- For a more challenging stretch, raise your head off of the floor, bring your chin toward your chest, and hold.

Special thanks to Pilar Caso from the Baptiste Power Yoga Institute for demonstrating the yoga stretches. Master trainer Josie Gardiner modeled the floor stretches and standing stretches, while Dr. Lauren Elson demonstrated the seated stretches.

3 | Floor pretzel

Primarily stretches the buttocks, hip, and outer thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your right knee bent and foot on the floor. Rest your left ankle on your right thigh, just above your right knee. Your left knee should point out to the side, toward the wall. Grasp the back of your right thigh with both hands.

Movement: Slowly lift your right foot off the floor until you feel the stretch in your left hip and buttock. Hold. Return to the starting position. Repeat with your left knee bent and your right ankle resting on your left thigh, just above your left knee. This is one rep.

Tips and techniques:

- Keep your shoulders down and back, relaxing them against the floor.
- Keep your head on the floor and your neck relaxed.
- If it's too hard to grasp your thigh with both hands, put a strap or small towel around the back of the thigh and hold both ends.

4 | Single knee rotation

Primarily stretches the back, hip, and outer thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your legs extended on the floor. Relax your shoulders against the floor and extend your arms out to the sides at shoulder level, palms up.

Movement: Bend your left knee and place your left foot on your right thigh just above the knee. Place your right hand on your left knee. Tighten your abdominal muscles, and slowly lower your left knee across your body toward the right wall. Feel the stretch in your low back and hip. Hold. Return to the starting position and repeat on the other side. This is one rep.

Tips and techniques:

- The hip of your bent leg will come off of the floor as you rotate your lower body.
- Keep both shoulders flat on the floor. If one lifts up, don't rotate so far.
- To increase the stretch, look in the direction opposite to your knee rotation.

5 | Double knee torso rotation

Primarily stretches the back, chest, hips, and outer thighs

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your knees bent and feet together, flat on the floor. Put your arms out comfortably to each side at shoulder level, palms up.

Movement: Tighten your abdominal muscles and lift both knees toward your chest, then lower them together to the left side on the floor. Keeping your shoulders relaxed and pressed into the floor, look in the opposite direction. Feel the stretch across your chest and torso and in your lower back and hip. Hold. Bring both knees back to center and return your right foot, then your left foot, to the floor. Repeat in the opposite direction. This is one rep.

Tips and techniques:

- Try to bring both knees up into the fetal position. Ideally, keep them together throughout the stretch.
- Keep both shoulders flat on the floor. If one lifts up, don't rotate so far.
- If necessary, put a rolled towel between your knees to make this stretch easier.

6 | Butterfly

Primarily stretches the inner thighs

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit on the floor with the soles of your feet together. Place your hands on your ankles. Let your knees fall apart toward the floor.

Movement: Hinge forward from your hips until you feel the stretch in your inner thighs. Hold. Return to the starting position.

Tips and techniques:

- Keep shoulders down and back throughout the stretch.
- One side is likely to be noticeably tighter. Focus on balancing the stretch.
- You can place pillows under your legs for support if the stretch is too challenging.
- For a greater stretch, press down on your legs with your elbows.

7 | Floor chest stretch

Primarily stretches the shoulders and chest

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your knees bent and feet flat on the floor. Keeping your shoulders down and back, press them against the floor. Place both hands gently behind your head, elbows pointing toward the ceiling.

Movement: Slowly lower your elbows toward the floor to the point of tightness. Feel the stretch across your chest and into your shoulders and arms. Hold. Return to the starting position.

Tips and techniques:

- Don't arch your back.
- If necessary, limit the stretch by placing a small pillow on either side of your shoulders and gently pressing into the pillows.
- You can do this stretch while seated, too.

8 | Cobra

Primarily stretches the abdomen and chest

Reps: 2–4

Hold: 10–30 seconds

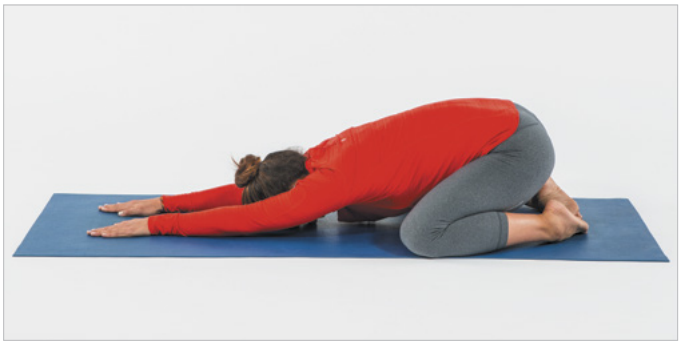
Starting position: Lie facedown with your forehead on the mat and legs comfortably extended with toes pointed. Place your hands just below your shoulders, palms facing down, and fingers together and parallel to your body.

