

The Science Behind Time-Restricted Eating

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✓ Fact Checked

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STORY AT-A-GLANCE

- › Time-restricted eating (TRE) is a form of intermittent fasting where you eat all of your meals for the day within a restricted window of time. Your eating window could range from two to eight hours a day, fasting for the remaining 16 to 22 hours
- › Researchers found that eating all meals between 8 a.m. and 2 p.m. resulted in greater metabolic flexibility, reduced hunger and increased sense of fullness, resulting in weight loss
- › In another study, an eight-hour time-restricted feeding schedule was found to produce mild caloric restriction and weight loss, without calorie counting
- › Compared to controls, strength training athletes who trained while adhering to a time-restricted eating schedule saw a decrease in fat mass after eight weeks, while maintaining muscle mass and maximal strength
- › A similar study found men who performed resistance training for eight weeks while eating all meals within four hours on non-workout days (four days a week) lowered their calorie intake while increasing strength and muscular endurance

This article was previously published August 9, 2019, and has been updated with new information.

Research overwhelmingly supports the notion that ditching the three square meals a day approach in favor of time-restricted feeding – a form of intermittent fasting – can do wonders for your health. Contrary to modern belief, your body isn't designed to be fed

throughout the day, and the near-continuous grazing that most engage in can have serious health consequences.

Research by Satchidananda Panda, Ph.D., suggests 90% of people eat for more than 12 hours a day, and over time this habit will wreak havoc on your metabolism and limit your ability to metabolize fat as a primary fuel.

When you eat throughout the day and never skip a meal your body adapts to burning sugar as its primary fuel, resulting in the downregulation of enzymes that utilize and burn stored fat.^{1,2}

As a result, you become progressively more insulin resistant and start gaining weight. Efforts to lose weight also become ineffective for this very reason, since to lose body fat, your body must first be able to actually burn fat.

Many biological repair and rejuvenation processes also take place while you're fasting, and this is another reason why all-day grazing triggers diseases while fasting prevents them.

What Is Time-Restricted Eating (TRE)?

Time-restricted eating is just what it sounds like. It's a form of intermittent fasting where you eat all of your meals for the day within a restricted window of time, ranging from two to eight hours. That means you're avoiding food (fasting) for 16 to 22 consecutive hours. Eating within a four- to six-hour window is likely close to metabolic ideal for most. As noted in the paper "A Time to Fast," published in the November 2018 issue of *Science*:³

"Adjustment of meal size and frequency have emerged as powerful tools to ameliorate and postpone the onset of disease and delay aging, whereas periods of fasting, with or without energy intake, can have profound health benefits.

The underlying physiological processes involve periodic shifts of metabolic fuel sources, promotion of repair mechanisms, and the optimization of energy

utilization for cellular and organismal health ...

In general, both prolonged reduction in daily caloric intake and periodic fasting cycles have the power to delay the onset of disease and increase longevity."

Fat-Burning Capacity Is Required for Weight Loss

As just mentioned, to shed body fat, your body must have the ability to burn fat for fuel. While it may seem like this ability should be inherent in everyone, all the time (since we know fat can be used as fuel), metabolic dysfunction triggered by an inappropriate diet and feeding schedule can prevent this. In a nutshell, to be an efficient fat-burner, you need to:

- Eat a diet with a higher fat-to-sugar ratio (i.e., more healthy fats and less net carbohydrates), and
- Restrict the timing of your meals so that you're fasting for a greater number of hours than you're eating

This will (over time) teach your body to burn fat for fuel again, rather than relying on fast-burning carbs, and in addition to burning dietary fats, your body will also start accessing and burning stored body fat.

While either of these strategies alone (fasting or eating a ketogenic diet) will shift your body from carb-burning to fat-burning, doing them together will yield the fastest results. To learn more about this, see "Why Intermittent Fasting Is More Effective Combined With Ketogenic Diet."

How Time-Restricted Feeding Promotes Weight Loss

So, what's the evidence that time-restricted eating actually promotes weight loss? Aside from a number of animal studies,⁴ consider the following research,⁵ published in the July 2019 issue of Obesity.

