

# Exercise

## Highlights

### Tips for Exercising:

- Drink plenty of fluids before, during, and after a workout.
- Do warm-up exercises for 5 - 10 minutes at the beginning of an exercise session. Strengthening exercises, quiet calisthenics, and walking are ideal.
- Do not eat for 2 hours before vigorous exercise.
- When exercising, listen to your body's warning symptoms

### New Research:

- A study of middle-aged men found that increasing physical activity at age fifty will result in a reduction in mortality rates similar to that of quitting smoking. After 10 years of increased physical activity, these men had the same mortality rate for their age group as men who were highly physically active throughout entire adult their lives.
- A study of over 4,300 twins found that physical activity can a genetic predisposition for high body mass index and large waist circumference.

### Benefits of exercise:

The benefits of exercise include:

- Decreased risk of stroke, heart disease, colon cancer, breast cancer, dementia, and more.
- Decreased body fat
- Improved movement of joints and muscles
- Improved oxygen delivery throughout the body
- Improved sense of well-being
- Improved strength and endurance

### Motivation:

Lack of motivation is one reason many people stop exercising. Tips for avoiding burnout include:

- Think of exercise as a menu rather than a diet. Choose a number of different physical activities that are personally enjoyable such as sports, dancing, or biking.
- Develop an interest or hobby that requires physical activity.
- Adopt simple routines such as climbing the stairs instead of taking the elevator, walking instead of driving to the local newsstand, or canoeing instead of zooming along in a powerboat.
- Try cross training (alternating between several types of exercises).
- Exercise with friends.

Consider getting a dog. One study found that dog owners walk almost twice as much as those who do not own a dog. Regular walking is a good way to improve health.

## **Introduction**

To enjoy a long and healthy life, everyone should make lifestyle choices that include a healthy diet, regular exercise, and maintaining normal weight. The combination of inactivity and eating the wrong foods is the second most common preventable cause of death in the United States (smoking is the first).

Most research on the benefits of exercise focuses on heart protection. Studies clearly show that exercise helps the heart. In addition, studies are reporting that even people at higher risk for heart disease may gain important protection from exercising.

Evidence suggests that our genes evolved to favor exercise. In other words, during prehistoric times, if a person couldn't move quickly and wasn't strong, that person died. Those who were fit survived to reproduce and pass on their "fitter" genes. Some researchers believe that with our current inactive lifestyle, these genes produce a number of bad effects, which can lead to many chronic illnesses.

The benefits of exercise include:

- Decreased risk of cardiovascular (heart) disease, high blood pressure, and stroke
- Decreased risk of colon and breast cancers
- Decreased risk of diabetes
- Decreased risk of osteoporosis
- Decreased risk of depression and dementia
- Decreased body fat
- Improved metabolic processes -- the way the body breaks down and builds necessary substances
- Improved movement of joints and muscles
- Improved oxygen delivery throughout the body
- Improved sense of well-being
- Improved strength and endurance

In addition, exercise can help change other dangerous lifestyle habits. A 2007 review of existing studies found that moderate exercise, for as little as 5 minutes at a time, can help combat the nicotine withdrawal symptoms people experience when they try to stop smoking.

No one is too young or too old to exercise. The United States Surgeon General recommends at least 30 minutes of moderate exercise, such as brisk walking, nearly every day. However, vigorous exercise carries risks that people should discuss with a doctor.

You should always check with your doctor before starting a new exercise program, especially if you have any of the following risk factors:

- A symptom you have never told your doctor about
- Arthritis of the hips or knees
- Blood clots
- Chest pain
- Chronic lung disease
- Diabetes
- Eye injury or recent eye surgery
- Family history of a cardiovascular disease
- Foot or ankle sores that won't heal
- Heart disease
- Heart palpitations
- Hernia
- High blood pressure
- History of smoking
- Infections
- Joint swelling
- Obesity
- Pain or trouble walking after a fall
- Shortness of breath

Fifty percent of all people who begin a vigorous training program drop out within a year. The key to reaching and maintaining physical fitness is to find activities that are exciting, challenging, and satisfying.

## **Recommended Exercise Methods**

A few simple rules are helpful as you develop your own routine.

- Don't eat for 2 hours before vigorous exercise.
- Drink plenty of fluids before, during, and after a workout.
- Adjust your activity level according to the weather, and reduce it when you are fatigued or ill.

When exercising, listen to the body's warning symptoms, and consult a doctor if exercise causes chest pain, irregular heartbeat, unusual fatigue, nausea, unexpected breathlessness, or light-headedness.

## **Heart Rate Goal**

Heart rate is the standard guide for determining aerobic exercise intensity. It is useful for people training at aerobic intensity, or people with certain cardiac risk factors who have been set a maximum heart rate by their doctor. You can determine your heart rate by counting your pulse, or by using a heart rate monitor. To feel your own pulse, press the first two fingers of one hand

gently down on the inside of the wrist or under the jaw on the right or left side of the front of the neck. You should feel a faint pounding as blood passes through the artery. Each pounding is a beat.

There are different types of heart rates.

*Resting heart rate.* The average heart rate for a person at rest is 60 - 80 beats per minute. It is usually lower for people who are physically fit, and often rises as you get older. You can determine your resting heart rate by counting how many times your heart beats in one minute. The best time to do this is in the morning after a good night's sleep *before* you get out of bed.

*Maximum heart rate.* To determine your own maximum heart rate per minute subtract your age from 220. For example, if you are 45, you would calculate your maximum heart rate as follows:  $220 - 45 = 175$ .

*Target heart rate.* Your target rate is 50 - 75% of your maximum heart rate. You should measure your pulse off and on while you exercise to make sure you stay within this range. After about 6 months of regular exercise, you may be able to increase your target heart rate to 85% (but only if you can comfortably do so).

Certain heart medications may lower your maximum and target heart rates. Always check with your doctor before starting an exercise program.

Note: Swimmers should use a heart rate target of 75% of the maximum and then subtract 12 beats per minute. The reason for this is that swimming will not raise the heart rate quite as much as other sports because of the so-called "diving reflex," which causes the heart to slow down automatically when the body is immersed in water.

<b>Target Heart Rates for a One-minute Pulse Count</b>		
Age	Low	High
	(50% max.)	(75% max.)
20	100	150
30	95	142
40	90	135
50	85	127
60	80	120

Source: American Heart Association

*VO2 Max.* Serious exercisers may use a *VO2 max calculation*, which measures the amount of oxygen consumed during intensive, all-out exercise. The most accurate testing method uses computers, but anyone can estimate VO2 without instrumentation (with an accuracy of about 95%):

- After running at top pace for 15 minutes, round off the distance run to the nearest 25 meters.
- Divide that number by 15.
- Subtract 133.
- Multiply the total by 0.172, then add 33.3.

Olympic and professional athletes train for VO<sub>2</sub> max levels above 80. A VO<sub>2</sub> max equaling between 50 and 80 is considered an excellent score for overall fitness. For the average person exercising for fitness and health, this value is not necessary.

### **Warm-Up and Cool-Down**

Warming up and cooling down are important parts of every exercise routine. They help the body make the transition from rest to activity and back again, and can help prevent soreness or injury, especially in older people.

- Practice warm-up exercises for 5 - 10 minutes at the beginning of an exercise session. Older people need a longer period to warm up their muscles. Strengthening exercises, quiet calisthenics, and walking are ideal.
- To cool down, you should walk slowly until the heart rate is 10 - 15 beats above your resting heart rate. Stopping too suddenly can sharply reduce blood pressure, and is dangerous for older people. It may also cause muscle cramping.
- Stretching may be appropriate for the cooling down period, but it must be done carefully for warming up because it can injure cold muscles. (There is no clear evidence, however, that stretching reduces muscle injuries.)

Warming up before exercise and cooling down after is just as important as the exercise itself. By properly warming up the muscles and joints with low-level aerobic movement for 5 - 10 minutes one may avoid injury. Cooling down after exercise by walking slowly, then stretching muscles, may also prevent strains and blood pressure fluctuation.