Movement: Press your palms against the floor to slowly lift your head, shoulders, and chest. Keep your elbows back and soft, and your head and neck in neutral alignment. Feel the stretch down the front of your torso and across your chest. Hold. Return slowly to the starting position.

Tips and techniques:

- Keep your shoulders down and back, away from your ears, and your chest open. While holding, take full breaths by inhaling gently through your nose and lengthening the breath as you exhale through your nose.
- As you become stronger and more flexible, you may be able to fully extend your arms. Be careful not to lock your elbows in the fully extended position.

9 | Child's pose three ways



Primarily stretches the back, shoulders, arms, and sides

Reps: 2–4

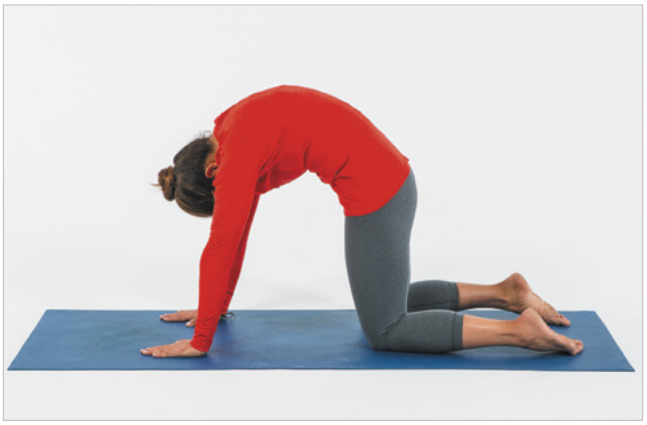
Hold: 10–30 seconds in each stretching position

Starting position: Position yourself on all fours, knees hip-width apart, big toes touching, and head and neck in neutral alignment.

Movement: This is a three-part stretch. Slowly drop your buttocks back toward your heels as you extend your hands in front of you and rest your forehead on the mat. Feel the stretch down your arms, shoulders, and back. Hold. Then walk your hands diagonally out to the right and place your left hand on top of your right hand. Feel the stretch down the left side of your body and your back. Hold. Then walk your hands diagonally out to the left and place your right hand on top of your left hand. Feel the stretch down the right side of your body and your back. Hold. Return to the starting position. That's one rep.

Tips and techniques:

- Rest your forehead on the mat when holding this stretch.
- Lower your buttocks only as far as feels comfortable. If necessary, place a pillow or towel between your thighs and calves to limit the stretch.
- While holding, take full breaths by inhaling gently through your nose and lengthening the breath as you exhale through your nose.



10 | Cat-cow

Primarily stretches the back, chest, and abdomen

Reps: 2–4

Hold: 10–30 seconds

Starting position: Position yourself on all fours, knees hip-width apart. Align your shoulders over your wrists, and your hips over your knees. Keep your head and spine in neutral alignment.

Movement: Slowly arch your back upward like a scared cat as you exhale. Pull your belly button in toward your spine and tuck your chin. Feel the stretch along your back. Hold. Slowly drop your belly, pull your shoulders back, and lift your head up to look forward as you inhale. Feel the stretch across your chest and down the front of your torso. Hold. Slowly return to the starting position.

Tips and techniques:

- The slow movements of this stretch are like a wave of your spine.
- Don't strain your neck by looking up too high.
- While holding, take full breaths by inhaling gently through your nose and lengthening the breath as you exhale through your nose.

11 | Downward dog

Primarily stretches the back, hips, hamstrings, calves, shoulders, and chest

Reps: 2–4

Hold: 10–30 seconds

Starting position: Position yourself on all fours, hands shoulder-width apart, knees hip-width apart, and fingers extended. Align your shoulders over your wrists, and your hips over your knees. Keep your head and spine in neutral alignment.

