



Intermittent fasting for the management of weight and diabetes

Intermittent fasting comprises a variety of dietary patterns in which eating and fasting are cycled over a regular period, with potential benefits in terms of body weight and metabolism. This factsheet covers the definitions, benefits and risks of intermittent fasting, and provides tips for supporting people who wish to adopt these patterns. Most research on intermittent fasting has been conducted in people with overweight or obesity, with or without diabetes. Many healthy-weight people are also interested in these diets; however, in this group, research shows minimal metabolic improvements and, concerning, reductions in physical activity and lean body mass.¹

Definition

The two most popular forms of intermittent fasting are **intermittent energy restriction (IER)** and **time-restricted eating (TRE)** (See *Box 1*), which are likely to have different effects on weight and glycaemic control. Other approaches include the commercial **fasting-mimicking diet (FMD)**, which utilises complete meal-replacement products (see *Box 2*).

Intermittent energy restriction (IER)

- 1–4 days of low energy (calorie) intake per week. Examples include the **5:2 diet** (two low-calorie days per week) or **alternate-day fasting** (3–4 low-calorie days per week).
- These diets are not feast-or-famine, as typically portrayed. Low-calorie days comprise 500–850 kcal/day. Other days usually require healthy eating (i.e. a Mediterranean or American Heart Association diet – see *Resources*).
- Low-calorie days are usually food-based. Popular commercial, non-evidence-based versions allow a free choice of foods within the calorie allowance. However, most researched intermittent diets promote satiety by advising at least 50 g protein per day and high-fibre foods. Low-calorie days may also utilise 3–4 total diet replacement products (e.g. shakes/soups) per day, +/- vegetables, which typically provide a nutritionally complete diet at ~850 kcal/day.

Time-restricted eating (TRE)

- **TRE** reduces the typical eating window from 14–16 hours/day to 6–12 hours/day, and extends the typical fasting period from 8–10 hours/day to 12–18 hours/day, on a daily or near-daily basis.
- Dietary intake in the eating window is often unlimited. Non-calorie fluids, including diet drinks, are usually allowed during fasting hours.

Box 1. Examples of intermittent fasting regimens.

Intermittent energy restriction (IER)

Example 1: “5:2 diet”

Limit calories 2 days a week (days together or apart); eat healthily 5 days a week.

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
500–850 kcal*	500–850 kcal*	Healthy eating	Healthy eating	Healthy eating	Healthy eating	Healthy eating

*Food and/or total diet replacements.

Example 2: Alternate-day fasting

Limit calories 3–4 days a week; eat healthily 3–4 days a week.

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Healthy eating	500–850 kcal*	Healthy eating	500–850 kcal*	Healthy eating	500–850 kcal*	Healthy eating

*Food and/or total diet replacements.

Time-restricted eating (TRE)

Example: “16:8 diet” (most common – others include 12:12 and 18:6)

Fast (no food or calorific drinks) for 16 hours a day; eat normally 8 hours a day.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
12 am							
4 am	Fast	Fast	Fast	Fast	Fast	Fast	Fast
8 am							
12 pm	Eat normally	Eat normally	Eat normally	Eat normally	Eat normally	Eat normally	Eat normally
4 pm							
8 pm	Fast	Fast	Fast	Fast	Fast	Fast	Fast
12 am							

Box 2. Fasting-mimicking diet (ProLon®).

The fasting-mimicking diet (FMD) is followed for five consecutive days each month. It comprises total diet replacement products to provide a plant-based, low-calorie, low-protein, low-carbohydrate diet (day 1: 1100 kcal, days 2–5: 750 kcal). This evokes modest weight loss (~3.6 kg) and reductions in HbA_{1c} (~3.2 mmol/mol) and diabetes medications (reduction in Medicine Effect Score ~0.3) at 12 months in people with type 2 diabetes using metformin and/or diet for glycaemic control.² Benefits of FMD independent of weight loss have not been demonstrated.



Potential benefits for individuals with overweight and obesity

Mechanism of impact

- Spells of energy restriction (**IER**) or total fast (**TRE**) result in weight loss if overall calorie intake is reduced.
- There may also be weight-independent benefits to systemic and cellular metabolism, potentially linked to the switch from carbohydrate to fat metabolism, which can increase insulin sensitivity, reduce oxidative stress and inflammation, and promote autophagy (the cleaning out of damaged cells to maintain optimal cell function).³ The precise duration and degree of energy restriction required to elicit these responses is unknown.

