Fitness Career Opportunity

Physical Education Teacher

Physical education teachers teach and assess physical fitness, athletic skills, and sportsmanship, and promote wellness and healthy lifestyles. Physical education teachers work in elementary schools, middle schools, high schools, or colleges. They are responsible for such things as designing physical fitness and athletic activities, maintaining equipment, and managing budgets.

In the growing field of adaptive physical education, teachers work with children who have been identified with a disability (e.g., mental handicaps, physical handicaps, learning disabilities, or emotional handicaps).

Coach

Many physical education teachers are also coaches. Coaches head sports teams in schools, colleges, or professional or youth leagues. They teach and evaluate sports skills, develop game strategies, develop physical conditioning drills and exercises, recruit players, and often oversee team administration.

For more information on physical education teaching and coaching, contact:

National Association for Sport & Physical Education (NASPE)
Reston, Virginia 22091
(703) 476-3410
www.aahperd.org/naspe/template/cfm

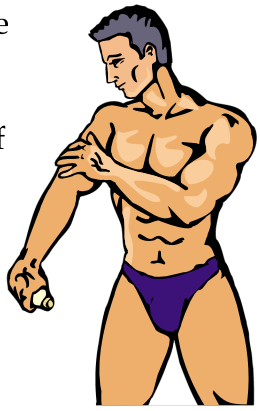
American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD)
1900 Association Dr.
Reston, Virginia 22091-1598
(800) 213-7193
www.aahperd.org

National High School Athletic Coaches Association
P.O. Box 4342
Hamden, CT 06514
(800) 262-2495
www.hscoaches.org

Unit 4: Muscular Fitness

Introduction

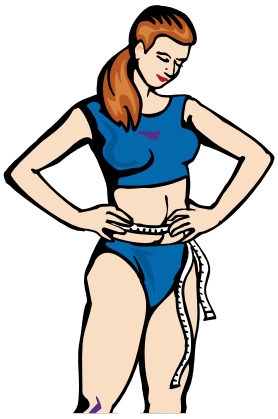
Have you ever looked with envy at someone on the beach whose body was muscular and well-defined? Those fit muscles not only looked good, but they were healthy, too! **Muscular fitness** not only improves your appearance but helps keep you lean, strengthens your bones, decreases your risk of injury, gives you more energy, and improves your control over your body. **Resistance training**, or **weight training**, is the best method to improve the tone, shape, and strength of your muscles and body.



Muscular fitness will tone and firm muscles, improving appearance.

Muscular Fitness: Strong Muscles That Can Keep Working

Muscular fitness includes two health-related components of physical fitness: **muscular strength** and **muscular endurance**. Muscular *strength* is the ability of a muscle or group of muscles to exert a maximal force in a single effort. Lift a heavy weight one time and you are using muscular strength. Muscular *endurance* is the ability of a muscle or group of muscles to repeat a movement over time without tiring. Carry a medium load for a long time and you are using muscular endurance.



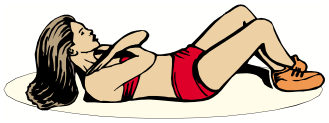
Muscular fitness helps keep you lean and strengthens your bones.

Every movement we make uses our muscular system. Well-conditioned muscles are essential for efficiently carrying out your daily activities. Without muscular strength and endurance, even carrying a load of library books home or unloading a trunk full of groceries can be exhausting.

Fit Muscles: The Benefits of Muscular Strength and Endurance

Muscular strength and endurance are important components of overall health. Muscular strength and endurance not only improve your physical health, but they can also improve your psychological health. When you work on your body, you work on your mind! Muscular fitness will do the following:

- increase muscle tissue, creating more strength
- tone and firm muscles, improving physical appearance
- burn a higher rate of calories than unfit muscles, even when the body is not exercising
- help decrease fat and improve body composition
- help in correcting muscular strength imbalances
- improve posture
- improve physical ability and athletic performance
- help improve coordination, giving you a better sense of control over your body
- help build self-confidence



- reduce risk of injuries by protecting joints
- help prevent and reduce lower back pain
- help strengthen bones
- reduce risk of heart disease, diabetes, and some forms of cancer
- slow the aging process
- help women build muscular strength and **muscle tone** without gaining bulky muscles
- reduces stress.

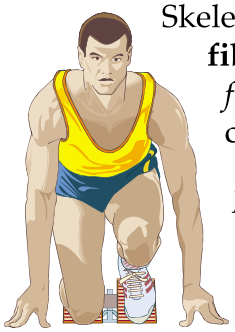
Unfit Muscles: The Body at Risk

A lack of adequate muscular strength and endurance can lead to many health-related problems. A lack of muscular fitness can cause the following:

- poor muscle tone and body composition
- a body that gains weight easily
- poor posture due to weakened muscles
- bone loss
- muscle and joint injuries
- lower back and other joint pain
- diabetes, heart disease, and certain cancers
- reduced control over body
- low energy level and quicker **fatigue** rate.

Muscle Structure: Fast- and Slow-Twitch Muscle Fibers

Movement by the body is produced by **skeletal muscles**. *Skeletal muscles* are attached to the bones by tendons. When we strengthen and exercise our skeletal muscles, we improve our muscular fitness.



A sprinter needs muscles with a large number of fast-twitch fibers.

Skeletal muscles are composed of three types of **muscle fibers**: **fast-twitch muscle fibers**, *intermediate twitch muscle fibers*, and **slow-twitch muscle fibers**. They also contain connective tissue, nerves, and blood vessels.

Fast-twitch or *white muscle fibers* contract, or tighten, quickly and are useful for short, intense bursts of action. However, fast-twitch muscle fibers tire quickly, so they can only be used efficiently for a brief time. A sprinter who needs to explode off the starting line and dash for 50 meters needs muscles with a large number of fast-twitch fibers. To generate an

explosive strength movement requires **power**. Power is the use of maximum strength at a rapid rate. Only a large number fast-twitch fibers can produce power. Someone trying to build muscular strength needs to train and increase the number of fast-twitch muscle fibers.

Long-distance runners require a large number of slow-twitch fibers.

Intermediate twitch muscle fibers are a combination of fast- and slow-twitch muscle fibers. They are not as fast as the fast-twitch muscles but they have more endurance. However, they do not have as much endurance as the slow-twitch muscle fibers.