This study was founded on the premise that by eating earlier in the daytime, you properly align with the natural fluctuations in the circadian rhythm that regulates your metabolism. As a result, weight loss is enhanced.

The question it sought to answer was whether this benefit is mediated through increased energy expenditure or simply lower energy intake. To find out, 11 overweight participants first adhered to an early time-restricted eating schedule, eating all meals between 8 a.m. and 2 p.m. for four days.

For the next four days, they ate all meals between 8 a.m. and 8 p.m. They were also required to maintain a regular sleep schedule throughout. On the last day of each trial, energy expenditure and substrate oxidation levels were measured.

Results revealed meal-timing primarily facilitates weight loss by reducing appetite and increasing fat oxidation. Energy expenditure remained unaffected. As explained by lead author Courtney Peterson, Ph.D., associate professor of nutrition sciences at the University of Alabama at Birmingham:⁶

"We think the longer daily fast gives people's bodies more time each day to dip into their fat reserves and burn fat. The body is typically maximally efficient at burning fat when people fast for at least 12-24 hours at a time."

Overall, eating all meals earlier in the day, between 8 a.m. and 2 p.m., resulted in greater metabolic flexibility, lower ghrelin (known as the hunger hormone) levels, reduced hunger and increased sense of fullness, and this is thought to drive the weight loss.

TRE Improves Weight Loss in Obese Adults

Another study⁷ published in the Nutrition and Healthy Aging journal in 2018 examined how TRE — without counting calories — affects weight in obese adults. Here, they used an eight-hour restricted eating window.

Twenty-three overweight adults were instructed to eat however much food they wanted between 10 a.m. and 6 p.m. for 12 weeks. For the remainder of the day and night, they

were only allowed water. Weight loss and metabolic parameters were compared to the historical records of a group of matched controls.

At the end of 12 weeks, body weight decreased by an average of 2.6% and energy intake decreased by 341 calories per day compared to controls. Systolic blood pressure also decreased by an average of 7 mm Hg.

According to the authors, their findings "suggest that 8-hour time restricted feeding produces mild caloric restriction and weight loss, without calorie counting. It may also offer clinical benefits by reducing blood pressure."

How Restricted Feeding Affects Fat and Muscle in Fit Adults

Overweight individuals are not the only ones who stand to benefit from time-restricted feeding, as evidenced by a 2016 study⁸ in the Journal of Translational Medicine, which evaluated the effects of TRE on basal metabolism, strength, body composition, inflammation levels and cardiovascular risk factors in fit men. As explained by the authors:⁹

"Thirty-four resistance-trained males were randomly assigned to time-restricted feeding (TRF) or normal diet group (ND). TRF subjects consumed 100% of their energy needs in an 8-h period of time each day, with their caloric intake divided into three meals consumed at 1 p.m., 4 p.m., and 8 p.m.

The remaining 16 h per 24-h period made up the fasting period. Subjects in the ND group consumed 100% of their energy needs divided into three meals consumed at 8 a.m., 1 p.m., and 8 p.m. Groups were matched for kilocalories consumed and macronutrient distribution."

Strength training consisted of a split routine with three weekly sessions on nonconsecutive days for eight weeks. All participants had engaged in continuous resistance training for at least five years before the study.¹⁰

Compared to controls, at the end of the eight-week study, the treatment group experienced a decrease in fat mass while maintaining muscle mass and maximal strength.¹¹

Interestingly, while blood glucose and insulin decreased significantly, as expected, so did testosterone and insulin-like growth factor 1, two anabolic hormones.¹²

Unfortunately, no hypothesis is presented for these findings.

They also found that, aside from a reduction in triglycerides, the time-restricted feeding protocol did "not confirm previous research suggesting a positive effect of [intermittent fasting] on blood lipid profiles."

The researchers address this in the discussion section of the study, postulating that this may be related to the fact that all of the subjects were "normolipemic athletes," meaning their blood lipid profiles were normal to start with. Despite that, the authors conclude:

"Our results suggest that an intermittent fasting program in which all calories are consumed in an 8-h window each day, in conjunction with resistance training, could improve some health-related biomarkers, decrease fat mass, and maintain muscle mass in resistance-trained males."

