Core training


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Definition

Core training is the strengthening and conditioning of the core muscles surrounding the middle of the body—the abdomen, hips, pelvis, and lower back. These muscles protect the spine and are responsible for stabilizing and balancing the body during movement. Therefore core training is sometimes referred to as core stabilization or balance training.

Purpose

Strong core muscles that contract appropriately are important for good posture and balance and for the stability and mobility of the spine, rib cage, pelvis, and hips. Movement is more powerful and efficient with a strong core. Strong core muscles also give better definition to the superficial muscles of the trunk and can help prevent or reduce lower back pain and injuries.

Everyone needs core strength and stability for daily activities. Core stability is particularly important for older adults, whose balance and coordination may slowly deteriorate. Weak core muscles put older people at risk for chronic back pain and poor balance that can lead to falls. Core training is said to balance the muscles and joints and work them in tandem, similarly to the way they must work in everyday life, be it climbing stairs or carrying groceries. However, as core training has increased in popularity, its value as a dedicated activity has come under question. In particular, some research suggests that core training is of questionable value for serious athletes.

Description

Muscles of the core
Every part of the body is connected directly or indirectly. Every movement affects other parts of the body and depends on the **strength** of the trunk for stability and power. The bones, discs, tough fibrous tissue, cartilage, and ligaments of the spine are all connected by muscles. If these muscles are strong and functioning properly, movement is stabilized and impact from the ground is absorbed. So-called "kinetic chains" extend from each foot, through the ankles, calves, knees, thighs, pelvis, and spine, coming together in the trunk. These kinetic chains form the bases of balance, posture, and coordinated movement.

The deep muscles are the most important for core stabilization. These include the transverse abdominis, the multifidus, and the pelvic-floor muscles. The transverse abdominis wraps around the front of the abdomen and pulls in the stomach. The multifidus extends along the spine, from the neck to the pelvis, with short fibers that connect each vertebra of the spine to other nearby vertebrae. The muscles of the pelvic floor are those that are felt when holding back urination.

Physical stability and balance depend on three coordinated systems, in addition to the core muscles: the vestibular or auditory system of the inner ear, the visual system, and the proprioceptive system. Sensory nerves called proprioceptors in the muscles, tendons, and joints signal the central nervous system, providing spatial and body-posture awareness. In addition to weak or unbalanced core muscles, poor posture, illness, or injury can interfere with equilibrium and result in physical unsteadiness or instability.

### Core-training formats

Core training ranked number six on the American College of Sports Medicine's survey of the top ten worldwide fitness trends for 2010. However, core training to promote health and **strength** is an ancient practice. Yoga, martial arts, T'ai chi, and Pilates all involve core training. Physical therapists and athletic trainers have long utilized core-training techniques, and most fitness centers now offer some form of balance or core training. In addition, core training is often incorporated into other exercise regimens, including **strength**, flexibility, and endurance training, and land and water aerobics classes.

Many core-training exercises are easy and can be performed anywhere at any time. Simple yoga poses, such as the tree pose, improve balance and stability. Changing the direction of one's gaze or balancing on one foot with the eyes closed makes such poses more challenging. Pilates is also a good core-training choice for beginners. A physical therapist, trainer, or exercise physiologist can help identify specific core weaknesses and muscle imbalances and suggest appropriate exercises.

Although core training requires no equipment, it is often performed with a balance or core board or an exercise ball, also called a Swiss, balance, or stability ball. Core training on an inflatable ball requires more coordination of major muscle groups and may work the muscles harder, providing cardiorespiratory and **strength** training, as well as balance training. Such props can also enliven a workout.

### Core-training exercises

Most core-training exercises are either isometric exercises that are held for a period of time or low-intensity exercises that use only the body weight as resistance and are repeated about 12 times or until the muscles tire. In general, core muscles are believed to respond better to more resistance with fewer repetitions. If the muscles have not tired after 12 repetitions, resistance can be increased with weights. Circuit core training, without resting between exercises, increases the intensity and burns more calories.