Slow-twitch or *red muscle fibers* contract slowly and have the ability to work for long periods of time without tiring. These fibers are best suited for aerobic or endurance activities. A long-distance runner requires a large number of slow-twitch fibers. A person trying to increase muscular endurance needs to train and increase the number of slow-twitch fibers.

Everyone is born with a different number of slow-twitch and fast-twitch muscle fibers. An individual born with many fast-twitch muscle fibers will have an advantage in a speed or power sport or activity. And a person born with many slow-twitch muscle fibers will have an advantage in an aerobic or endurance sport or activity. However, everyone can improve the fitness, size, and performance of each kind of muscle fiber through proper exercise training.

Developing Muscular Fitness: Isometric, Isotonic, and Isokinetic Exercise

To train each kind of muscle fiber and the overall fitness of muscles, there are three different methods of exercising: **isometric**, **isotonic**, and **isokinetic**. Each of these methods works the muscle against resistance to improve fitness.

Isometric Exercise: Pressing against an Immovable Object

Isometric exercises are exercises in which the muscle contracts when pressed against an immovable object. For example, squeezing a tennis ball in your hand as hard as you can for six to ten seconds is an isometric contraction.

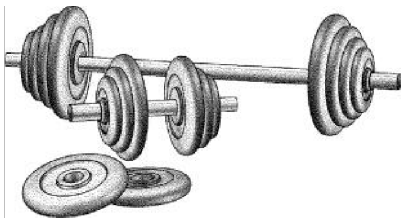
Isometric exercises take very little space and equipment to perform.

Isometric exercises develop strength only at the position the exercise is performed, not throughout the full range of motion. They do not change the length of the muscle. Isometric exercises are not effective in developing overall strength.

The advantage of isometric exercises is that they take very little space and equipment to perform, and can be done while sitting at a desk or driving in a car. However, they can cause an increase in blood pressure and may not be recommended for persons with circulatory problems.

Isotonic Exercise: Using Calisthenics, Free Weights, and Weight Machines

Isotonic exercises are exercises that cause a muscle to lengthen and shorten through a full range of motion while lifting and lowering a weight or resistance. This resistance may be in the form of weight training equipment such as **free weights** or weight training machines. Free weights are objects of various weight used for developing and increasing muscular strength and endurance. Free weights consist of weighted bars, called *barbells* and *dumbbells*, or *light handheld weights*.

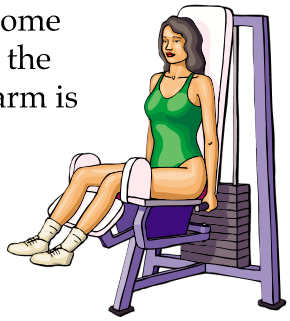


Free Weights

Isotonics also include **calisthenics**, or exercises that use the weight of your own body for resistance. Push-ups or abdominal curl-ups are examples of calisthenics.

Guidelines for Muscular Fitness Exercises	
1. Begin with a warm-up.	A warm-up consists of exercises that increase the body's temperature and prepare it for more vigorous activity. A proper warm-up will make you less prone to a muscle or joint injury. A typical warm-up might include light jogging to heat up the body, then some gentle stretching to lengthen the muscles.
2. Use proper gear.	Wear rubber-soled shoes or other non-skid shoes when working out. Wearing gloves can be helpful in protecting your hands and preventing weights from slipping. Always secure barbell plates properly to prevent slipping. Learn proper ways of handling free weights and weight machines.
3. Use proper form.	To get better results out of the exercises and reduce chance of injury, learn and use proper exercise technique and posture for all exercises. Never sacrifice form in an attempt to perform more reps or use more weight. Avoid locking joints when performing any exercise.
4. Avoid horse play.	When working with weights do *not* play around. Do not attempt to lift weights that are too heavy or perform exercises that are too advanced for your fitness level.
5. Begin slowly.	If you are new to any type of muscular fitness program, begin with very light weights. This will give your body a chance to learn and perform the exercises correctly.
6. Use a spotter.	Do not lift free weights without a partner. A spotter is essential for safety and can aid you in making improvements. Be sure to tell your spotter how many reps you intend to complete and tell the spotter when you need assistance.
7. Exercise major muscle groups.	For total muscle conditioning and balanced fitness, it is essential to exercise the whole body. Avoid exercising only the parts you enjoy the most.
8. Exercise large muscles first.	Since the large muscles require the most energy, workout sessions should be organized with the largest muscle groups first, followed by the smaller groups.
9. Work your full range of motion.	Choose a weight that allows you to perform the exercise through a full range of motion. Range of motion is the distance a joint can move without pain or injury. Working the full range of motion helps to target weak and injury prone areas and avoid tightening of the muscle.
10. Use controlled movements.	Exercise movements should be slow and controlled. When training with weights, take 2 counts to lift the weight, and 4 counts to lower the weight. Swinging or bouncing the weights in attempt to lift them places stress on the joints and muscles. This increases the risk of injury.
11. Remember to breathe.	Avoid holding your breath during any exercise. Holding your breath could cause you to get dizzy. Try to exhale when you are applying the greatest force to the movement, and inhale during the easy part.
12. Rest.	A brief pause of 1 to 2 minutes between sets allows the muscles to recover a bit before beginning the next set. This is a good time to stretch the muscle that has just been worked. Also, workouts with weights that focus on strength should be scheduled every other day. This helps to allow for adequate rebuilding of muscles.
13. End with a cool-down.	Always take adequate time to cool down after working out. This cool-down may include stretching all the major muscle groups, plus any others used in the activities.
14. Train, don't strain.	It is normal to expect some muscle soreness from muscle strength or endurance training. But, it is not necessary to push to pain to improve. A gradual level of progression as your body adapts to exercise is much safer. Always let your muscles adjust to the new weight or exercise before moving on.

Each isotonic exercise demands more muscle force in some positions and less muscle force in others. For example, the muscle effort used to lift a barbell is greater when the arm is perpendicular to the ground than when the arm is parallel to the ground. The change in muscle effort throughout the exercise movement is the only disadvantage to isotonic exercises. Isotonic exercises are the most common and popular form of developing muscular fitness.



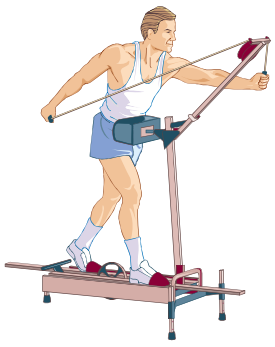
Isokinetic Exercise: Using Specially Designed Weight Machines

Isokinetic exercises are exercises done on specially designed weight machines that work muscles through their entire range of motion using variable resistance and speed. By altering the resistance and speed, these machines are able to keep the resistance you are working against at a constant level. The advantage of this method is that maximum resistance is provided at strong points and less resistance is provided at the weak points of the movement.