For most people, exercise may be divided into three general categories:

- Aerobic or endurance
- Strength or resistance
- Flexibility

A balanced program should include all three. Speed training is also a major category, but generally only competitive athletes practice it.

### **Aerobic (Endurance) Training**

*Benefits of Aerobic Exercise.* Regular aerobic exercise provides the following benefits:

- Protection from heart attack, stroke, diabetes, dementia, depression, colon and breast cancers, and early death

- Builds endurance
- Keeps the heart pumping at a steady and high rate for a long time
- Boosts HDL ("good") cholesterol levels
- Helps control blood pressure
- Strengthens the bones in the spine
- Helps maintain normal weight
- Improves one's sense of well-being

*Types of Aerobic Exercise.* Aerobic exercise is usually categorized as high or low intensity. High intensity aerobic exercise is further classified as high or low impact. Examples of each include the following:

- Low- to moderate-impact exercises: Walking, swimming, stair climbing, step classes, rowing, and cross-country skiing. Nearly anyone in reasonable health can engage in some low- to moderate-impact exercise. Brisk walking burns as many calories as jogging for the same distance and poses less risk for injury to muscle and bone.
- High-impact exercises: Running, dance exercise, tennis, racquetball, squash. Perform high-impact exercises no more often than every other day, and less often for those who are overweight, elderly, out of condition, or have an injury or other medical problem that would rule out high-impact.

*Aerobic Regimens.* As little as one hour a week of aerobic exercises is helpful, but 3 - 4 hours per week are best. Some research indicates that simply walking briskly for 3 or more hours a week reduces the risk for coronary heart disease by 45%. In general, the following guidelines are useful for most individuals:

- For most healthy young adults, the best approach is a mix of low- and higher-impact exercise. Two weekly workouts will maintain fitness, but three to five sessions a week are better.
- People who are out of shape or elderly should start aerobic training gradually. For example, they may start with 5 - 10 minutes of low-impact aerobic activity every other day and build toward a goal of 30 minutes per day, three to seven times a week. (For heart protection, weekly total is the key.)
- Swimming is an ideal exercise for many elderly people, and for certain people with physical limitations. People with physical limitations include pregnant women, individuals with muscle, joint, or bone problems, and those who suffer from exercise-induced asthma.
- People who seek to lose weight should concentrate on calories burnt each week, not the number of workout sessions.

One way of gauging the aerobic intensity of exercise is to aim for a "talking pace," which is enough to work up a sweat and still be able to converse with a friend without gasping for breath. As fitness increases, the "talking pace" will become faster and faster.

*Shoes.* All that's really necessary for a workout is a good pair of shoes that are made well and fit well. They should be broken in, but not worn down. They should support the ankle and provide

cushioning for walking as well as for impact sports such as running or aerobic dancing. Airing out the shoes and feet after exercising reduces chances for skin conditions such as athlete's foot.

*Clothing.* Comfort and safety are the key words for workout clothing. For outdoor nighttime exercise, a reflective vest and light-colored clothing must be worn. Bikers, inline skaters, and equestrians should always wear safety devices such as helmets, wrist guards, and knee and elbow pads. Goggles are mandatory for indoor racquet sports. For vigorous athletic activities, such as football, ankle braces may be more effective than tape in preventing ankle injuries.

*Aerobic-Exercise Equipment.* Home aerobic exercise machines can be adapted to any fitness level and used day or night. Before investing in any exercise machine, however, it is wise to first test it at a gym. In addition, initial supervised training when using these machines can reduce the risk of injury that might occur with self-instruction.

Very inexpensive exercise machines tend to be flimsy and hard to adjust, but many sturdy machines are available at moderate prices. The higher-end models may utilize computers to record calories burned, speed, and mileage. Their readouts may provide motivation and gauge the intensity of a workout, however, they are not always accurate.

The following are a few observations on specific equipment:

- A good floor mat is important to provide cushioning for all home exercises.
- A simple jump rope improves aerobic endurance for people who are able to perform high-impact exercise. Jumping rope should be done on a floor mat plus a surface that has some give to avoid joint injury.
- For burning calories, the treadmill has been ranked best, followed by stair climbers, the rowing machine, cross-country ski machine, and stationary bicycle. (Elliptical trainers, however, may be even better than treadmills for increasing heart rate, calorie expenditure, and oxygen consumption.)
- Stationary bikes condition leg muscles and are fairly economical and easy to use safely. The pedals should turn smoothly, the seat height should adjust easily, and the bike's computer should be able to adjust intensity.
- Stair machines also condition leg muscles. They offer very intense, low-impact workouts and may be as effective as running with less chance of injury.

Rowing and cross-country ski machines exercise both the upper and lower body.

<b>Shoes for Sports</b>	
<b>Aerobic dancing</b>	Sufficient cushioning to absorb shock and pressure that are many times greater than ordinary walking. Arches that maintain side-to-side stability. Thick upper leather support. Toe-box. Orthotics may be required for people with ankles that over-turn inward or outward. Soles should allow for twisting and turning.
<b>Cycling</b>	Rigid support across the arch to prevent collapse during pedaling. Heel lift. Cross-training or combination hiking/cycling shoes may be sufficient for casual bikers. Toe clips or specially designed shoe cleats for serious cyclers. In some cases,

	orthotics may be needed to control arch and heel and balance forefoot.
<b>Running</b>	Sufficient cushioning to absorb shock and pressure. Fully bendable at the ball of the foot. Sufficient traction on sole to prevent slipping. Consider insoles or orthotics with arch support for problem feet.
<b>Tennis</b>	Allow side-to-side sliding. Low-traction soles. Snug fitting heels with cushioning. Padded toe box with adequate depth. Soft-support arch.
<b>Walking</b>	Lightweight. Breathable upper material (leather or mesh). Wide enough to accommodate ball of the foot. Firm padded heel counter that does not bite into heel or touch ankle bone. Low heel close to ground for stability. Good arch support. Front provides support and flexibility.

### **Strength or Resistance Training**

*Benefits of Strength Exercise.* While aerobic exercise increases endurance and helps the heart, it does not build upper body strength or tone muscles. Strength-training exercises provide the following benefits:

- Build muscle strength while burning fat
- Help maintain bone density

It is also associated with a lower risk for heart disease, possibly because it lowers LDL (the so-called "bad" cholesterol) levels.

Strength exercise is beneficial for everyone, even people in their 90s. It is the only form of exercise that can slow and even reverse the decline in muscle mass, bone density, and strength that occur with aging.

Please note: People at risk for cardiovascular disease should not perform strength exercises without checking with a doctor.

*Types of Muscle Contractions.* There are three types of muscle contractions involved in strength training:

- Isometric contractions do not change the length of the muscle. An example is pushing against a wall.
- Concentric contractions shorten muscles. An example is the "up" phase of the biceps curl.
- Eccentric contractions lengthen muscles. An example is the "down" phase as weights are lowered.

*Strength-Training Regimens.* Strength training involves intense and short-duration activities. For beginners, adding 10 - 20 minutes of modest strength training two to three times a week may be appropriate. The following are some guidelines for starting a strength regimen:



- The sequence of a strength training session should begin with training large muscles and multiple joints at higher intensity, and end with small muscle and single joint exercises at lower intensities.
- You should perform both shortening and lengthening muscle actions. Emphasizing the movements that lengthen muscles is of increasing interest. This approach involves slowing and increasing the duration of these "down" movements. It appears to significantly increase blood flow, and some evidence suggests it may achieve stronger muscles more quickly. It may also improve heart function compared to standard movements. Exercises that lengthen muscles may be particularly beneficial for older people and some people with chronic health problems. This type of training increases the risk for muscle soreness and injury, however, and this approach is still controversial.
- Strength training involves moving specific muscles in the same pattern against a resisting force (such as a weight) for a preset number of times. This is called a repetition. People should first choose a weight that is about half of what would require a maximum effort in *one* repetition. In other words, if it would take maximum effort to do a single repetition with a 10-pound dumbbell, the person would start with a five-pound dumbbell. In the beginning, most people can start with one set of 8 - 15 repetitions per muscle group with low weights. As individuals are able to perform one or two repetitions over their routine, weights can be increased by 2 - 10%.
- Breathe slowly and rhythmically. Exhale as the movement begins. Inhale when returning to the starting point.
- The first half of each repetition typically lasts 2 - 3 seconds. The return to the original position lasts 4 seconds.
- Joints should be moved rhythmically through their full range of motion during a repetition. Do not lock up the joint while exercising it.
- For maximum benefit, one should allow 48 hours between workouts for full muscle recovery.

