

Exercise for Diabetes

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.

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.

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.

Shoes for Sports	
Aerobic	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

dancing	ankles that over-turn inward or outward. Soles should allow for twisting and turning.
Cycling	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 cyclists. In some cases, orthotics may be needed to control arch and heel and balance forefoot.
Running	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.
Tennis	Allow side-to-side sliding. Low-traction soles. Snug fitting heels with cushioning. Padded toe box with adequate depth. Soft-support arch.
Walking	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 increased 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 entire adult their 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 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.

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

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.

Dr Shahjada Selim

Department of Endocrinology & Metabolism

BIRDEM, Shahbag, Dhaka

Chamber:

First Lab

Mozaffar Tower (2nd Floor)

55, BirUttam C R Datta Road, Paribag, Bangla Motor, Dhaka

Phone: 01919000022, 01745999990, 9613389-90

Email: selimshajada@gmail.com

© DR. SHAHJADA SELIM