Movement: Exhale as you lift your knees off the floor, straightening your legs without locking your knees. While maintaining a neutral neck and spine, align your ears with your biceps (upper arms). Try to keep your weight evenly distributed between your hands and feet. Press your heels down toward the floor, if possible, while keeping your shoulders down and rolled back. Feel the stretch down the backs of your legs, throughout your back, and into your shoulders and arms. Hold. Return to the starting position.

Tips and techniques:

- Soften your elbows and keep your shoulders down and rolled back as you lengthen your spine. Brace your abdominal muscles throughout.
- If necessary, bend your knees slightly and let your heels come up off the floor.
- While holding, take full breaths by inhaling gently through your nose and lengthening the breath as you exhale through your nose.

12 | Side-lying quadriceps stretch

Primarily stretches the front of the thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your left side with your legs stacked and extended on the floor. Rest your left arm under your head.

Movement: Bend your right knee and bring your heel toward your right buttock, reaching back with your right hand to grasp your foot. Feel the stretch in the front of your thigh and hip. Hold. Slowly return to the starting position. Turn onto your other side and repeat. This is one rep.

Tips and techniques:

- Keep your hips stacked; don't roll forward or back.
- Don't arch your back.
- If you have trouble reaching your foot, place a strap around your ankle and gently pull the strap toward your buttocks.

13 | Kneeling hip flexor stretch

Primarily stretches the front of the hip and thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Kneel with your hands at your sides.

Movement: Put your right leg in front of you with the knee bent at a 90-degree angle and foot flat on the floor. Place your hands on your right thigh for support. Lean forward, pressing into the hip of your left leg while keeping your right foot on the floor. Feel the stretch in the front of your left thigh and hip. Hold. Return to the starting position, then repeat with your left leg forward. This is one rep.

Tips and techniques:

- Keep your front knee over your ankle, not jutting out past your toes.
- Keep your head and spine neutral, your shoulders down and back, and your abdominal muscles tightened.
- Keep your pelvis tilted forward (tailbone tucked under), rather than letting it tip back (tailbone lifted).

14 | Torso rotation on all fours

Primarily stretches the back, torso, chest, arms, and sides

Reps: 2–4

Hold: 10–30 seconds

Starting position: Position yourself on all fours, aligning your hands and knees directly under your shoulders and hips.

Movement: Gently place your right hand behind your head. Slowly bring your right elbow down toward your left hand. Feel the stretch in your upper back and arm. Hold. Then rotate your elbow up toward the ceiling. Feel the stretch across the front and side of your torso. Hold. Return to the starting position. Repeat on the other side. This is one rep.

Tips and techniques:

- Keep your head and spine neutral, shoulders down and back, and abdominal muscles tightened.
- Follow your elbow with your eyes as you rotate toward the ceiling.
- Keep your hips squared. Don't let them jut out to the sides as you twist.

Floor stretches using a strap

The strap used in these five stretches helps you position yourself correctly even if your muscles are tight. It allows you to limit a stretch by keeping the strap long or gently deepen a stretch as your body becomes more flexible by moving your grip up on the strap. As with all floor stretches, using a cushioned mat, or a thick carpet or towels, will help keep you comfortable.

1 | Hamstring stretch with strap

Primarily stretches the back of the thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your right leg extended on the floor. Bend your left knee to place the strap securely around your left foot. Hold the strap with both hands.

Movement: Flex the foot of your left leg and lift that heel toward the ceiling, straightening the leg as much as possible without locking the knee. As you do so, flex the foot of your extended right leg, pressing the thigh and calf down toward the floor. Gently pull on the strap to the point of muscle tightness. Feel the stretch in the back of your left thigh. Hold. Return to the starting position. Repeat on the other side. This is one rep.

Tips and techniques:

- Stretch the leg that is raised toward the ceiling to the point of mild tension. You should not feel any pressure behind the knee.
- Place the strap in the middle of your foot to secure it safely.
- Keep your leg pointing straight up to the ceiling. Don't let it roll out to the side or across your body.

2 | Inner thigh stretch with strap

Primarily stretches the inner thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your right knee bent and foot on the floor. Bend your left knee to place the strap securely around your left foot. As you extend your foot toward the ceiling, straighten your leg as much as possible without locking the knee. Keeping your shoulders down and pressing into the floor, hold both ends of the strap in your left hand. Place your right arm out to your side on the floor, just below shoulder level.

