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LETTER

Increased physical activity is a cornerstone in the prevention of type 2 diabetes in high-risk individuals

D. E. Laaksonen · J. Lindström · J. Tuomilehto · M. Uusitupa · Finnish Diabetes Prevention Study Group

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Abbreviations
DPS Diabetes prevention study
IGT impaired glucose tolerance

To the Editor: We read with interest the review by Yates et al. [1] and the corresponding editorial by Carnethon [2]. We agree with most of the interpretations and conclusions, but feel that the authors may have underestimated the current evidence on the role of physical activity in the prevention of type 2 diabetes in individuals with impaired glucose tolerance.

The only trial published thus far on the prevention of type 2 diabetes that has included a separate arm of exercise only is the Da Qing IGT and Diabetes Study [3]. We agree with Yates et al. [1] that physical activity was poorly documented in the Chinese study. Therefore, we disagree with their conclusion that higher levels of physical activity at baseline are likely to explain why the rate of type 2 diabetes development was lower in the exercise arm than in the control arm. Rather, it only raises the possibility.

Yates et al. [1] stated that in the trials reported, only small changes in physical activity were found, also referring to the 9 min/day increase in moderate to vigorous physical activity reported in the intervention group of the Finnish Diabetes Prevention Study (DPS) [4]. We do not agree that 1 h/week of moderate to vigorous physical activity is insubstantial. Quite the opposite—we found a shift in physical activity from inactive to active in the intervention group of the DPS. The percentage of sedentary individuals (<1 h/week of moderate to vigorous physical activity) decreased from 37 to 15%, and those engaging in at least 2.5 h/week increased from 41 to 62% [4]. This is likely to result in substantial health benefits. We relied on self-reported data on physical activity, collected through a validated questionnaire. The rapid development of physical activity monitors will make objective measurement of physical activity more feasible in future trials.

Yates et al. [1] interpreted the Finnish DPS data to suggest that it provided evidence for a protective effect only of large changes in physical activity. We also reported that individuals who engaged in at least 2.5 h/week of brisk walking or other forms of moderate to vigorous physical activity were 44–69% less likely to develop diabetes than

D. E. Laaksonen (✉)
Department of Medicine, Kuopio University Hospital,
P.O. Box 1777, 70211 Kuopio, Finland
e-mail: david.laaksonen@uku.fi

D. E. Laaksonen
Institute of Biomedicine, Physiology, University of Kuopio,
Kuopio, Finland

J. Lindström · J. Tuomilehto
Department of Health Promotion and Chronic Disease Prevention,
Diabetes Unit, National Public Health Institute,
Helsinki, Finland

J. Tuomilehto
Department of Public Health, University of Helsinki,
Helsinki, Finland

J. Tuomilehto
South Ostrobothnia Central Hospital,
Seinäjoki, Finland

M. Uusitupa
Department of Clinical Nutrition, School of Public Health
and Clinical Nutrition, University of Kuopio,
Kuopio, Finland

individuals engaging in less than 1 h/week [4]. These findings are based on post hoc analyses from a trial testing the effect of increased physical activity, improvements in diet and weight loss in a single intervention arm. Our results nonetheless suggest that compliance with recommendations for physical activity [5] may substantially reduce the risk of type 2 diabetes.

In the DPS, the effect of the overall intervention on 2 h glucose levels was modest, but the risk reduction for type 2 diabetes was a substantial 58% [6]. Similarly, changes in reported moderate to vigorous leisure time physical activity had only modest effects on the changes in fasting and 2 h glucose concentrations, which were not significant after adjustment for changes in BMI (Finnish DPS Study Group, unpublished results). In contrast, a change in the duration of moderate to vigorous physical activity in the upper third was associated with a 49% lower risk of diabetes than a change in the lower third, independently of changes in diet and BMI [4]. As Carnethon hypothesised [2], such findings suggest that physical activity and the lifestyle intervention in general had more of an effect in preventing a worsening of glucose tolerance than improving glucose tolerance. Moreover, the substantial risk reduction in diabetes suggests that the effects are greatest in those most susceptible to diabetes.

We also disagree with the extrapolation by Yates et al. [1] of meta-analyses of exercise intervention trials on weight loss in patients with type 2 diabetes to individuals with IGT [7]. Type 2 diabetic patients seem to be less responsive to weight loss interventions in general, but even in type 2 diabetes, exercise interventions have improved glycaemic control and decreased visceral adiposity in the absence of weight loss [8]. In the Finnish DPS, those in the upper third of the change in duration of moderate to vigorous physical activity lost 2.1 kg more body weight than those in the lower third, independently of changes in diet (p=0.001, Finnish DPS Study Group, unpublished results). The corresponding difference in the change in waist circumference was 2.6 cm (p<0.001); the difference tended to be independent of changes in BMI (p=0.080, Finnish DPS Study Group, unpublished results). These modest changes in body composition, when coupled with other benefits of physical activity, may contribute to substantial benefits in the prevention of type 2 diabetes.

We disagree with Carnethon's statement that only a handful of observational studies have found an inverse relationship between physical activity and the development of diabetes [2]. We are aware of at least 15 such prospective cohort studies, almost all of which found an inverse association of physical activity with the development of diabetes (the authors will provide the references upon request).

We agree with Carnethon that there is a need to evaluate the role of low-intensity physical activity. In the Finnish DPS we reported that the incidence of diabetes in individuals whose change in duration of low-intensity physical activity was in the upper third was 50% lower than in those whose change was in the lower third, independently of changes in diet and BMI [4]. In high-risk individuals, total energy expenditure on physical activity may be more important than intensity.

Stronger trial evidence on the dose, intensity, type and successful promotion of physical activity in the prevention of type 2 diabetes is needed. Based on consistent evidence from epidemiological studies and growing evidence from trials, health professionals should already emphasise increased moderate to vigorous physical activity, moderate weight loss and qualitative dietary changes as the cornerstone for the prevention of type 2 diabetes in high-risk individuals. Such an approach is safe, likely to yield other health benefits, and is consistent with current knowledge of the main causes of the epidemic of type 2 diabetes [9].

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