*Strength-Training Equipment.* Unlike aerobic exercise, strength training almost always requires some equipment. Strength-training equipment does not, however, have to cost anything.

- Any heavy object that can be held in the hand, such as a plastic bottle filled with sand or water, can serve as a weight.
- Dumbbells (1 - 10 pounds) and resistance bands are inexpensive, portable, and effective.
- Wearable weights help strengthen and tone the upper body.
- Ankle weights strengthen and tone muscles in the lower body. They should not be worn during high-impact aerobics or jumping.
- Hand grips strengthen arms and are good for relieving tension.
- A pull-up bar can be mounted in a doorway for chin-ups and pull-ups.

More elaborate and expensive home equipment for working body muscles is also available, costing from \$100 to over \$1,000. No one should purchase or use strength-training equipment without instruction from a professional.

## **Flexibility Training (Stretching)**

*Benefits of Flexibility Training.* Flexibility training uses stretching exercises. Many stretching exercises are particularly beneficial for the back. In general, flexibility training provides the following benefits:

- Prevents cramps, stiffness, and injuries
- Improves joint and muscle movement (improved range of motion)

Certain flexibility practices, such as yoga and tai chi, also involve meditation and breathing techniques that reduce stress. Such practices appear to have many health and mental benefits. They may be very suitable and highly beneficial for older people, and for patients with certain chronic diseases.

*Flexibility Training Regiments.* Doctors recommend performing stretching exercises for 10 - 12 minutes at least three times a week. The following are some general guidelines:

- When stretching, exhale and extend the muscles to the point of tension, not pain, and hold for 20 - 60 seconds. (Beginners may need to start with a 5- to 10-second stretch.)
- Breathe evenly and constantly while holding the stretch.
- Inhale when returning to a relaxed position. Holding your breath defeats the purpose; it causes muscle contraction and raises blood pressure.
- When doing stretches that involve the back, relax the spine to keep the lower back flush with the mat, and to work only the muscles required for changing position (often these are only the abdominal muscles).

## **Specific Exercise Tips for Older People**

Studies continue to show that it is never too late to start exercising. Elderly adults who exercise twice a week can significantly increase their body strength, flexibility, balance, and agility. Studies show that even small improvements in physical fitness and activity can prolong life and independent living. A recent study based on a 35-year follow-up showed that in men who increased their physical activity at age 50, the reduction in mortality rate was similar to that of smoking cessation. In fact, after 10 years of increased physical activity, these men had the same mortality rate for their age group as men who were highly physically active throughout their entire adult lives.

Still, about half of Americans over 60 describe themselves as sedentary (inactive). According to a 2004 report by the Centers for Disease Control and Prevention, about 12% of people aged 65 - 75 years, and 10% of people aged 75 years or older, meet current recommendations for strength training.

The following tips for exercising may be helpful:

- Any older person should have a complete physical and medical examination, as well as professional instruction, before starting an exercise program.

- Start low and go slow. For sedentary, older people, one or more of the following programs may be helpful and safe: Low-impact aerobics, gait (step) training, balance exercises, tai chi, self-paced walking, and lower legs resistance training, using elastic tubing or ankle weights. Even in the nursing home, programs aimed at improving strength, balance, gait, and flexibility have significant benefits.
- Strength training assumes even more importance as one ages, because after age 30 everyone undergoes a slow process of muscular weakening (atrophy). This process can be reduced or even reversed by adding resistance training to an exercise program. As little as 1 day a week of resistance training improves overall strength and agility. Strength training also improves heart and blood vessel health.
- Flexibility exercises promote healthy muscle growth and help reduce the stiffness and loss of balance that accompanies aging.
- Chair exercises may be performed by people who are unable to walk.
- Older women are at risk for incontinence accidents during exercise. This can be reduced or prevented by performing Kegel exercises, limiting fluids (without risking dehydration), going to the bathroom frequently, and using leakage prevention pads or insertable devices.

## **Exercise's Effects on the Heart**

Inactivity is one of the major risk factors for heart disease. However, exercise helps improve heart health, and can even reverse some heart disease risk factors.

Like all muscles, the heart becomes stronger as a result of exercise, so it can pump more blood through the body with every beat and continue working at maximum level, if needed, with less strain. The resting heart rate of those who exercise is also slower, because less effort is needed to pump blood.

A person who exercises often and vigorously has the lowest risk for heart disease, but any amount of exercise is beneficial. Studies consistently find that light-to-moderate exercise is even beneficial in people with existing heart disease. Note, however, that anyone with heart disease or cardiac risk factors should seek medical advice before beginning a workout program.

The heart is a large muscular organ that pumps blood throughout the body. Valves inside the heart open and close. This controls how much blood enters or leaves the heart.

## **Effects of Exercise on Heart Disease and Cholesterol**

Exercise has a number of effects that benefit the heart and circulation (blood flow throughout the body). These benefits include improving cholesterol and fat levels, reducing inflammation in the arteries, helping weight loss programs, and helping to keep blood vessels flexible and open. Studies continue to show that physical activity and avoiding high-fat foods are the two most successful means of reaching and maintaining heart-healthy levels of fitness and weight.

The American Heart Association recommends that individuals perform moderately-intense exercise for at least 30 minutes on most days of the week. This recommendation supports similar exercise guidelines issued by the Centers for Disease Control and Prevention, and the American College of Sports Medicine.

*Coronary Artery Disease.* People who maintain an active lifestyle have a 45% lower risk of developing heart disease than do sedentary people. Experts have been attempting to define how much exercise is needed to produce heart benefits. Beneficial changes in cholesterol and lipid levels, including lower LDL ("bad" cholesterol) levels, occur even when people performed low amounts of moderate- or high-intensity exercise, such as walking or jogging 12 miles a week. However, more intense exercise is required to significantly change cholesterol levels, notably increasing HDL ("good" cholesterol). An example of this kind of intense program would be jogging about 20 miles a week. Benefits occur even with very modest weight loss, suggesting that overweight people who have trouble losing pounds can still achieve considerable heart benefits by exercising.

Some studies suggest that for the greatest heart protection, it is not the duration of a single exercise session that counts but the total weekly amount of energy expended.

Resistance (weight) training has also been associated with heart protection. It may offer a complementary benefit to aerobics. If you have heart disease or risk factors for heart disease, check with your doctor before starting resistance training.

*Effects of Exercise on Blood Pressure.* Regular exercise helps keep arteries elastic (flexible), even in older people. This, in turn, ensures good blood flow and normal blood pressure. Sedentary people have a 35% greater risk of developing high blood pressure than physically active people do.

It should be noted that high-intensity exercise may not lower blood pressure as effectively as moderate-intensity exercise. In one study, moderate exercise (jogging 2 miles a day) controlled high blood pressure so well that more than half the patients who had been taking drugs for the condition were able to discontinue their medication.

Experts recommend at least 30 minutes of exercise on most -- if not all -- days. Studies show that yoga and tai chi, an ancient Chinese exercise involving slow, relaxing movements, may lower blood pressure almost as well as moderate-intensity aerobic exercises.

Anyone with existing high blood pressure should discuss an exercise program with their doctor. Before starting to exercise, people with moderate-to-severe high blood pressure should lower their blood pressure, and be able to control it with medications. Everyone, especially people with high blood pressure, should breathe as normally as possible through each exercise. Holding the breath increases blood pressure.

