

DIABETES and EXERCISE

The treatment goal for diabetics is glucose control, which includes diet, medications, and exercise. Intensive treatment to control blood glucose has been documented to reduce the risk of progression of diabetic complications 50% to 75% in type 1 diabetic adults (6) and has been considered to be of similar efficacy in type 2 diabetic adults (4). Exercise is effective in glucose control because exercise has an insulin-like effect that enhances the uptake of glucose even in the presence of insulin deficiency. Outcomes of exercise treatment in diabetes include improved glucose tolerance, increased insulin sensitivity, decreased glycosylated hemoglobin, and decreased insulin requirements (3). Additional benefits of exercise for diabetic patients include improved lipid profiles, blood pressure reduction, weight management, increased physical work capacity, and improved well-being (14).

Some of the Considerations an Exercise Physiologist looks at when creating an Exercise plan for a person with Diabetes includes:

- For resistance training, lower resistance and lower intensity is recommended.
- Hypoglycemia is the most common problem for diabetics who exercise. See Table below for common symptoms associated with hypoglycemia. Because of the increase of glucose uptake during exercise, the risk of hypoglycemia exists during and after exercise. Hypoglycemia, usually considered <80 mg.dL is relative. Rapid drops in blood glucose also can cause the signs and symptoms of hypoglycemia in elevated glycemic states.
- Hyperglycemia during exercise is a risk, particularly for type 1 diabetics, who are not in glycemic control. See Table below for common symptoms associated with hyperglycemia.
- Hyperglycemia, common to diabetes may cause polyuria, polydipsia, weight loss (sometimes with polyphagia), and blurred vision.
- Hypoglycemia, associated with exercise, may last as long as 48 hours after exercise (12). To prevent post-exercise hypoglycemia, monitor plasma glucose levels and ingest carbohydrates as needed.
- Monitor blood glucose to prevent hypoglycemia or hyperglycemia associated with exercise, especially if taking insulin or oral hypoglycemic agents that increase insulin production.
- Monitor blood glucose prior to exercise and following exercise, especially when beginning or modifying the exercise.
- A late-onset hypoglycemia can occur up to 48 hours following exercise, especially when beginning or modifying the exercise program.
- Avoid physical activity if fasting glucose >250 mg.dL and ketosis are present, and use caution if glucose >300 mg.dL and no ketosis is present (5).
- Adjust carbohydrate intake or insulin injections prior to exercise based on blood glucose and exercise intensity to prevent hypoglycemia associated with

exercise. Twenty to thirty grams of additional carbohydrates should be ingested if pre-exercise blood glucose is <100 mg.dL.

-To lower the risk of hypoglycemia associated with exercise, avoid injecting insulin into exercising limbs; an abdominal injection site is preferred (16).

-When exercising late in the evening, an increased consumption of carbohydrates may be required to minimize the risk of nocturnal hypoglycemia.

-*Intense* resistance exercise often produces an acute hyperglycemic effect, whereas post-exercise hypoglycemia in the hours following *basic* resistance training is an increased risk for patients on insulin or oral hypoglycemic agents (8).

-For diabetic patients with retinopathy, prevent retinal detachment and vitreous hemorrhage associated with exercise (1):

-For moderate nonproliferative diabetic retinopathy, avoid activities that dramatically elevate blood pressure.

-For severe nonproliferative diabetic retinopathy, avoid exercise that increases systolic blood pressure >170 mm Hg.

-For proliferative diabetic retinopathy avoid strenuous activities, Valsalva maneuvers, or activities of pounding or jarring.

-For diabetic patients with autonomic neuropathy (16):

-Monitor for signs and symptoms of hypoglycemia because of the inability of the patient to recognize them.

-Monitor for signs and symptoms of silent ischemia because of the inability to perceive angina.

-Monitor blood pressure following exercise to manage hypotension and hypertension associated with vigorous exercise.

-Understand that the heart rate and blood pressure response to exercise may be blunted and that the use of perceived exertion may help guide exercise intensity.

-Use precautions for poor thermoregulation in both hot and cold environments.

Table. Signs and symptoms of hyperglycemia and hypoglycemia

<u>Hyperglycemia (>300 mg.dL)</u>	<u>Hypoglycemia (<80 mg.dL)</u>	
Weakness	Poor coordination	Apathy
Increased thirst	Inability to concentrate	Confusion
Dry mouth	Fainting or feeling faint	Delusion
Soft eyeballs	Blurred vision	Headache
Frequent, scant urination	Hand tremors	Fatigue
Decreased appetite	Loss of Consciousness	Irritability
Nausea	Excessive hunger	Dizziness
Vomiting	Somnolence	Crying
Abdominal tenderness	Nervousness	Drowsy
Acetone breath	Slurred speech	Sweat
Kussmaul respirations	Unsteady gait	
	Convulsions	
	Double vision	

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