

The Science of Intermittent Fasting

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Intermittent Fasting: What is it?

Intermittent fasting (also referred to as time-restricted feeding) is the act of going without food or calories for a defined period of time [1]. Some of the proposed benefits of fasting include: rapid weight loss, improved cognition, lower inflammation and reduced risk of metabolic diseases such as type 2 diabetes [2].

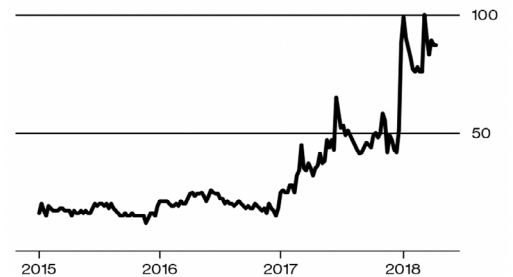
Although the act of fasting to improve health dates back to the 20th century, a recent surge in interest has spread throughout popular media. According to Google's 2018 year end search report, intermittent fasting was ranked in the top 10 of searched diets [3]. Over the past five years, there has been a 40 percent increase in scientific publications examining the impact of intermittent fasting on health and wellness.

The purpose of this fact sheet is to provide an overview of the most popular types of fasting diets, how our bodies respond to fasting and the science surrounding fasting.

What is happening during a fast?

Within the human body, tiny fuel sensors exist at the cellular level. These sensors continuously gage the amount of energy (calories) available for our bodies to use. Typically, the preferred source

Global search activity for "intermittent fasting"
As measured by Google Trends index*



*Highest point indexed to 100
Data: Google Trends

Source: <https://www.bloomberg.com/news/articles/2018-04-24/intermittent-fasting-is-getting-silicon-valley-startup-treatment>

of available energy is glucose. The body prefers to maintain blood glucose (blood sugar) levels to provide a constant source of energy for our cells.

Your diet provides the majority of glucose, so if you miss a meal, your body will tend to seek out an additional source of energy to power your cells. One way the body does this is through the transformation of proteins into glucose. Amino acids, which are the building blocks of proteins, can be converted into glucose when glucose levels are low [4]. This process is called gluconeogenesis. While amino acids can be used as cellular fuel, they are also needed for other essential processes throughout the body, including maintaining muscle mass and supporting the immune system. Thus, it is important not to burn through the amino acids on hand or tap into reserves stored within muscles to replenish the continuous loss of glucose while fasting.

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Thankfully, our bodies have a protein sparing fuel option called ketones.

Ketones originate from fat tissue. During a fast, the body breaks down fat tissue into molecules called fatty acids. Next, the fatty acids are transported to the liver where they are repackaged into structures called ketones. Finally, the ketones travel throughout the body where they can be used as fuel. Ultimately, this allows our bodies to remain active during times of low glucose intake or prolonged fasting without having to rely on the breakdown of skeletal muscle for fuel.

How do you fast?

There are different types of intermittent fasting regimens [5] that involve restricting food intake for anywhere from 12 to 24 hours. The most popular fasting methods include the 16/8 fast, alternate day fasting and the fast mimicking diet.

Time Restricted Feeding (16:8)

The 16:8 diet is one of the most popular intermittent fasting methods. The 16:8 diet divides the 24-hour day into an eight-hour eating window followed by a 16-hour fast [6]. For example, someone following a 16:8 fasting regimen would eat their first meal at noon and finish eating before 8 p.m. After 8 p.m., the fast would begin and they would not eat anything until noon the next day.



Source: <https://www.vectorstock.com/royalty-free-vector/scheme-and-concept-intermittent-fasting-clock-vector-22935401>

Time restricted feeding has been shown to result in weight loss and improved body composition [5]. Perhaps the underlying reason behind this is improved regulation of daily calorie intake. In a recent study, researchers instructed individuals to follow a 16:8 fast for 12 weeks. Interestingly, the individuals in the 16:8 group consumed fewer calories without being told to do so. In response, they lost more body weight when compared to the control group [7]. In a similar study, individuals lost more fat mass following a 16:8 fast when compared to controls. However, neither group restricted calories, consuming 100 percent of their needed calories [6].

Alternate Day Fasting (ADF, 5:2)

Alternate day fasting (ADF) requires individuals to fast for as long as 24 hours. The day following the fast is typically referred to as a feasting day, in which individuals do not restrict their caloric intake [8]. A variation of ADF is the 5:2 diet. The 5:2 diet consists of 5 days a week in which you can eat as much as you like, followed by two days of fasting [9]. Not all individuals choose to completely abstain from food during their fasting day, instead opting to eat 25 percent of their calorie needs (about 500 calories) on fasting days instead of completely avoiding food.