Weight loss and metabolic effects

- **IER (5:2 or alternate-day fasting)** amongst people with overweight/obesity, with or without type 2 diabetes, achieves slightly better weight loss (-7%) compared with daily calorie restriction (5%) in the short term (studies of <6 months), but weight loss is comparable in the longer term (-5–6%).⁴
 - **IER** leads to similar reductions in glycaemic and other metabolic effects to daily diets,⁴ with some evidence for improved post-prandial lipid metabolism.⁵
- **TRE** often leads to a reduction in calorie intake of 200–300 kcal/day. However, it is associated with more modest weight loss than IER: around 3% in the short term and 1% in the long term.^{6,7}
 - There are modest improvements in glycaemic parameters, which may be attributed to energy deficit and weight loss rather than food timing.
 - More healthy profiles are seen with eating windows earlier in the day, which avoids the potential adverse metabolic effects of late-night eating, but this eating pattern can be disruptive to family life and socialising.⁸

Remission of type 2 diabetes

- The modest weight loss with **IER** (-7%) and **TRE** (-3%) means that they are unlikely to be as effective for diabetes remission as a daily low-calorie diet of 850 kcal/day over 8–12 weeks, currently being piloted by the National Health Service in the UK,⁹ which results in around 10% weight loss.
- Remission may be achieved in individuals who achieve and maintain large weight loss with **IER** (e.g. 15% of participants in the MIDDAS study¹⁰).
- There are no studies of **TRE** and diabetes remission.

Prediabetes and TRE

- Early **TRE** might improve glycaemic control in people with prediabetes (3–6-hour eating window, with dinner before 3.00 pm), with weight-independent benefits on insulin sensitivity, beta-cell responsiveness, blood pressure, oxidative stress and post-prandial glucose metabolism.^{11,12}

Gestational diabetes (GDM)

- The **5:2 diet** has been studied in women with a history of GDM and was comparable to a standard daily diet for weight loss and glycaemic measurements.¹³
- A small feasibility study is currently testing the acceptability and safety of a **5:2 diet** with two non-consecutive days of 1000 kcal/day intake (100 g carbohydrate, 70 g protein) in the last trimester of pregnancy for women diagnosed with GDM.¹⁴

Type 1 diabetes

- There is very limited research on the safety and efficacy of intermittent fasting in the management of type 1 diabetes. A small pilot study tested a **5:2 diet** in ten people over 12 months and reported no change in hypoglycaemia and no episodes of diabetic ketoacidosis.¹⁵

Factsheet continues overleaf



Risks and contraindications

Medication management in type 2 diabetes

- There is no evidence of increased hypoglycaemia or hyperglycaemia during **IER** or **TRE** in people with type 2 diabetes and overweight/obesity on hypoglycaemic agents (i.e. sulfonylureas and insulin), as long as participants are asked to regularly monitor blood glucose and medication is adjusted per protocol^{10,16} – see **Box 3** for example protocols.
- Antihypertensives may also need to be adjusted due to the blood pressure-lowering effect of low-calorie days and subsequent weight loss.¹⁰

Box 3. Examples of diabetes medication management protocols for intermittent fasting.

Intermittent energy restriction (IER) protocol¹⁰

Non-insulin medications	<p>HbA_{1c} <53: Stop all medications likely to cause hypoglycaemia.</p> <p>HbA_{1c} ≥53 and <86: Stop all medications likely to cause hypoglycaemia on low-calorie days only.</p> <p>HbA_{1c} ≥86: Continue all diabetes medications.</p>
Insulin	<p>HbA_{1c} <53: Stop basal and rapid-acting insulin.</p> <p>HbA_{1c} ≥53 and <86: Stop basal and rapid-acting insulin on low-calorie days only.</p> <p>HbA_{1c} ≥86: Reduce insulin by 50% on low-calorie days.</p>

