



## Exercise for People with Diabetes: If it is all Good, Why are we still Studying it?

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When a person is diagnosed with diabetes, changes in diet and physical activity are at the heart of their health care plan, especially when the diagnosis is type 2 diabetes. Adequate exercise is a cost-effective, clinically proven intervention that can delay the onset of type 2 diabetes or reduce the impact of the disease in people with type 1 or type 2 diabetes. Yet, the majority of Americans do not meet the national guidelines for physical activity, mainly citing a lack of time [1]. Often the lack of priority for exercise is due to a deficiency of immediate and obvious results. Thus, researchers continue to search for ways to improve the effectiveness of exercise and modify exercise prescriptions to match the needs of subpopulations of diabetics.

For those with type 2 diabetes, evidence that exercise is beneficial is plentiful. Since 2004 the American Diabetes Association has recommended regular aerobic and resistance exercise for people with type 2 diabetes without major complications [2]. In fact, in 2010 the American College of Sports Medicine and the American Diabetes Association issued a Joint Position Statement on exercise and type 2 diabetes [3]. With a goal of normal blood glucose levels, the guidelines suggest performing moderate-intensity aerobic exercise at least 3 days/week with no more than 2 consecutive days between bouts. This joint statement provides an extensive literature review and details on exercise prescriptions, but only relates to type 2 diabetes.

While there is agreement in most of the literature about the advantage of exercise for people with type 2 diabetes, questions still linger about the specifics of the exercise prescription to maximize the benefit, while minimizing risk [4-6]. For example, can patients with severe diabetes and complications still benefit from exercise, or is the health risk too great [7]? Alternatively, there is a void for research identifying the procedures for progressing exercise intensity or volume for people with type 2 diabetes in order to continually benefit from the activity [3].

Far less is known about the beneficial effects of exercise for people with type 1 diabetes. In general, studies suggest that exercise improves blood glucose regulation, reduces the daily insulin dosage, reduces hemoglobin A1c levels, improves the quality of life, and decreases the risk of diabetes-associated complications in people with type 1 diabetes [8-12]. Unfortunately, few of these studies have been randomized controls or they included small numbers of subjects and short durations of exercise [13]. In fact, between 1971 and 2011, there were only 48 randomized clinical studies focused on people with type 1 diabetes and the effects of exercise [13]. From those studies, the authors of a meta-analysis concluded that physical activity improved fitness, decreased insulin requirements, improved lipid levels, and vascular endothelial function in people with type 1 diabetes. The research provides little guidance concerning the type, duration, or intensity of the exercise prescription. Due to the paucity of research focused on exercise and type 1 diabetes, most guidelines for exercise training for people with type 1 are based on data obtained from non-diabetics or people with type 2 diabetes.

A lack of activity can be as negatively impactful for people with type 1 diabetes as those with type 2 diabetes. Significant research has

shown that exercise is critical for the prevention of “diabetic disuse syndrome” which compromises the functional capacity of people with type 1 diabetes adding to the risk of some complications [14]. Yet, adults with diabetic complications of the eyes, kidneys, nerves or heart are less likely to obtain recommended levels of activity [15]. More recently, we chronicled the effect of exercise on organs that are typically associated with diabetic complications [16]. In diabetic animal models, mixed results have been obtained concerning potential positive effects of exercise on islets [17,18]. However, positive effects of exercise on diabetics have been measured on the vasculature [19] and heart disease [20]. The evidence on the effects of exercise on kidney function in diabetics is also mixed and should be approached cautiously in people with already existing kidney disease [21].

Yes, exercise is good. In spite of that, more studies are necessary to better define the exercise prescription for people with diabetes, including the question of exercise type, intensity, progression and duration. For those with type 1 diabetes, there is inadequate research to guide the public concerning both the exercise prescription along with a better understanding of hypoglycemic risks. Adding to that body of knowledge is the goal of this special edition of the Journal of Diabetes and Metabolism.

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Received June 11, 2013; Accepted June 15, 2013; Published July 04, 2013

Citation: Stehno-Bittel L (2013) Exercise for People with Diabetes: If it is all Good, Why are we still Studying it? *J Diabetes Metab* S10: e001. doi:10.4172/2155-6156.S10-e001

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**Citation:** Stehno-Bittel L (2013) Exercise for People with Diabetes: If it is all Good, Why are we still Studying it? J Diabetes Metab S10: e001.  
doi:[10.4172/2155-6156.S10-e001](https://doi.org/10.4172/2155-6156.S10-e001)

This article was originally published in a special issue, **Diabetes & Exercise** handled by Editor(s). Dr. Lisa Stehno-Bittel, University of Kansas Medical Center, USA

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