



MENNO HENSELMANS
— Science to master your physique —



ADHERENCE

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Social science is a 'fuzzy field' unlike the 'hard sciences' like chemistry and physics. As a result, people often rely on their intuitions or introspection instead of the objective data on the topic. The lack of evidence-based reasoning for psychological issues is ironic, because the psychological literature vastly exceeds the combined fields of nutrition and exercise science. Let's put this knowledge to use to make it easier to sustainably adhere to a fitness program. The first thing we need to discuss is why dieting is difficult: what is the exact problem we're dealing with?

➤ Lectures [optional]

- [How to stick to your diet basics](#)
- [The science of diet adherence](#) [[slides](#)]

The psychology of dieting: the flesh is strong, but the mind is weak

The reason dieting is difficult mentally may seem obvious. Low energy levels, the inability to muster up energy to do something, a mental fog, these problems occur because of a low energy intake, right?

A team of researchers led by Harris Lieberman designed [a clever experiment](#) to test what the mental effects of energy deprivation are without having people know they're dieting. The researchers took a group of healthy individuals and gave them gel-based diets. The gel structure allowed the researchers to greatly manipulate the energy content of the food without altering the physical appearance, taste or texture of the food. The study subjects were then given either a maintenance diet of 2294 calories or a starvation diet of 313 calories to eat for 2 days. The researchers compared the groups on a battery of cognitive, physiological and psychological tests on the subjects. How big do you think the difference between the groups was?

There was none, except that the subjects were predictably hungrier when eating next to nothing. Their mood, sleep quality and mental performance were not affected by the 2 days of practical starvation. In fact, after the study, the subjects were informed of the study design and asked if they thought they were in the starvation or the maintenance group. The subjects couldn't tell.

The similarity between dietary energy intake – how many Calories we consume – and mental energy is largely metaphorical.

- A Calorie is a measurement unit to quantify chemical reactions, officially “the approximate amount of energy needed to raise the temperature of one gram of water by one degree Celsius at a pressure of one atmosphere”.

Technically, the nutritional Calorie should be spelled with a capital C, because it's a kilocalorie, but few nutritionists adhere to this rule.

- Mental energy is a vague, unscientific term used to refer to psychological or cognitive capacity, frequently motivation. After dinner, you may be in a massive dietary energy surplus and still not have mental energy to do the dishes (read: not be motivated to do the dishes).

As the above experiment demonstrated, there is very little inherent relation between dietary energy intake and mental energy intake. They are fundamentally different concepts. Multiple lines of research consistently demonstrate that being in an energy deficit has practically no physiological effect on your brain's ability to function or your mood.

Research on the mental effects of energy restriction dates back as far as a [1987 trial on crash diets by the University of Pennsylvania School of Medicine](#). In this study, participants were assigned to either a 500- or 1200-Calorie protein-sparing modified fast (PSMF) for 2 months. The dieters didn't feel any different on the different diets: "There were no significant differences between conditions in subjects' ratings of their preoccupation with eating or in their ratings of the acceptability or disruptiveness of their diets." Remarkably, the 500-Calorie diet did in fact result in overt hypothyroidism symptoms: their thyroids, the centers of their metabolism, were shutting down. So not only are we generally unable to blindly tell what energy intake we're consuming, or if we're in energy deficit at all, when our body is actually suffering from our diet, we may not be aware of that either. Anecdotally, you can see this in many people starting vegan and carnivore diets. When not properly implemented, these diets quickly result in significant nutritional deficiencies, yet people that try them are often convinced their diet is the stairway to heaven. So some people report feeling 'better than ever', yet when you look at their bloodwork, things are going downhill fast.

One of the most carefully controlled studies we have on the mental effects of dieting is [a 2015 metabolic ward study](#). Metabolic ward studies are the scientific gold standard for many nutritional interventions, because the subjects are kept in a ward and continuously monitored while all the food they eat is prepared for them. In this study, non-obese individuals in a massive 40% energy deficit experienced an initial dip in their mood during the transition from maintenance, but in the subsequent weeks there was no longer any effect on mood, sleep quality or mental performance compared to when eating a maintenance diet. The participants were exercising 3-4x a week. In fact, 10% of the deficit was achieved by increasing the amount of exercise they did. So the subjects could notice a difference in how they felt when suddenly going into massive energy deficit and starting to exercise more, but they quickly habituated to 'the new normal'.

We have very long-term studies as well. [Grigolon et al. \(2020\)](#) and [LeClerc et al. \(2019\)](#) analyzed the cognitive performance of 220 non-obese adults over a 2-year diet. They found that the diets improved cognitive performance, in particular working memory, whereas energy intake per se had no effective on cognitive functioning.

Another line of research comes from the military. [In soldiers during a month-long field exercise, being in a massive 40% deficit compared to a moderate 14% deficit did not affect mood, psychological health or reaction time.](#)

Research has also specifically investigated how energy intake affects our sleep quality. [It doesn't.](#)

Additionally, we can learn from research on Ramadan fasting and fasting in general. [Ramadan fasting does not impair brain functioning.](#) It's not nearly enough of a stress for our bodies. [It takes 24 hours of total food deprivation before mental performance](#)

[starts to deteriorate in some research](#) and this most likely due to dehydration, not lack of energy intake. Multiple studies confirm that [even severe energy deficits or complete fasting up to 48 hours do not impair cognitive functioning, our mood, brain activity or motor performance](#) [3, 4].