Isokinetic equipment is becoming more commonly seen in gyms or health clubs. Isokinetics are a superior way of increasing muscular strength and endurance.

Training Principles for Muscular Fitness: Overload, Progression, and Specificity

The equipment and type of exercise you use will determine the training principles you need. *Isometric exercises* are not always safe, and *isokinetic exercises* require expensive equipment. Therefore, *isotonic exercises* are most commonly used. The following points apply to isotonic exercise training.



In order to improve your muscular fitness, you must consistently *overload* or work your muscles harder than usual. After your muscles have been overloaded, they must be rested. It is during these rest periods that your muscles build and muscular development takes place. You can achieve overload to increase muscular strength and endurance by applying the *F.I.T.T. formula*.

F.I.T.T. Formula

(F) Frequency

- Perform muscular fitness exercises three or four times a week.
- Space workouts 48 hours apart to allow the muscles to recover and rebuild if training for muscular strength.
- Increase the length of your exercise sessions to increase muscular fitness.

(I) Intensity

- Use light resistance and high **repetitions** or *reps* if you desire muscle tone and general strength. *Repetitions* are the number of complete times an exercise is performed.
- Reach fatigue between 12 and 15 repetitions during light resistance.
- Use greater resistance and perform fewer repetitions if your goal is muscular growth and increased strength.
- Reach fatigue between six and 10 repetitions during heavy resistance.
- To improve muscular strength, lift 60-90 percent of what you can lift one time.
- To improve muscular endurance, lift 30-50 percent of what you can lift one time.
- Increase weight and repetitions slowly

(T) Type

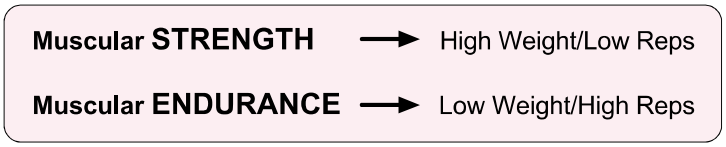
- Determine your normal level for an exercise.
- Exercise at a level above normal to cause the body to function more efficiently.
- Change types of exercises you are performing by moving from above normal to advanced exercises and techniques.

(T) Time

- Perform one to three **sets** of each exercise for a general fitness program. A *set* is a group of repetitions performed without resting.
- Include at least eight to 10 exercises for the entire body.

- Take a one- to two-minute rest between sets or exercises.
- Try reducing the resting time between sets to increase muscular fitness as your body gets used to a certain workout. Your workout may take from 20 minutes to an hour or more, depending upon your goals.

Even though muscular strength and muscular endurance are separate components of health-related fitness, they are closely related to one another. The primary difference between the two is in the amount of weight lifted and the number of times the movement is performed.



Progression: Increasing Muscular Fitness

If you are just beginning a muscular fitness program, experts recommend that you develop muscular endurance before muscular strength. To build muscular endurance, train with lighter weights and perform a higher number of repetitions. This will lessen the chance of injury, reduce muscle soreness, and give your body adequate time to learn proper exercise technique.

To progress in a muscular fitness program, increase the resistance and/or the number of repetitions. Once you can perform a pre-established number of repetitions, add a small increase in weight. When you increase the weight you are lifting, decrease the number of repetitions. Then, as your muscles develop, increase the number of repetitions with the heavier weight.

Specificity: Targeting Specific Parts of the Body

Although doing any resistance exercises with proper technique will benefit your muscular fitness, you should design a training program with specific goals in mind. To develop muscular strength or endurance in a particular part of your body, you must work those particular muscles. For example, to increase leg strength, you need to do specific leg exercises. To firm and tighten the stomach area, you must do abdominal strengthening exercises. Moderate resistance training is recommended by the American College of Sports Medicine. One set of 8-10 repetitions of 8-10 exercises at least 2 times a week is also suggested.

Common Fallacies Associated with Weight Training

Fallacy: Weight training is only for athletes.

Fact: Resistance training has important health benefits for everyone! People from all walks of life can benefit from increasing their muscular strength and endurance. Stronger muscles prevent lower back and joint pain, reduce the risk of many chronic diseases, delay the aging process, and can improve your physical abilities and appearance.

Fallacy: Steroids are a safe way of developing muscle mass.

Fact: *Steroids* are not only illegal but have many dangerous side effects. The health risks are not worth the muscle mass that can be developed using steroids. The safest way to develop stronger, larger muscles is to follow a regular, strength training program.

Fallacy: As a female, I worry I will develop big, bulky muscles if I lift weights.

Fact: Certain hormones—such as testosterone, a male hormone—are necessary for big muscles, and females generally don't have them in sufficient quantity. Females improve in muscle tone when they weight train but do not gain as much in muscle size as males.

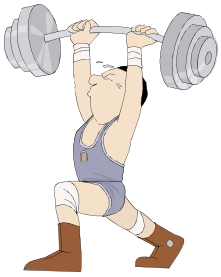
Fallacy: Weight training is not a safe activity for growing and developing adolescents.

Fact: A safe weight training program can be very beneficial to adolescents. It can help growing adolescents maximize bone development.

Fallacy: Muscle soreness is an indication I have worked out too hard or perhaps injured myself.

Fact: Muscle soreness is a normal response to a new physical activity or an increased workload. It is experienced by nearly everyone who trains for muscular fitness. It is common to experience a deeper soreness when your body is new to an exercise or workload. Once your body has adapted to exercise, severe muscle soreness should not occur. However, if you are goal-oriented and push yourself hard in every workout, expect muscle soreness. No matter what your fitness level, when you perform a new activity, you can expect some muscle soreness. Gentle stretching before and after training, as well as light exercises, are ideal for speeding your recovery from muscle soreness.

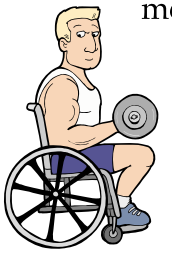
Fallacy: Once I develop the strength I desire, I can stop lifting weights.



Fact: The adage *use it or lose it* applies to every component of physical fitness. The body maintains or improves with use and deteriorates with disuse. You must follow a regular exercise program to maintain your fitness level.

