

WITHIN-DAY ENERGY DEFICIENCY



What is the problem with skipping meals as an athlete?

As an athlete, with multiple commitments, it can be difficult to find time for every meal. Certain athletes may also struggle with a lack of appetite following exercise leading them to skip meals. Regardless of the reason for skipping meals, this is a dangerous habit to fall into.

Skipping meals leads to increased risk of energy deficiency and the associated health risks (see our fact sheets on Low Energy Availability and Relative Energy Deficiency in Sport). These include, but are not limited to, fatigue, loss of one's period, bone health issues, and reduced sport performance.

- ✓ Increased risk of energy deficiency
- ✓ Increased risk of RED-S
- ✓ Fatigue during class and at practice
- ✓ Suppressed metabolic rate
- ✓ Elevation of cortisol levels

Health risks associated with skipping meals



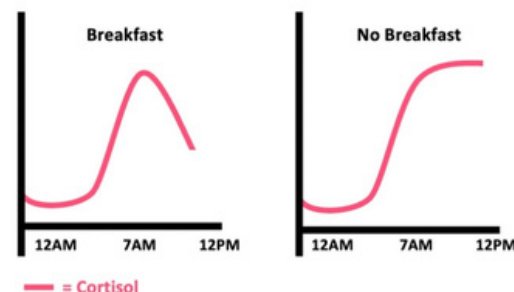
Why is skipping breakfast in particular so bad?

While skipping any meal is negative for one's health, skipping breakfast is particularly negative. As we sleep at night, our body releases a hormone called cortisol. Cortisol levels peak in the morning right before awakening. These levels then decrease upon eating breakfast.

Cortisol is sometimes referred to as the "stress hormone". This definition of stress is somewhat different from our typical use of the word. While we generally associate stress as something negative, our body can experience positive stressors as well that are healthy and normal in typical amounts. For example, exercise is a stressor on our body causing release of certain molecules in response to this stress. Sleep is the same way.

As we sleep, we enter a period of fasting which our body perceives as a stressor. Throughout this period of fasting, we release more and more cortisol which in part is what leads to awakening in the morning. By eating breakfast, we take away the stress of fasting while asleep.

If breakfast is not eaten, then cortisol levels will not go down because the body is still in a perceived state of stress. While release of cortisol during sleep is normal and healthy, long-term cortisol release throughout the day until lunchtime (if breakfast is skipped) is not healthy. When breakfast is frequently skipped, this can lead to excess cortisol in the body. Excess release of cortisol is associated with negative cardiovascular and metabolic health consequences (e.g. increased risk of heart disease and type II diabetes). For this reason, eating breakfast is especially important (Witbracht 2015).

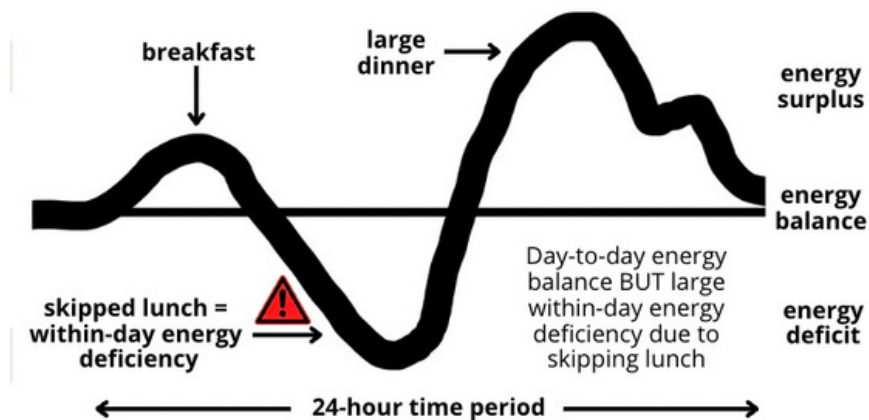


Skipping breakfast can lead to elevated cortisol levels which are associated with cardiometabolic health risks

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What is within-day energy deficiency?

When it comes to energy deficiency, we tend to focus on the idea of “calories in = calories out”. While this is accurate to an extent, energy balance is much more nuanced in real practice. Recent research has shown that periods of energy deficiency throughout the day (such as when an athlete skips a meal or snack) even if total caloric intake is adequate at the end of the day can contribute to poor health and sport performance outcomes (Fahrenholtz 2017).