In fact, [some aspects of mental functioning improve after missing a meal](#) and when dieting. [A 2015 systematic review](#) concluded cognitive functioning is not consistently affected by our diet, but there was a trend for long-term energy restriction to improve some measures of cognitive functioning, especially memory. Energy restriction and healthier diets may improve brain functioning by reducing neuro-inflammation. From an evolutionary perspective, it makes sense that energy restriction sharpens our brain. When you run out of food, you need to become active and stay alert to obtain new food. If you collapse whenever you venture out of walking distance from a McDonald's, your genes don't stand a very good chance of making it to the next century.

But what about blood sugar?

So how does this all jive with what we know about blood sugar? Everyone knows that after a meal, you feel better, and when your blood sugar levels fall again, you experience a dip, right?

Wrong. This conventional wisdom was debunked back in 1980. [Johnson et al.](#) studied symptoms of hypoglycemia in 192 men and women during an oral glucose challenge: monitoring blood sugar levels after consuming a lot of sugar. While many participants did indeed experience symptoms similar to hypoglycemia (light-headedness, shakiness, diaphoresis, weakness, and fatigue), in the vast majority of cases there was no actual hypoglycemia at the time of the symptoms. In fact, there was no correlation between symptoms and blood sugar levels at all. [More research since consistently](#)

[demonstrates there's no clear correlation between blood sugar levels and mood, appetite and symptoms of alleged hypoglycemia.](#)

So what caused the symptoms? The researchers tested the personality types of the participants and found that they scored high on measures of conversion V, a personality trait that in theory makes people susceptible to psychosomatic symptoms. In other words, the symptoms were placebo effects: in their head, self-induced.

Several other studies have confirmed that [alleged subjective symptoms of hypoglycemia after meals generally do not coincide with actual hypoglycemia](#) and that relief of symptoms after eating does not correlate with an increase in blood sugar [2, 3]. In fact, there was a decrease in blood sugar levels during symptom relief in many participants.

How about when you're *not* eating? [Green et al. \(1997\)](#) studied the effect of food deprivation – not allowing people to eat – on how they felt and mentally functioned during a set of cognitive performance tests. Food deprivation did not generally affect brain functioning with one exception: memory *improved*. They also related glucose levels to cognitive performance: there was no relation. They concluded: “...the brain is relatively invulnerable to short food deprivation.”

Blood sugar levels are tightly controlled within a narrow range in healthy individuals. The waves of ‘spikes and crashes’ after meals are normally more like the gentle lapping of the sea at the beach.

Nevertheless, food and carbohydrate intake can acutely impact how we feel. Conventional wisdom says carbs give you a ‘sugar rush’, but all-you-can-eat sushi veterans can attest that all you’ll be rushing to after 5k calories of rice is your bed. [A](#)

[2019 meta-analysis](#) firmly concluded carbohydrates do not improve our overall mood and generally make us drowsy: “Analysis of 176 effect sizes (31 studies, 1259 participants) revealed no positive effect of carbohydrates on any aspect of mood at any time-point following their consumption. However, carbohydrate administration was associated with higher levels of fatigue and less alertness compared with placebo within the first hour post-ingestion.” This sleepiness occurs not because of our blood sugar, but because of our nervous system’s response to food intake, a phenomenon called postprandial somnolence.

Postprandial somnolence

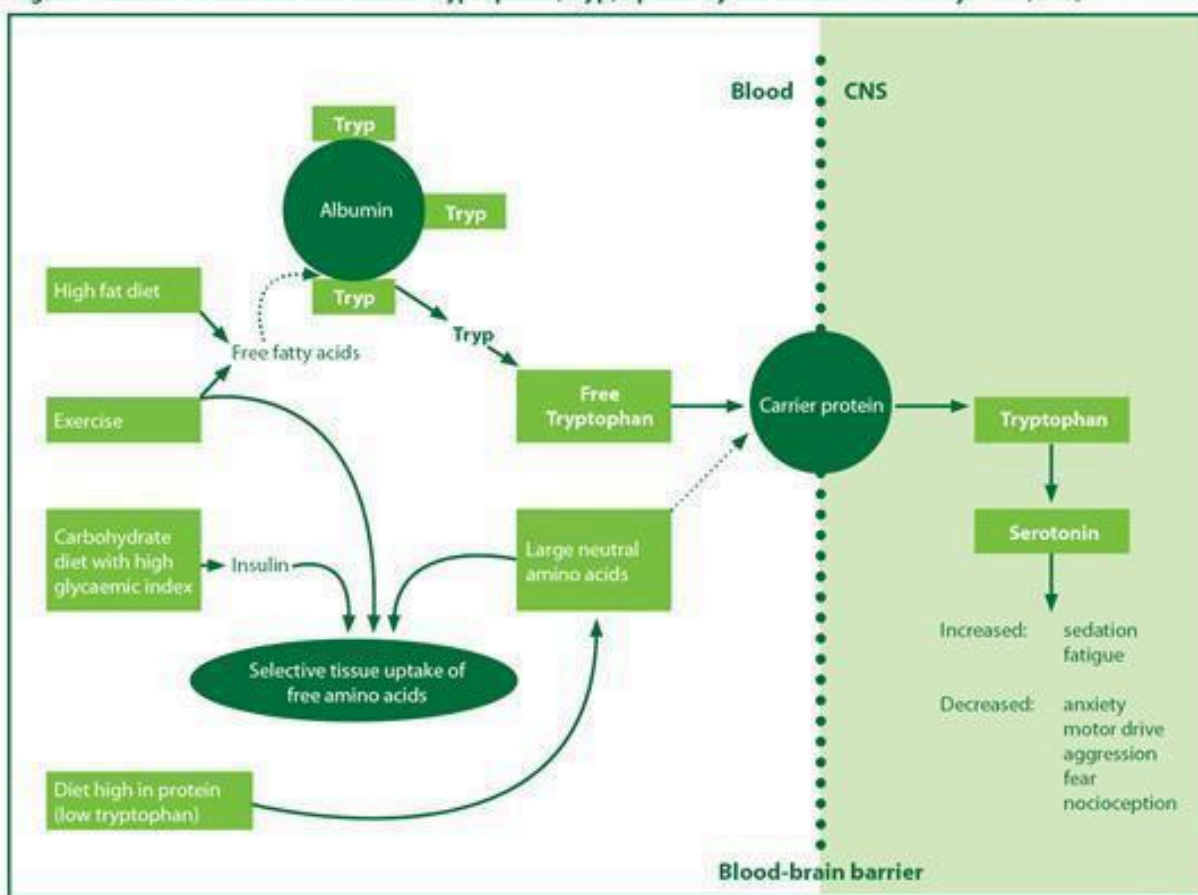
The idea that food gives you mental energy is fundamentally misguided. It is based on the intuition that food has energy, so surely it must give you mental energy. The problem here is semantic, as you learned: despite the similar words, mental energy and food energy are entirely different concepts. Food energy is physical energy, akin to heat and movement. Mental energy is a vague term informally used to refer to either cognitive functioning – how well the brain performs mental tasks – or psychological motivation.

