

Studies Suggest Time-Restricted Eating May Boost Metabolic Health

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Time-restricted eating may help some patients lose weight and reduce cardiometabolic risk factors, according to emerging evidence presented at the American Heart Association (AHA) 2022 Scientific Sessions. The session was titled “Chronotherapy: Non-Pharmacologic and Pharmacologic Interventions to Improve Circadian Blood Pressure.”

The evidence builds on a growing understanding of the role of circadian rhythms in metabolic health and how modern life may interfere with those rhythms, explained presenter Pam Taub, MD, professor and director of the Step Family Foundation Cardiovascular Rehabilitation and Wellness Center at the University of California, San Diego Health System. For example, studies have linked alterations in normal circadian rhythms in night shift workers to a high incidence of cardiovascular disease,¹ type 2 diabetes,² and cancer³ in these individuals. In modern human societies, people may eat over 14 to 15 hours a day, Taub noted. Even those with more traditional work schedules may experience circadian disruptions that interfere with the cellular processes occurring during daily rest periods.

“Circadian biology drives metabolism,” she said. “Regulating circadian biology is important for overall

human health, and one of the ways we may be able to intervene on circadian biology is by fasting or restricting eating hours.”

For example, a single-arm study⁶ presented by Taub on 19 individuals with metabolic syndrome and an average baseline daily eating window of 14 or more hours found several benefits when restricting eating to 10 hours a day for 10 weeks. Participants in Taub’s study used the myCircadianClock application (app)⁷ to log their eating patterns. On average, participants reduced their weight by 3%, waist circumference by 4%, systolic blood pressure by 4%, and diastolic blood pressure by 8%. Participants also experienced an 11% reduction in low-density lipoprotein cholesterol.

FROM MICE TO MEN

A study⁴ presented by Ming Gong, MD, PhD, professor of physiology in the College of Medicine at the University of Kentucky in Lexington, during the AHA Scientific Sessions 2022, found that time-restricted feeding might benefit mice prone to hypertension.

In the study, Gong et al restricted mice prone to obesity and type 2 diabetes to an 8-hour window of eating during their active time of day. The regimen helped restore

normal blood pressure dipping patterns in the mice that became “nondippers” over time without the intervention. Closer studies of the metabolic disease-prone animals found that, without any eating restrictions, the mice consumed about 30% to 40% of their diet during the day when mice typically sleep. The mice experienced perturbations in their sleep-wake cycle and in the secretion of genes that regulate circadian rhythms that were corrected by time-restricted eating.

“Time-restricted eating is very effective,” Gong said. “It can not only prevent the development of nondipping blood pressure. It can also correct preexisting nondipping blood pressure.”

The study is part of a growing body of preclinical evidence⁵ that time-restricted eating may benefit metabolic health. Scientists have not fully elucidated the mechanism, but the studies suggest improvements in circadian rhythms, reduced calorie intake, reduced insulin resistance, and greater metabolism of adipose tissue.

Preliminary studies in people like the one presented by Taub also suggest that restricting eating to a limited time window during the day may contribute to weight loss or other beneficial effects on metabolism.

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But not all clinical trials have found such a substantial benefit. A clinical trial⁸ that enrolled 139 patients in either calorie restriction alone or calorie restriction plus an 8-hour eating window found no significant difference in weight loss between the 2 groups. Metabolic health measures were also similar between the 2 groups. However, Taub noted the participants were overweight but had good metabolic health overall and were already eating during about a 10-hour window before the study started, which may have limited the effects of restricting the eating period to only 8 hours.

"There is definitely a group of patients who are going to benefit the most," said Taub in a follow-up interview. "From our research, it is patients who have underlying cardiometabolic risks."

TIME-RESTRICTED EATING IN PRACTICE

Taub said that the most well-studied fasting schedule restricted eating regimen is 10 hours of eating a day and 14 hours of fasting. So far, the benefits for weight loss appear to be modest, about 2 to 5 kg of weight loss, said Lisa Chow, MD, MS, director of the University of Minnesota Division of Diabetes, Endocrinology and Metabolism, in an interview. A recent meta-analysis of clinical studies found that time-restricted eating was associated with weight loss, reduced triglycerides, total cholesterol, and low-density lipoprotein cholesterol. However, there were no significant differences in waist circumference, body mass index, glycosylated hemoglobin, or blood pressure.⁹

There are likely multiple mechanisms that may contribute to the benefits associated with time-restricted eating, Taub said. These may include giving the body more time for cellular repair processes or inducing low-grade ketosis, which reduces inflammation. It may also help patients

eat fewer calories. For example, Taub noted that late-night snacks are often high-calorie and low-nutrition.