A similar study¹³ published in the European Journal of Sport Science found that men who performed resistance training for eight weeks while eating all meals within four hours on non-workout days (four days a week) lowered their calorie intake while still increasing strength and muscular endurance.

The Many Health Benefits of Intermittent Fasting

A large and growing body of medical research supports the use of time-restricted feeding (intermittent fasting), showing it has a wide range of biological benefits. Aside from facilitating fat loss while protecting and even promoting muscle strength, studies show various forms of fasting,¹⁴ including a variety of intermittent fasting protocols and time-restricted feeding, can:

Promote insulin sensitivity,^{15,16} which is crucial for your health as insulin resistance or poor insulin sensitivity contributes to nearly all chronic diseases

Improve leptin sensitivity¹⁷

Improve blood sugar management by increasing insulin-mediated glucose uptake rates¹⁸

Lower triglyceride levels¹⁹

Increase human growth hormone production (HGH) – Commonly referred to as "the fitness hormone," HGH plays an important role in maintaining health, fitness and longevity, including promotion of muscle growth, and boosting fat loss by revving up your metabolism.

Research^{20,21} shows fasting can raise HGH by as much as 1,300% in women and 2,000% in men. The fact that it helps build muscle while simultaneously promoting fat loss explains why HGH helps you lose weight without sacrificing muscle mass, and why even athletes can benefit from intermittent fasting

Suppress inflammation and reduce oxidative damage

Promote multisystem regeneration²² by upregulating autophagy and mitophagy,²³ natural cleansing processes necessary for optimal cellular renewal and function, and promoting regeneration of stem cells²⁴

Prevent or reverse Type 2 diabetes, as well as slow its progression

Improve immune function by regenerating damaged stem cells^{25,26}

Lower blood pressure^{27,28}

Reduce your risk of heart disease²⁹

Boost mitochondrial energy efficiency and biogenesis³⁰

Reduce your risk of cancer, in part by optimizing autophagy³¹

Increase longevity^{32,33,34} — There are a number of mechanisms contributing to this effect. Normalizing insulin sensitivity is a major one, but fasting also inhibits the mTOR pathway,³⁵ which plays an important part in driving the aging process

Regenerate the pancreas³⁶ and improve pancreatic function

Improve cognitive function and protect against neurological diseases (such as dementia, Alzheimer's disease³⁷ and Parkinson's disease^{38,39}) thanks to the production of ketone bodies⁴⁰ (byproducts of fatty acid breakdown, which are a healthy and preferred fuel for your brain) and brain-derived neurotrophic factor⁴¹ (BDNF, which activates brain stem cells to convert into new neurons, and triggers numerous other chemicals that promote neural health).

Animal research⁴² also shows intermittent fasting increases neurons resistance to excitotoxic stress

Eliminate sugar cravings as your body adapts to burning fat instead of sugar

TRE Is Beneficial for Most

Contrary to longer fasts and calorie restriction, TRE is a strategy that can work for most people. Remember, you're not actually limiting or counting calories — you can (theoretically) eat whatever you want in any amount — you're simply restricting the time in which you eat all this food, although you will get better results by eating healthy nonprocessed foods and not consuming excessive carbs.

Weakness and lethargy, which are signs of undernourishment, should not occur. It's a practice that should make you feel good and actually reduce your hunger over time.

Your hunger and craving for sugar will slowly dissipate as your body starts burning fat as its primary fuel. Once your body has successfully shifted into fat burning mode, it will be easier for you to fast for as long as 22 hours and still feel satiated. I typically fast for at least 18 hours a day and sometimes as much as 22 hours.

While time-restricted feeding and intermittent fasting will in theory work regardless of your diet, I do not recommend it if you're eating a preponderance of processed foods. The quality of your diet is particularly important if you're looking for more than mere weight loss.

It's critical to avoid refined carbohydrates, sugar/fructose and grains. Focus your diet on vegetable carbohydrates, healthy protein in moderate amounts, and healthy fats such as butter, eggs, avocado, coconut oil, olive oil and raw nuts.

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