



# Impact of Exercise on Type 1 Diabetes in Children

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## Introduction

Exercise offers many health-promoting benefits for people with and without diabetes. Physical activity is associated with many health benefits and is an important part of any healthy life style. For individuals with type 1 diabetes, exercise provides additional benefits.

Being active is most beneficial when it's done on a regular basis.

Children with type 1 diabetes need to be active. Physical activity has an impact on the blood glucose levels. It also results in a greater sense of well-being, help with weight control, improved physical fitness, and improved cardiovascular fitness, with lower pulse and blood pressure and improved lipid profile.

A study by Gabriel *et al*[1] demonstrates that aerobic exercise training can improve endothelial function in different vascular beds in patients with long-standing type 1 diabetes, who are at considerable risk for diabetic angiopathy.

### *Benefits of exercise*

In addition to all of the usual health benefits of exercise, such as weight control, stress reduction, improved muscular strength and flexibility, and reduced bone loss, a sound exercise program can also help children with type 1 diabetes better to maintain

the blood glucose levels within the normal limits and reduce their risk of heart disease later.

Exercising on a regular basis can improve the sensitivity and number of insulin receptors in the body, according to the American Council on Exercise; this in turn helps train the muscles to use insulin better. These improvements in insulin utilization may lead to a decrease in insulin requirements for some individuals, but because people with type 1 diabetes are unable to make any insulin, no amount of exercise will ever eliminate the need for insulin injections.

People with type 1 diabetes are at an increased risk for heart attack, stroke and other cardiovascular diseases, but regular exercise can help reduce the risks. Consistent physical activity has been proven to raise HDL cholesterol, lower LDL cholesterol and reduce triglycerides in the bloodstream. Physical activity also improves blood flow, increases the heart's pumping power and reduces blood pressure.

It is worth noting that exercise has not consistently been shown to improve blood glucose control in people with type 1 diabetes. However, given its other numerous benefits, exercise is still an important part of living well with type 1 diabetes.

### *Exercise Risks and How to Avoid Them*

Exercise can be risky to anyone who hasn't been physically active in awhile, but there are several potential risks that people with type 1 diabetes must carefully consider prior to beginning an exercise program. You should have a lengthy discussion with your health care provider to better understand how exercise influences blood glucose, and how to avoid potential problems, minimize risks, and recognize when you need to get additional information or medical care. Here are four of the most common problems that you must consider and address when

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planning your exercise program.

### *Hypoglycemia*

Exercise typically reduces blood sugar levels especially when combined with insulin injections. When blood sugar drops too low, a complication known as hypoglycemia (low blood sugar) occurs. Hypoglycemia can happen during exercise, right after exercise, or even up to 24 hours after you work out. Symptoms of hypoglycemia can be mild and gradual, but it is more common for them to occur quickly. In rare cases, individuals may not experience any symptoms of hypoglycemia at all. By paying close attention to how you're feeling, and by knowing how to recognize and treat symptoms of low blood sugar correctly, you can prevent problems before they put you at risk of injury.

Because the risk of hypoglycemia increases with exercise, it is important to plan your new exercise regimen carefully (more on that below). Here are some ways people with type 1 diabetes can reduce their risk of hypoglycemia during and after exercise.

- Always check your blood sugar before, during, and after exercise.
- Talk with your doctor about whether adjusting your insulin doses (or basal infusion rates, if you use an insulin pump) around planned exercise is right for you. Adjusting insulin doses around planned exercise can minimize your need for extra snacks prior to exercise, thereby helping you manage your weight.
- Never adjust these doses under any circumstances, without consulting your physician first.
- Eat 15-30 grams of carbohydrates 30 minutes prior to any physical activity that is not part of your regular fitness plan for diabetes management. Talk to your doctor or diabetes educator for specific guidelines.
- In order to ensure that insulin is not absorbed too quickly, increasing the risk of hypoglycemia, it is best to avoid giving any insulin injections prior to exercise into areas of the body that will be worked during exercise (upper thighs and tricep region of the upper arms).

- Do not skip planned meals prior to exercise or go too long without eating.
- Carry an easy-to-consume source of fast-acting sugar (such as juice, hard candy, or glucose tablets) when you exercise. You will use this to treat hypoglycemia should it occur.
- Drink plenty of water before and during exercise. Dehydration can affect blood glucose levels.
- Avoid exercising in extreme weather conditions.
- In special cases, athletes and people who have successfully adopted a long-term fitness plans will need specific self-management instructions from their physicians.

Discontinuing basal insulin during exercise is an effective strategy for reducing hypoglycemia in children with T1D, but the risk of hyperglycemia is increased.

### *Poor Blood Sugar Control*

In some cases, exercise can cause blood sugar levels to rise, resulting in hyperglycemia. If your blood glucose levels are not in your target range, talk to your doctor before beginning an exercise program. To prevent exercise-related blood sugar problems:

- Do not exercise if your blood glucose is above 250 mg/dL and you have ketones in your urine. Call your doctor's office for additional advice.
- Check your glucose level before, during, and after exercise, to see how your exercise has affected it. Share this information with your doctor.

### *Diabetic Retinopathy*

In this condition (damaged blood vessels in the retina of the eye), exercise could damage the eyesight. Strenuous activities could lead to bleeding or retinal detachment, so one may need to avoid certain activities, such as weight lifting or jogging. The doctor must be consulted to recommend appropriate exercise activities.

### *Reduced Sensation or Pain in the Extremities*

Because diabetes can cause nerve damage (neuropathy) and interfere with blood circulation, many people with diabetes can lose all or part of the sensation in their feet. To prevent exercise-related foot problems:

- Check your feet for cuts, blisters, or signs of infection on a regular basis.
- Wear good, properly-fitting shoes with ample cushioning and support
- Wear synthetic, wool or cotton-blend socks (not 100% cotton) that minimize moisture problems.

If you experience pain in your legs (or other extremities) at anytime during or after your exercise routine, contact your doctor right away. Exercise-induced pain can be a symptom of one or more diabetes-related complications that require medical attention. If numbness or pain becomes constant or severe, talk to your doctor about alternate forms of exercise that may be appropriate.

### *Tips for exercising safely*

- Do not exercise if blood sugar is over 250 mg/dL or ketones are present.
- Make sure the blood sugar is in the target range before exercise-to avoid low blood sugar.
- Remember to wear identification.
- Drink water to avoid dehydration.
- Talk with the doctor about lowering the insulin dose that is taken before exercise.
- Inject the insulin before exercise in a site other than the parts of the body that will be used during exercise. For example, in case of running, do not inject insulin in the leg.
- May eat 15 to 30 grams of quick-sugar food (hard candy, fruit juice, honey) 15 to 30 minutes before exercise.

- If case of organized sports, give the coach a list of the symptoms of low blood sugar and instructions about what to do if it occurs.
- Have some quick-sugar food (hard candy, fruit juice, honey) on hand at all times.
- Watch for symptoms of low blood sugar up to 24 to 36 hours after exercise. .

### **Conclusion**

In essence, exercise helps your child control his or her diabetes. And in the long run, this will reduce the chances of your child experiencing certain health problems related to diabetes. You can read more about the benefits of physical activity for people with type 1 diabetes in our article about exercise and type 1 diabetes.

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