The two most basic core-training exercises are contraction of the transverse abdominis and bridging. To contract the transverse abdominis, the belly is pulled in toward the neutral spine. The spine is held in the neutral position—with its three natural curves—so that the back does not bend forward. The contraction is held for about six seconds while breathing normally, followed by a 10-second rest, with eight to 12 repetitions. This exercise can be performed anywhere—sitting at a desk, standing, or
driving. Bridging is performed while lying on the back with knees bend and feet flat on the floor. With the spine neutral and pushing with the feet, the transverse abdominis is tightened and the buttocks are raised a few inches. The position is held for about six seconds, while breathing normally, with up to ten seconds of rest between repetitions.

The bent-knee sit-up or abdominal crunch is the iconic core-training exercise. It is most often performed with the lower back against the floor and the arms across the chest or behind the head, bending at the waist. Extending the arms overhead increases the intensity. However, some experts now suggest that, rather than flattening the back to the floor, the hands should be placed, palms down, under the lower back to reduce pressure on the spine, with the head and shoulders lifted only slightly. With sit-up machines, a padded bar is pushed with the chest toward the thighs. Sitting upright in the machine prevents neck strain.

Lower-back muscles are worked by back extensions and leg lifts. Back extensions are performed lying facedown with the arms at the sides and lifting the chest. If this is too difficult, the arms can be under the chest with the forearms on the floor facing forward. If possible, the back lifts the chest off the forearms. A back-extension machine, which may be safer than floor exercises, is the opposite of a sit-up machine, with a padded bar that is pushed with the back. Leg lifts are gentle exercises for both the lower back and abdominal muscles. Lying on one's back, with arms at the sides, the legs are lifted about 12 in. (30 cm) or as high as is comfortable. The legs can be lifted together or alternately.

Various standing exercises for the upper body, such as standing rows and shoulder presses, as well as lower-body exercises such as squats, lunges, and step-ups, contribute to core strength. Other common core-training exercises include:

- the cat-camel--on the hands and knees, arching and lowering the back through a complete range of motion
- the cobra--lying facedown, lifting the upper body using the arms and holding for 20-30 seconds
- the bird-dog--on hands and knees, alternately lifting and extending the right arm and left leg and left leg and right arm, holding for two counts
- supine pelvic tilts--tilting the pelvis while lying on the back with the knees up and feet flat on the floor
- front plank--lifting up from a facedown position, with the arms under the shoulders, and holding for five to 30 seconds before slowly lowering back to the floor
- side plank, with straight legs to work the oblique muscles--lifting up from the floor on one forearm, and holding for five to 20 seconds before slowly lowering back to the floor and repeating on the other side

Core-training exercises with props include:

- the standing wood chop, with a single dumbbell, medicine ball, or weight plates
- standing cable rotations, with a cable machine or resistance tubing attached to an immobile object and held at chest/shoulder height
- seated trunk rotations, with a single dumbbell, medicine ball, or weight plates

**Precautions**

Some experts question the value of core training, and of abdominal crunches in particular. Some research suggests that repeated bending of the spine, which usually occurs with crunches, can over time contribute to spinal disc damage and rupture. Some experts argue that just six or eight crunches a few times per week are perfectly adequate. In any case, it is very important to perform crunches--and all core-training exercises--correctly. It is more important to do them correctly than to perform many repetitions. It is helpful to learn core training from an exercise physiologist or physical therapist to ensure that the correct muscles are being worked and that breathing is normal throughout.

**Preparation**
Core training may be preceded by a general cardiorespiratory warm-up, perhaps five to ten minutes of low-to-moderate intensity aerobic activity, such as walking or using a stationary bike or elliptical trainer. Core training requires learning to use diaphragmatic breathing and maintaining a neutral spine. Breathing with the diaphragm, the large muscle under the lungs, moves the abdomen and chest in and out rather than moving the chest and shoulders up and down. A neutral spine maintains the three normal curves—in the neck, upper back, and lower back. These curves help absorb shock and impact, whether sitting, standing, or moving. In contrast, slumping down puts additional stress on the spine and other body parts.