Movement: Tighten your abdominal muscles and slowly lower your left foot out to the left to the point of tightness while keeping your hips pressed to the floor. Feel the stretch in your inner thigh. Hold. Return to the starting position. Repeat on the other side. This is one rep.

Tips and techniques:

- Stretch to the point of mild tension, not pain. You should not feel any pressure behind the knee.
- Focus on keeping both shoulders and hips evenly on the floor, and your shoulders down and back.
- Don't arch your back.

3 | Outer thigh stretch with strap

Primarily stretches the buttocks, outer thigh, and back of the thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with your right knee bent and foot on the floor. Bend your left knee to place the strap securely around your left foot. Hold both ends of the strap in your right hand and place your left arm on the floor just below shoulder level.

Movement: Slightly bend your left knee and slowly lower your left leg across your body toward the right wall. Feel the stretch in your left hip, buttocks, and outer thigh. Hold. Return to the starting position. Repeat on the other side. This is one rep.

Tips and techniques:

- Keep your shoulders down and pressing into the floor.
- Don't let your bent leg drop toward the floor as you stretch the opposite leg.
- To increase the stretch, pull the leg across your body and then up toward the wall behind you.

4 | Full-body stretch with strap

Primarily stretches the upper body, abdominal muscles, and lower body

Reps: 2–4

Hold: 10–30 seconds

Starting position: Lie on your back with both legs extended. Hold the strap shoulder-distance apart with both hands by your hips.

Movement: Slowly lift the strap up toward the ceiling, then over your head and down toward the floor behind you. Imagine you are trying to reach your hands to the wall behind you and your feet to the wall in front of you. Feel the stretch throughout your body. Hold. Return to the starting position.

Tips and techniques:

- Keep your feet together and point your toes.
- Keep your shoulders down as you reach overhead. Don't let them scrunch up toward your ears.
- If you cannot comfortably bring your arms down to the floor when reaching overhead, try placing a pillow above your head and pressing the backs of your arms into it.

5 | Side stretch with strap

Primarily stretches the sides, arms, and shoulders

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight on the floor with chest lifted, shoulders down and back, knees bent, and ankles crossed. Hold the strap in both hands with your arms extended in a V shape in front of you.

Movement: Slowly lift the strap up toward the ceiling. Then lower your right hand to the floor near your right hip while continuing to hold the strap with your arms extended. Feel the stretch down the left side of your body. Hold. Return to the starting position, then repeat on the other side. This is one rep.

Tips and techniques:

- If you can't reach the floor, slide your hand down the strap until you are able. Or hold the stretch without touching the floor if that is comfortable.
- As you reach to one side during this stretch, press the opposite hip into the floor.
- Keep your chest open as you stretch. Don't let your top arm and shoulder roll forward.

Seated stretches

Practically everyone can do these 11 seated stretches. They can be done virtually anywhere—at work, in a hotel, or at home—and are especially helpful if you have trouble balancing while standing or find our floor stretches too challenging. Many of these stretches are perfect for relaxing muscles that tense up during desk work.

1 | Seated shoulder stretch

Primarily stretches the shoulder

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight on a chair. Put your left hand on your right shoulder. Cup your left elbow with your right hand.

Movement: Roll your shoulders down and back, then gently pull your left elbow across your chest as you extend your left arm. Feel the stretch in your left shoulder. Hold. Return to the starting position, then repeat on the opposite side. This is one rep.

Tips and techniques:

- Keep your shoulders down and back away from your ear during the stretch.
- Keep your head up straight; don't turn or bend it as you stretch.
- Don't twist your torso as you stretch. Keep your shoulders facing forward.

2 | Seated triceps stretch

Primarily stretches the back of the upper arm and the shoulder

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight. Place your right hand on your right shoulder. Clasp your right elbow with your left hand.

Movement: Keeping your shoulders down and back, lift your right elbow up toward the ceiling to the point of tightness. Feel the stretch in the back of your upper right arm and shoulder. Hold. Return to the starting position. Repeat on the other side. This is one rep.

Tips and techniques:

- Keep your head and spine neutral, shoulders down and back, and abdominal muscles tightened.
- Keep your elbow by your ear.
- For a deeper stretch, shift your supporting arm overhead and gently pull your elbow back.

3 | Seated overhead stretch

Primarily stretches the arms, shoulders, fingers, and wrists

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight with your arms at your sides.

