4 Things to Know About How Sleep Affects Metabolism

There's big news about metabolism from recent study findings that is shaking up our understanding of how metabolism changes with age.

January 14, 2022 By Michael Breus, PhD

The findings of this landmark study, published in the journal Science, challenge a major, longstanding belief about how metabolism changes over our lifetime: namely, that our metabolism slows during middle age. A slowing of metabolism in adulthood has long been thought to be a reason for adult weight gain, especially during middle age.

This large, rigorous study involving roughly 6,500 people between the ages of 8 days and 95 years, with data collected over a 40-year period, came to a radically different conclusion. Researchers discovered that metabolism, rather than declining in middle age, remains steady between the ages of 20-60. Scientists found that metabolism skyrockets in infancy, then declines gradually between ages 1-20. From 20-60, metabolism holds at a stable rate, before beginning to decline again in the years after 60. These lifetime patterns were found to be the same for both men and women. (It's long been thought that menopause was associated with a slowing of metabolism. Based on this research, that appears not to be the case.)

Individuals have different metabolic rates, the study confirmed. Some of us have higher metabolic rates than average, for our age, and others of us have slower metabolisms than average for our age. But we all appear to follow this broad pattern of metabolic changes over our lifetime, with a constant metabolic rate during our young and middle-aged adulthood.

On the heels of this important study, I thought we'd look at some of the most important things we know about how sleep affects metabolism, and how we can use sleep to keep our bodies at a healthy weight, and reduce our risks for cardiometabolic disease, including cancer and heart disease.

What is metabolism?

Before we jump into the science on sleep and metabolism, let's get clear on the basics. Metabolism refers to the body's complex process of energy expenditure—how our bodies convert calories into energy that enables us to function.

There are factors that affect our individual rate of metabolism. They include:

- Body size (larger bodies need more energy to function that smaller bodies do)
- Muscle mass

Physical activity also has a big impact on individual energy expenditure. Exercising and being physically active demand our bodies to expend additional energy (aka calories), rather than storing that energy as fat.

Sleep also affects individual metabolism. Getting sufficient, high-quality rest can help your body maintain its optimal metabolic rate for your age, make it easier to lose weight (and keep from gaining weight), and help reduce risks for diseases associated with weight gain.

And metabolism is most profoundly influenced by our genes. Like our individual chronotypes, our individual metabolic type—slow, medium, or fast—is determined by our DNA.

Regular readers know that I've spent many years researching, talking, and writing about the importance of chronotype in creating daily routines that support consistently excellent sleep, as well as overall mental and physical health AND productivity. Over time, I also came to realize that working with chronotype wasn't the only remedy for the fatigue, weight gain, stress, and mental distraction that so many people experience. Too many of us (myself included) who were working diligently with their chronotype were still spending too much time feeling run down, exhausted, off our best game.

That's when a deeper understanding of metabolism becomes essential. When we pair understanding of our individual chronotype with knowledge of our individual metabolic type, we take a huge leap forward in our ability to develop highly personalized daily schedules and habits that align with our DNA-driven biological inclinations and needs.

And that, I'm excited to tell you, is the subject of my new book: Energize: Go From Dragging Ass to Kicking It in 30 Days. My co-author, Stacey Griffith, is a founding instructor of SoulCycle and together, we dug deep into the scientific research (and conducted research of our own) to develop personalized daily protocols for sleeping, eating and activity based on both chronotype and metabolic type. Energize! is a step-by-step guide to creating individualized routines and habits that help you shed fatigue, stress, sleeplessness, and low mood, and reclaim abundant energy and vitality in your daily life, using your body's unique biology as a roadmap. If you're interested in learning how to bring more energy into your daily life, from morning to night, I hope you'll check it out—and let me know what you think!

4 things to know about how sleep can affect your metabolic health

Sleep alters hormones that regulate hunger and fullness

Hormones that regulate appetite and control calorie consumption are affected by sleep. There is a strong body of research showing that not getting enough sleep increases the production of ghrelin,

a hormone that stimulates appetite and makes us inclined to consume more calories. This study found that a single night of short sleep (4.5 hours) elevated ghrelin levels and significantly increased feelings of hunger the following day in healthy, normal weight men. Research also shows that lack of sufficient sleep reduces levels of leptin, a hormone that acts as an appetite suppressant and promotes feelings of fullness. Leptin sends an important message to the brain that we have consumed sufficient calories to meet our energy needs for the time being.

The takeaway: Being sleep deprived delivers a one-two punch to the body's ability to maintain a balance of energy consumption, in line with our needs for energy expenditure. As this latest research on metabolism indicates, for many decades of adulthood energy imbalance and the weight gain that it creates appear to be less about a reduced capacity to burn calories, but rather about an excess consumption of calories, beyond what the body needs to function. Getting enough sleep to meet your individual sleep needs can help you regulate your appetite and avoid the cravings for sugary and high-fat foods that undermine our best efforts to stick to a healthful eating routine.

Here's what to know about how sugar affects your sleep.