Rather than becoming more energetic after a meal, most people become sleepier. This phenomenon is called postprandial somnolence. Postprandial means ‘after eating’. Somnolence means ‘sleepiness’. From an evolutionary perspective this sleepiness makes a lot of sense. Hunter gatherer populations had to be wakeful and alert when food was scarce but could relax more when there was ample food available. To quote [Vanitallie \(2006\)](#): “the neurophysiologic and metabolic mechanisms responsible for the control of food-seeking behavior and the control of sleep and wakefulness are coordinated so that hunger and vigilance are paired during the daylight hours, and satiety and sleep are paired during darkness.”

The classic explanation for postprandial somnolence is that during digestion blood flow gets shuttled to the digestive system with greater priority, leaving less blood available for the brain. It was a plausible theory, but it turned out to be incorrect. Much like blood sugar, [an abundance of evidence shows the body strictly controls blood flow and oxygenation in the brain.](#) Even when [exercising, your body maintains cerebral \(brain\) oxygenation.](#) Turns out, your brain's kind of important, so if it didn't get enough oxygen and blood every time you ate, that would be kind of bad.

[Another explanation was that the feel-good-but-sedated neurotransmitter serotonin was responsible for postprandial somnolence.](#) The graphic below illustrates how carbohydrate rich meals generally promote serotonin production, while protein rich meals decrease it. The theory was that it's thus specifically the carbohydrate content of the meal that influences postprandial somnolence ('carb knockout'). While it's true that serotonin production is generally higher following high carb, low protein meals, [the macronutrient composition of a meal does not reliably affect its resulting postprandial somnolence.](#) (Except before bed, when serotonin is further converted into melatonin and thereby promotes sleep onset.)

Figure 1. Effects of diet and exercise on tryptophan (Tryp) uptake by the central nervous system (CNS).