ADF Schedule						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Eat Normally	24 hr Fast	Eat Normally	24 hr Fast	Eat Normally	24 hr Fast	Eat Normally

Similar to the 16:8 method, ADF has been shown to lead to weight loss and improved body composition [10]. However, the degree and effectiveness of weight loss when compared to continuous calorie restriction is unclear, as no significant advantages of ADF to calorie restriction for weight loss have been observed [10, 11]. Nevertheless, ADF may be more effective at improving insulin levels in overweight and obese individuals when compared to calorie restriction [12], thus warranting the need for additional research to explore the potential of fasting as a nutritional therapy for metabolic diseases such as insulin resistance.

Fasting Mimicking Diet:

One should consult with a health expert before adopting an intermittent fasting regimen. Overall,

intermittent fasting is not recommended for children, pregnant woman or individuals with a history of eating disorders. Additionally, those performing heavy physical work, or are at risk of falls, should practice increased caution due to the risk of experiencing periodic hypoglycemia (low blood sugar) during a fast. However, structured regimens such as alternate day fasting and 16:8 fasts are shown to be safe for healthy and obese individuals [14].

Conclusion

For more than a century, intermittent fasting has existed as a fad diet for promoting weight loss and longevity. In the wake of the current obesity epidemic, some individuals have become desperate to find a preventative and treatable dietary strategy. Although research shows that intermittent fasting regimens lead to weight loss, the Academy of Nutrition and Dietetics is critical of dietary behaviors that include skipping meals [15]. The Academy recommends consulting with a doctor before beginning a fast and to meet with a registered dietitian to discuss healthy weight loss programs [16]. In the meantime, more clinical research is needed to reach a consensus on whether or not intermittent fasting is safe and effective for the general public and specifically which fasting regiment is ideal.

References

1. Stockman, M.C., et al., *Intermittent Fasting: Is the Wait Worth the Weight?* Curr Obes Rep, 2018. 7(2): p. 172-185.
2. BSc, K.G. 10 *Evidence-Based Health Benefits of Intermittent Fasting*. 2016; Available from: <https://www.healthline.com/nutrition/10-health-benefits-of-intermittent-fasting>.
3. *Google trends year in search 2018*. Available from: <https://trends.google.com/trends/yis/2018/US/>.
4. Berg JM, T.J., Stryer L., *Biochemistry*. 5th edition. 2002.
5. Cho, Y., et al., *The Effectiveness of Intermittent Fasting to Reduce Body Mass Index and Glucose Metabolism: A Systematic Review and Meta-Analysis*. J Clin Med, 2019. 8(10).
6. Moro, T., et al., *Effects of eight weeks of time-restricted feeding (16/8) on basal metabolism, maximal strength, body composition, inflammation, and cardiovascular risk factors in resistance-trained males*. J Transl Med, 2016. 14(1): p. 290.
7. Gabel, K., et al., *Effects of 8-hour time restricted feeding on body weight and metabolic disease risk factors in obese adults: A pilot study*. Nutr Healthy Aging, 2018. 4(4): p. 345-353.
8. Klempel, M.C., et al., *Dietary and physical activity adaptations to alternate day modified fasting: implications for optimal weight loss*. Nutr J, 2010. 9: p. 35.
9. Cioffi, I., et al., *Intermittent versus continuous energy restriction on weight loss and cardiometabolic outcomes: a systematic review and meta-analysis of randomized controlled trials*. J Transl Med, 2018. 16(1): p. 371.
10. Catenacci, V.A., et al., *A randomized pilot study comparing zero-calorie alternate-day fasting to daily caloric restriction in adults with obesity*. Obesity (Silver Spring), 2016. 24(9): p. 1874-83.
11. Trepanowski, J.F., et al., *Effect of Alternate-Day Fasting on Weight Loss, Weight Maintenance, and Cardioprotection Among Metabolically Healthy Obese Adults: A Randomized Clinical Trial*. JAMA Intern Med, 2017. 177(7): p. 930-938.
12. Gabel, K., et al., *Differential Effects of Alternate-Day Fasting Versus Daily Calorie Restriction on Insulin Resistance*. Obesity (Silver Spring), 2019. 27(9): p. 1443-1450.
13. Brandhorst, S., et al., *A Periodic Diet that Mimics Fasting Promotes Multi-System Regeneration, Enhanced Cognitive Performance, and Healthspan*. Cell Metab, 2015. 22(1): p. 86-99.
14. Gabel, K., K.K. Hoddy, and K.A. Varady, *Safety of 8-h time restricted feeding in adults with obesity*. Appl Physiol Nutr Metab, 2019. 44(1): p. 107-109.
15. Ruth Frechman, M., RDN, CPT. *What a Healthy Weight Loss Plan Really looks like*. 2017; Available from: <https://www.eatright.org/health/weight-loss/tips-for-weight-loss/what-a-healthy-weight-loss-plan-really-looks-like>.
16. Barbara Gordon, R., LD. *What is Intermittent Fasting?* 2019; Available from: <https://www.eatright.org/health/weight-loss/fad-diets/what-is-intermittent-fasting>.

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