Movement: Interlace your fingers and rotate your palms so they face down. Keep your shoulders down and back as you lift your arms up toward the ceiling. Your palms should now be facing up. Hold. Slowly return to the starting position.

Tips and techniques:

- Keep your shoulders down and back, away from your ears, during the stretch.
- Aim to bring your arms up in line with your ears. If that's too difficult, raise your arms only as high as is comfortable for you.
- The straighter your arms are, the deeper the stretch will be.

4 | Seated chest stretch

Primarily stretches the chest and shoulders

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight facing sideways in a chair without arms.

Movement: Roll your shoulders down and back. Clasp your hands behind you, intertwining your fingers so your palms face you. Gently lift your hands toward the ceiling to the point of tightness. Feel the stretch in the front of your shoulders and across your chest. Hold. Slowly return to the starting position.

Tips and techniques:

- Look straight ahead, keeping your chin level with the floor.
- Keep your shoulders down and back, away from your ears, during the stretch.
- Don't lean forward as you lift.

5 | Seated wrist stretch

Primarily stretches the wrist and forearm

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight in a chair. Put your left arm out in front of you, palm down.

Movement: This is a two-step stretch. Point the fingers of your left hand toward the ceiling. Place the palm of your right hand across your left fingers on the palm side. Using your right hand, gently pull your fingers toward you to increase the stretch, stopping if you feel any pain. Feel the stretch in the bottom of your wrist and forearm. Hold. Return to the starting position. Now bend your left hand at the wrist, pointing your fingers downward. Cup your right hand across the back of your left hand, then gently press to increase the stretch, stopping if you feel any pain. Feel the stretch in the top of your wrist and hand. Hold. Finish all reps, then switch arms and repeat both steps on the other side.

Tips and techniques:

- Keep your shoulders down and back, away from your ears.
- Don't arch your back as you stretch. Keep a neutral spine with your abdominal muscles tight.
- If this stretch is too difficult for you, perform circular motions with your wrists in both directions to help loosen the joint.

6 | Seated hamstring stretch

Primarily stretches the back of the thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight near the front of a chair with your feet flat on the floor.

Movement: Extend your right leg straight in front of you with your heel grounded on the floor and your toes pointing toward the ceiling. Hinge forward from the hip, placing your hands on your left thigh for support. Keep your spine neutral. Hold. Return to the starting position. Repeat with your left leg. This is one rep.

Tips and techniques:

- Stretch to the point of mild tension, not pain. You should not feel any pressure behind the knee or at your back.
- Keep your shoulders down and back, away from your ears, as you stretch.
- As you hinge forward, keep your chest lifted and imagine your chin reaching toward your foot.

7 | Seated ear-to-shoulder stretch

Primarily stretches the neck

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight near the front of a chair (or on a bench) with your hands at your sides.

Movement: Roll your shoulders down and back. Bring your arms behind your back and grasp your left wrist with your right hand at waist level. Gently pull your left hand toward your right hip and drop your right ear toward your right shoulder. Feel the stretch down the left side of your neck. Hold. Slowly return to the starting position. Repeat on the other side. This is one rep.

Tips and techniques:

- Keep your shoulders down and back, away from your ears, as you stretch.
- Don't bend at your waist as you stretch. Bend only your neck.
- For additional stretches, you can straighten your arm or drop your chin slightly toward your chest, or both. Feel how the area that's being stretched changes.

8 | Seated neck rotation

Primarily stretches the neck

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight in a chair with your chest lifted, shoulders down and back, and chin parallel to the floor. Rest your hands on your thighs.

Movement: Slowly rotate your head to the right. Feel the stretch in the left side of your neck. Hold. Repeat on the other side. This is one rep.

Tips and techniques:

- Keep your shoulders down and back, away from your ears, as you stretch.
- Keep your chin parallel to the floor. Don't look up or down.
- Each time you rotate your head, choose a spot to focus on while holding. This spot should move noticeably as your range of motion improves.

9 | Seated pretzel

Primarily stretches the buttocks, hip, and outer thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight in a chair and rest your left ankle on your right thigh above your knee. Place your hands on your thighs.

Movement: Keeping your spine neutral, slowly hinge forward from your hips until you feel a stretch in your left hip and buttock. Hold. Slowly return to the starting position. Repeat with your right ankle on your left knee. This is one rep.