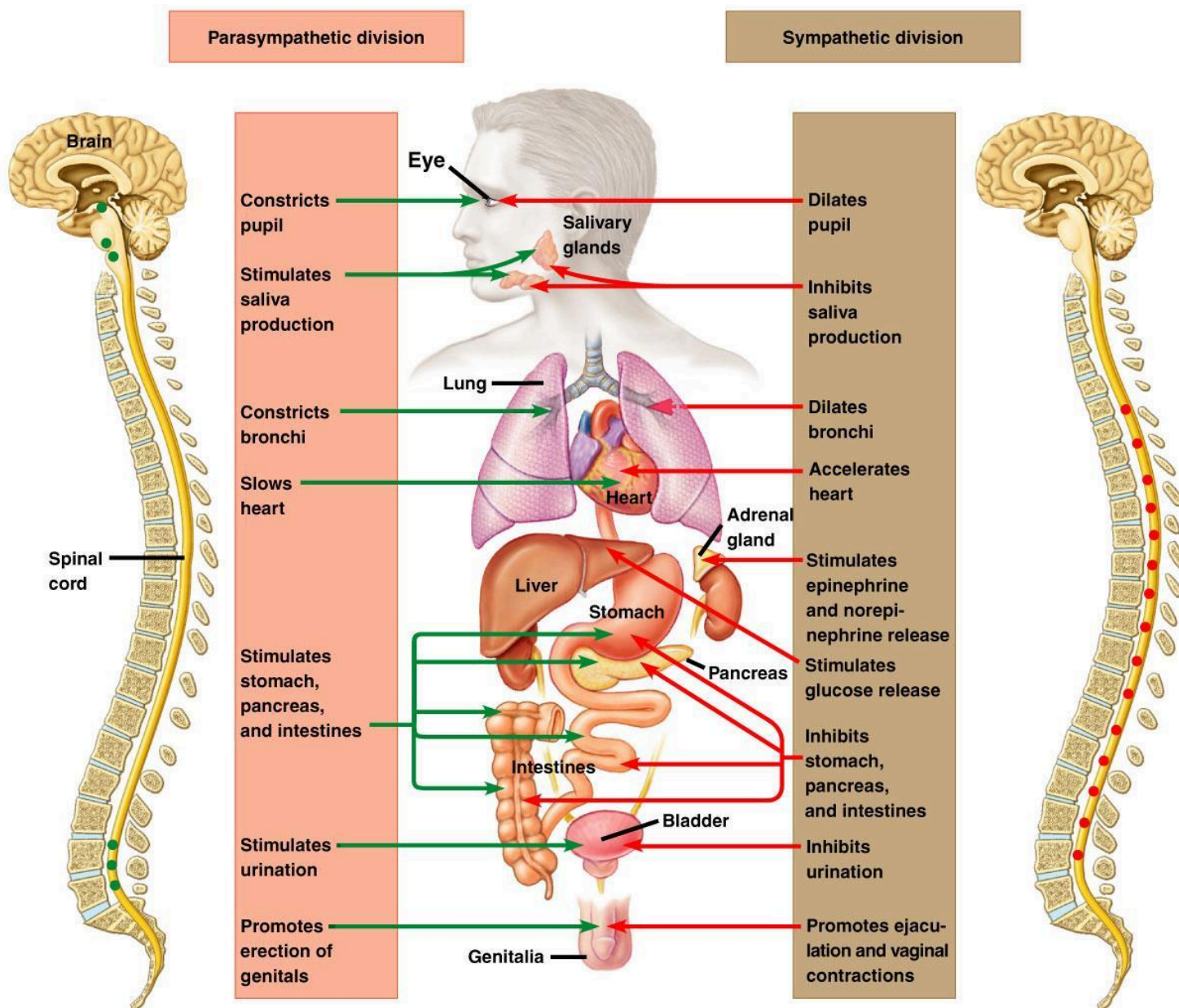


Traditional theory of the regulation of serotonin production. Serotonin production is increased following highly insulinogenic meals with few large neutral amino acids that compete to cross the blood-brain barrier (phenylalanine, tyrosine, tryptophan, threonine, methionine, valine, isoleucine, leucine and histidine). Insulin causes your muscles to absorb BCAAs from the blood, which leaves less of them to compete with tryptophan at the blood-brain barrier, causing more tryptophan to reach your brain.

Tryptophan is converted to serotonin. [Source](#)

The currently most well supported theory is that [the central nervous system's state is altered by hunger](#). Hunger motivates you to become active and search for food via activation of the sympathetic 'fight or flight' state, whereas satiety activates the parasympathetic 'rest and digest' state. Specifically, the hypothalamus - the area in

your brain that controls vegetative functions such as eating, sleeping, bowel function, sex etc. - senses satiety through the detection of blood borne metabolites from foods, endogenous peptides from the gut and signals from the vagus nerve, the biggest nerve of your parasympathetic nervous system. These signals of satiety can stimulate sleep centers which results in postprandial somnolence. Satiety as the key driving force of postprandial somnolence explains why [solid meals are more sleep inducing than liquid meals](#). It also explains why [larger meals generally result in greater postprandial somnolence than smaller meals](#).



The division of the central nervous system's functions. Source: Pearson Education

From an evolutionary point of view, the nervous system's reaction to satiety makes perfect sense. When you're hungry, you're stimulated to be active and go find food. When you've eaten your belly full, the nervous system sees: "Mission accomplished. The threat of starvation is gone. Now it's time to chill and go find a partner to make babies with... Maybe take a nap first."

In conclusion, you don't need food to be mentally energized. Being in physical energy deficit does not inherently affect your cognition, mood or sleep quality.

If you're like most people and you have any experience dieting, at this point you probably feel like you're Neo that got red-pilled in the Nutrition Matrix and you protest: "I don't know about these studies, but I can definitely tell when I'm on a diet and it doesn't feel good!" And that's probably true. Because the participants in most of these studies share a crucial commonality that we commonly do not share. What do people eating nothing but gels or liquids, soldiers and people in metabolic wards have in common? Blissful ignorance. These study participants were not aware they were on fat loss diets. They didn't feel restricted. The soldiers just ate their provisions, the metabolic ward crowd just ate what the cafeteria made and Lieberman's human guinea pigs just ate the provided gels. You, on the other hand, must consciously restrict yourself. Restricting yourself causes 2 large problems in your mind.

The dieting nocebo

The first problem with restricting yourself to go on a diet is the dreaded nocebo effect. As you saw in the studies on fake low blood sugar symptoms, the expectation of feeling poorly on a diet can actually make you feel poorly. This preoccupation with dieting makes it much harder than it needs to be. [A 2018 meta-analysis of studies](#) supports that diet-induced psychological stress is unrelated to how much weight you're losing. In fact, the researchers found that people that aren't losing any weight on their diet, which means they are in fact still consuming maintenance calories, often experience just as much stress from their diet as people that are actually losing weight. In other words, any stress comes from the idea of 'being on a diet', not from the psychological state of negative energy balance.

A large body of research indicates that our brains do not react to caloric intake per se at all but rather use contextual cues to estimate our perceived food intake. When the energy density of food is secretly reduced in [research](#), unaware people still eat approximately the same amount of total food volume and thus consume significantly fewer calories. Moreover, hunger, fullness, desire to eat and prospective consumption ratings are the same, showing that you can be just as satiated with less, as long as you're not obsessing over the fact that you're restricting your caloric intake.

In a [study by Crum et al. \(2011\)](#), researchers told their participants that they were drinking a high-calorie 'indulgent' milkshake or a low-calorie 'sensible' milkshake, when in fact it was the same milkshake in both groups. The participants consuming the supposedly indulgent milkshake reported higher satiety and they even experienced a greater decrease in levels of the hunger hormone ghrelin.

In sum, it's the feeling of deprivation and the expectation of suffering, not the actual energy restriction, that causes most problems when dieting. To counter these effects, it's good to realize that in terms of physical health, our bodies actually thrive in energy deficit, at least until you get close to essential body fat levels, like during a bodybuilding contest. Virtually all health biomarkers – including our blood pressure, blood sugar, cholesterol levels, heart rate and systemic inflammation – improve with fat loss, as you learned in the health module. The problem is the dreaded placebo in our head. Your body is strong and your battle is psychological. You don't need food to feel good.

