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Later circadian timing of food intake is associated with increased body fat

Andrew W McHill^{1,3}, Andrew JK Phillips^{1,3}, Charles A Czeisler^{1,3}, Leigh Keating², Karen Yee², Laura K Barger^{1,3}, Marta Garaulet⁴, Frank AJL Scheer^{1,3}, and Elizabeth B Klerman^{1,3}

Author Affiliations

Author Notes

Address correspondence to AWM (e-mail: amchill@bwh.harvard.edu).

Abstract

Background: Weight gain and obesity have reached alarming levels. Eating at a later clock hour is a newly described risk factor for adverse metabolic health; yet, how eating at a later circadian time influences body composition is unknown. Using clock hour to document eating times may be misleading owing to individual differences in circadian timing relative to clock hour.

Objective: This study examined the relations between the timing of food consumption relative to clock hour and endogenous circadian time, content of food intake, and body composition.

Design: We enrolled 110 participants, aged 18–22 y, in a 30–d cross-sectional study to document sleep and circadian behaviors within their regular daily routines. We used a time-stamped-picture mobile phone application to record all food intake across 7 consecutive days during a participant's regular daily routines and assessed their body composition and timing of melatonin release during an in-laboratory assessment.

Results: Nonlean individuals (high body fat) consumed most of their calories 1.1 h closer to melatonin onset, which heralds the beginning of the biological night,

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Nutritional status, dietary intake, and body composition

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than did lean individuals (low body fat) (log-rank $P = 0.009$). In contrast, there were no differences between lean and nonlean individuals in the clock hour of food consumption ($P = 0.72$). Multiple regression analysis showed that the timing of food intake relative to melatonin onset was significantly associated with the percentage of body fat and body mass index (both $P < 0.05$) while controlling for sex, whereas no relations were found between the clock hour of food intake, caloric amount, meal macronutrient composition, activity or exercise level, or sleep duration and either of these body composition measures (all $P > 0.72$).

Conclusions: These results provide evidence that the consumption of food during the circadian evening and/or night, independent of more traditional risk factors such as amount or content of food intake and activity level, plays an important role in body composition. This trial was registered at clinicaltrials.gov as [NCT02846077](https://clinicaltrials.gov/ct2/show/study/NCT02846077).

Keywords:

[metabolism](#) [sleep duration](#) [body composition](#) [caloric intake](#) [melatonin](#)

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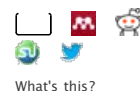
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1. [Chronobiology and obesity: Interactions between circadian rhythms and energy regulation.](#)
Keith C Summa et al., *Adv Nutr*, 2014
2. [Association of self-reported sleep duration with eating behaviors of American adults: NHANES 2005–2010](#)
Ashima K Kant et al., *Am J Clin Nutr*, 2014
3. [Effects of Diet on Sleep Quality](#)
Marie-Pierre St-Onge et al., *Adv Nutr*, 2016

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