Tips and techniques:

- Keep your spine neutral, not rounded, and your chest lifted as you lean forward.
- Keep your shoulders down and back, away from your ears, as you stretch.
- For a deeper stretch, gently press down with the hand on your bent leg.

10 | Seated inner thigh stretch

Primarily stretches the inner thighs

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight near the front of a chair. Open your legs as far apart as possible, knees and toes pointed outward. Place your hands on your thighs near your knees.

Movement: Keeping your spine neutral, hinge forward from the hips until you feel a mild stretch along your inner thighs. Hold. Return to the starting position.

Tips and techniques:

- Keep your spine neutral, not rounded, and your chest lifted as you lean forward.
- Keep your shoulders down and back, away from your ears, as you stretch.
- For a deeper stretch, push your hands into your legs as you lean forward.

11 | Seated rotation

Primarily stretches the back and neck

Reps: 2–4

Hold: 10–30 seconds

Starting position: Sit up straight on a chair with your feet flat on the floor, hip-width apart, and your arms at your sides.

Movement: Slowly rotate your head and torso to the right side, placing your left hand on the outside of your right knee and your right hand next to your right hip. Feel the stretch in your back. Hold. Slowly return to the starting position. Repeat to the opposite side. This is one rep.

Tips and techniques:

- As you rotate, keep your hips squared and facing forward.
- Each time you rotate, choose a spot to focus on while holding. This spot should move noticeably as your range of motion improves.
- To deepen the stretch, use your hands to gently twist a little farther.

Standing stretches

These five classic stretches enhance flexibility in key leg muscles and parts of the upper body. These stretches can help you walk, run, and reach more easily, which makes a difference in sports and daily tasks.

1 | Calf stretch

Primarily stretches the calf, Achilles tendon, and ankle

Reps: 2–4

Hold: 10–30 seconds

Starting position: Stand up straight. Hold the back of a chair or press your hands against a wall, arms extended at shoulder height.

Movement: Extend your right leg straight back and press the heel into the floor. Allow your left knee to bend as you do so, while keeping that heel grounded on the floor. Feel the stretch up the back of your lower right leg. Hold. Return to the starting position, then repeat with your left leg. This is one rep.

Tips and techniques:

- Hold a full-body lean from the ankle as you stretch.
- Keep your body in a straight line. Step closer to the chair or wall if you find yourself bending at the waist.
- Keep your front knee over your ankle, not jutting out past your toes.

2 | Soleus stretch

Primarily stretches the soleus (deeper calf muscle) and Achilles tendon

Reps: 2–4

Hold: 10–30 seconds

Starting position: Hold the back of a chair or press your hands against a wall, arms extended at shoulder height.

Movement: Extend your right leg slightly behind you and press the heel into the floor. Allow your left knee to bend as you do so, while keeping the heel grounded on the floor. Now bend your right knee as much as possible, pressing into your heel until you feel a stretch low in your calf. Hold. Return to the starting position. Repeat with the opposite leg. This is one rep.

Tips and techniques:

- Keep your shoulders directly over your hips. Don't bend at your waist.
- Keep your front knee directly over your ankle, not jutting out past your toes.
- Step closer to the chair or wall if you are having trouble balancing or maintaining good form—that is, keeping your heel down and your torso erect.

3 | Standing chest and shoulder stretch

Primarily stretches the chest, shoulder, and biceps

Reps: 2–4

Hold: 10–30 seconds

Starting position: Stand at arm's length away from a wall or a doorway, facing away from it. Extend your left arm and put your left hand on the wall, or the edge of the door frame, slightly below shoulder level, palm facing forward and touching the door frame.

Movement: Slowly turn your body to the right, away from the wall or door frame, until you feel the stretch in your chest and shoulder. Hold. Return to the starting position. Repeat on the other side. This is one rep.

Tips and techniques:

- Keep your shoulders down and back, away from your ears.
- If you feel unstable, stand with your feet apart.
- If the stretch is too difficult, lower your arm on the wall or door frame.

4 | Standing quadriceps stretch

Primarily stretches the front of the thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Stand up straight, feet together, holding the back of a chair with both hands.

Movement: Bend your right knee and reach back with your right hand to grasp your foot, lifting it toward your right buttock. Feel the stretch in the front of your thigh. Hold. Slowly lower your foot to the floor. Switch position to repeat with your left leg. This is one rep.