It also helps to stay busy. The best way not to realize you're on a diet is to be busy with something else. Get work done. Go to the cinema. Create a website that tracks the number of funny cat videos on Youtube. Be productive or have fun. [Focusing on a task you're doing reduces food cravings \[2\]](#). More generally speaking, actively [thinking about anything other than food helps reduce food cravings and it doesn't seem to](#)

[matter what else you think about](#). Keeping yourself occupied prevents you from obsessing over the fact you're on a diet. Whatever you do, don't sit around and think about food. Distraction is your friend.

In addition to the nocebo effect of energy restriction, restricting diet poses a second problem: it requires self-control, willpower.

Willpower

Starting in the 60s, a group of researchers performed what would later become known as the [Stanford marshmallow experiment](#). In one of the studies, researchers offered children a dilemma: you can have 1 marshmallow now or, if you can wait 15 minutes in this room and you don't eat the marshmallow now, you can have 2 marshmallows later. This simple test turned out to have remarkable predictive power about how the children's lives would unfold. About a third of the children managed to resist temptation and enjoy the double treat. These children ended up more successful in life with better grades in school, lower body fat levels and a better ability to cope with failure [\[1, 2\]](#).

What separated the children that immediately ate the marshmallow from the children that managed to delay gratification?

The dominant theory on self-control is that of Roy Baumeister. Baumeister coined the term 'ego depletion' to describe the state of mind in which self-control is likely to fail. Briefly, the theory proposes that willpower is a limited resource that you tap into when you exert self-control. When the 'willpower container' is empty, you succumb to the temptations of your baser instincts. The theory of willpower as a limited resource is well-known and seemingly supported by a number of scientific studies running into the

triple digits. Here are some of the findings to illustrate situations of self-control failure as a result of 'ego depletion'.

- Resisting the temptation of eating tasty chocolates results in [less perseverance afterwards](#) during the completion of frustrating puzzles.
- Controlling your emotions while watching a movie results in [snacking on more ice cream](#) during a follow-up ice cream tasting task.
- Balancing an object while counting backwards from 1000 results [in less perseverance during subsequent physical exercise](#), such as a push-up or sit-up challenge, even in competitive athletes.
- In general, cognitive effort and mentally demanding activities like puzzles and brain games result in [more snacking and indulgence of our sweet tooth](#) instead of sticking to our regular diet.

Supposing that our willpower is indeed like a glass that slowly empties as we use up its powers, we want to know how we can increase the size of the glass. Scientists have been looking for this 'glass' in our body for around 2 decades now and have not been able to find anything like it. Our brain's structure doesn't have vials with fluids or anything that seems like a 'willpower resource' that empties over time. It's just a bunch of neurons. Like a computer, there has to be a power supply – in our case oxygen and nutrients delivered via blood – but when the power is on, the computer functions and it can keep repeating the same task over and over. This line of thinking led scientists to suspect that glucose, more commonly known as blood sugar, is our willpower reserve. The scientists Matthew Gailliot and Roy Baumeister put this idea to the test and found drinking a sugary beverage can [indeed](#) increase our self-control. Other research confirms this. Consuming glucose can increase our ability to control our aggression and improve our focus during memory games [2, 3].

Paradoxically, however, [engaging in self-control does not reduce our blood sugar levels](#), at least no more than any other kind of brain activity does [2].

Moreover, it doesn't need to be sugar that you drink to prevent willpower failure. [An artificially sweetened beverage has the same effect as one with actual sugar](#).

These findings indicate that our willpower is not limited by our blood sugar level. So what is the willpower reserve that 2 decades of scientific research have been unable to find? The simplest answer is: willpower is not a limited resource. There is nothing that *physiologically* prevents you from having perfect willpower. The problem is *psychological*.

Modern research methods allow us to look into our brain to see what happens when our self-control fails, but in order to grasp this, we first have to understand 3 basic principles of how our brains work.

Principle 1: [We instinctively approach pleasure and avoid pain](#)

Our brains are continuously monitoring what psychologists call our affect. It is our level of wellbeing, pleasure or contentment. Positive affect basically means we feel good; negative affect means we feel bad. For simplicity's sake, I'm often going to use the less scientific term enjoyment rather than affect.

Our brain does not stop at monitoring our affect: it continuously simulates future scenarios and their predicted level of enjoyment. Based on the predicted enjoyment, it sends a signal to either approach or avoid. This signal often comes in the form of an emotion. For example, when we look over the edge of a tall building, we may experience fear, driving us to move away from the edge. This is, in a nutshell, how we make decisions, whether consciously or subconsciously. We evaluate our options and

pick the one we deem best. This is how we intuitively avoid things that may cause pain, like fire, and approach things that give us pleasure, like food.

Principle 2: [Cognitive conflict is inherently unpleasant](#)

When we entertain 2 opposing thoughts, such as 2 opinions that contrast with each other, we experience cognitive conflict. When these thoughts take the forms of beliefs or behaviors, we call this conflict 'cognitive dissonance' and we are strongly motivated to solve this conflict. For example, if you see yourself as a trustworthy person, yet you broke a promise to a friend, you may experience cognitive conflict in the form of regret or shame.

Minimizing cognitive dissonance generally makes us pretty reasonable, as consistency of thought is a prerequisite of rationality. However, our brain is quite flexible in how it solves cognitive conflicts. In a classic demonstration of cognitive dissonance, a UFO cult called The Seekers believed the world would end in 1955. When the world didn't end even though they prepared for it, this required some serious cognitive dissonance solving. Some of the cult members reasonably concluded they were wrong and went on with their lives. Others, however, became more devoted to the cause. They had quit their jobs, broken up with their spouses and sold their apartments. The idea this was all for nothing was too painful, so their minds instead solved their cognitive conflict by believing their devotion had made God call off the apocalypse and they had saved the world.

