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## Exercise and Diabetes: A Review of the Evidence

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### Abstract

Diabetes or Diabetes is a big problem in public health communities. More than 300/000 people worldwide have the disease. According to the World Health Organization, nearly two million Iranians in the year 2000 deaths have been diagnosed with the disease. Projections indicate that by the year 2030 the number of people with diabetes 6/5 million people increases. This is followed by hyperglycaemia occur. Sports critical role in the prevention and control of diabetes plays. . Since the role of exercise in controlling this disease has been shown, Exercise can prevent the development of diabetes. Therefore, should exercise appropriate clinical care systems people be at risk of diabetes. In this article, we briefly review the pathophysiological diabetes. The more detailed the benefits of exercise therapy on glycaemic control and cardiovascular risk factors in diabetes, Along with recommendations and instructions sports programs will be discussed.

**Keywords:** diabetes, hyperglycemia, pathophysiological, glyceic control

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### 1.Introduction

Diabetes is a disease that is based on the apidemik metabolici estimation of the offered about five to eight percent of adults in the world to it is suffering. The risk of death and premature morbidity, cardiac diseases, renal, neurologic, and blindness in people with double the non-diabetic people (1). Although regular physical activity may have occurred in the prevention and treatment of Diabetes and complications involved, but most of the people in the prone to diabetes are disabled. In this Review article on this is after trying to provide knowledge about the beneficial effects of exercise in diabetes some instructions about the administration of the training program for these individuals

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offering. Two General forms of Diabetes mellitus and Diabetes insipidus classified. No taste in diabetes sugar absorbed in indigent there is no blood and urine volume increased only due to diabetes there is a resemblance. The two main forms of diabetes mellitus type 1 and type 2 classified. The other type is less common, Gestational diabetes and this in the happens during pregnancy. The risk of diabetes increases with age, obesity and inactivity (2).

### The immediate effects of exercise

**Fuel metabolism during exercise:** Muscle contraction absorbed blood glucose to the muscles. Physical activity causes a change in the substrate of the free fatty acids (the dominant fuel during the rest) to mitochondrium, glycogen, glucose, fat, muscle, and amino acids may be less than the amount (4). Classification of evidence-based Gatherer: physical activity increased the uptake of active glucose to the muscles and liver glucose production to maintain blood glucose helps. Of the story, with increasing exercise intensity relying on high carbohydrate to active muscles.

**Insulin dependent glucose absorption and no dependent insulin during exercise:** Evidence-based conclusions: the absorption of glucose into skeletal muscle insulin stimulation during rest, mostly by the enumerator is disturbed in diabetic individuals, while Contracting muscle transfer of glucose insulin sensitivity through improved and more mechanisms stimulation of separate.

**The effects of aerobic exercise:** During moderate intensity exercise in non-diabetic, glucose uptake, climbing by peripheral tissues (skeletal muscle) with increased liver glucose production. The result is that blood glucose during long-term exercise does not change (3). Evidence-based conclusions: Moderate intensity aerobic exercise, insulin action and glucose uptake by skeletal muscles to improve temporarily. In these conditions and without the use of in these conditions and without the use of insulin causing poor blood glucose risk of outsourcing.

**The effects of resistance training:** In the immediate effects of resistance training on blood glucose levels in diabetic patients compared to aerobic exercise there is little evidence. In people with pre-diabetes conditions (level glucose 100 to 125 mg per deciliter) resistance training resulting in a decrease in fasting blood glucose for up to 24 hours thereafter.

**Evidence-based conclusions:** Report about the immediate effects of resistance training in diabetic patients is limited, but the people before diabetes is a resistance exercise to reduce blood glucose for 24 hour.

**Instantaneous changes in muscle insulin resistance:** Gorman and Partners showed up to 16 hours after a aerobic exercise reduces blood glucose and paths signal are actively involved in glucose

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uptake into the skeletal muscle (5). In one study showed immediate improvements in insulin sensitivity in women low-intensity and high-intensity diabetes walk (with the same amount of energy consumed) were similar (6). **Evidence-based conclusions:** Physical activity enhances insulin action instantaneously, which will last from two to 72 hours.