Tips and techniques:

- Try to keep both knees together, with the bent knee pointing toward the floor.
- Keep your pelvis neutral (neither tilted forward nor back); don't arch your back.
- If you have trouble grasping your foot, place a strap around it to assist with the stretch.

5 | Standing hamstring stretch

Primarily stretches the back of the thigh

Reps: 2–4

Hold: 10–30 seconds

Starting position: Stand up straight with your arms at your sides.

Movement: Extend your right leg straight in front of you, heel grounded on the floor and toes pointing to the ceiling. Place your hands on your upper thighs for support and hinge forward from the hip, keeping your spine neutral (no rounding or arching). Bend your left knee and sit back until you feel a stretch up the back of your right thigh. Hold. Return to the starting position. Repeat with the other leg. This is one rep.

Tips and techniques:

- Stretch to the point of mild tension, not pain. You should not feel any pressure behind the knee or at your back.
- Keep your shoulders down and back, away from your ears, as you stretch.
- As you hinge forward, keep your chest lifted and imagine your chin reaching toward your foot.

Resources

Organizations

American Academy of Physical Medicine and Rehabilitation
9700 W. Bryn Mawr Ave., Suite 200
Rosemont, IL 60018
847-737-6000
www.aapmr.org

This is the professional organization for physiatrists, medical doctors trained in physical medicine and rehabilitation. A referral service on the website locates physiatrists state-by-state.

American College of Sports Medicine
401 W. Michigan St.
Indianapolis, IN 46202
317-637-9200
www.acsm.org

ACSM is a nonprofit association that educates and certifies fitness professionals, such as personal trainers, and offers information to the public on various types of exercise. A referral service on the website locates ACSM-certified personal trainers.

American Council on Exercise
4851 Paramount Drive
San Diego, CA 92123
888-825-3636 (toll-free)
www.acefitness.org

ACE is a nonprofit organization that promotes fitness and offers educational materials for consumers and professionals. Their website has a referral service to help locate ACE-certified personal trainers and a free video library of exercises.

American Physical Therapy Association
1111 N. Fairfax St.
Alexandria, VA 22314
800-999-2782 (toll-free)
www.apta.org

This national professional organization fosters advances in education, research, and the practice of physical therapy. The website has a search engine to help locate board-certified clinical specialists who have additional training in specific areas of physical therapy.

Arthritis Foundation
1355 Peachtree St. NE, 6th floor
Atlanta, GA 30309
844-571-HELP (4357) (toll-free)
www.arthritis.org

This national nonprofit organization has local chapters in many states. The website has information on different forms of arthritis, pain control, treatments, alternative therapies, and other topics, including a database of exercise classes that are geared to people who have arthritis and that are offered in many locales.

National Institute on Aging
Building 31, Room 5C27
31 Center Drive, MSC 2292
Bethesda, MD 20892
800-222-2225 (toll-free)
www.nia.nih.gov
www.nia.nih.gov/Go4Life

Among other publications, the National Institute on Aging offers a free, easy-to-follow booklet and companion video packed with aging-friendly exercises called "Exercise & Physical Activity." The NIA's Go4Life website hosts an exercise campaign aimed at enhancing endurance, strength, balance, and flexibility for people ages 50 and older, including those recovering from injuries or living with chronic illnesses.

Harvard Special Health Reports

You can find additional exercise plans in these Special Health Reports from Harvard Medical School. To order, call 877-649-9457 (toll-free) or to go www.health.harvard.edu.

Better Balance: Simple exercises to improve stability and prevent falls
Suzanne Salamon, M.D., and Brad Manor, Ph.D., Medical Editors
(Harvard Medical School, 2017)

This report explains health problems that may impair balance and prompt falls. It offers six complete workouts to strengthen muscles, boost confidence, and interrupt a downward spiral that can compromise independence. Includes personal safety and home hazards checklists to prevent falls and other injuries.

Core Exercises: 5 workouts to tighten your abs, strengthen your back, and improve balance
Lauren E. Elson, M.D., Medical Editor, with Michele Stanten, Fitness Consultant
(Harvard Medical School, 2016)

Core exercises have received a lot of publicity for helping to flatten bellies and build washboard abs. But strong core muscles underlie almost everything you do, from walking to playing sports. That's because your core—which includes back, side, pelvic, and buttock muscles—forms a sturdy central link between your upper body and lower body. These workouts help build core strength.