*Effects of Exercise on Heart Failure.* Traditionally, heart failure patients have been discouraged from exercising. Now, exercise performed under medical supervision is proving to be helpful for select patients with stable heart failure.

Progressive resistance training may be particularly useful for heart failure patients, since it strengthens muscles, which commonly weaken in this disorder. Simply performing daily handgrip exercises can improve blood flow through the arteries.

Experts warn, however, that exercise is not appropriate for all heart failure patients.

### **Effects of Exercise on Stroke**

Physical activity lowers stroke risk.

All stroke survivors should have a medical evaluation before starting an exercise program.

The effects of exercise on stroke are less established than those on heart disease, but most studies show benefits.

### **Exercise Programs for High-Risk Individuals**

Anyone with heart disease or risk factors for developing heart disease or stroke should seek medical advice before beginning a workout program. Patients with heart disease can nearly always exercise safely as long as they are evaluated beforehand. Some will need to begin their workout under medical supervision. Still, it is often difficult for a doctor to predict health problems that might arise as the result of an exercise program. At-risk individuals should be very aware of any symptoms warning of harmful complications while they exercise.

Some believe that anyone over 40 years old, whether or not they are at risk for heart disease, should have a complete physical examination before starting or intensifying an exercise program. Some doctors use a questionnaire for people over 40 to help determine whether they require such an examination. The questions they use are as follows:

- Has any doctor previously recommended medically supervised activity because of a heart condition?
- Does physical activity bring on chest pain?
- Has chest pain occurred during the previous month?
- Does the person faint or fall over from dizziness?
- Does bone or joint pain intensify during or after exercise?
- Has medication been prescribed for hypertension (high blood pressure) or heart problems?
- Is the person aware of, or has a doctor suggested, any physical reason for not exercising without medical supervision?

Those who answer "yes" to any of the above questions should have a complete medical examination before developing an exercise program.

Some people should get a full evaluation and a stress test.

*Stress Test.* A stress test helps determine the risk for a heart problem resulting from exercise. Anyone with a heart condition or history of heart disease should have a stress test before starting an exercise program. Some health care professionals also recommend this test before a vigorous exercise program for older persons who are sedentary, even in the absence of known or suspected heart disease. The test is expensive, however. Many physicians believe that it may not be necessary for older people who start low intensity exercise such as walking, and have no evident health problems or risk factors.

## **Heart Attack and Sudden Death from Strenuous Exercise**

A small percentage of heart attacks occur after heavy physical work.

*High-Risk Individuals.* In general, the following people should avoid intense exercise or start it only with careful monitoring:

- People who have certain medical conditions: These conditions include uncontrolled diabetes, uncontrolled seizures, uncontrolled high blood pressure, a heart attack within the previous 6 months, heart failure, unstable angina, significant aortic valve disease, or aortic aneurysm.
- People with moderate-to-severe hypertension: Moderate or severe high blood pressure (systolic blood pressure over 160 mm Hg or diastolic (lower number) pressure over 100 mm Hg) should be brought to lower levels before a person starts a vigorous exercise program.
- Sedentary people should be cautious.
- Episodes of exercise-related sudden death in young people are rare but of great concern. Some are preceded by fainting, which is due to a sudden and severe drop in blood pressure. It should be noted that fainting is relatively common in athletes, and is dangerous only in people with existing heart conditions. Young people with genetic or congenital (present at birth) heart disorders should avoid intensive competitive sports.
- Anabolic steroids or products containing ephedra have been associated with cases of stroke, heart attack, and even death.

The risk for heart attack from exercise should be kept in perspective, however. Some form of exercise, carefully personalized, has benefits for most of the individuals mentioned above. In many cases, particularly when the only risk factors are a sedentary lifestyle and older age, exercise can often be increased over time until it is intense.

*Hazardous Activities for High-Risk Individuals.* The following activities may pose particular dangers for high-risk individuals:

- Intense workouts may be particularly hazardous for people with risk factors for heart disease, especially older people. Examples of intense workouts include snow shoveling, running, race walking, tennis, heavy lifting, heavy gardening. These workouts tend to stress the heart, raise blood pressure for a brief period, and may cause spasms in the arteries leading to the heart. (See image: *Coronary Artery Spasm*)

- Some studies suggest that competitive sports, which couple intense activity with aggressive emotions, are more likely to trigger a heart attack than other forms of exercise.

*Listening for Warning Signs.* It should be noted that according to one study, at least 40% of young men who die suddenly during a workout have previously experienced, and ignored, warning signs of heart disease. In addition to avoiding risky activities, the best preventive tactic is simply to listen to the body and seek medical help at the first sign of symptoms during or following exercise. These symptoms include the following:

- Irregular heartbeat
- Shortness of breath
- Chest pain

## **Exercise's Effects on Diabetes**

Moderate aerobic exercise can lower your risk for type 2 diabetes.

Exercise has positive benefits for those who have diabetes. It can lower blood sugar levels, improve insulin sensitivity, and strengthen the heart. Strength training, which increases muscle and reduces fat, may be particularly helpful for people with diabetes.

People with diabetes who begin a new or vigorous exercise program should have their eyes examined, and discuss footwear and heart risks with their physician.

*Type 1 diabetes:* Aerobic exercise has significant and particular benefits for people with type 1 diabetes. It increases sensitivity to insulin, lowers blood pressure, improves cholesterol levels, and decreases body fat.

For improving glycemic control, the American Diabetes Association recommends at least 150 minutes per week of moderate-intensity physical activity (50 - 70% of maximum heart rate) or at least 90 minutes per week of vigorous aerobic exercise (more than 70% of maximum heart rate). Exercise at least 3 days a week, and do not go more than 2 consecutive days without physical activity.

*Strength Training.* Strength training, which increases muscle and reduces fat, is also helpful for people with diabetes who are able to do this type of exercise. The American Diabetes Association recommends performing resistance exercise three times a week. Build up to three sets of 8 - 10 repetitions using weight that you cannot lift more than 8 - 10 times without developing fatigue. Be sure that your strength training targets all of the major muscle groups.

## **Some Precautions for People with Diabetes Who Exercise**

The following are precautions for *all* people with diabetes, whether type 1 or 2:

- Because people with diabetes are at higher than average risk for heart disease, they should always check with their doctors before starting a demanding exercise program.

For people who have been sedentary, or have other medical problems, lower-intensity exercises are recommended, using programs the patients designed with their doctors.

- Strenuous strength training or high-impact exercise is not recommended for people with uncontrolled diabetes. Such exercises can strain weakened blood vessels in the eyes of patients with retinopathy (a common diabetic complication). High-impact exercise may also injure blood vessels in the feet.

Patients who are taking medications that lower blood glucose, particularly insulin, should take special precautions before starting a workout program.

- Wear good, protective footwear to help avoid injuries and wounds to the feet.
- Glucose levels swing dramatically during exercise. People with diabetes should monitor their levels carefully before, during, and after workouts.
- Patients should probably avoid exercise if glucose levels are above 300 mg/dL or under 100 mg/dL.
- To avoid hypoglycemia (low blood sugar), people with diabetes should inject insulin in sites away from the muscles they use the most during exercise.
- People with diabetes should drink plenty of fluids. Before exercising, they should avoid alcohol and certain medications, such as beta-blockers, which increase the risk of hypoglycemia.
- Insulin-dependent athletes may need to decrease insulin doses, or take in more carbohydrates, prior to exercise. However, they may need to take an extra dose of insulin.

A person with diabetes must regularly check their blood sugar (glucose) level.

## **Exercise's Effects on Bones and Muscles**

Exercise is critical for strong muscles and bones. Muscle strength declines as people age, but studies report that when people exercise they are stronger and leaner than others in their age group.

Exercise may help kids lower their risk of chronic pain in the future.

