

Type 2 diabetes mellitus (T2DM)

What is type 2 diabetes mellitus?

Type 2 diabetes mellitus (T2DM), previously known as Non Insulin Dependent Diabetes Mellitus [NIDDM], is a chronic disease defined by insulin resistance (in which the body's cells do not respond properly to insulin); and impaired secretion of insulin by the pancreas. Most often, this leads to increased blood glucose (sugar) levels, called hyperglycaemia. Insulin is a key metabolic hormone and its release is triggered by rises in blood glucose levels. In 2002, about 7.4% of the Australian population had T2DM, with half of people unaware they had this condition (1). The proportion of Australians with T2DM increases every year, and costs the economy more than \$3 billion per year.

How is type 2 diabetes monitored?

People with T2DM may monitor their own blood glucose one or more times a day with a blood glucose meter. Measuring blood glucose levels is particularly important before, during and after exercise. Health care professionals monitor long-term disease by measuring a compound in the blood called glycated haemoglobin (HbA_{1c}). Other markers like blood lipids and blood pressure should also be monitored.

What are the benefits of exercise for people with type 2 diabetes?

Studies show that exercise can help prevent T2DM, as well as improve control of blood glucose, decrease the proportion of body fat, decrease the risk of heart disease, and increase heart and lung fitness in people with T2DM (2, 3). People with poor fitness have an increased risk of developing T2DM. Increasing physical activity can reduce the incidence of T2DM by almost 60% in people at risk (4). People who already have T2DM can increase their fitness levels (and improve their symptoms) by about 12% through exercise training (5). Poorly controlled blood glucose leads to earlier onset of other serious effects of T2DM, such as heart, kidney and eye diseases, and an increased risk of death. Better blood glucose control often means people can reduce their T2DM medications (6). As people with diabetes age, the benefit of maintaining muscle mass through exercise is also likely to improve physical function and independence (7).

How much exercise is enough?

The table below shows the type, intensity, duration and frequency of exercise recommended for people with T2DM. The total amount of exercise should include a combination of aerobic and resistance training. Aerobic exercise (e.g. walking or running) increases heart and lung fitness, while resistance training (e.g. lifting weights) can maintain and increase muscle and bone strength.

As most exercise involves walking or running, adequate footwear is essential and if neuropathy (nerve damage/loss of sensation) is present, foot checks after exercise are also advised.

Type of exercise	Intensity	Duration	Frequency
Aerobic exercise (for heart and lung fitness)	Moderate	Total of 210 minutes	On at least 3 days a week with no more than two consecutive days without exercising
	Vigorous	Total of 125 minutes	
Resistance training (for muscle and bone strength)	Moderate to vigorous	30 minutes per session (included in totals above)	2 or more times per week (2–4 sets of 8–10 repetitions)

Who should exercise?

Although some risks are associated with physical activity for people with T2DM, the risks of inactivity mostly outweigh them. Even half the recommended levels of exercise are probably beneficial (8) if people cannot initially exercise at recommended levels.

The following points should be kept in mind before starting an exercise program:

- **Low blood glucose.** Occurs relatively rarely in people with T2DM. If necessary, consult with your health professional before commencing exercise to discuss your medications and monitoring of your blood glucose levels. Exercise may need to be temporarily modified if T2DM is unstable;
- **Risk of cardiac events** (e.g. heart attacks). The risk of remaining inactive usually outweighs this risk. However, people wishing to exercise vigorously, older people, and people with established cardiovascular disease should be screened by their GP prior to commencement of their program;
- **Peripheral neuropathy.** This condition is associated with T2DM and alters sensation in the hands and feet. Appropriate footwear, regular foot inspection and low-impact exercises are essential with peripheral neuropathy, and are also highly advised for all people with T2DM;
- **Hypertension** (high blood pressure). Although exercise reduces hypertension in people with T2DM, those with poorly controlled blood pressure should avoid vigorous exercise, particularly resistance training of vigorous intensity; and
- **Obesity.** For overweight people with T2DM, weight loss will reduce joint pain and discomfort when exercising, and encourage them to continue exercising.

Related information and references

Diabetes Australia www.diabetesaustralia.com.au

Exercise & Sports Science Australia www.essa.org.au

1. Dunstan DW, Zimmet PZ, Welborn TA, et al. The rising prevalence of diabetes and impaired glucose tolerance. *Diabetes Care* 2002; 25(5): 829–34.
2. Marwick TH, Hordern MD, Miller T et al. Exercise training for type 2 diabetes mellitus: impact on cardiovascular risk: a scientific statement from the American Heart Association. *Circulation* 2009; 119(25): 3244–62.
3. Hansen D, Dendale P, van Loon LJ, Meeusen R. The impact of training modalities on the clinical benefits of exercise intervention in patients with cardiovascular disease risk or type 2 diabetes mellitus. *Sports Med* 2010; 40(11): 921–40.
4. Knowler WC, Barrett-Connor E, Fowler SE et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002; 346(6): 393–403.
5. Boule NG, Kenny GP, Haddad E et al. Meta-analysis of the effect of structured exercise training on cardiorespiratory fitness in Type 2 diabetes mellitus. *Diabetologia* 2003; 46(8):1071–81.
6. Dunstan DW, Puddey IB, Beilin LJ et al. Effects of a short-term circuit weight training program on glycaemic control in NIDDM. *Diabetes Res Clin Pract* 1998; 40(1): 53–61.
7. Park SW, Goodpaster BH, Lee JS et al. Excessive loss of skeletal muscle mass in older adults with type 2 diabetes. *Diabetes Care* 2009; 32(11): 1993–7.
8. Church TS, Earnest CP, Skinner et al. Effects of different doses of physical activity on cardiorespiratory fitness among sedentary, overweight or obese postmenopausal women with elevated blood pressure: a randomized controlled trial. *JAMA*. 2007; 297(19): 2081-91.

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