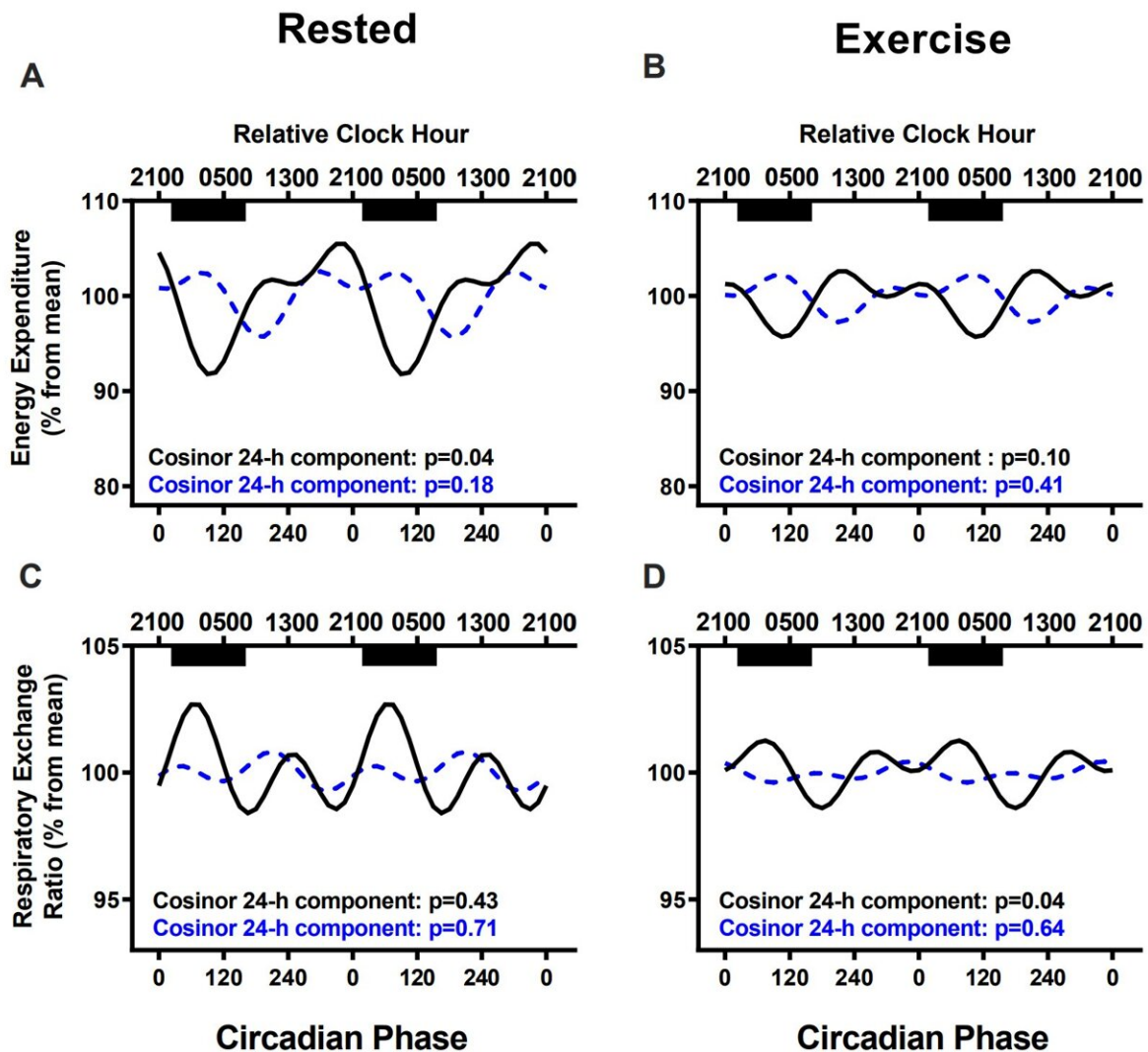


# Study: People with obesity burn less energy during day

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Cosinor modeled data of the influence of circadian timing and obesity on energy expenditure and respiratory exchange ratio. Black and blue lines denote