Principle 3: Our brains can be divided into [2 systems](#), a rational and an intuitive part

We have 2 systems in our brain: a conscious and a subconscious part. The Nobel prize-winning psychologist Daniel Kahneman described system 1 as the intuitive system and system 2 as the reasoning system. System 1 operates rapidly and

effortlessly and can process huge amounts of data, but it's fallible to errors resulting from its use of shortcuts and associative rather than causative reasoning. System 2 is the conscious part of our brain you probably identify mostly as 'you'. System 2 allows us to make rational decisions, understand logic and do math. While intellectually superior, system 2 is slow and its use is effortful. Therefore, system 1 first filters all information it registers from the environment and passes on only a fraction of it to system 2 for higher processing. In this sense, system 1 is like a company with system 2 as its director. The renowned psychologist Jonathan Haidt used the metaphor of a rider (system 2) sitting on top of an elephant (system 1). As the rider, system 2 is in control. In theory, that is. If the elephant insists on going left where you want to go right, you don't have a leg to stand on (no pun intended).

With the previous 3 principles in mind, we can understand [what happens in our brain when self-control fails](#). Self-control is required when there is conflict between system 2 of our brain, the rational rider, and system 1, the emotional elephant. Say you're filing your taxes, but you're hungry and your Ramen noodles are beckoning you. System 2 says you should finish your work, but system 1 says it's time to ditch the numbers and down some noodles. Since conflict is inherently unpleasant, self-control is unpleasant as well. Our anterior cingulate cortex (ACC) plays a crucial role here, as it is active during conflict resolution and the location of our attentional focus. It is also sensitive to our wellbeing. When the ACC registers decreasing wellbeing, its activity during conflict resolution decreases and we gradually lose attentional focus. We also see decreased activation in other parts of system 2, such as the prefrontal cortex. We experience this change in brain activity as mental fatigue or boredom, which feel essentially the same way if you think about it. This is why ego depletion is sometimes also called 'task fatigue'.

In other words, when you are performing an effortful and unpleasurable activity with a conflict between systems 1 and 2, system 2 gradually shuts down, our attention shifts from have-to to want-to goals, we get bored and after a certain amount of time, system 1 wins, your self-control fails and you succumb to activities resulting in more instant gratification.

[A 2017 study](#) of self-control in students illustrates how our willpower fatigues. Students generally will show signs of task fatigue within an hour of studying. Most students will be intimately aware of this as they'll find it difficult to maintain their attention on their work. However, this generally doesn't affect their self-control on other tasks across the day: the fatigue is task-specific. There was also no time-of-day effect on self-control: self-control didn't deplete across the day independent of study behavior. These findings contrast with the idea that our willpower is like a vat in our brain that we drain. Instead, they support that engaging in prolonged have-to activities causes our brains to shift our attention to want-to activities.

When our inner emotional elephant has gotten [bored with a task and our rational rider loses the reins, our attention shifts to things that offer more immediate gratification](#), such as food. This is not merely a motivational change but also a cognitive one. For example, [one study](#) found that the change in brain activity causes us to see and process cues like a dollar sign (\$) more readily than mathematical symbols like a percentage sign (%). Our inner elephants apparently like money but dislike math, not a good combination for economics. This sensitization for signs of instant enjoyment is also why a Facebook pop-up or notification on your phone while you're working can be so disastrous for your productivity.

[Another study](#) found that when task-fatigued dieters saw food, they experienced more brain activity in their reward centers and reduced connectivity with the top-down

control centers of system 2 than non-fatigued dieters. This is why it's difficult to stick to your diet after a long day at work. Throughout the day, you accumulate mental fatigue from all the have-to tasks at work and by the time you get home, all your brain wants is instant gratification. It just wants to watch TV and have ready-to-eat comfort food. (We'll get to how to solve this problem in the chapter on how to stick to your diet.)

The realization that self-control failure occurs not because your willpower is a limited resource but because your attention shifts from have-to to want-to goals, allows us to explain many things about self-control.

For one, self-control doesn't fail us when we're doing something we love. For example, reading a good book or playing a videogame can keep you focused for hours. Psychologists – and probably certain drug users too – call this '[flow](#)'. More generally, research has found that [motivation for a task wards off mental fatigue and self-control failure](#). You don't get bored easily when you're doing something you enjoy. As a less obvious example, [people are more likely to persevere on a task when they believe it will help others](#). Doing things we like is also beneficial for diet adherence, as it prevents task fatigue and unhappiness, which can result in self-medication of comfort food later on.

Fortunately, we can motivate ourselves to do something unenjoyable. There just has to be a [perceived reward at the end](#). Then self-control allows us to forego immediate rewards and invest in the future with the aim of being better off in the end, like resisting 1 marshmallow to get 2 later.

[The difficulty of the task also influences how soon our self-control fails during the task.](#)

Remember that it's the inherently unpleasant conflict resolution taking place in the anterior cingulate cortex that causes your brain to shift attention away from the task to

something more pleasant. During an easy task, by definition there isn't much cognitive conflict being registered by the brain. That's the essence of something being easy to understand: there's no cognitive conflict. A very difficult puzzle, on the other hand, can be a real brain breaker, as they say. This is one of the reasons why [humans in general are averse to effort](#). Given the choice, we naturally tend to prefer leisure over labor.

Third, [self-control failure is less likely to occur during tasks we choose to do ourselves](#). This is consistent with an abundance of psychological research showing autonomy is a key driver of intrinsic motivation and overall happiness. Think about reading a book you want to read compared to reading a book you have to read for work or school. A good book, even if it's not a simple one, can keep you engaged for hours on end, whereas it can be a struggle to even get to the next page of a boring book you have to read. Self-control only fails us during have-to tasks, not during want-to tasks.