Joints are complex structures. They are designed to bear weight and move the body. Above the knee is the femur (thigh bone). Below the knee is the tibia (shin bone) and fibula. The kneecap is also called the patella. It rides on top of the lower portion of the femur and the top portion of the tibia. The muscles and ligaments connect these bones, and the space between them is cushioned by fluid-filled capsules (synovia) and cartilage. When you exercise, the muscles pull on the bones, strengthening them. The range of motion of a joint represents how far it can be flexed (bent) and extended (stretched).

## **Effects of Exercise on Osteoarthritis**

Joints require motion to stay healthy. Long periods of inactivity cause the arthritic joint to stiffen and the adjoining tissue to weaken. A moderate exercise program that includes low-impact aerobics, power, and strength training has benefits for osteoarthritic patients, even if exercise



does not slow down the disease progression. Many patients who start an exercise program report less disability and pain. They are also better able to perform daily chores, and remain independent longer than their inactive peers. Older patients and those with medical problems should always check with their doctor before starting an exercise program.

The following are useful exercises for osteoarthritis patients:

- Strengthening exercises build muscle strength. Exercises to strengthen leg muscles are a reasonable first step, even before using pain relievers. Health care professionals fear that patients who rely on painkilling drugs may overuse knees, which do not have strong enough muscle tissue to protect the joints from further damage. Strengthening the thigh muscles is certainly protective for those who have not developed osteoarthritis.
- Range-of-motion exercises increase the amount of movement in a joint and muscle. Examples are yoga and tai chi, which focus on flexibility, balance, and proper breathing.
- Low-impact aerobic workouts help stabilize and support the joints. Cycling and walking are beneficial, and swimming or exercising in water is highly recommended for people with arthritis. Patients with arthritis should avoid high-impact sports, such as jogging, tennis, and racquetball.
- Some researchers are now focusing on "power" training, which involves improving the muscle's ability to move more rapidly against resisting forces, such as gravity. For example, such training helps people stand up or climb stairs more quickly. Muscle power declines more rapidly than muscle strength, and may be particularly important in older people.

### **Exercises Effect on Fractures and Falls**

Exercise is very important for slowing the progression of osteoporosis, and extremely important for reducing the risk of falling, which causes fractures. Falls are one of the leading causes of death in people over the age of 65. Exercise helps build balance and flexibility, which reduces the risk of falling.

Specific exercises may be especially helpful for reducing the risk of fractures:

- Weight-bearing exercise is very beneficial for bones in people of all ages, including older people. This approach applies tension to muscle and bone, and the body responds to this stress by increasing bone density, in young adults by as much as 2 - 8% a year. Careful weight training can also be very beneficial for elderly people, particularly women. In addition to improving bone density, weight-bearing exercise reduces the risk of fractures by improving muscle strength and balance, thus helping to prevent falls.
- Regular brisk long walks improve bone density and mobility. In one 2002 study, for example, older women reduced their risk of hip fracture by over 40% by working out just four hours a week.
- Exercises specifically targeted to strengthen the back can be beneficial in improving posture, and may even reduce kyphosis (hunchback) in people with osteoporosis.

- Low-impact exercises, particularly yoga and tai chi, which improve balance and strength, have been found to decrease the risk of falling. In one study, tai chi reduced this risk by almost half.

*Note on Female Athlete Triad.* Some young female athletes who exercise very intensely, and are subject to intense pressure to remain thin, are at risk for the female athlete triad. This syndrome is a combination of three disorders -- an eating disorder, loss of menstrual periods, and osteoporosis.

### **Effect of Exercise on Back Pain**

People who do not exercise regularly face an increased risk for low back pain, especially during times when they suddenly have to perform stressful, unfamiliar activities. These activities may include shoveling, digging, or moving heavy items. Although no definitive studies have been done to prove the relationship between lack of exercise and low back pain, sedentary living is probably a contributing risk factor for this condition.

Lack of exercise leads to the following conditions that may threaten the back:

- Muscle inflexibility can restrict the back's ability to move, rotate, and bend.
- Weak stomach muscles can increase the strain on the back and can cause an abnormal tilt of the pelvis (hip bones).
- Weak back muscles may increase the load on the spine and the risk of disk compression.
- Obesity puts more weight on the spine and increases pressure on the vertebrae and disks. Studies report only a weak association between obesity and low back pain, however.

*Benefits for Chronic Back Pain.* People with sudden and severe back pain should not exercise. Exercise plays a very beneficial role in relieving chronic back pain, however.

Exercise should be considered as part of a broader program to return to normal home, work, and social activities. In this way, the positive benefits of exercise not only affect strength and flexibility but they also alter and improve the patients' attitudes toward their disability and pain.

Repetition is the key to increasing flexibility, building endurance, and strengthening the specific muscles needed to support the spine. Some exercise programs used for prevention or treatment of chronic low back pain include the following:

- **Low-impact Aerobic Exercises:** Low-impact aerobic exercises, such as swimming, bicycling, and walking, can strengthen muscles in the abdomen and back without overstraining the back. Programs that use strengthening exercises while swimming may be a particularly beneficial approach for many patients with back pain..
- **Lumbar Extension Strength Training:** Exercises called lumbar extension strength training are proving to be effective. Generally, these exercises attempt to strengthen the abdomen, and improve lower back mobility, strength, and endurance. They also enhance flexibility in the hip and hamstring muscles, and in the tendons at the back of the thigh.

- **Yoga, Tai Chi, and Chi Kung:** These exercises combine low-impact physical movements and meditation. They are based on principles of disciplining the mind to achieve a physical and mental balance, and can be very helpful in preventing recurrences of low back pain. This approach deserves further research.
- **Flexibility Exercises:** Whether flexibility exercises alone offer any significant benefit for chronic back pain is uncertain.
- **Retraining Deep or Core Muscles:** Studies are finding a link between low back pain and poor motor control of deep muscles in the back and trunk. According to these studies, contraction exercises specifically designed to retrain these muscles may be effective for patients with both acute and chronic pain.

It is important for any person who has low back pain to have an exercise program guided by professionals who understand the limitations and special needs of back pain, and who can address individual health conditions.

*Hazardous Effects on the Back.* Improper or excessive exercise can also cause back pain.

## **Exercise's Effects on the Lungs**

Patients with chronic lung problems have difficulty exercising. Shortness of breath is a major limitation in most patients, but in about a third, muscle fatigue is an even greater problem. Although exercise does not improve lung function, training helps many patients with chronic lung disease by strengthening their limb muscles, thus improving endurance and reducing breathlessness.

## **Effects of Exercise on Respiratory Infections (Colds and the Flu)**

In people who already have colds, exercise has no effect on the illness' severity or duration. People should avoid strenuous physical activity when they have fevers, muscle aches, or other symptoms of a widespread viral illness.

## **Effects of Exercise on Asthma**

People with asthma who enjoy running should consider using an indoor track, to avoid pollutants and cold winter air. Swimming is particularly excellent for people with asthma. Yoga practice, which uses stretching, breathing, chest expansion, and meditation techniques may have specific benefits that include stress reduction as well as airway opening.

*Exercise-Induced Asthma (EIA).* Exercise-induced asthma occurs when exercise triggers coughing, wheezing, or shortness of breath. It occurs most often in children and young adults and during intense exercise in cold dry air. EIA is triggered *only* by exercise. Unlike allergic asthma, there is no long-term increase in airway activity. People who have only EIA do not require long-term maintenance therapy. The warm-up and cool-down periods, which are important for any exercise regimen, may help reduce EIA events. EIA is not a reason to exclude people from physically demanding occupations.

*Hints for Reducing EIA.* EIA occurs only after exercise and is more likely to occur with regularly-paced activities in cold, dry air. The following are some suggestions for reducing the impact of EIA:

- Follow the health care provider's instructions for using long-term control medications, particularly inhaled corticosteroids, when prescribed.
- Warm-up and cool-down periods are important.
- Patients with EIA might do better with activities that involve short bursts of exercise (tennis, football), rather than with exercises involving long-duration regular pacing (cycling, soccer, and distance running).
- When exercising in cold air, breathing through a scarf or through the nose helps warm up the airways.