individuals categorized as either a healthy-weight (n=9) or obese (n=7) body mass index, respectively. The black bars along the top x-axis represent the circadian night when habitual sleep would occur and correspond to the night designation in the bar graphs (other phases without the black bar correspond to the day designation). Note, these times are not when sleep occurred in the laboratory, but based on the timing the week prior to the in-laboratory study. Data are double plotted and circadian phase is derived from the dim-light melatonin onset, wherein melatonin onset equates to 00. P values denote mixed model test results of the cosinor model with a 24-hour period fit to test for significant 24-hour rhythms and a 12-hour harmonic to account for non-sinusoidal circadian effects. Credit: *Obesity* (2023). DOI:10.1002/oby.23940

**Weight influences how and when bodies burn energy, new research indicates.**

An Oregon Health & Science University study published in the [journal \*Obesity\*](#) found people who have a healthy weight use more energy during the day, when most people are active and eat, while those who have [obesity](#) spend more energy during the night, when most people sleep. The study also found that during the day, those with obesity have higher levels of the hormone insulin—a sign that the body is working harder to use glucose, an energy-packed sugar.

It was surprising to learn how dramatically the timing of when our bodies burn energy differed in those with obesity," said the study's first author, Andrew McHill, Ph.D., an assistant professor in the OHSU School of Nursing and the Oregon Institute of Occupational Health Sciences at OHSU. "However, we're not sure why. Burning less energy during the day could contribute to being obese, or it could be the result of obesity."

Obesity is defined as having a Body Mass Index, or BMI, of 30 or more.

Being overweight or obese increases the risk for [health conditions](#) such as [high blood pressure](#) and Type 2 diabetes.

Schedules and when people sleep, eat and exercise can also affect [health](#), by either complementing or going against the body's natural, daily rhythms. Every 24 hours, people experience numerous changes that are triggered by the human body's internal clock. These changes normally occur at certain times of the day in order to best serve the body's needs at any given hour.

McHill and the study's senior author, Steven A. Shea, Ph.D., director of the Oregon Institute of Occupational Health Sciences at OHSU, focus their research on how [circadian rhythms](#) and sleep impact the human body. McHill leads the OHSU Sleep, Chronobiology and Health Laboratory.

While previous research has suggested circadian rhythm misalignment affects energy metabolism and glucose regulation, those studies have largely involved participants who have a healthy weight. To explore this further, McHill, Shea and colleagues organized a study that included people of different body sizes.

A total of 30 people volunteered to participate in the study, which involved participants staying at a specially designed circadian research lab for six days. The study followed a rigorous circadian research protocol involving a schedule designed to have participants be awake and sleep at different times throughout each day.

After each period of sleep, volunteers were awakened to eat and participate in a variety of tests for the remaining time of each day. One test had participants exercise while wearing a mask that was connected to a machine called an indirect calorimeter, which measures exhaled [carbon dioxide](#) and helps estimate [energy](#) usage. Blood samples were

also collected to measure glucose levels in response to an identical meal provided during each day.

Next, the research team plans to explore eating habits and hunger in people who are obese, as well as those who have a healthy weight. That new study will also follow up on a 2013 study, led by Shea, that found circadian clocks naturally increase food cravings at night.

**More information:** Andrew W. McHill et al, Obesity alters the circadian profiles of energy metabolism and glucose regulation in humans,

*Obesity* (2023). [DOI: 10.1002/oby.23940](https://doi.org/10.1002/oby.23940) ,  
[onlinelibrary.wiley.com/doi/abs/10.1002/oby.23940](https://onlinelibrary.wiley.com/doi/abs/10.1002/oby.23940)

Provided by Oregon Health & Science University

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