Find Your Starting Point: Measuring Muscular Strength and Endurance

Before starting a muscular fitness program you should measure your muscular strength and endurance. You will then be able to measure your progress over time.



Everyone can benefit from increasing their muscular strength and endurance.

Muscular strength and endurance can be measured in many ways. One simple method is to determine if a person can push, pull, and carry her own body weight effectively.

Isometric Exercises: Limited Gains but Convenient

Isometric exercises can be useful for individuals trying to recover from an injury, people with certain physical disabilities, and for those confined to a small space. Remember, though, that the strength gains from isometric exercises are minimal.

Isometric Exercises

Praying Hands	**strengthens arms, shoulders, and upper back**	Place palms of hands together at chest level. Either stand or sit. Press palms together for 6-10 seconds, then release.
Doorway Push	**strengthens shoulders and arms**	Stand in doorway with arms extended down by sides, palms facing in. Raise arms from sides to doorway and push against door frame. Hold for 6-10 seconds and release.
Wall-Sit	**strengthens major muscles of legs**	Slide down the wall until knees form a 90° angle. Feet should be flat on the floor and point directly forward. Relax extended arms by your sides. Hold position for 6-10 seconds and release.
Wall Posture	**strengthens abdominals, back, and buttocks**	Place back to the wall with feet about 3" in front of you, knees slightly bent. Relax arms by your side. Contract your abdominal muscles and push your back, shoulders, and buttocks against the wall. Hold 6-10 seconds and release.
Pelvic Tilt	**strengthens abdominals, back, and buttocks**	Lie on back with legs extended and arms next to body, palms down. Contract the abdominal muscles, and at the same time press the lower back against the floor. Hold 6-10 seconds and release.
Static Push-up	**strengthens arms, chest, and upper back**	Assume a face-down position on a mat with your hands directly under your shoulders, legs extended, and toes tucked to support body. Lower the body until the arms and the elbows are flexed, or bent to a 90° angle or less. Hold this position 6-10 seconds and release.

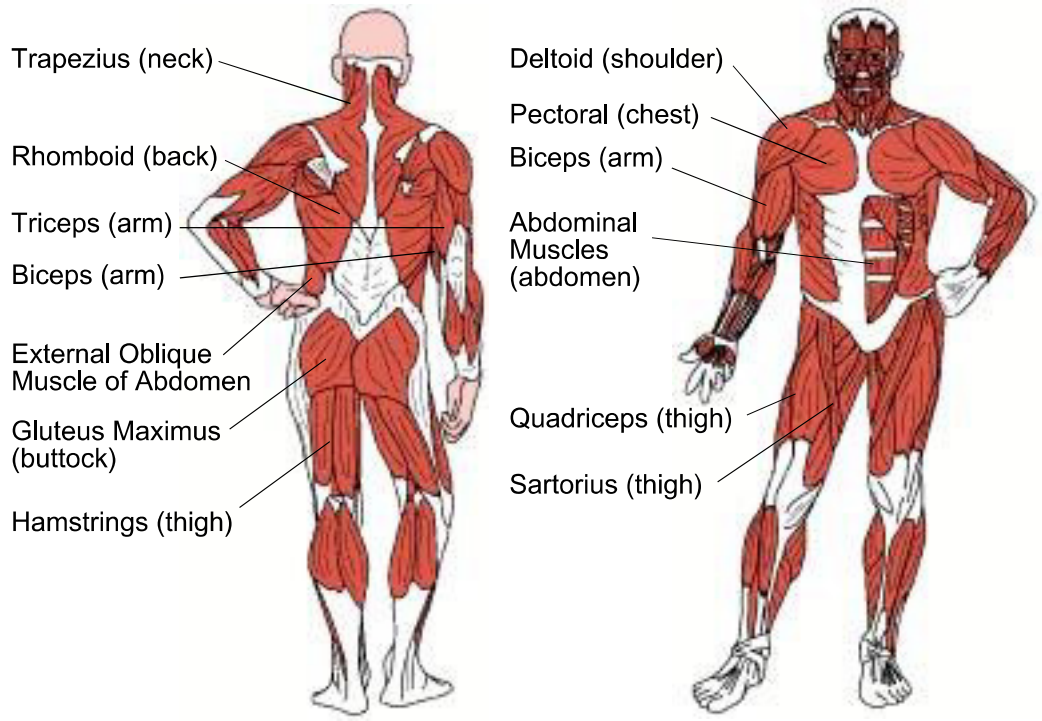
Isotonic Exercises/Calisthenics: Large Gains and Convenient

Many exercises for muscular fitness require little or no equipment besides the weight of your own body! Body conditioning exercises which use your own weight as resistance are called *calisthenics*. Calisthenics only permit you to increase the repetitions you do but not the (body) weight you use as resistance. Therefore, these exercises mainly develop muscular endurance, not muscular strength.

However, by adding free weights such as dumbbells, barbells, or strapped-on weights in many of these exercises, you can develop muscular strength as well as muscular endurance.

Calisthenics are very popular and a great way to exercise in your own home! They help to develop firm, toned muscles.

The Muscular System

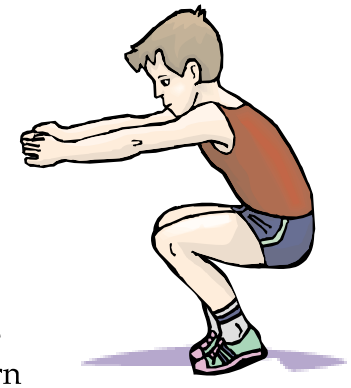


The exercises on the following page are common exercises used to increase the muscular fitness of major muscle groups of the body. Try to complete one set of each exercise, performing as many repetitions as you can. As your muscular fitness improves, you can either add one or two more sets, or add free weights to the exercises. Stretch the muscle groups that are being exercised between every set.

Remember the laws of motion when working out (see Unit 1, page 17). For every action, there is an equal and opposite reaction. This will help remind you to apply force equally through the entire exercise. If you are using a weight machine, you should use the same amount of force to raise and lower the weight. This will give your muscles a full range of motion. Do not raise the weight with great speed and allow it to drop or fall back down.

Exercises for the Thighs, Buttocks, and Legs

1. Half Squats



Purpose: Develops muscular strength and endurance in the thighs and buttocks.

Action: Start with your feet shoulder-width apart, your hands on hips or straight out in front of your body.