Fourth, [our self-control is intricately tied to our wellbeing](#). People report greater self-control when they're happy and less when they feel poorly. The reason our attention shifts to something else is because our current attention is focused on something insufficiently rewarding: the purpose of the shift is to make us happier. Thus, [positive emotions increase our willingness to consume healthy foods](#), whereas [negative feelings stimulate us to consume comfort foods in a dose-response manner](#). If there is something that 'depletes' during task fatigue, it's our happiness, so feeling good provides you with a buffer against ego depletion.

Lastly, remember scientists thought glucose was our willpower reserve because drinking sugar improved self-control, but it turned out artificially sweetened drinks had the same effect? You don't even need to actually drink the sugary beverage for it to improve your self-control: just rinsing it in your mouth is sufficient to improve your self-control [1, 2, 3, 4]. [A carbohydrate mouth rinse can even improve endurance](#)

[exercise performance](#) [2]. In fact, [one study](#) found that actual glucose consumption *decreased* cognitive performance compared to an artificially sweetened placebo. Digestion of energy isn't required, because self-control failure is psychological in nature. It's the pleasure of the sweet taste, not the sugar's metabolic effects, that gives your brain a boost in how long it can ward off the shift of your attention.

➤ Lecture [optional]

[Is willpower limited?](#)

The goal of losing fat is exclusively a goal from the rational and deliberate part of your brain, system 2: you have formulated this goal consciously and deliberately. The more primitive part of your brain, system 1, is never motivated to lose fat, because it has no foresight. It sure has a concept of tasty ice cream though. System 1 just registers hunger and the pleasure of eating. So dieting, like virtually any type of investment into the future, poses an inherent conflict between systems 1 and 2 in our brain. Only as long as your rational system 2 can override system 1, can you deliberately choose to eat only foods that are in line with your diet. You could even choose not to eat any food at all.

Since consciously restricting your food choices is essentially a battle of willpower, many people see dieting as a period of suffering they must endure to achieve their desired physique. Discipline is regarded as the key to success: you must push yourself through these periods. When you stumble, you must double up on your efforts and be stricter. Research, however, finds [self-restraint does not significantly improve weight loss success and the degree of restraint doesn't matter](#). Just look around you to see how successful the traditional disciplinary approach is. [Over 2 out of 3 people in the US are overweight and over 1 in 3 is obese](#). Even with help, most people don't lose

more than a few percent of their bodyweight after years of dieting. And then [the majority of people gain back most of the weight they lost over time](#) (the yo-yo effect).

Part of the rationale for the disciplinary approach to fat loss is the idea that your willpower is like a muscle and gets stronger over time as it is taxed. Yet as we discussed, this idea is fundamentally wrong. There is no ‘willpower tissue’ that you can make stronger. Nor do you need to. Your willpower capacity is not limited. Instead, self-control failure during dieting occurs when your brain perceives your current goals to be insufficiently rewarding relative to their required efforts. Your attention then shifts from system 2’s goals to those of system 1, which invariably result in greater instant gratification. It’s not like your ‘brain fuel’ has run out: your brain has just shifted your priorities. Your inner emotional elephant takes the rational rider’s reins into its own... trunk. As a result, you choose to eat the want-to pizza instead of the have-to salad.

Unfortunately, relying on sheer will to prevent yourself from eating is bound to fail eventually, because your body has homeostatic mechanisms in place to prevent starvation. Specifically, [fat mass has a negative feedback loop to your appetite via various mechanisms](#), including directly by secreting leptin. Leptin is an appetite suppressing hormone. So the less fat mass you have, the less leptin you produce, and the greater your appetite. Appetite is a potent system 1 sensation, so as you get leaner, it becomes progressively harder for system 2 to keep suppressing system 1. We feel this cognitive conflict between our inner rational rider and emotional elephant as mental fatigue and unhappiness. These [negative feelings motivate us to self-medicate on comfort foods to make us feel better](#). As a result, [exerting willpower increases the chance we’ll later deviate from our diet](#). For example, [people that try to control their emotions while watching a movie subsequently snack more ice cream during other tasks](#). In other words, as our inner rational rider forces our inner elephant not to eat what it wants, it becomes progressively more unhappier, until eventually it becomes

impossible to control the reigns. Some people can maintain control for longer than others, but everyone has a breaking point. Even if you can maintain control, it's not a pleasant way to diet, as the conflict between systems I and II makes you feel unhappy.

How do we prevent self-control failure? Well, in a laboratory, researchers can put a magnetic prod near the right part of your brain. This device creates a magnetic field that sends an electrical current to your prefrontal cortex, the part of your brain that governs self-control, your system II. It sounds like science fiction, but it works. This method, called [transcranial magnetic stimulation \(TMS\), can reduce energy intake, appetite, cravings and snacking behavior](#). It's currently not available or practically usable for consumers, but it illustrates that the challenge with dieting is essentially staying rational. If we could engage system II more, dieting would simply be a matter of choice without any internal conflict.

So our dieting mindset should not be to grind ourselves through every day. You will need self-control many times, but it should be a last resort. Rather than double up on your willpower efforts, your goal should be to minimize the amount of willpower you need to stay on your diet.