Exercise-induced asthma is distinct from allergic asthma in that it does not produce long-term increase in airway activity. People who only experience asthma when they exercise may be able to control their symptoms with preventive measures such as warm-up and cool-down exercises.

### **Effects of Exercise on Emphysema**

Walking is the best exercise for people with emphysema. Patients should try to walk three to four times daily for 5 - 15 minutes each time. Devices that assist ventilation may reduce breathlessness that occurs during exercise.

*Strengthening Exercises for the Limbs.* Exercising and strengthening the muscles in the arms and legs helps some patients improve their endurance and reduce breathlessness

Inspiratory muscle training involves exercises and devices that make inhaling (breathing in) more difficult, in order to strengthen breathing muscles. Yoga or martial arts exercises, such as tai chi, which emphasize breathing techniques and balanced movements, may be particularly beneficial for patients with emphysema.

### **Exercise's Effects on Weight**

Exercising helps people reduce their weight, maintain weight loss, and fight obesity. Research has shown that women who regularly exercise but do not change their diet can lose significantly more weight than less active women.

Thirty minutes of moderate-intensity exercise may be adequate to maintain cardiovascular health, but it might not prevent weight gain. Between 45 and 60 minutes of exercise per day may be needed to promote weight loss. Children may need more activity.

Losing significant weight requires both exercise and calorie restriction. In addition, if a person exercises without dieting, any actual weight loss may be minimal because dense and heavier

muscle mass replaces fat. Nonetheless, regardless of weight loss, a fit body will look more toned and be healthier.

People who exercise are more apt to stay on a diet plan. Exercise improves psychological well-being and replaces sedentary habits that usually lead to snacking. Exercise may even act as a mild appetite suppressant.

Exercising without dieting still adds health benefits, maybe even lowering the death rate of overweight, unfit people. People who have trained for a long time may develop more efficient mechanisms for burning fat and are able to stay leaner.

Lifting weights builds muscle, which burns calories more efficiently than other body tissues.

The following are some suggestions and observations on exercise and weight loss:

- The treadmill burns the most calories of standard aerobic machines. Exercise sessions as short as 10 minutes, which are done frequently (about four times a day), may be the most successful program for obese people.
- The more strenuous the exercise, the longer the body continues to burn calories before returning to its resting level. This state of fast calorie burning can last for as little as a few minutes after light exercise, to as long as several hours after prolonged or heavy exercise.
- Resistance (strength) training is excellent for reducing fat and building muscles. It should be performed two or three times a week.
- Fidgeting may be very helpful in keeping pounds off. Regular exercise is certainly the best course, but for people who must sit for hours at work, frequently shifting positions while sitting may have some benefit.
- It is important to realize that as people slim down, they burn fewer calories per mile of walking or jogging. The rate of weight loss slows down, sometimes discouragingly so, after an initial dramatic head start using diet and exercise combinations. People should be aware of this trend and keep adding to their daily exercise routine.
- Changes in fat and muscle distribution may differ between men and women as they exercise. Men tend to lose abdominal fat (which lowers their risk for heart disease faster than reducing general body fat). In women, aerobic and strength training are more likely to result in fat loss in the arms and trunk. However, they do not gain muscle tissue in those areas.

Because obesity is one of the risk factors for heart disease, anyone who is overweight must discuss their exercise program with a physician before starting.

## **Exercise's Effects on Other Conditions**

Physical activity makes you healthier. It lowers your risk for cardiovascular disease and reduces bone loss. Physical activity also helps the body use calories more efficiently, which helps you eliminate body fat and lose weight. It also helps you maintain weight loss by increasing your metabolism and reducing your appetite.

## **Effect of Exercise on Cancer**

A number of studies have indicated that regular exercise may reduce the risk of breast, colon, and possibly prostate cancers.

Studies confirm that exercise significantly reduces the risk of both colon cancer (by up to 50%). Exercise also decreases the risk of breast cancer in pre and post menopausal women by up to 30%.

Low intensity exercise has a protective effect against colon cancer, according to studies, including the Nurses Health Study and the American Cancer Society's Cancer Prevention Study II. People with colon cancer who exercise may reduce their risk of a recurrence.

Exercise also has a beneficial effect on people receiving treatment for cancer. Aerobic and resistance training can reduce fatigue in patients undergoing chemotherapy or radiation treatments for cancer. Fatigue is a common side effect of such treatments.

## **Effects on the Gastrointestinal Tract**

Endurance athletes often report stomach problems, such as bloating, diarrhea, and gas, even at rest. Moderate regular exercise might reduce the risk for some intestinal disorders. These disorders include ulcers, irritable bowel syndrome, indigestion, and diverticulosis. Older people who exercise moderately may have a lower risk for severe gastrointestinal bleeding.

## **Effects on Neurological Diseases and Mental Decline**

Studies have shown that regular exercise, particularly walking, helps reduce one's risk for memory loss. Epidemiologic studies have found an association between increased exercise and slower rate of functional decline in older adults. To date, there are no clear explanations for this apparent benefit. Aerobic exercise has been linked to improved reaction time in people of all ages.

Exercise seems to improve the physical and emotional well-being of patients who already have Alzheimer's disease. The patients exercised moderately for as little as 60 minutes each week. Doctors noted patients who exercised were less depressed, wandered away less, suffered fewer falls, and were placed in nursing homes later, compared to patients who did not exercise.

People with existing neurological diseases, such as multiple sclerosis, Parkinson's disease, and Alzheimer's disease, should be encouraged to exercise. Specialized exercise programs that improve mobility are particularly valuable for patients with Parkinson's disease. Patients with neurological disorders who exercise experience less stiffness, as well as reduction in, and even reversal of, muscle wasting. In addition, the psychological benefits of exercise are extremely important in managing these disorders. Exercise machines, aquatic exercises, and walking are particularly useful.

## Effects on Emotional Disorders

Some research has suggested that exercise may have antidepressant effects. Although there is little evidence that exercise can correct major depression, a number of studies have suggested benefits in mild to moderate depression in adults. Research findings include:

- Just 30 minutes of brisk exercise three times a week was as effective as medication in relieving symptoms, and reducing relapse, in many patients with mild-to-moderate depression.
- Over half of older women with depression that did not respond to medication showed improvement with 10 weeks of exercise. (About a third of women who did not exercise also improved during that time.)
- Studies on elderly, depressed patients report modest benefits from exercise, even in those who do not respond to antidepressants. Simply participating in a group activity may help improve mood.
- Teenagers who are active in sports have a greater sense of well-being than their sedentary peers. The more vigorously they exercise, the better their emotional health.
- Physical inactivity is strongly linked to depression in children 8 - 12 years of age.
- Exercise decreases some of the most troublesome emotional symptoms of menopause. Women who exercise during menopause showed less anxiety, stress, and depression than inactive women with menopause did.

Specific exercises may be particularly beneficial:

*Aerobics.* Either brief periods of intense training or prolonged aerobic workouts can raise levels of certain chemicals in the brain. These chemicals -- which include endorphins, adrenaline, serotonin, and dopamine -- produce the so-called runner's high. Weight loss and increased muscle tone can boost self-esteem.

*Yoga.* Yoga practice, which involves rhythmic stretching movements and breathing, has been found to positively affect mood. It may have clinical potential as a technique for improving and stabilizing mood. A study comparing yoga to aerobic exercise found that men have significantly lower levels of tension, fatigue, and anger after yoga, compared with levels after swimming. Yoga and swimming tended to produce equal benefits in women.

## Effect of Exercise on Pregnancy

Moderate exercise in healthy pregnant women does *not* increase the risk for miscarriage, preterm labor, or rupture of the membrane. Not exercising increases the risk for complications, including low-birth weight babies. Exercising increases the fetal heart rate, which in turn protects the baby.

Healthy women with normal pregnancies should exercise at least three times a week, being careful to warm up, cool down, and drink plenty of liquids. Many prenatal calisthenics programs are available.