Slowly squat until your thighs are parallel to the floor and then return to a full-standing position. Do not squat into deep-knee bend, or squat, as this position places too much stress on the knees.

To Increase Intensity: Hold dumbbells by your sides or a barbell on your shoulders.

2. Lunges

Purpose: Develops muscular strength and endurance in the thighs and buttocks.

Action: Stand with your feet together, your toes facing forward, and your arms at your sides.

Step forward, lunging with one foot so the knee of your lunging leg is over your heel, and the lower part of your leg is perpendicular to the floor. Push off with your front leg to return to starting position.

Alternate lunges, leading first with your right leg and then with your left leg.

To Increase Intensity: Hold a barbell on your shoulders or dumbbells by your sides.

3. Side Leg Raises

Purpose: Develops muscular strength and endurance in the outer thigh and buttock region.

Action: Lie on your left side and support your head with your left hand. Rest your right hand on the floor in front of your chest for balance. Extend your legs without locking knees.

Lift your right leg slowly up while keeping your bottom leg flat on the floor. Lower your leg slowly back to the starting position. Perform this exercise very slowly in a controlled manner. Do as many repetitions as you can before switching to the other leg.

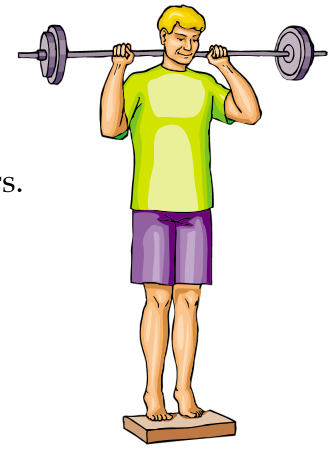
To Increase Intensity: Strap weights onto your ankles.

4. Heel Raises

Purpose: Develops muscular strength and endurance in the calves, the muscles in the lower leg.

Action: Place your feet shoulder-width apart, and rest your hands on hips. Stand tall with good upright posture.

Raise up on your toes as far as possible, and then lower back down until your heels touch the floor. Do as many repetitions as you can in a slow, controlled manner. Stretch your calf muscles, then repeat.



To Increase Intensity: Hold dumbbells by your sides or a barbell behind your head on the shoulders. Also, place your toes on an elevated surface approximately six inches high.

Exercises for the Upper Body

1. Push-Ups

Purpose: Develops muscular strength and endurance mainly in the chest.

Action: Lie on your stomach with your body straight and your weight on your toes and hands. Place your hands shoulder-width apart.

Keeping your back straight, lower your whole body until your chest is about a fist's distance off the floor. Push yourself back up again. Exhale on the exertion of the movement. Perform push-ups in a slow, rhythmic fashion. It is important not to let your back sag or arch.

Modified Push-Ups

- **Wall push-aways** (easiest)**:** Stand facing wall about 20 inches away. Place your hands shoulder-width apart on the wall. Slowly lower your chest to the wall as you bend your arms at the elbows. Return to the starting position.
- **Bent-knee push-ups:** With your knees on the floor and your back straight, perform push-ups in the same manner as standard push-ups.
- **Push-ups with feet elevated** (most advanced; box or raised surface needed)**:** Place your feet on an elevated surface and your hands on the floor. Lower your body down and then extend your arms back up. Try to avoid arching your back.

2. Pull-Ups

Purpose: Develops muscular strength and endurance mostly in the back and arms.

Materials: horizontal bar raised high enough so that when grasped, the feet are off the floor

Action: Grasp the bar with palms forward, using an overhand grip, your hands shoulder-width apart, and your arms fully raised.

Pull your body up so that your chin is slightly above the bar. Lower your body back to an arms-extended position. Complete as many reps as possible. Use a spotter to give you a slight help so you complete more reps after you fatigue.

Wheelchair adaptation—use a bar that is low enough to be reached from your wheelchair. Raise your body from the wheelchair. (Make sure wheelchair is in locked position.)

Variation: Pull-ups can also be done with a wider grip and pulling body up with bar behind the head and neck.

Modified Pull-Ups

Action: Lie flat on the floor under a horizontal bar that can be grasped at arm's length.

Grab the bar with your palms either facing out or in. With your body straight, lift your chin up to the bar as you keep your heels on the floor. Then lower your body to an arms-extended position. Complete as many reps as you can.

3. Back Arch

Purpose: Develops muscular strength and endurance in the lower back.

Materials: none

Action: Lie on your stomach with your fingers laced and placed behind your head. Slowly lift your head and chest off the floor as you keep your legs in contact with the floor. Keep your head in neutral alignment. Return to the starting position and repeat.

4. Chair Dips

Purpose: Develops muscular strength and endurance mainly in the triceps, or back of the arm.

Materials: sturdy chair

Action: Place a chair against the wall. Place your hands with your knuckles forward on the front edge of the chair. Extend your legs forward so you are balanced on your heels.

Lower your buttocks down towards the floor as far as possible. Then raise your body back up by fully extending your arms. Exhale as you push your body up. Do as many reps as you can.

Modification: If chair dips are too difficult, substitute the modified chair dips described below.

Modified Chair Dips

Action: Sit on the floor with your hands flat on the floor next to your hips and your fingers pointing outward.

Keeping your arms straight, raise your hips off the floor until your body is straight and at a 45-degree angle from the floor. Your heels and hands should be the only body parts touching the floor. Lower your buttocks towards the floor as you keep your arms straight. Complete as many reps as you can.

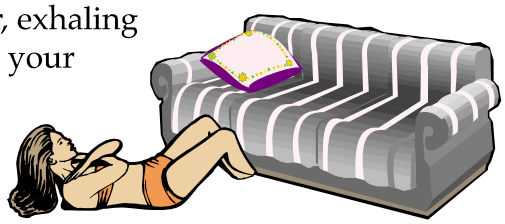
5. Curl-Ups

Purpose: Develops muscular strength and endurance in the abdominal muscles.

Materials: a couch or other secure object

Action: Sit with your legs bent at the knees and your feet flat on the floor with your heels about 12 inches from your buttocks. Cross your arms in front of your chest with your hands grasping the opposite shoulders.

Slowly lower your upper body and trunk back until your shoulder blades touch the floor. Lift your body off floor, exhaling as you come up. Touch your elbows to your thighs. Continue moving back and forth with slow, controlled movements.



Modification: Place feet under a couch or other secure object.

