

## Cardiorespiratory Fitness and Type 2 Diabetes

Wei M, Gibbons LW, Mitchell TL, Kampert JB, Lee CD, Blair SN. The association between cardiorespiratory fitness and impaired fasting glucose and type 2 diabetes mellitus in men. *Ann Intern Med* 1999;130:89–96.

### Study Overview

**Objective.** To determine whether cardiorespiratory fitness is associated with risk for impaired fasting glucose and type 2 diabetes.

**Design.** Population-based, longitudinal prospective study.

**Setting and participants.** A cohort of 8633 nondiabetic men aged 30 to 79 years at baseline who were examined at least twice between 1970 and 1995 at the Cooper Clinic, Dallas, TX. 1122 participants had impaired fasting glucose at baseline. Study participants tended to be of middle and upper socioeconomic status but were similar to other population-based cohorts in terms of blood pressure, cholesterol level, body weight, and cardiorespiratory fitness (determined by a maximal exercise test on a treadmill) [1].

**Main outcome measures.** Incidence of impaired fasting glucose and type 2 diabetes.

**Main results.** During an average follow-up of 6 years, 149 patients developed type 2 diabetes and 593 patients developed impaired fasting glucose. After age, cigarette smoking, alcohol consumption, and parental diabetes were considered, men in the low-fitness group (the least fit 20% of the cohort) at baseline had a 1.9-fold risk (95% confidence interval [CI] = 1.5- to 2.4-fold) for impaired fasting glucose and a 3.7-fold risk (CI = 2.4- to 5.8-fold) for diabetes compared with those in the high-fitness group (the most fit 40% of the cohort). The risk for impaired fasting glucose was increased in older men and in those with a higher body mass index. Risk for type 2 diabetes was increased in older persons and in those with higher body mass index, blood pressure, and triglyceride levels and a parental history of diabetes.

### Conclusion

Low cardiorespiratory fitness is associated with increased risk for impaired fasting glucose and type 2 diabetes.

### Commentary

Several well-known prospective studies have shown an inverse association between physical activity and type 2 diabetes [2–4]. However, these studies were limited by their use of self-report to determine level of physical activity and the

presence of type 2 diabetes. Wei and colleagues' study used objectively determined data and provides strong evidence of a steep, clinically significant, inverse relationship between the incidence of impaired fasting glucose and cardiorespiratory fitness categories. Moreover, their study finds a strong, clinically significant, inverse relationship between baseline cardiorespiratory fitness levels and the development of type 2 diabetes, which was diagnosed in patients based on fasting plasma glucose level using American Diabetes Association criteria [5].

The current study is limited, however, by the fact that all participants were men, and 97% of them were white. Its findings may or may not be reproduced in women and other ethnic groups.

### Applications for Clinical Practice

A sedentary lifestyle may contribute to the progression from normal fasting glucose to impaired fasting glucose and diabetes. This finding and the findings of Stofan and colleagues [6] suggest that physical activity can promote fitness levels that will result in health improvement and morbidity reduction across a variety of disease conditions.

### References

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