Before core training, the neutral spine should be located while standing, sitting, and lying on one's back with knees bent. Recognizing and maintaining a neutral spine enables good posture, both while exercising and while performing daily activities. To locate the neutral spine:

- Standing before a mirror with hands on hips just below the waist, the lower back is arched so the stomach moves forward, the buttocks back, and the hands rotate forward.
- Tightening the stomach and buttocks muscles flattens the lower back and rotates the hands back.
- Halfway between the forward and back positions, with the pelvis neutral, and standing tall with the ears and shoulders in line with the hips, defines the neutral spine.

**Aftercare**

Core training can be followed with a general cardiorespiratory cool down. This can be the same or similar exercises as performed during the warm-up.

**Complications**

Core training does not normally have any complications. However, as with any exercise, injuries are possible.

**Results**

Everyone needs some degree of core strength for everyday activities—even for standing up from a chair—and athletes require more core strength than the average person. However, although coaches, trainers, athletes, and the general public have emphasized core training in recent years, its value as a distinct training activity has been questioned. A study of novice adult runners with weak core muscles did find that six weeks of core training significantly improved times on 5-km runs compared with the control group who did not core train. However, other studies have found little or no benefit from core training. A study of college rowers found that, although eight weeks of strenuous core training tightened abdomens, it did not improve their rowing. A 2011 study evaluated back-, abdominal-, and side-muscle fitness by having young adults perform squats, lunges, twists, crunches, and rigid plank positions. The subjects were then given a series of physical performance tests, such as throwing a medicine ball backwards over the head and sprinting through an obstacle course. The researchers found little correlation between strong core muscles and athletic performance. They suggested that although core training should be a component of overall fitness programs, especially for preventing injuries, it should not be the main focus of any training program.

**Key Terms**

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<tr>
<td>Diaphragmatic breathing</td>
<td>Deep breathing from the diaphragm, utilizing the entire lungs.</td>
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Muscular contraction against resistance without significant change in muscle fiber length.

**Kinetic chain**
The connection or relationship between the nerves, muscles, and bones during movement.

**Medicine ball**
A weighted exercise ball about 14 in. (36 cm) in diameter that is used for strength training.

**Multifidus**
A muscle of the fifth, deepest layer of the back, extending from the sacrum to the skull, that helps erect and rotate the spine.

**Neutral spine**
Good posture; the three natural curves of the spine.

**Obliques**
The two flat muscles on each side that form the middle and outer layers of the lateral walls of the abdomen.

**Pilates**
An exercise regimen specifically designed to improve overall physiological and mental functioning, with special emphasis on core training.

**Proprioceptors**
Sensory receptors located deep within tissues, such as skeletal muscle, that respond to physical or chemical changes in the body.

**Swiss ball**
An inflated exercise or fitness ball, also called a balance or stability ball, 14-34 in. (36-86 cm) in diameter, that is used for exercise, athletic training, and physical therapy.

**Transverse abdominis**
The flat muscle that forms the innermost layer of the abdominal wall and that constricts the abdominal organs.

**Vertebrae**
The bony or cartilaginous segments of the spinal column.

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### questions to ask your doctor

- Should I do core training?
- How can I incorporate core training into my regular exercise?
- What should I concentrate on in my core training?
- What benefits should I see from core training?
- Are there any precautions I should take during core training?

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### For More Information

#### Books


#### Periodicals
• Cardozo-Pfeiffer, Rebecca. "Balance of Power: Proper Core Training Creates a Strong, Balanced Center. Here are Some of the Best Aquatic Exercises to Achieve It." Aquatics International 21, no. 8 (September 2009): 44-45.

• Carlson, Mike. "Short Circuit: Fit in Your Ab Workout at Home with this Quick yet Efficient Core-Training Program." Joe Weider's Muscle & Fitness 71, no. 6 (June 2010): 78-82.


• Strump, Brian. "Middle Management: Bolster Your Big Lifts with this Challenging Core Workout." Joe Weider's Muscle & Fitness 72, no. 6 (June 2011): 194.

Websites


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