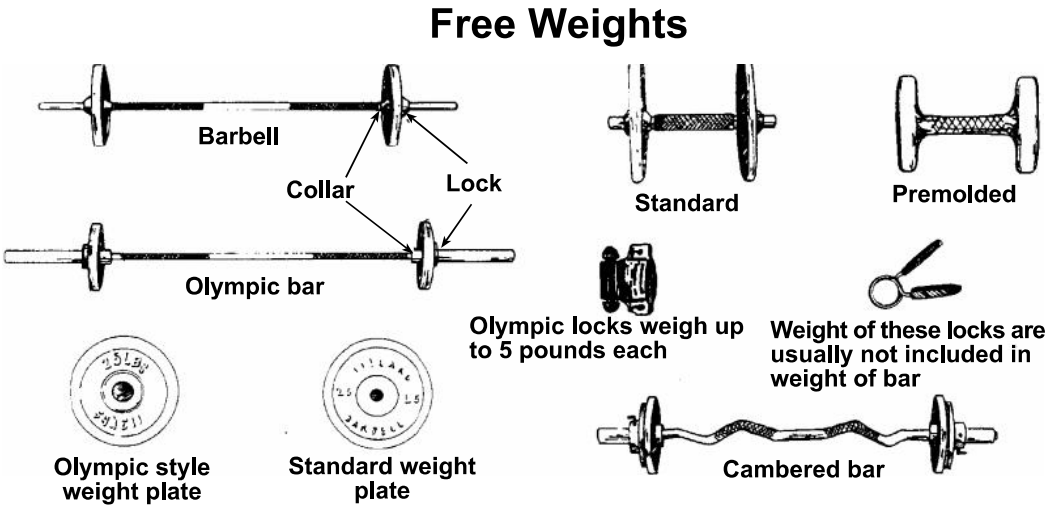
Variation: Crunches

Action: Lie on your back with your knees bent, your feet flat on the floor, and your arms folded across your chest.

Curl your shoulders and upper back off the floor together as a unit. Slowly lower your body to floor. Exhale each time you come up. You can also add a twist to the crunches by alternately curling your shoulders and upper back toward your opposite knees.

Isotonic Exercises: Free Weights and Weight Machines

When you train with free weights and weight machines, you need to protect yourself from injury by selecting the appropriate weight to lift. Take a conservative approach when starting out: Lift less rather than more.



Remember the training principles for gaining muscular strength and endurance. If specific strength gains are your goal, you need to find a weight that will cause fatigue at between six and 10 repetitions. If you want general strength and firm, toned muscles but not a size increase, find a weight that will cause fatigue at between 12 to 15 repetitions.

Become familiar with free-weight equipment. The most common free-weight equipment used when lifting are dumbbells, barbells, locks, and weight plates. When you train with weight machines, you need to find a certified instructor to show you how to use the equipment safely and properly. You should also train with a partner. A partner can serve as a spotter and keep you from being pinned under a weight. There are many settings on the weight equipment that need to be adjusted for your individual body size. Most machines can be adjusted to vary the seat, arm, leg, and weight settings.

How you breathe during a lift is very important. Always breathe out when raising or pushing a weight. Always breathe in when lowering or releasing a weight. *Never* hold your breath when lifting or pushing a weight. Holding your breath can cause dizziness or fainting. Holding your breath can also cause a dramatic increase in your blood pressure and may damage some blood vessels.

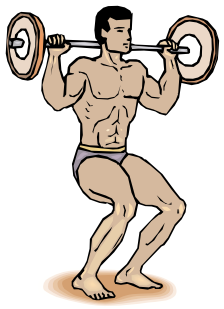
Here are a few of the more common exercises for training on free weights and weight machines. Free weight exercises require a spotter.

Exercises for the Thighs, Buttocks, and Legs

1. Half Squats (using free weights)

Purpose: Develops muscular strength and endurance in the thigh and buttocks muscles.

Action: Rest a barbell across your shoulders behind your neck. Keeping your back as straight as possible, bend your knees and lower your body into a half-squat position. Do not let your knees flex beyond your toes. Slowly, stand up straight again.



2. Lunges (using free weights)

Purpose: Develops muscular strength and endurance in the thigh and buttocks muscles.

Action: Hold a dumbbell in each hand, and keep your arms down at your sides. Lunge forward with your right foot, bending at the knee. To avoid strain, keep your knee in line with your ankle. Push off with your front leg to return to the starting position. Alternate lunges moving forward and back off your right leg and then off your left leg. Lunges can also be performed with a barbell on the shoulders.

3. Leg Press (using weight machine)

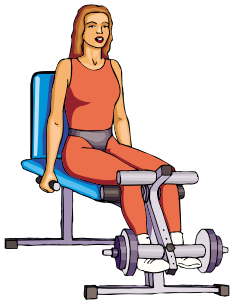
Purpose: Develops muscular strength and endurance in the thigh and buttocks muscles.

Action: Sit with your torso upright and your back against the back of the seat. Your legs should be flexed 90 degrees or less. Holding onto the handrails, push the footpad to the extended knee position without locking your knees. Exhale during the outward press. Slowly, return to the starting position.

4. Knee Extension (using weight machine)

Purpose: To develop muscular strength and endurance in the muscles in the front of the thighs—the quadriceps.

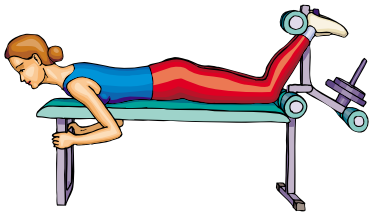
Action: Sit on the seat and place your ankles under the roller pad. Keep your torso erect and your lower back flat against the seat. Slowly extend your lower legs through a complete range of motion. Exhale while extending your legs. Pause briefly in the extended position, and then slowly lower the weight without letting the weight plate hit the stack. Repeat until the set is completed.



5. Knee Flexion (using weight machine)

Purpose: Develops muscular strength and endurance in the hamstrings, or the back of the thigh.

Action: Lie on your stomach and grip the handles or edge of the bench. Place your kneecaps at the edge of the bench with your ankles under the pads. Flex your legs at the knee as you bring your heels as far as possible towards your buttocks. Exhale during the upward movement. Pause briefly in the fully flexed position. Then lower the weight slowly, but don't allow your hips to rise off the bench. Repeat until set is completed.



