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Improving Patients' Adherence to Physical Activity in Diabetes Mellitus: A Review

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Regular physical activity (PA) is a key element in the prevention and management of type 2 diabetes mellitus (T2DM). Participation in regular PA improves blood glucose control and can prevent or delay T2DM and its complications, along with positively affecting lipids, blood pressure, cardiovascular events, mortality, and quality of life. However, most people with T2DM are not active and show poor adherence. This paper reviews the possible barriers to PA and strategies to improve the adherence to PA. Based on the currently available literature, it is concluded that self-efficacy and social support from family, friends, and health care providers play the important role in adoption and maintenance of regular PA. Here we also highlight some new modern and innovative interventions that facilitate exercise participation and improve the adherence.

Keywords: Adherence; Diabetes mellitus; Education; Motor activity; Self efficacy; Social support

INTRODUCTION

It has been estimated that the world prevalence of diabetes among adults (aged 20 to 79 years) will be 6.4%, affecting 285 million adults, in 2010, and will increase to 7.7%, and 439 million adults by 2030 [1]. However, the age-standardized prevalence of total diabetes (which included both previously diagnosed diabetes and previously undiagnosed diabetes) were 9.7%, accounting for 92.4 million adults with diabetes in 2010 in China [2]. Diabetes has become a widespread epidemic, with rising physical inactivity and obesity major contributing factors [3]. As we know, regular physical activity (PA) is a cornerstone of lifestyle modifications and is recommended since it can prevent and manage type 2 diabetes mellitus (T2DM) and its related morbidities. Prospective cohort and cross-sectional observational studies that assessed PA with questionnaires showed that higher PA levels are associated with reduced risk for T2DM, regardless of method of activity assessment, ranges of activity categories, and statistical methods; Observational studies have reported that greater fitness is associated with a reduced risk of developing T2DM, even if only moderate-intensity exercise is undertaken [4]. Regular PA improves blood glucose control and positively affects lipids, blood pressure, cardiovascular events, mortality, and quality of life as well [4]. With possible increase in glycogen synthase activity and glucose transporter 4 protein expression, regular PA plays an important role in the glycemic control, which can reduce HbA1c – a result that is clinically significant and close to the difference between conventional and intensive glucose-lowering therapy in the United Kingdom Prospective Diabetes Study (UKPDS). In addition, PA or cardiorespiratory fitness was associated with lower all-cause or cardiovascular mortality in people with T2DM.

Despite the clear evidence that PA is a key element in controlling and managing T2DM, individuals with diabetes are among the least likely to engage in regular PA, and the adherence to PA is surprisingly poor. Most American adults with T2DM or at highest risk for developing it do not engage in

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regular PA, the rate of participation is significantly below national norms. Among adults with diabetes, 39% reported they were physically active compared with 58% of those without diabetes [5]. Recent data showed that based on the American Diabetes Association (ADA, 2007) and the Department of Health and Human Services (DHHS, 2008) guidelines, just only 25% and 42% of older adults with diabetes mellitus (DM) met recommendations for total PA, respectively. Adults with DM were 31% to 34% less likely to participate in PA at recommended levels and 13% to 19% less likely to be physically active at insufficient levels than those without DM [6]. In a survey of "the situation of self-management in Chinese patients with T2DM" from Chinese Diabetes Society in 2010 reported that only 35.2% of patients with T2DM remained physically active at recommended levels of PA. In the other survey of adults aged 55 years with T2DM, 55% of respondents reported no weekly PA [7].

This paper will review the strategies for improving patients' adherence to PA based on the present literature as well as on our knowledge and experience. We will firstly focus on the reasons why so many people failed to remain regular physically active, which resulted in the poor management of DM; thereafter, the review will focus on the available ways for the improvement in the adherence to PA, which included some modern and innovative devices and novel concept of management.

BARRIERS TO REGULAR PA

The evidence for the multifaceted benefits of PA is compelling. Nevertheless, the PA behavior of most people with DM does not comply with current guidelines. In the following, the evaluation about the possible barriers to regular PA among individuals either at high risk or already diagnosed with T2DM will be discussed.

Two kinds of barriers to regular PA were identified within the available papers reviewed, which were internal and external barriers. The internal barriers included factors which could be influenced by the individual's own decision-making [8]. Recently, a cross-sectional study examined barriers to PA in older adults in Germany found that poor health ranked first (a percentage of 57.7%) as a barrier to PA. Lack of company accounted for 43.0%, and over one-third of respondents showed no interest in PA. Lack of time was the least important barrier and impeded PA in 16.4% of respondents [9]. Other barriers such as pain, tiredness, and negative emotions such as depression [10] were also reported in the quantitative studies using questionnaires [11]. In addition, overweight subjects often found exercise uncomfortable and difficult life situations also presented barriers to exercise [11,12]. Due to these factors, individuals with T2DM felt that the reasons and benefits of exercise are insufficient compared to the costs of exercise.

