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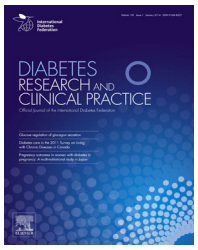

Review

The effectiveness of regular leisure-time physical activities on long-term glycemic control in people with type 2 diabetes: A systematic review and meta-analysis

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ABSTRACT

The objective of this study was to systematically review the effectiveness of different types of regular leisure-time physical activities and pooled the effect sizes of those activities on long-term glycemic control in people with type 2 diabetes compared with routine care. This review included randomized controlled trials from 1960 to May 2014. A total of 10 Chinese and English databases were searched, following selection and critical appraisal, 18 randomized controlled trials with 915 participants were included. The standardized mean difference was reported as the summary statistic for the overall effect size in a random effects model. The results indicated yoga was the most effective in lowering glycated haemoglobin A1c (HbA1c) levels. Meta-analysis also revealed that the decrease in HbA1c levels of the subjects who took part in regular leisure-time physical activities was 0.60% more than that of control group participants. A higher frequency of regular leisure-time physical activities was found to be more effective in reducing HbA1c levels. The results of this review provide evidence of the benefits associated with regular leisure-time physical activities compared with routine care for lowering HbA1c levels in people with type 2 diabetes.

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Contents

1. Introduction

Diabetes is one of the leading causes of mortality throughout the world [1]. Type 2 diabetes is a chronic disease characterized by a lack of insulin or the ineffective use of insulin by the human body, often associated with lifestyle factors such as a lack of physical activity and obesity. The consequences of long-term hyperglycemia include neurological or vascular complications, which may result in amputation, retinopathy, kidney failure, or other severe complications [3,4].

Effective strategies for glycemic control in patients with type 2 diabetes include strict compliance to medications, a suitable diet, and regular physical activity [2]. Randomized controlled studies have shown that regular physical activity effectively lowers blood sugar levels in people with type 2 diabetes in the short term and lowers glycated haemoglobin A1c (HbA1c) levels in the long term. Among these physical activities, aerobic physical activities and resistance training are more beneficial [5–7]. Therefore, the World Health Organization and American College of Sports Medicine (ACSM) suggests that type 2 diabetes patients should maintain at least 150 min of moderate intensity exercise or 90 min of vigorous intensity exercise every week as part of glycemic control [2,8]. The types of physical activities can be further classified into housework, leisure-time physical activities, and physical activities at work. Leisure-time physical activity is defined as physical activity practiced during leisure time [35]. If patients with diabetes increase the amount of leisure-time physical activities in addition to housework and physical activities at work, it would provide additional benefit for glycemic control [9]. In addition, regular leisure based physical activity has been associated with better self-rated health among people with diabetes [10]. Kaizu et al. [11] investigated the effect of leisure-time physical activities on glycemic control and cardiovascular risk factors in 4870 patients with type 2 diabetes. The study found that a high participation rate in leisure-time physical activities correlated with good control of HbA1c levels [11].

Appropriate leisure-time physical activities in type 2 diabetes patients included hula hoop, jogging, walking, gardening, yoga, tai chi, qigong, swimming, dancing, cycling [12]. Previous systematic reviews or meta-analyses have demonstrated a beneficial effect of leisure-time physical activities on glycemic control in type 2 diabetes patients. For example, the meta-analysis by Qiu et al. found a positive association between regular walking exercises, lower HbA1c levels, body mass index, and diastolic blood pressure [13]. However, meta-analyses to date have only focused on single leisure-time physical activities [14], or included control groups that did not receive routine care [15]. No systematic reviews have been published to date that systemically explore the effectiveness of different types of regular leisure-time physical activities and pooled the effect sizes of those activities on glycemic control compared with routine care.

The objective of this study was to conduct a thorough and comprehensive systemic review of randomized controlled studies, using meta-analysis to provide a pooled estimate of the beneficial effects of different types and overall regular leisure-time physical activities on long-term glycemic control in patients with type 2 diabetes. This study also compared the effect of different frequency of leisure-time physical activities on long-term glycemic control.

2. Methods

2.1. *Search strategy*

The date range of the included databases was from 1960 to May 2014 and included English language and Chinese language papers. The databases searched were CINAHL Plus with Full Text, PubMed, Academic Search Complete, The Cochrane Central Register of Controlled Trials, Medline, SPORTDiscus with Full Text, Embase, Web of Science, Science Direct, and Airiti Library. The initial key words were identified in the Medical Subject Headings (MESH) database. The keywords included ‘‘diabetes’’, ‘‘exercise’’, ‘‘yoga’’, ‘‘tai chi’’,