6. Heel Raises (using free weights)

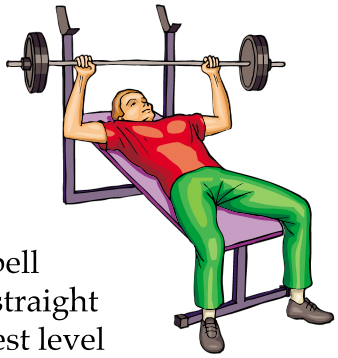
Purpose: Develops muscular strength and endurance in the calf muscles.

Action: Place a barbell on your shoulders or hold dumbbells down at your sides. Place the balls of your feet on the edge of an elevated and stable surface about six inches high. Place your feet about hip-width apart. Keep your torso erect and your legs straight. Slowly come up onto your toes, raising your heels as high as possible. Exhale as you lift up. Slowly lower your heels to a full stretch without pain. Do not bend your torso or flex your knees.

Exercises for the Upper Body

1. Bench Press (using free weights)

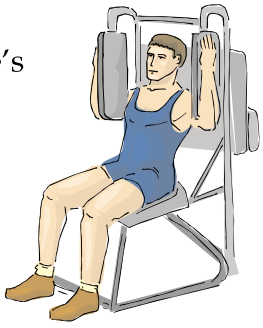
Purpose: Develops muscular strength and endurance in the chest muscles.



Action: For this exercise you will need a spotter. Lie on your back on the bench with your feet flat on the floor. Grasp the barbell with an overhand grip, hands slightly wider than shoulder-width apart. A spotter should help you lift the barbell off the standards. Press the barbell straight up above your mid-chest level until your arms are fully extended but not locked at the elbow. Exhale during the upward movement. Do not bounce the bar off your chest, and make sure your hips remain on the bench at all times. Slowly lower the bar to your chest, and continue until you complete the set. Support the barbell until the spotter can help you rack it.

2. Pec Deck (using weight machine)

Purpose: Develops muscular strength and endurance in the chest muscles.

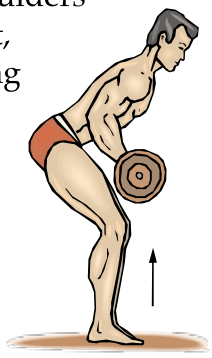


Action: Sit on the seat with your back, head, and shoulders in contact with the back pad. Align your shoulders with the machine's axis of rotation. Squeeze the pads or rollers together with your forearms not your hands. Exhale as your elbows come together, pulling the arm pads in front of your chest. Continue reps until you complete the set.

3. Bent-Over Rowing (using free weights)

Purpose: Develops muscular strength and endurance in the large muscles of the back.

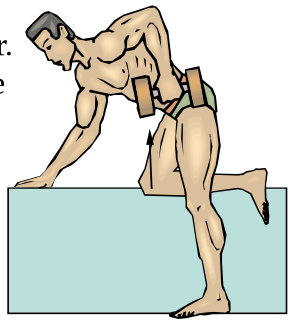
Action: Bend over to pick up the barbell with an overhand grip and your knees flexed. Keep your shoulders higher than your hips, your lower back flat, your arms straight, and your head up facing forward. Slowly pull the bar straight up until it touches your mid-chest. Exhale as you lift the barbell and keep your torso rigid. Slowly lower the barbell straight down. Extend your arms fully without allowing the weight to touch the floor. Continue reps until you complete the set.



4. One-Arm Dumbbell Rowing (using free weights)

Purpose: Develops muscular strength and endurance in the large muscles of the back.

Action: Using a bench for support, bend at your waist with your back parallel to the floor. Grasp a dumbbell in one hand and place your other hand and knee on a bench for back support. Exhale as you pull the dumbbell to your chest. Pause briefly then slowly lower the weight until your arm is extended. Continue reps until you complete the set.



5. **Lat Pulldowns** (using weight machine)

Purpose: Develops muscular strength and endurance in the large muscle groups of the back.

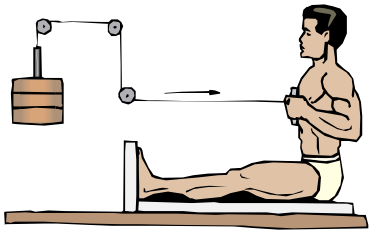
Action: Grasp the long bar with an overhand grip slightly wider than shoulder-width. You may either sit on the bench, kneel on one knee, or kneel on both knees. Keeping your torso erect, pull the bar smoothly straight down. Keep your elbows out and away from your body. Exhale as you pull the bar down to the base of your neck. Slowly extend your arms back upward. Continue reps until you complete the set.

Variation: You can also pull the bar to the front of your body under your chin at chest level.

6. Seated Rows (using weight machine)

Purpose: Develops muscular strength and endurance in the large upper back muscles.

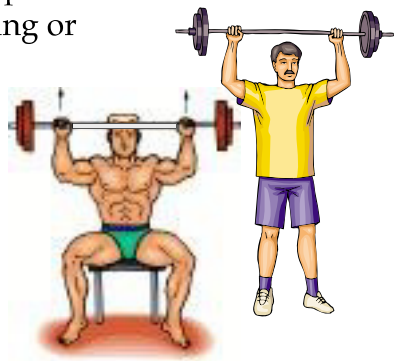
Action: Assume a seated position either on the floor or bench with your knees slightly flexed. Keeping your torso erect, grasp the handles with palms facing inward. Exhale while pulling the handles smoothly into your chest. Pull with your arms and back, keeping your back upright. Avoid letting your torso pull the weight. Return to the arms-extended position. Continue reps until you complete the set.



7. Military Press (using free weights)

Purpose: Develops muscular strength and endurance in the muscles of the shoulder.

Action: For this exercise you will need a spotter. This exercise can be done either standing or seated. Grasp the barbell with an overhand grip about shoulder-width apart. Exhale while pressing the bar upward and overhead until your arms are fully extended. Slowly lower the bar to chest position. Continue reps until you complete the set.



8. Seated Dumbbell Press (using free weights)

Purpose: Develops muscular strength and endurance in the shoulder muscles.

Action: Grasp the dumbbells and place them at your chest level. With your palms facing outward, press the weights upward and overhead until your arms are fully extended. Slowly lower the weights back down to your chest. Continue reps until you complete the set.

9. Upright Rows (using free weights)

Purpose: Develops muscular strength and endurance in the shoulder muscles.

