

Principles of Exercise and Body Movement

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According to the National Institutes of Health, exercise:

- Involves movement of large skeletal muscles.
- Results in energy expenditure.
- Is planned, structured and repetitive body movement.
- Is done to improve or maintain health and fitness.

Exercise has several benefits including:

- Reduced cardiovascular disease risk.
- Reduced risk of type 2 diabetes and certain cancers.
- Increased strength of bones and muscles.
- Improved mental health, mood and ability to do daily activities.
- Decreased falling risk.
- Increased life span.

Muscles play different roles depending on the type of exercise movement.

- The **Agonist** muscles are the primary muscles involved in the movement.
- The **Antagonist** muscles are the muscles opposing the agonist or primary muscles.

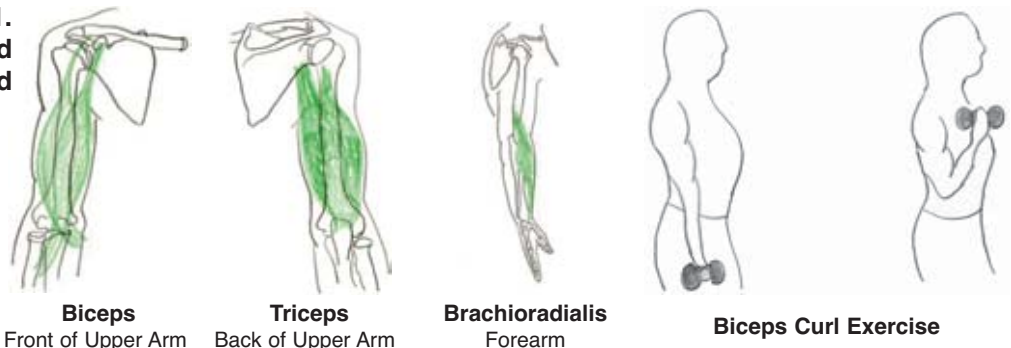


These muscles work together to control the flow of movement. While one muscle lengthens, the other muscle shortens.

- The **Synergist**, or **Guiding**, muscles move alongside the agonist or primary muscles to assist in movements.

For example, the agonist for the biceps curl is the biceps muscle. The biceps muscle is located on the front side of the upper arm. The antagonist muscle for this exercise is the triceps muscle that is located behind the biceps muscle on the back side of the upper arm. A synergist muscle for the biceps curl is the brachioradialis muscle which is located on the forearm. During the lifting phase of the movement, the biceps muscle shortens while the triceps muscle lengthens. Just the opposite occurs during the lowering phase of the movement. (See Figure 1.)

Figure 1.
Biceps Curl and
Muscles Used



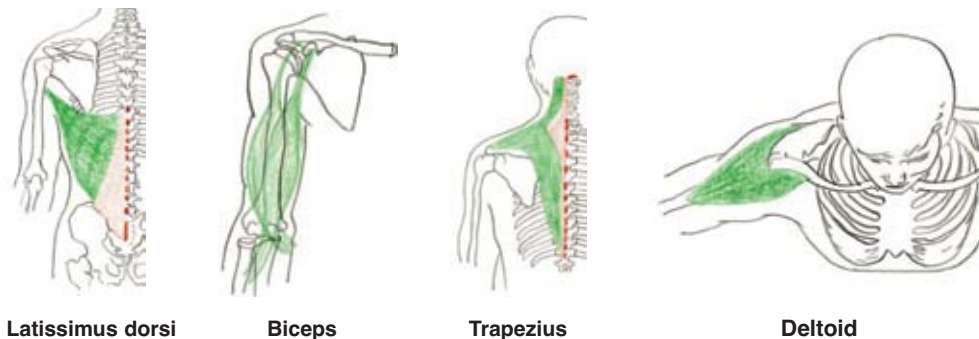
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Proper Form During Strength Training

Proper form or technique during exercise is important to reduce your risk of injury. In addition, correct body alignment and posture can decrease the amount of unnecessary stress that is placed on your muscles and joints and helps to ensure you will use the muscle group you are targeting rather than a “neighboring” muscle group. If you do an exercise incorrectly, you may work the synergist or guiding muscles rather than the agonist or primary muscles and/or risk harming your joints.