### Long-term effects of exercise training

**Blood glucose levels and insulin resistance:** Traditionally prescribed for the prevention and treatment of diabetes aerobic exercise. Even an hour of aerobic exercise a week can Sensitivity improve insulin in diabetic patients. Exercise can skeletal muscle response to insulin by increasing expression or he activity of proteins involved in metabolism and insulin signaling lift. Practicing a person's status, the use of carbohydrate during exercise aerobic is affected. A few weeks of aerobic training increased use of fat during the same activity this action saves muscle glycogen and blood glucose and finally, reduction of glycogen after exercise is less immediate (7). **Evidence-based conclusions:** Both aerobic and resistance training action of insulin, improves glucose control and lipid oxidation them. At the same time, however, resistance training increases muscle mass effects as well.

**Evidence-based conclusions:** Blood lipid response to exercise is not clear, but may be partial reduction in LDL cholesterol and no change in HDL cholesterol and triglycerides to be accompanied. But the combination of weight loss and physical activity compared to exercise alone in improving lipid profile more effective.

**High blood pressure:** High blood pressure is a major problem that about 60 percent of diabetics are faced with hair (9). In a study by the American Diabetes Association showed injury and weight reduction in both systolic and diastolic blood pressure in diabetes reduced (10). **Evidence-based conclusions:** Aerobic exercise may be systolic blood pressure decreased slightly, but the decrease in pressure lower diastolic blood injury in diabetic patients is common.

**Mortality and risk of cardiovascular disease:** Diabetes is one of the main causes of cardiovascular disease. As the prevalence diabetes, heart attacks and strokes in patients with triple Group is matched controls (10). **Evidence-based conclusions:** Studies suggest that physical activity and physical fitness to reduce the risk of death mortality from cardiovascular disease in people with diabetes.

**Body weight maintenance and loss:** Obesity is a risk factor for diabetes and negative effects significant progress and treatment of diabetes. Studies show that people can be managed to reduce significantly the weight of which about 7 hours per week of moderate to pay to sports (15).

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**Evidence-based conclusions:** Evidence suggests to weight loss through exercise alone, at least 60 minutes of activity exercise per day is needed.

**Evidence-based conclusions:** It seems to do three sessions exercise activities to improve mental health and quality of life people with diabetes can help.

### Physical activity recommendations for diabetics

#### Aerobic exercise:

**Number of training sessions:** Aerobic exercise at least three days week with 48 hours of rest between intervals of exercise done. In most clinical studies, exercise interventions in diabetes three days a week **Intensity:** Aerobic exercise should be moderate, about 40 to 60 percent of maximum aerobic capacity (Vo<sub>2</sub>max) run.

**Duration:** Diabetic patients with at least 150 minutes per week do moderate intensity. Implementation of 150 minutes, intensity exercise aweek of moderate to severe reduction in mortality in diabetic patients their relatives (12). **Evidence-based conclusions:** People with diabetes should at least aerobic exercise for at least 150 minutes per week of moderate to severe three days a week.

#### Resistance training

**Number of training sessions:** resistance training at least two times week (course three times better) with doing aerobic exercise, This means that a combination of resistance training and aerobic each session will lead to greater improvement in insulin sensitivity it is possible (12).

**Intensity:** Resistance training should be moderate intensity (50% repetition maximum, maximum weight that can be lifted once) or evere (75 to 80% of one repetition maximum) to achieve the goal improvement in muscle strength and improve insulin action be taken (13).

**Duration:** at least five to ten movements per training session that includes the large muscles of the upper and lower trunk and every move must be repeated 10 to 15 times per set (12,13,14).

**Evidence-based conclusions:** In addition to aerobic exercise, people diabetes need two to three sessions per week of resistance training moderate to severe (at least six repetitions for each move) to pay.