Gentle Core Exercises: Start toning your abs, building your back muscles, and reclaiming core fitness today
Lauren E. Elson, M.D., Medical Editor, with Michele Stanten, Fitness Consultant
(Harvard Medical School, 2016)

A strong core can contribute to balance and stability, while helping to maintain a healthy back and good posture. This special program of gentle core exercises and stretches presents a beginning program that lets you get started in a safe, easy way, if you've had an injury, you've been unwell, you're afraid you'll hurt yourself, or you're concerned that you might make an existing injury worse. It complements the regular *Core Exercises* report, which contains harder exercises.

An Introduction to Yoga: Improve your strength, balance, flexibility, and well-being
Sat Bir Singh Khalsa, Ph.D., and Lauren E. Elson, M.D., Medical Editors
(Harvard Medical School, 2016)

Resources *continued*

Yoga classes have been multiplying in this country, but given so many types of yoga, it can be hard to know where to begin—and classes at gyms can be grueling. This report provides a safe, simple program, including sitting, standing, and floor exercises that can help with balance and flexibility.

The Joint Pain Relief Workout: Healing exercises for your shoulders, hips, knees, and ankles
Edward M. Phillips, M.D., Medical Editor, with Josie Gardiner and Joy Prouty, Physical Trainers
(Harvard Medical School, 2014)

The exercises in this report can help tame ankle, knee, hip, or shoulder pain. When practiced regularly, the workouts may permit people to postpone—or even avoid—joint surgery by strengthening supportive muscles and restoring flexibility.

Strength and Power Training for Older Adults: Two complete workouts to start rebuilding your muscles
Elizabeth Pegg Frates, M.D., Medical Editor, with Michele Stanten, Fitness Consultant
(Harvard Medical School, 2015)

This report provides a basic program to help build strength as well as power—the boost that adds speed to strength to help you move faster when walking, for example, or react more quickly, so that a trip doesn't become a fall.

Walking for Health: Why this simple form of activity could be your best health insurance
Lauren E. Elson, M.D., Medical Editor, with Michele Stanten, Fitness Consultant
(Harvard Medical School, 2015)

Walking is one of the simplest forms of exercise—and one of the best. This report includes five different walking workouts, information on proper technique, tips on finding the right shoes and socks, safety pointers, and more.

Glossary

ballistic stretch: A bouncing movement used to quickly extend muscle length. These stretches carry the potential for injury if the movement is not carefully controlled.

cartilage: Tough, flexible tissue that cushions the intersections between bones.

dynamic stretch: A movement pattern intended to take specific muscles and joints through a full range of motion: a golf swing or knee lifts, for example. Sometimes called a dynamic warm-up.

ergonomics: The science of designing and arranging things, usually in a workplace setting, to reduce physical stress and minimize risk of injury to the person in a particular environment.

extend: Straighten out a joint (for example, extending your arms means straightening your elbows).

flex: Bend a joint (for example, flexing your knee means bending your knee).

intensity: How hard you are exercising.

joint: A junction in the body where bones are linked together.

ligament: A tough, fibrous band of connective tissue that binds bone to bone, or bone to cartilage, at a joint, allowing a safe range of movement.

neutral alignment: Keeping your body in a straight line from head to toe except for the slight natural curves of the spine.

neutral posture: Positioning your body with chin parallel to the floor; shoulders, hips, and knees at an even heights; and knees and feet pointing straight ahead, whether standing or seated.

proprioceptive neuromuscular facilitation (PNF): A two-step approach to stretching that starts with isometric contraction of the opposing muscle, followed by a passive static stretch of the target muscle, usually applied by a partner who focuses on moving a joint through its range of motion. PNF requires expertise to do safely.

proprioceptor: A specialized nerve that assists in stretches by relaying information about joint angle, movement, and changes in muscle tension. One type of proprioceptor (a muscle spindle) helps trigger the stretch reflex; another (golgi tendon organ) triggers a lengthening reaction in muscles.

range of motion: The extent of movement in a joint and thus flexibility. This is measured in the degrees of a circle.

repetition: A single, complete performance of an exercise. Also called a rep.

static stretch: An exercise that involves holding a position that stretches a muscle to the point of tension. Static stretches can be active (the muscle being stretched does the work) or passive (a strap, barre, or partner does the work).

stretch reflex: Reflexive resistance to a stretch that compels the lengthening muscle to contract to avoid an injury.

tendon: A flexible cord of strong connective tissue that tethers muscle to bone.

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