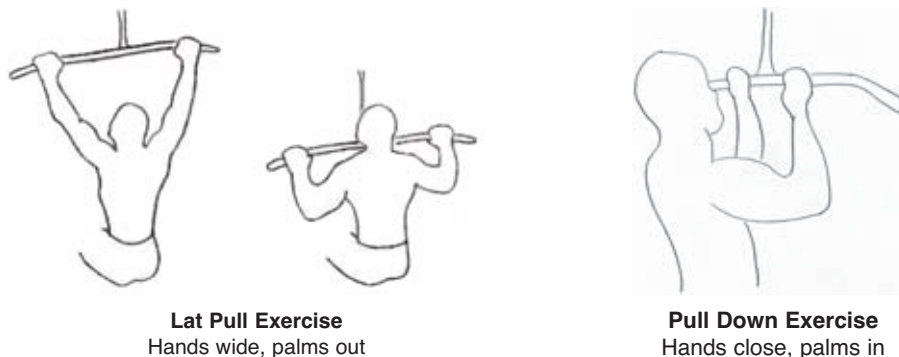
During the latissimus pull, or “lat” pull, the agonist, or primary muscle, is the latissimus dorsi, which is located on either side of the spine of the lower half of the back. Several synergist muscles assist in doing the lat pull: the biceps muscle located on the front side of the upper arm; the trapezius muscle, which runs from the base of the head, across the back of the shoulder and down the spine; and the deltoid muscle, which spans across the top of the shoulder. (See Figure 2.)

Figure 2. Muscles Used in the “Lat” Pull



Usually, the lat pull is performed with the hands placed wide and the palms facing away from the body. Reversing the grip and facing the palms toward the body requires placing the hands closer together. This can reduce the focus placed on the latissimus dorsi muscle and may incorporate the biceps muscle more. (See Figure 3.)

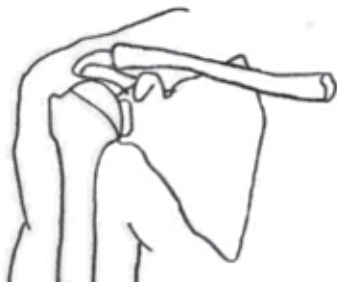
Figure 3. Hand Positions



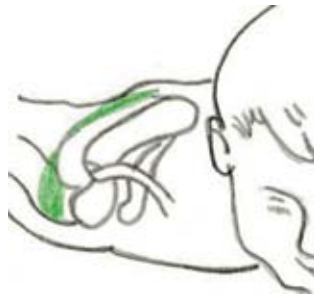
The shoulder and knee joint are especially prone to injury caused by incorrect form or technique. Precautions for exercises involving these joints are described on the following page.

Shoulder Joint: The shoulder joint is the most mobile joint in the human body and is composed of the four muscles of the rotator cuff. (See Figure 4.) Because the shoulder joint is so mobile, it is also susceptible to injury. Injury can occur when the arms are raised higher than shoulder height while bearing excessive weight. This may cause the muscles to become pinched or trapped, leading to compression, inflammation and possible damage.

Figure 4. Shoulder Joint and Muscles



Shoulder Joint



Infraspinatus



Subscapularis



Teres minor



Supraspinatus

Two common exercises that use the shoulder joint are the front and side raise. Both exercises are often performed incorrectly by lifting the arms higher than shoulder level. To prevent injuries, take care to lift the arms no higher than shoulder level. See Figure 5 for correct form.