Lack of sleep changes the way our bodies metabolize fat

Recent research into sleep and metabolism has shown that lack of sleep may diminish the body's ability to convert fat to energy. The effects of sleep on fat metabolism have been relatively understudied. This area of research is critical to our understanding of the impact of sleep on the body's ability to maintain energy balance.

This 2019 study looked at the impact of short sleep on fat metabolism in a group of 15 healthy men over a period of 10 nights, with a schedule that simulated a typical work week, with insufficient sleep on consecutive weeknights. In this laboratory study, participants were given a high-fat, high-calorie meal at dinner: a bowl of chili mac and cheese. For four consecutive nights, the participants slept no more than 5 hours.

Using blood tests, the researchers compared metabolic response to the evening meal after 4 sleep-deprived nights, compared to a well-rested response. They found that after 4 consecutive nights of short sleep, participants showed a significant difference in their ability to break down fat into energy, with more fat being stored, rather than consumed as fuel. A subsequent night of recovery sleep, typical of what one might get on a weekend night after a long work week, improved fat metabolism to a degree, but did not restore it to pre-sleep-deprivation levels. Also, researchers found that the men felt less full and satisfied after eating the heavy meal when they were sleep deprived, compared to when they were rested.

The takeaway: We have a lot more to learn about how sleep influences fat metabolism, but there's an emerging picture that suggests our bodies are less likely to expend fat as energy, and more likely to store it, when we don't get enough rest on a consistent basis. Shortchanging sleep during a busy work week appears to be enough to have a meaningful impact on our fat-burning

capabilities. Maintaining a consistent routine of sleep, with regular bedtimes and waketimes, can prime your metabolism to function at its best.

Consistent sleep routines also deliver major benefits for our mood—here's how.

Poor sleep quality slows fat burning

More recent research shows that it's not only the amount of sleep we get, but also the quality of that sleep, that affects how well our bodies burn fat. A study from 2020 by a group of Spanish scientists examined the impact of sleep quantity and sleep quality on fat oxidation (the body's ability to consume fat as fuel) in a group of sedentary middle-aged adults, ages 40-65. They found lower sleep quality was associated with reduction in rate at which the body burned fat.

The researchers also looked at how diet might influence the relationship between sleep and fat burning. In their analysis, they investigated whether adherence to their participants' Mediterranean diet—a diet rich in fruits, vegetables, whole grains, healthful oils, nuts, seeds, and lean sources of protein such as fish—affected sleep's impact on fat oxidation. They found that eating a Mediterranean diet did not diminish the negative association between poor sleep quality and a slower rate of fat burning, in middle-aged people who were not physically active.

The takeaway: Eating well is critical for metabolic health. (It's also really important for healthy sleep.) But a healthful diet is one component of maintaining a healthy metabolism, and lowering risks for cardiometabolic disease. Sleep matters to the health of your metabolism, independent of your diet. And of course, exercise matters, too. These three are the foundation of healthy aging, yet too often sleep gets shortchanged, including for people who are paying a lot of attention to diet and exercise.

These are some of the best foods to promote a healthy metabolism and better sleep.

Poor sleep and circadian misalignment affect glucose and insulin

Glucose, aka blood sugar, is the body's primary source of energy, broken down from foods we consume. Insulin is a hormone that works as a glucose facilitator and regulator: it works to transfer glucose from blood to cells where it is consumed as fuel, and it acts as a messenger to avoid excess glucose in the bloodstream. Maintaining healthy blood sugar levels and keeping insulin working optimally are critical for metabolic health, and to avoid metabolic conditions such as diabetes.

There is a large and growing body of evidence that poor sleep affects the body's ability to regulate blood sugar and use insulin effectively. Research shows several ways that poor sleep negatively affects blood sugar and insulin:

- Sleep deprivation and poor sleep quality both inhibit the body's ability to metabolize glucose

and use insulin effectively, which contribute to higher blood sugar levels

- Not getting enough high-quality sleep elevates cortisol, a hormone that in turn contributes to a rise in blood sugar
- Sleeping out of sync with our circadian rhythms is also associated with changes to the body's ability regulate blood sugar, and with overproduction of insulin and increased cortisol
- Poor sleep increases inflammation, which contributes to insulin resistance (a decrease in the effectiveness of insulin) and elevates blood sugar

The takeaway: Sleeping well is a powerful well to protect metabolic health, because of its influence over blood sugar and insulin. Make time for enough sleep, and follow these strategies to ensure your sleep is high-quality. Sleeping on a consistent schedule, one that aligns with your individual chronotype, is also important to helping to regulate blood sugar and insulin.

Not sure how to use your chronotype? Take this quiz to find out your individual chronotype, and read about how to put your chronotype to work to improve your sleep, health, and productivity. But don't stop there. Understanding both your metabolic type and your chronotype is how you'll make the smartest, most-informed-by-science choices about when and how to sleep, eat, and move, to live your life with abundant energy and vitality, on a schedule that fits with your genes.

This post originally appeared on The Sleep Doctor on October 21, 2021. It is republished with permission.