Within-day energy deficiency can occur when an athlete forgoes eating for extended periods of time leading to periodic energy deficits throughout the day. Despite being in an overall energy balance, the athlete may still experience the impacts of poor energy availability due to these within-day energy deficits.

The best way to explain this is through an example. Let's say you have a female athlete who skips breakfast every morning due to being rushed to catch the bus. This athlete then eats a quick lunch with normal snacking dispersed throughout the day. By the time dinner rolls around, our athlete is pretty hungry - she has had a full day of class in addition to after-school practice. Because of this, our athlete eats a large dinner and evening snack. If we look at the athlete's "calories in = calories out" daily equation, the large dinner she eats in the evening compensates for the skipped breakfast earlier in the day. Or does it?

The problem with the example described above is that the athlete is still experiencing a period of energy deficiency earlier in the day due to skipping breakfast. Fueling appropriately for sport is not just about matching energy input and output but also about consistency in fueling habits. On a daily basis, our athlete is achieving energy balance, but when we break down her fueling throughout the day, she is experiencing within-day energy deficiency by skipping breakfast.

Within-day energy deficiency is attributed with higher risk of RED-S and menstrual dysfunction despite overall energy balance from day-to-day, suppression of resting metabolic rate and elevated cortisol levels throughout the day (remember our discussion on skipping breakfast?). The main takeaway is that fueling for sport is not just about matching energy input and output but also making sure you engage in consistent fueling throughout the day to avoid within-day energy deficiency (Logue 2020).

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Tips and tricks for consistent eating

We know that as an athlete it can be difficult to find time to fuel throughout the day. Check out some of our tips and tricks for consistent fueling below:

Plan ahead: It can be difficult to make breakfast in the morning if you are rushed to get to school. Try options that can be prepared the night before to save time in the morning (e.g. overnight oats). The same goes for packing your school lunch. If you can, pack this the night before, when you have more time, instead of rushing to get it done in the morning.

Carry snacks in your backpack: Consistent snacking is a great way to avoid within-day energy deficiencies (in addition to regular meals). Fill your backpack with easy snacks that won't go bad to have some additional fueling options throughout the day. Try trail mix, pretzels, goldfish or dried fruit.

Prioritize pre- and post-workout snacks: Not only are pre- and post-workout snacks important to enhance your sport performance and recovery, but they also ensure energy levels stay balanced during and after exercise. Depending on the time of your practice, you can also just utilize a full meal for your pre- or post-workout fueling.

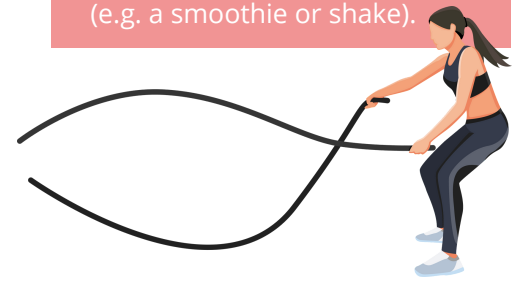
Try liquid fueling options: If you struggle with your appetite following exercise or need a quick option on-the-go, try liquid options such as a smoothie or shake. Certain athletes may find these liquid fueling options easier on their stomach.

Start small: Learning to fuel our bodies for sport takes practice. You do not need to have everything down perfect at first. For example, if you struggle to get consistent snacks throughout the day, start small with one snack and work your way up. If you cannot get a full breakfast in the morning due to lack of appetite, start with liquid options or a more minimal breakfast while working your way up to a more balanced breakfast.

1 Pack meals ahead - especially if you know you will be rushed (e.g. overnight oats for breakfast).

2 Carry snacks in your backpack. Snacks are a great way to get consistent eating in between meals and before/after practice.

3 If you struggle with appetite following exercise or in the morning, go for liquid options (e.g. a smoothie or shake).



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Citations

Fahrenholtz, IL, Sjödin, A, Benardot, D, et al. Within-day energy deficiency and reproductive function in female endurance athletes. *Scand J Med Sci Sports*. 2018; 28: 1139– 1146. <https://doi.org/10.1111/sms.13030>

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Witbracht M, Keim NL, Forester S, Widaman A, Laugero K. Female breakfast skippers display a disrupted cortisol rhythm and elevated blood pressure, *Physiology & Behavior*, Volume 140, 2015, Pages 215-221, ISSN 0031-9384, <https://doi.org/10.1016/j.physbeh.2014.12.044>.



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