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### Athletes and clinical considerations:

- Before and even after exercise insulin dose should be reduced.
- Blood glucose before, during and after exercising to be.
- With low levels of blood glucose is not to exercise.
- A meal or snack containing carbohydrates 3 hours ago the sport is received.
- Always some carbohydrate compounds such as chocolate, fruit dried (raisins) and fruits is associated person.
- Team coach and as a person skilled person aware of the condition of diabetes.
- In order to prevent dehydration always received lots of water (16,17).

### 2.Method

This study is a documentary research. Using analysis and based on studies and research carried out in recent years to address the issue of pay.

### 3.Results and Discussion

Sports play a key role in the prevention and control of insulin resistance, pre-diabetes conditions and problems

Diabetes-related health plays. Both aerobic exercise and insulin resistance and improve glucose management

Blood, blood lipids, blood pressure, risk of death and cardiovascular mortality and quality of life are. It should be noted for the advantage of these benefits, exercise regularly and continued to do be.

### 4.References

1. Thomas GN, Jiang CQ, Taheri S, Xiao ZH, et al. A systematic review of lifestyle modification and glucose intolerance in the prevention of diabetes. *Curr Diabetes Rev.* 2010; 6: 378-87.
2. American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care.* 2011; 34: 11-61.
3. Suh SH, Paik IY, Jacobs K. Regulation of blood glucose homeostasis during prolonged exercise. *Mol Cells.* 2007; 23:272-9.
4. Goodwin ML. Blood glucose regulation during prolonged, submaximal, continuous exercise: a guide for clinicians. *J Diabetes Sci Technol.* 2010; 4(3): 694-705.
5. O'Gorman DJ, Karlsson HK, McQuaid S, Yousif O, et al. Exercise training increases insulin-stimulated glucose disposal and GLUT4 (SLC2A4) protein content in patients with diabetes. *Diabetologia.* 2006; 49: 2983-92.

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6. Galbo H, Tobin L, van Loon LJ. Responses to acute exercise in diabetes, with an emphasis On metabolism and interaction with oral hypoglycemic agents. *Appl Physiol Nutr Metab.* 2007; 32(3): 567-75.
  7. Saremi A, Moslehabadi M, Parastesh M. [Effects of Twelve-week Strength Training on Serum Chemerin, TNF- $\alpha$  and CRP Level in Subjects with the Metabolic Syndrome]. *IJEM.* 2011; 12: 536-43.
  8. Saremi A, Gheraati MR. [The effect of resistance training on serum myostatin level and insulin resistance in obese/overweight men]. *HARAKAT.* 2010; 4: 93-108.
  9. Saremi A. Effects of resistance training on serum chemerin level and cardiometabolic risk factors in obese men. 2nd International Congress of Metabolic Syndrome, Obesity & Diabetes. 2010; Zanjan, Iran.
  10. Stewart KJ. Role of exercise training on cardiovascular disease in persons who have diabetes and hypertension. *Cardiol Clin.* 2004; 22: 569-86.
  11. Pi-Sunyer X, Blackburn G, Brancati FL, Bray GA, et al. Reduction in weight and cardiovascular disease risk factors in individuals with diabetes: one-year results of the look AHEAD trial. *Diabetes Care.* 2007; 30: 1374-83.
  12. Donnelly JE, Blair SN, Jakicic JM, Manore MM, et al. American College of Sports Medicine Position Stand. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc.* 2009; 41: 459-71.
  13. Nelson ME, Rejeski WJ, Blair SN, Duncan PW, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Med Sci Sports Exerc.* 2007; 39: 1435-45.
  14. Dunstan DW, Daly RM, Owen N, Jolley D, et al. Home-based resistance training is not sufficient to maintain improved glycemic control following supervised training in older individuals with diabetes. *Diabetes Care.* 2005; 28: 3-9.
  15. Gordon BA, Benson AC, Bird SR, Fraser SF. Resistance training improves metabolic health in diabetes: a systematic review. *Diabetes Res Clin Pract.* 2009; 83: 157-75.
  16. American Diabetes Association. Diabetes mellitus and exercise. *Diabetes Care.* 2002; 25: 64-570.
  17. Hornsby WG, Chetlin RD. Management of competitive athletes with diabetes. *Diabetes spectrum.* 2005; 18: 102-7.