The following are specific exercises that may benefit the pregnant woman:

- Swimming and water aerobics may be the best option for most pregnant women. Water exercises involve no impact, overheating is unlikely, and swimming face down promotes optimum blood flow to the uterus.
- Performing yoga exercises under the guidance of informed instructors can be very helpful.
- Walking is also beneficial.

To strengthen pelvic muscles, women should perform Kegel exercises at least six times a day. This involves contracting the muscles around the vagina and urethra for three seconds 12 - 15 times in a row.

The following precautions are generally recommended for pregnant women who exercise:

- Fit women who have exercised regularly before pregnancy may work out intensely as long as the doctor approves and no discomfort occurs. However, excessive exercise can cause undernourishment of the fetus.
- As a rule for previously sedentary, low-risk expectant mothers, the pulse rate should not exceed 70 - 75% of the maximum heart rate, or more than 150 beats per minute. Any sedentary expectant mother should check with her doctor before starting an exercise program.
- Vigorous exercise may improve the chances for a timely delivery. All pregnant women, however, should avoid high-impact, jerky, and jarring exercises, such as aerobic dancing, which can weaken the pelvic floor muscles that support the uterus.
- During exercise, women should monitor their temperature to avoid overheating, a side effect that can damage the fetus. (Pregnant women should also not use hot tubs or steam baths, which can cause fetal damage and miscarriage.)

Note: Strenuous exercise may affect the flavor of breast milk for a short time afterward. Nursing mothers who engage in such activity might want to wait about an hour after exercising before they feed their infant.

## **Complications**

Exercise may lead to injury. Always exercise with care. Be sure you have clear instructions on how to perform your exercises and how to use any equipment you exercise with.

### **Injuries from High-Impact Exercise**

Competitive running or high-impact aerobics pose a high risk of a number of injuries to the bones and muscle. Injuries to knees, ankles, hips, back, shoulders, and elbows are all possible.



*Preventing High-Impact Injuries.* The following may be helpful for preventing injury:

- Wear shock-absorbing footwear with weight-dampening inserts.
- Combine weight lifting with jumping exercises. This may prevent injury by strengthening hamstrings and improving coordination.
- Vary training and alternate easy and harder workouts.
- Be careful to warm up, cool down, and stretch. Flexibility is the key to preventing many muscle strains.
- Take days off now and then. The risk of injury increases when athletes train more than five times a week.

*Treating Minor Injuries.* Most mild or moderate injuries respond well to a simple, four-step treatment: rest, ice, compression, and elevation (RICE). This combination works well for both spot injuries and chronic problems. Ice packs, which reduce inflammation and pain, can help new injuries, and can be useful for the first few hours after a chronically injured area is exercised. How much or how long to compress the injury is unclear.

Evidence suggests that early movement is helpful, although taping or bracing in people with a *recurrent* ankle sprain is known to be protective. It may not be helpful in those without a previous ankle injury.

Minor injuries like sprains may be treated at home if broken bones are not suspected. The acronym RICE can help you remember how to treat minor injuries: "R" stands for rest, "I" is for ice, "C" is for compression, and "E" is for elevation. Pain and swelling should decrease within 48 hours. Gentle movement may help, but pressure should not be put on a sprained joint until pain is completely gone. This can take up to a few weeks.

Heat, ultrasound, whirlpool, and massage may speed healing if applied a day or two after the initial injury, or for warm-up before another workout session.

### **Female Athlete Triad**

Some young female athletes who exercise very intensely, and are subject to intense pressure to remain thin, are at risk for a syndrome known as the female athlete triad. This combination of symptoms includes loss of menstruation, eating disorders, and osteoporosis. Eating disorders among young female athletes are estimated at 15 - 62%. Women at higher risk include ballet dancers, gymnasts, and divers. Continued intense exercise causes a stress response in which estrogen (the primary female hormone) levels are reduced. Estrogen loss can lead to infertility and osteoporosis. Iron loss and anemia may also be a problem in women who exercise frequently, even at moderate intensity. A doctor should be consulted for any of these concerns.

### **Improper Mechanics and Its Effect on the Back and Shoulders**

Incorrect movements can literally cause mechanical problems in the muscles. These problems are usually the result of improper exercise instruction, and lack of attention. A single jerky golf

swing, or the incorrect use of exercise equipment (especially free weights, nautilus, and rowing machines), can cause serious back injuries.

Between 30 - 70% of cyclists experience low back pain. Pain may be improved by adjusting the angle of the bicycle seat.

## **Dehydration**

Everyone should drink lots of fluid during intense exercise. Thirst is often a poor indicator of dehydration in people who exercise, particularly older people. During a tough workout in a hot environment, the body can lose two liters of fluid per hour through sweat.

Anyone who exercises intensely should take the following precautions:

- Drink 6 - 8 ounces of fluid about 15 minutes before a workout, and then pause regularly during exercise to drink more.
- Water is the best choice for replenishing body fluids. Glucose-sodium-potassium solutions, the so-called "sports drinks," which promise instant energy, appear to be no better than water at improving endurance during prolonged intense running.
- Caffeinated beverages like coffee and soft drinks give short bursts of energy, but can actually cause fluid loss. Caffeine before a workout has been shown to temporarily raise blood pressure, and reduces blood flow to inactive limbs.

Contrary to popular belief, drinking fluids will not cause cramps. Drinking enough, in fact, helps prevent the painful involuntary muscle spasms that sometimes occur during exercise.

## **Hyperthermia (Overheating)**

Overheating, or hyperthermia, can be a problem with hard exercise, or when working out in hot weather. Overheating can cause mild to life-threatening conditions. Heat exhaustion, a moderate form of hyperthermia, is characterized by the following symptoms:

- Lightheadedness, nausea, headache, hyperventilation, fatigue, and loss of concentration
- A high temperature (above 103° F), possibly accompanied by complaints of chills and clammy skin

Individuals should rest in a cool, dry place, drink plenty of fluids, and bring down their body temperature with ice packs pressed against the skin.

*Heat stroke.* Heat stroke is the most dangerous complication of hyperthermia. The victim may suddenly stop sweating, after which symptoms such as altered consciousness, seizures, and even coma may quickly follow. Heat stroke is a medical emergency and requires immediate cooling of the victim in an ice-water bath or with ice packs. Complications from exercising in high temperatures may persist as late as the following day, even if the weather has cooled down.

## **Frostbite and Hypothermia**

Precautions are also necessary in cold weather. When exercising in winter dress in layers, including gloves and socks, which create insulated air pockets that trap heat. In cold weather, wear shoes with less ventilation than those worn in the summer. Fingers, toes, ears, and nose are most susceptible to frostbite. Frostbite progresses from stinging or aching to numbness. Fingers and toes may become white. Soaking the hands and feet in warm water can help, but only once there is no risk of refreezing, since a second bout of frostbite after thawing can quicken tissue damage.

Hypothermia can be life-threatening and can occur even after long exposure to temperatures that are above freezing. The condition is characterized by extreme fatigue, mental confusion, apathy, and a lack of coordination. The victim should be warmed as soon as possible with blankets, body heat, and warm fluids.

## **Motivation**

Motivation, or a lack thereof, is one reason many people stop exercising. Here are some tips for avoiding burnout:

- Think of exercise as a menu rather than a prescription. Choose a number of different physical activities that are personally enjoyable such as sports, dancing, or biking. Although experts say you should get 30 minutes of aerobic exercises at least five times a week, those times can be divided into shorter periods -- such as 10 minute sessions. In addition, people can achieve health benefits from other exercise programs, including weight training, yoga, or tai chi.
- Stick to a prepared schedule and record progress.
- Develop an interest or hobby that requires physical activity.
- Adopt simple routines such as climbing the stairs instead of taking the elevator, walking instead of driving to the local newsstand, or canoeing instead of zooming along in a powerboat.
- Try cross training (alternating between exercise types). Studies suggest it is more beneficial than focusing only on one form of exercise.
- Exercise with friends.
- Join a gym or take classes. Many affordable programs are available.
- For those who can afford them, personal trainers can be very helpful and are available in many gyms and exercise clubs. Personal trainers without any connection to a well-reputed gym or fitness club should be certified by a major fitness organization, such as the Aerobics and Fitness Association of America (AFAA) or the American Council on Exercise.
- Exercise videos may also be helpful, but people should be sure they are suited to their individual age and health needs, and bear the AFAA seal.
- Consider getting a dog. A study in the February 2006 *American Journal of Preventive Medicine* found that dog owners in Canada walk almost twice as much as those who do not own a dog. Regular walking is a good way to improve health.