"It reduces the opportunities to eat," Chow said. She said that if the eating window is earlier, it may also better align with the body's circadian clock.

Chow said that patients find it easy to shorten their eating window, and they can combine this intervention with others, like reducing carbohydrates or calorie restriction. Chow and Taub said they have gotten positive feedback from study participants. Taub noted that after following a more restricted eating schedule, many participants say they feel better and will feel unwell if they eat too late.

"Once people get into the routine of time-restricted eating, it is self-sustaining because they have improvements in quality of life, including improved sleep quality," Taub said. "The key is getting patients to start this regimen, and once they start it, they get intrinsic feedback that helps them sustain it."

However, time-restricted eating is not for everyone. Chow said she avoids recommending it for patients with a history of eating disorders and only recommends it for patients who are good at meal tracking and receptive to the change in their routine. Taub also urges caution for time-restricted eating with patients with diabetes taking insulin or sulfonylureas, which can cause hypoglycemia, or in patients with heart failure taking diuretics, who may be at risk of volume depletion. Taub said that clinicians might also have to consider medication adjustments for patients taking diuretics or blood pressure medications.

It may also be challenging for patients who do shift work, Taub said. But a randomized trial¹⁰ by Taub and her colleagues enrolled 137 firefighters who work 24-hour shifts to follow a 10-hour eating schedule for 12 weeks or a standard eating schedule. They found time-restricted eating to be feasible. Those in the time-restricted

eating group reported improved quality of life and had significant decreases in very-low-density lipoprotein size. The study also showed improvements in blood pressure and glycated hemoglobin A1C in participants with elevated cardiometabolic risks at enrollment.

There is also evidence that eating earlier in the day may be better from a metabolic perspective, Chow noted. For example, from 7 AM to 3 PM. Chow acknowledged, however, that societal constraints might make eating earlier difficult. Taub said there is some flexibility in how patients implement time-restricted eating. If eating dinner later in the day is unavoidable because of regular schedules or an event, people can wait to eat their first meal later the next day to create a 14-hour fasting window, she said.

Chow cautioned that there might be more excitement in the lay media about fasting and time-restricted eating than the data support. Both Taub and Chow say that more studies are necessary to understand the mechanism of time-restricted eating and to study which patients may benefit. Both have clinical trials underway in patients with type 2 diabetes, and Taub recently wrapped up a study of time-restricted eating in patients with metabolic syndrome.

Chow said it is reasonable for clinicians to recommend that patients eat earlier and avoid eating around the clock. Taub recommends the myCircadianClock app to many of her patients to help them choose an eating window and track their food.

"I see benefits very synergistic with their pharmacologic therapy," Taub said.

REFERENCES

1. Torquati L, et al. Shift work and the risk of cardiovascular disease. A systematic review and meta-analysis including dose-response relationship. *Scand J Work Environ Health*. 2018;44:229–238. doi: 10.5271/sjweh.3700
2. Gan Y, et al. Shift work and diabetes mellitus: a meta-analysis of observational studies. *Occup Environ Med*. 2015;72:72–78. doi: 10.1136/oemed-2014-102150

3. International Agency for Research on Cancer. *Night Shift Work*. 2020. Volume 124. <https://publications.iarc.fr/593>
4. Hou T, et al. Time-restricted feeding protects the blood pressure circadian rhythm in diabetic mice. *Proc Natl Acad Sci USA*. 2021;118:e2015873118. doi: 10.1073/pnas.2015873118
5. Manoogian ENC, et al. Time-restricted eating for the prevention and management of metabolic diseases. *Endocr Rev*. 2022;43:405–436. doi: 10.1210/edrv/bnab027
6. Wilkinson MJ, et al. Ten-hour time-restricted eating reduces weight, blood pressure, and atherogenic lipids in patients with metabolic syndrome. *Cell Metab*. 2020;31:92–104.e5. doi: 10.1016/j.cmet.2019.11.004
7. My Circadian Clock. Optimize your rhythms and stay healthy. Accessed March 20, 2023. <https://mycircadianclock.org>
8. Liu D, et al. Calorie restriction with or without time-restricted eating in weight loss. *N Engl J Med*. 2022;386:1495–1504. doi: 10.1056/NEJMoa2114833
9. Liu L, et al. Metabolic efficacy of time-restricted eating in adults: a systematic review and meta-analysis of randomized controlled trials. *J Clin Endocrinol Metab*. 2022;107:3428–3441. doi: 10.1210/clinem/dgac570
10. Manoogian ENC, et al. Feasibility of time-restricted eating and impacts on cardio-metabolic health in 24-h shift workers: the Healthy Heroes randomized control trial. *Cell Metab*. 2022;34:1442–1456.e7. doi: 10.1016/j.cmet.2022.08.018