Time-restricted eating (TRE) protocol¹⁷

Non-insulin medications	<p>HbA_{1c} <53: Stop all medications likely to cause hypoglycaemia.</p> <p>HbA_{1c} ≥53 and <80: Reduce all medications likely to cause hypoglycaemia by 50%.</p> <p>HbA_{1c} ≥80: Continue all diabetes medications.</p>
Insulin	<p>HbA_{1c} <53: Reduce rapid-acting insulin by 50%. Basal insulin remains unchanged.</p> <p>HbA_{1c} ≥53 and <80: Reduce rapid-acting insulin by 10%. Basal insulin remains unchanged.</p> <p>HbA_{1c} ≥80: Insulin doses remain unchanged.</p>

Lean body mass (muscle mass)

Some **IER** and **TRE** studies have reported clinically significant reductions in lean body mass in older subjects (average age 60 years), which may reflect inadequate protein intake.¹⁸ Lean body mass preservation alongside weight loss is important for health, function and maintained metabolic rate.

Mood and eating disorders

There are concerns that intermittent fasting could trigger eating disorders. However, studies of **alternate-day fasting** in people with overweight/obesity show reductions or no change in eating disorders,¹⁹ and no change was reported with **TRE**.²⁰ Nonetheless, healthcare professionals should remain vigilant. It is possible that people with a history of eating disorders are more likely to be attracted to this form of eating, which may enhance their preoccupation with food.

Minor side effects

- There may be some minor side effects, such as dizziness, nausea, headaches and constipation; however, these are often transient and disappear within a few weeks of starting **IER** and **TRE**.²¹
- The impact on sleep is variable. Some find sleep is impaired on low-calorie days, whilst others find sleep is improved, likely due to an improvement in diet quality and not eating late at night (in the case of **TRE**).

Contraindications

Not recommended	With medical supervision	Need more evidence
Current or history of eating disorders and other severe mental illnesses, alcohol or substance abuse	Type 1 diabetes	Pregnant/lactating
Liver failure	Type 2 diabetes prescribed insulin or sulfonylureas	Frail elderly/sarcopenia
Unstable cardiac or cerebrovascular disease	Adolescence	Gout/gallstones (linked to the degree of weight loss and not intermittent fasting <i>per se</i>)
Children		



How to advise and support people with intermittent fasting

Adherence

Intermittent fasting is not for everyone and should be seen as an alternative to other dietary approaches for weight loss and improved metabolic health.

- The simple rules of these diets can make them easier to follow in the short term, but adherence with **IER** has been shown to decrease over time.²²
- Flexibility (e.g. separating the two low-calorie days of **5:2** and moving the eating window of **TRE** as needed) is key to adherence. Adherence to **IER** and **TRE** is improved with ongoing healthcare professional support.

Diet quality

- What we actually eat is important for health. A healthy, balanced diet should be encouraged (e.g. a Mediterranean-style diet). Those with type 2 diabetes should moderate the amount of carbohydrate they eat and ideally choose higher-fibre and slow-releasing carbohydrates (see **Resources**).
- To help preserve muscle mass and metabolic rate, a good protein intake on low-calorie days and good activity levels (particularly resistance exercise) should be encouraged.
- Sufficient fibre and fluid should be encouraged, to help prevent constipation and headaches.

Monitoring

- Regular self-monitoring of blood glucose (if the person has type 2 diabetes and is on medications that may cause hypoglycaemia) and blood pressure in those who are on antihypertensives.
- Adherence; changes in weight and, where possible, body composition (muscle mass); diet quality (e.g. Mediterranean diet score); eating behaviours (check not over/under-restricting or over-eating during non-fasting periods); physical activity levels; mood; wellbeing; and sleep.

Resources

5:2 diet practical resources

- Prevent Breast Cancer Research Unit: [Your guide to the 2 Day Diet](#)
- Michael Mosley and Mimi Spencer: [The 5:2 Fast Diet](#)
- Carbs & Cals: [Very Low Calorie Recipes & Meal Plans](#)
- Carbs & Cals: [5:2 Diet Photos](#)

Time-restricted eating

- British Dietetic Association; Michael Titmus: [The influence of time-restricted eating on weight management and metabolic health](#)

Type 2 diabetes and intermittent fasting

- Diabetes UK: [Intermittent fasting diets for type 2 diabetes remission](#)
- Nestlé Nutrition Institute: [Intermittent Fasting: Weight Loss and Type 2 Diabetes video](#)

Diet quality

- British Dietetic Association: [Food Fact Sheet: Heart Health](#)
- Diabetes UK: [Carbs and diabetes](#)

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