*Differences in Motivation Between Men and Women.* Motivation factors may differ by gender, and women appear to have a harder time. In one study, weight loss was the greatest motivator to exercise for women, and muscle tone was the primary motivator for men. Unfortunately, effects on appearances may take a long time to show, discouraging people from continuing an exercise program even though their health is improving.

## **Motivating Children and Adolescents**

Overweight among children and adolescents has now become an epidemic in the United States. Children should be vigorously active for at least 20 - 60 minutes 3 - 5 days a week. Parents and schools must be imaginative and rigorous in encouraging children to exercise.

*Role of Parents.* Parents must make conscious efforts to limit sedentary activities, and to encourage physical ones for their children. This includes monitoring the time children spend on the computer, in front of the TV, or playing video games. In fact, decreasing the amount of time children spend in front of a screen leads to a reduction in their body mass index (BMI), an indicator of obesity. This loss in BMI in children is the result of increased activity and reduced snacking.

Parents should suggest different forms of entertainment. Even children who aren't interested in joining a Little League team may enjoy a round of catch with their parents, walking in the park, or swimming in a local lake.

*Role of Schools.* Early school physical education (PE) programs can make a significant difference, and the earlier these routines are learned the more likely they will be carried forth into a healthy adulthood. There are also physical benefits to PE programs that are just now becoming known. For example, a study found that incorporating jumping exercises into an elementary school's PE program increased children's bone densities, a measure of bone strength.

Schools should emphasize team cooperation or individual improvement and self-mastery. Studies have shown that people tend to give up more quickly and feel less competent if their perceptions of success are based only on comparison to their peers.

People mature at different rates, and there seems to be a genetic component to coordination, strength, speed, and one's response to resistance exercise. Nonetheless, everyone should strive to be as fit as they possibly can, given their strengths and limitations.

*New national program.* We Can! (Ways to Enhance Children's Activity & Nutrition) is a new national program designed to help children live healthier lives. This program "focuses on three important behaviors: improved food choices, increased physical activity and reduced screen time." We can! Is a collaboration of the National Heart, Lung, and Blood Institute; the National Institute of Diabetes and Digestive and Kidney Diseases; the National Institute of Child Health and Human Development; and the National Cancer Institute.

## Stages for Adopting Healthy Behavior

The decision to adopt a healthier behavior -- whether it's more exercise, weight loss, or quitting smoking -- is not as simple as just deciding to do it. Behavior change expert James Prochaska and his colleagues outlined a theory, which has been supported by numerous studies, showing that people cycle through a variety of stages before a new behavior is successfully adopted over the long term. It may help you to understand how this works. As you read the description of each stage -- specifically as it relates to exercise -- you may find yourself nodding and saying to yourself, "Yes, that's me!"

*Stage 1: Pre-Contemplation.* People at this stage have no plans or desire to exercise. They aren't even considering exercising. They are generally unaware of the specific benefits that exercise can bring -- exercise may seem more like a hassle than something worth doing. Or, they may simply have "failed" in the past and have given up.

There's no point in talking about how to start an exercise program if you are at this stage. Instead, it is important to think about how exercise might be good for you personally -- by helping you to lose weight, feel better, have more confidence, live longer, sleep better, or reduce your stress levels. The benefits must be identified before a person will consider exercise.

If you are at this stage, a good activity is to ask four friends or family members why they exercise. Their answers may show you some real-life benefits, and inspire enough interest to compel you to take the next step.

*Stage 2: Contemplation.* A person at this stage is thinking, "I think I should probably exercise, but I need help getting started." People at this stage know that exercise is good for them, but it seems like a daunting task or they don't think they can pull it off. Some may have tried and "failed" in the past, but they are still receptive to another go-round.

It's important for people at this stage to consider some of the truths and falsehoods of exercise. For example, it is helpful to know that there are many forms of physical activity to select from, and that you can do your exercising in small chunks. It is not true that exercise has to be painful, or that you either succeed or fail. There is no such thing as "failure" -- people become more or less active at different stages of their lives, and it is never too late to get moving again. And people at this stage should find assurance that an exercise plan can be very simple.

If you are at this stage, a good activity is to write down all the things that you believe make exercise difficult -- and to learn strategies for overcoming or side-stepping those hurdles. People at this stage might benefit from making a pledge, contract, or other commitment that they are going to get more active in the near future. The goal is to get unstuck by identifying the roadblocks and the ways to overcome these roadblocks. The final goal at this stage is to make a commitment.

*Stage 3: Preparation.* These folks are primed and motivated. They are ready to give exercise a try. The goal of this stage is to create a specific action plan that takes all factors into account, so that the "launch" is successful. People at this stage need to know how much they should be

exercising, their target heart rate, and the types of exercises. They should explore the different kinds of exercises and decide which ones to try.

At this stage, people will evaluate exercise machines and health plans, if that interests them, pick the proper clothing or accessories, and consult a doctor if necessary. They also need to think about how they are going to fit their exercise plans into their daily and weekly schedule.

If you are at this stage, you should also consider some backup plans -- what to do if it rains, or if you don't feel like exercising. That way you are prepared to overcome that hurdle when you encounter it. You should be aware of what to expect realistically at the beginning -- for example, be aware that weight loss takes time, but health benefits begin immediately.

*Stage 4: Action!* People at this stage have just started exercising. This stage is where the biggest behavior change occurs -- these people have started to exercise but it is not yet a long-term, ingrained habit. This stage requires significant commitment and energy.

If you are at this stage, keep talking to friends and family for inspiration. Review your backup plans. Reward yourself for small achievements. Give yourself notes and reminders to exercise. Having a friend to exercise with can be very helpful as you get through this stage. You want to build and maintain momentum, because exercising gets easier once it is a habit!

*Stage 5: Maintenance.* The people at this stage have been exercising for at least 6 months. At this point, exercising has started to become a habit. The goal here is to prevent relapse. If you are at this stage, identify ways that you can fine-tune your program. Continue to identify roadblocks and improve your backup plans. Think about what you have found most enjoyable about exercising.

What benefits have you gained? Keep reminding yourself of these perks. If giving yourself a challenge was part of your initial motivation, set new goals and find new challenges. If you risk getting bored with your routine, find ways to vary it. Or maybe you have found a comfortable routine that you enjoy -- if it's working, great! There is no need to change it. You might want to read or learn more about your method of exercising, and develop a deeper level of understanding about it. Soon you'll be a pro!

One point about this theory is that people do not proceed from one stage to another in a simple, step-by-step fashion. They actually cycle or spiral back and forth, so that they may move from stage 1 to 2 to 3, and then back to 2 again. They may stay in maintenance mode for years and then fall back to stage 2. Remember that this is normal -- if you tried exercising in the past and didn't stick with it, don't consider yourself a failure. Just know that it's time to try again!

## Resources

- <http://fitness.gov> -- The President's Council on Physical Fitness and Sports
- [www.ncppa.org](http://www.ncppa.org) -- National Coalition for Promoting Physical Activity
- [www.acefitness.org](http://www.acefitness.org) -- American Council on Exercise
- [www.arthritis.org](http://www.arthritis.org) -- The Arthritis Foundation offers tips on exercising with arthritis
- [www.justmove.org](http://www.justmove.org) -- Just Move (American Heart Association)
- [www.nhlbi.nih.gov/health/public/heart/obesity/wecan](http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan) -- We Can! (National Heart, Lung, and Blood Institute)