Action: In a standing position, grasp dumbbells with an overhand grip, placing your hands about two to four inches apart. Rest the dumbbells on your thighs with your arms extended and your feet shoulder-width apart. Exhale while pulling the dumbbell upward along your abdomen and chest. As you pull the dumbbell to your shoulders, keep your elbows higher than your wrists. Pause briefly at the top position, then slowly lower the dumbbell until your arms are fully extended. Continue reps until you complete the set.

Variation: Upright rows can also be performed with a barbell.

10. Military Press (using weight machine)

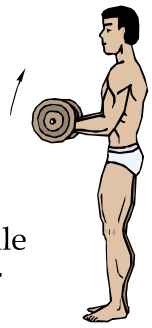
Purpose: Develops muscular strength and endurance in the shoulder muscles.

Action: Sit on the stool or bench so that the front of your shoulders are directly below handles of the weight machine. Grip the handles with your palms forward and shoulders directly under the handles. Keep your lower back flat. Exhale while pushing the weight upward to complete the extension. Slowly return back to the starting position without letting the weights touch. Continue reps until you complete the set.

11. Biceps Curl (using free weights)

Purpose: Develops muscular strength and endurance in the biceps or the upper arm muscles.

Action: Stand erect and grasp the dumbbell with an underhand grip with your hands shoulder-width apart. Hold your upper arms against your ribs with your arms down and the dumbbell touching the front of your thighs. Keeping elbows to your sides, curl the dumbbells one at a time to shoulder level while exhaling on the lift. Do not jerk or swing your body to lift the weight. Slowly lower the dumbbells to your sides with your arms fully extended.



Variation: The biceps curl can also be performed using a cambered (curved) bar or straight barbells.

12. Preacher Curls (using weight machine)

Purpose: Develops muscular strength and endurance in the biceps muscle (the muscles on the front of the upper arm).

Action: Sit with your chest against the pad. Place your elbows on the pad in line with the machine's axis of rotation. Using an underhand grip, curl the handles upward as far as possible. Exhale on the lift. Slowly lower the bar until your arms are extended, but not locked. Continue the reps until you complete the set.

13. Triceps Extension (using free weights)

Purpose: Develops muscular strength and endurance in the triceps, the muscles on the back of the upper arms.

Action: Start in a standing or sitting position. Grasp a dumbbell using an overhand grip and your hands about six inches apart. Keep your torso erect and your feet shoulder-width apart. Hold your elbows straight up and close to your ears. Lower the dumbbell slowly behind your head to the top of your shoulders. Then push the dumbbell to full extension, exhaling on the most difficult part. Continue reps until you complete the set.

Variation: The triceps extension can also be done with a straight barbell or cumbered (curved) bar.

14. Kickbacks (using free weights)

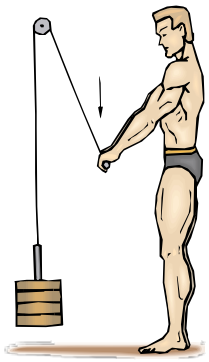
Purpose: Develops muscular strength and endurance in the triceps muscle.

Action: Place your right hand and right knee on a bench. Put your left foot on the floor to support your body. Grasp a dumbbell in your left hand with your arm bent and your upper arm parallel to the floor. Keeping your elbow close to body, raise the dumbbell so that your arm is fully extended behind you. Slowly lower the weight back down, keeping your upper arm parallel to the floor. Continue reps until you complete the set.

15. Pressdowns (using weight machine)

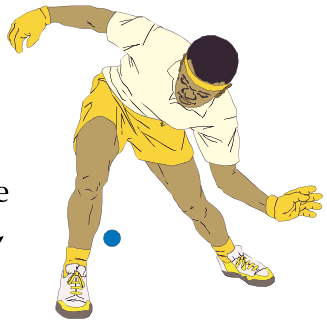
Purpose: Develops muscular strength and endurance in the triceps muscle.

Action: Assume an erect standing position facing the weight machine with your feet about shoulder-width apart. Grasp the bar using an overhand grip and your hands no more than six inches apart. Begin the exercise with the bar at chest height with your upper arms pressed firmly against your ribs. Exhale while extending your forearms until your arms are fully extended and the bar is touching your thighs. Slowly return the bar to chest height without moving your upper arms and torso. Continue reps until you complete the set.



Summary

Muscular fitness is important for overall health and fitness. Muscular fitness includes both *muscular strength* and *endurance*. Muscular strength is the ability of a muscle to exert a maximum force in a single effort. Muscular endurance is the ability of a muscle to continue to do work repeatedly over time without *fatigue*.



Improving muscular strength and endurance leads to better appearance, greater resistance to injury, decreased fat, and better weight maintenance.

A lack of adequate muscular strength or endurance can increase your risk for muscle and joint injuries, diabetes, heart disease, bone loss, back pain, and posture problems. It is much more difficult to achieve your appropriate body weight without sufficient muscle tissue.

There are three types of *muscle fibers* found in *skeletal muscles*. *Slow-twitch muscle fibers* help in endurance activities, *fast-twitch muscle fibers* are useful for activities requiring speed and *power*, and *intermediate-twitch muscle fibers* are a combination of both.

Isometrics, *isotonics*, and *isokinetics* are three methods of exercise that develop muscular strength and endurance. Isometric exercises consist of a muscle contracting, or tightening, while pressing against an immovable object. Isotonics are exercises that cause the muscle to lengthen and shorten through a full *range of motion* while lifting and lowering a weight or resistance. *Calisthenics*, *free weights*, and most weight machines are isotonic. Isokinetic exercises require specially designed machines that work the muscle through the entire range of motion using variable resistance and speed.

To improve muscular strength or endurance, a muscle needs to be consistently overloaded or worked harder than it is used to. Frequency, intensity, and time should be altered periodically to insure continued progress in a muscular fitness program. If *muscle tone* is desired, then high *repetitions* and low weight should be performed. If muscular strength is desired, then lift heavier weights and perform fewer repetitions.

To ensure safety and get the best results from a muscular fitness program, always follow safety guidelines. A few of these include beginning with a warm-up, using proper form on all exercises, using a spotter with free weights, working the large muscles first, exercising through a full range of motion, using slow and controlled movements, breathing correctly, resting between sets, ending with a cool-down, and resting 48 hours between workouts. Also, remember how the laws of motion apply to correct weight training.

Both males and females can benefit from muscular fitness exercises. Females need not worry about bulking up since they do not have enough of the hormone *testosterone*. Testosterone is the male hormone that plays an important role in building muscle.

Strong muscles make the everyday tasks of life, work, and recreation easier and more satisfying.