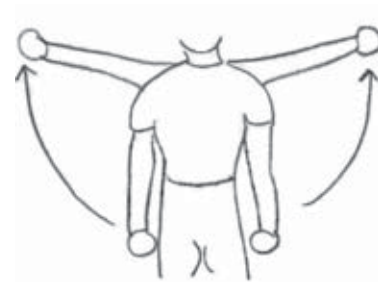
Figure 5. Exercises Using the Shoulder Joint and Muscles



Side Raise



Front Raise

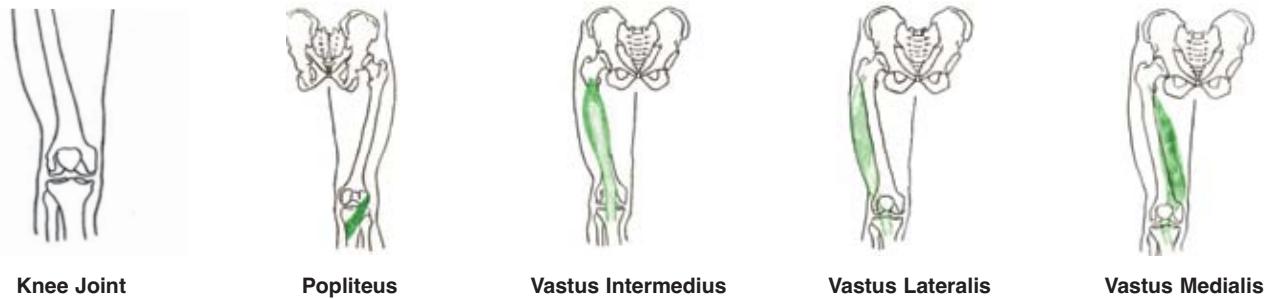


Incorrect Side Raise

Knee Joint: The knee joint is composed of multiple muscles. (See Figure 6.) The knee can bear a tremendous amount of stress, especially when performing squat or lunge exercises. These exercises are two very effective lower body exercises. The squat mimics movement of sitting down and getting up out of a chair, and the lunge helps to improve balance and stability. The squat and lunge incorporate multiple muscle groups in the hips, thighs, buttocks and calves. To prevent excessive stress on the knee joint when doing the squat or lunge, make sure you:

- Avoid leaning forward; keep your torso erect.
- Avoid pushing your knees forward. Keep your knees aligned over your ankles – not your toes.
- Avoid locking your knees when standing. Keep a slight bend in your knees.
- Keep your knees pointed in the same direction as your foot.

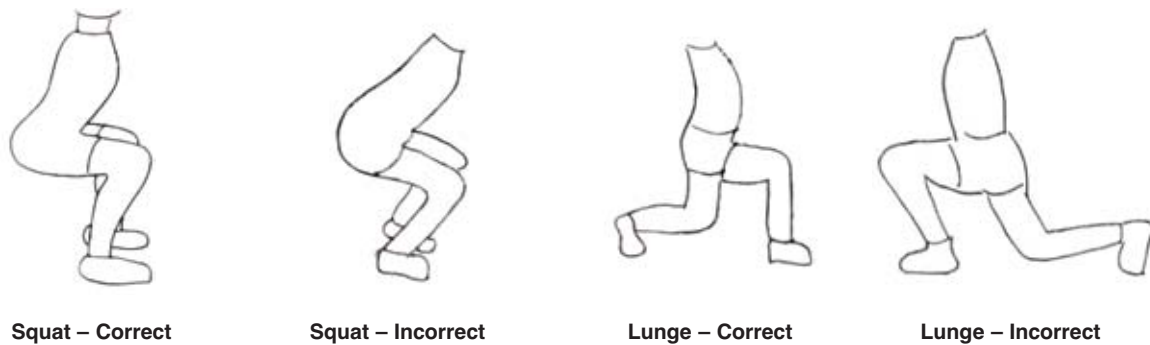
Figure 6. Knee Joint and Muscles



When form is correct and your knees are positioned over your ankles, the bulk of your body weight is distributed through the heels. When form is incorrect and knees are pushed forward toward the toes, body weight can be situated in the front part of your knees increasing the risk for injury.