Besides the internal barriers, external barriers were also noted to be associated with PA decline. External barriers included factors which are independent of an individual's decision-making, such as weather [13] or cultural barriers [14]. These factors prevented exercising through, for instance, the lack of exercise facilities [10]. Factors such as lack of social support also affect motivation to exercise [15]. Lack of supportive and motivating companionship is certainly one relevant factor that hampers the PA. Beyond that, the lack of company may play a key role in aged men and women who are concerned about their safety when increasing PA levels. Cost [16], transportation [11,16], and whether an activity is available [17] were also reported to influence PA.

PA was also correlated with socio-demographic characteristics. For example, inactivity is more common among women, people with lower incomes and less education, African Americans and Hispanics, and adults residing in northeastern and southern states. Report from the other study, showed that the highest rates of regular PA were among the youngest, most educated, and most economically advantaged adults, but even then over a third was inactive [5]. Moreover, for individuals with type 1 diabetes mellitus, higher PA levels were associated with a younger age, being single, higher income, lower level of perceived disability, and not smoking, while for T2DM, a younger age, male gender, higher education, higher income, lower body mass index, and lower level of perceived disability were associated with higher PA levels [18].

STRATEGIES FOR IMPROVING THE ADHERENCE TO REGULAR PA

Given the importance of PA to diabetes management, the low prevalence of PA should raise concerns among clinicians. Perceived barriers to PA are critical in the self-management of DM, because by identifying the barriers, an individual can find the solutions to them and possibly focus on the benefits more strongly than the barriers.

Education and PA conselling

Education have been focused on prioritizing PA, making time for PA and lessening worry about injuries during PA [19]. In this way, they may succeed in increasing PA in sedentary individuals at high risk of T2DM or already diagnosed with it. The patient support counsellor helps the individual set realistic goals for PA and helps identify solutions for participants regarding their primary barriers to PA. Although, a number of PA counselling programmes administered through primary health care have been shown to be feasible and cost-effective strategies for promoting PA [20-22], the wide acceptance of the concept is supported by the fact that a number of professional organizations state that PA advice should be incorporated into routine patient visits in primary health care as a first step towards raising the PA level of patients [23]. PA counsulling or individualized education is an essential part to motivate people to exercise. Several studies have shown a great satisfactory result on the effect of educating individuals with DM with PA consultation [24-27]. PA counseling in addition to diabetes education is effective for promoting PA behavior change [25], which alternatively increased the level of PA.

Enhance self-efficacy

PA is a cornerstone of diabetes treatment, but changing PA behavior is difficult for individuals with T2DM [28]. Understanding behavior change has been improved by behavioral theories, such as social cognitive theory for which self-efficacy is a major construct. Feedback given to the individual concerning how she/he is responding to the effects of the behavior can strengthen one's sense of self-efficacy, which means changing and maintaining behaviors are functions of expectations about one's ability to perform a certain behavior and one's expectations of the resulting outcomes. Self-efficacy has been shown to predict PA behavior in individuals with diabetes [29-31].

An important component of behavioral change programs can be new technologies or innovative devices that provide feedback on the body's internal responses [29-32]. One type of innovative devices that may serve in counseling people with diabetes about changing PA is the continuous glucose monitoring system (CGMS). The CGMS graphs can be used to teach people with diabetes about interactions between diet, PA, medications, and glucose levels [29]. The result showed that PA counseling interventions using CGMS feedback for individuals with T2DM may improve PA levels. The other modern devices applied for the higher level of PA is the pedometer, which is put at the hip to count the number of steps walked per day. A systematic review has showed the results suggest that the use of a pedometer is associated with significant increases in PA and significant decreases in body mass index and blood pressure [33,34]. Besides modern and innovative devices, new technology can be used for increase the PA, such as the Internet. Studies evaluating the adherence to PA with the feedback from the internet intervention showed a satisfactory result which significantly improved the PA adherence [32,35,36]. In addition, keeping daily activity records and monitoring blood glucose levels before and after the exercise can increase PA and self-efficacy levels [30,37]. Focused interactions between health care providers and patients may be enough to motivate people to higher levels of PA [30].

Improve social environment

Studies have found that social environment factors such as social support for PA, social cohesion in organizations, social engagement, and protective social and community factors were positively associated with PA [38,39]. Counseling delivered by health care professionals may be a meaningful source of support and effective source for delivery. A programme called Move More Diabetes has demonstrated that benefits of partnership and natural peer support and the utility of social marketing in planning and implementing a community-based chronic disease self-management and PA promotion program [40]. Affective responses to exercise may be important predictors of adoption and maintenance of PA. Practitioners are encouraged to use factors such as choice and enjoyment in helping determine specifically how an individual would meet recommended participation [4].

PA is an important, but often underused, therapeutic strategy within diabetes care. Maybe the best way to promote PA in diabetes care will be individualized education, proper conselling and periodic feedback.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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