For the squat exercise, shift your hips back as though you are going to sit in a chair. This will help to prevent premature forward movement of the knee. Using a wider stance can reduce the amount of stress placed on the knee joint. For the lunge, take a large step forward and lower your torso down toward the floor. For both the squat and the lunge, make sure to not bend your knee more than 90 degrees. (See Figure 7.)

Figure 7. Exercises Using the Knee Joint and Muscles



Proper Form During Stretching

Proper form and technique are also important when doing stretching or flexibility exercises. Stretching exercises can help keep your body flexible by enabling more freedom of movement for regular physical activity and activities of daily living such as getting dressed, tying your shoes and reaching for objects overhead. Stretching can also help prevent injuries, reduce muscle tightness and tension, promote relaxation and help with coordination. Stretching can be done as a stand-alone exercise or after other types of exercise, such as endurance and strength training, to help prevent muscle soreness and stiffness.

Stretching exercises, when done incorrectly, can result in injury to the muscle, joint and/or ligaments and tendons. Be sure to use correct form and technique when stretching.

- Always warm up at least 5 minutes before stretching. A warm up should increase blood flow through muscle tissue and increase overall body temperature.
- Slowly stretch into a position as far as possible without pain. Relax, breathe and hold the stretch for 10 to 30 seconds. Repeat the stretch a second time. The first stretch “wakes up” the targeted area. You should be able to reach into the stretch a little farther the second time.
- Do not bounce or jerk into a stretch.
- Do not lock your joints. Always keep a slight bend in your elbows and knees while stretching.
- Remember to breathe normally.

Some stretching exercises target specific areas of the body: upper body, mid-section or trunk and the lower body. Within these areas, several muscles work together to perform specific movements. Similarly, stretching exercises can benefit several muscles at a time when done correctly.

Benefits of Exercise

Muscles of the Upper Body: Muscles of the upper body include those in the areas of the neck, upper back, chest and shoulders. Stretching and strengthening these muscles can help to:

- Ease tension, stiffness and pain around the neck and upper spine.
- Improve posture and prevent the body from hunching forward.
- Improve range of motion and prevent injury.
- Increase bone density and prevent osteoporosis.

Muscles of the Mid-Body: Strong abdominal (stomach) muscles are vital to a strong body. Strong abdominal muscles can help to stabilize, support and move your torso, which can, in turn, help to reduce discomfort in the lower back and hips. The torso is comprised of muscles within the abdominal wall and those of the posterior or back surface of the spine.

Muscles of the Lower Body: The legs, or the muscles of the lower body, are the body's foundation. When compared to the muscles of the upper body, these muscles are usually bulkier and stronger. A stronger lower body can make activities of daily living and exercise easier, reduce the risk of falls and increase sense of balance. Muscles of the lower body include those in the hips and buttocks, thighs, hamstrings and calves.

If you have a chronic health condition, such as arthritis, diabetes or heart disease, check with your medical provider before starting an exercise program to see if you have any restrictions that may limit or prevent your ability to exercise.



It is also important to start a new exercise program slowly and to gradually increase your level of activity.



Exercise Pointers

Here are a few exercise pointers to help reduce your risk of injury:

- Refrain from excessive joint flexion (narrowing the angle of a joint), extension (widening the angle of a joint) or locking. This can cause ligament and cartilage damage.
- Never exceed your comfortable range of motion.
- Do not excessively flex or extend your back. Maintain the natural curvature of your spine. This can be accomplished by tightening your core muscles.
- Breathe. Failing to breathe normally increases your blood pressure, puts strain on your heart and arteries and can cause dizziness, headaches and even blackouts.
- Keep a steady tempo. Performing exercises at the right tempo reduces your risk of injury by helping to ensure proper form and range of motion.

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For examples of a strength training exercise routine, see the poster MP528, *Get Pumped: Seated Strength Training Basics*, and the fact sheet FSFCS27, *Get Pumped: Seated Strength Training Basics*, available at www.uaex.uada.edu (click the "Publications" link).

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