One vital dieting skill to minimize your reliance on willpower is appetite management. Of the many predictors of diet attrition in research, [hunger is the primary reason diets fail \[2\]](#). Even a seemingly psychological problem like [binge eating is predicted well simply by hunger](#). [Comparison of unsuccessful with successful weight losers \(the only time it's great to be a loser\) shows that successful dieters were less hungry during the diet](#). [Meal satisfaction is also strongly related to fullness, especially for men](#). Hunger is a primary stimulus of system 1, so the hungrier you are, the more difficult it is for system 2 to stay in control. [Hunger increases negative emotions and decreases positive emotions](#), hence the saying people get 'hangry'. This affects not only your

direct ability to resist the temptation of food, it also reduces your overall self-control. [Hunger has also been found to affect strength training performance](#). So make sure you've mastered the appetite management strategies from the ad libitum dieting topic.

Realizing that willpower is not a limited resource but rather a shifting in goals due to lack of instant gratification has many more implications for how to live a fit lifestyle.

Exercising when fatigued

Common wisdom holds that it may not be a good idea to exercise after work when you feel fatigued or already 'willpower depleted' as this will only further deplete your willpower and leave you even more prone to overeating than you already were after a long day at work. (For the effects of mental fatigue on exercise performance, see the topic on periodization.)

Based on the modern findings on willpower, such a mentally fatigued state is the perfect moment to exercise. Since willpower isn't limited and the real issue is in essence boredom, immersing yourself in a different kind of activity is exactly what you need to rid yourself of the mental fatigue. Exercise in particular is very effective at normalizing your mental state, similar to meditation or a computer's 'reset' button. As such, [exercising in a mentally fatigued state prevents rather than aggravates overeating](#).

A trick to get rid of mental fatigue

Exercise can effectively rid you of mental fatigue, but of course you can't always go hit the gym whenever you're bored or tired. Fortunately, for other situations we can replicate some of the arousing effects of exercise with something else that's surprisingly effective: cold showers.

Yes, a cold shower is probably the last thing you want to take when you're not feeling well. But if you can muster the strength – or better yet, build a habit – to take a cold shower whenever you're feeling mentally drained, the benefits are immediate.

“Exposure to cold is known to activate the sympathetic nervous system and increase the blood level of beta-endorphin and noradrenaline and to increase synaptic release of noradrenaline in the brain as well.” [Pilot research has demonstrated anti-depressive effects of cold showers](#) and [hydrotherapy in general is an ancient and now evidence-based therapy for a wide range of problems](#), but the effects are really so obvious that you shouldn't need research to tell you what happens when you take a cold shower: no matter how drained you felt beforehand, afterwards you feel energetic. While the internet abounds with talk of seemingly magical properties of cold showers, the energizing effect is most likely purely psychological. And that's all you need.

If cold showers are too hardcore for you, you can also get rid of mental fatigue by almost anything that makes you feel good. Remember: the problem at its core is lack of instant gratification, so you need to have things in your life that bring you joy other than food. This is where being a nutrition coach for someone merges into lifestyle coaching, as often excessive feelings of mental fatigue are more related to an overall unsatisfactory lifestyle than someone's diet.

Dealing with overeating during a diet

The most common situation where 'willpower' fails is when trying to diet by relying purely on discipline. Most people think dieting is supposed to suck and the way forward is iron discipline and willpower. This couldn't be more ineffective, evidently. Most people just end up being a time bomb ticking towards the next binge.

Willpower is overrated. Planning beats willpower any day. This brings us back to the best types of plans you can make: implementation intentions. We'll discuss

implementation intentions in more detail later, but in short, they're lifestyle rules: if X, I will do Y. [Implementation intentions are even more effective than motivation to increase exercise participation.](#)

More generally, [people have only a limited ability to change their core personality traits, so you are better off learning to cope with your personality by forming implementation intentions.](#)

The same holds for self-restraint: don't focus on trying to improve your self-restraint, because it's not limited in the first place. Rather, learn to deal with your psychology and prevent your attention from shifting to food.

The key to success lies in specificity and concreteness. That's why implementation intentions are so effective: they are practical. And that's why most motivational talks are so ineffective: they're vague and don't specify which behaviors exactly should be changed.

Here's a more practical framework to help prevent overeating during a diet.

- 1. Identify the situations in which overeating occurred.**

Simply doing this often solves the problem already, as the solution becomes readily apparent.

- 2. Determine the drive to overeat.**

The following categories are useful.

- a. Hunger.
- b. Self-medication. This includes boredom, stress related eating and most kinds of 'decision fatigue'.
- c. Mindless eating.

3. Provide concrete, specific advice on how to deal with this problem in the future, preferably implementation intentions.

The solution should aim to achieve the following.

- a. Hunger: make the diet more satiating and implement appetite control (discussed in the topic on *ad libitum* dieting).
- b. Self-medication: increase wellbeing and incorporate task breaks to prevent attention from shifting to food.
- c. Mindless eating: planning, e.g. not eating in front of the TV.

Case study: dealing with overeating

As an example of how to implement the above framework, here's the exact exchange between Menno and one of his clients. Menno asked the client to identify exactly during which situations the client was overeating and list them.

Client: 1. I've gone over my allowed calories a couple times after very long days and stopped to get something quick rather than prepare a meal at home.

Menno: The solution here is planning. It's good to prepare your food in bulk so that many meals are already available and just have to be reheated/finished/grabbed from the fridge. This also saves a ton of time compared to preparing each meal on the spot. I also like to have some extremely convenient back-up meals available at all times. I personally, for example, in my current situation always have a few cans of either mussels, low fat cheese or smoked turkey and gherkins available that I can eat with minimal prep (tip: sucralose sweetener in traditional mustard sauce makes low-calorie honey mustard sauce).

Client: 2. I've had times eating too much out of boredom on weekends.

Menno: This one's trickier, as the solution is to increase your wellbeing in other ways. Boredom eating is essentially self-medication. I find it helps to have [zero/low-calorie snacks](#) available. Coffee's a common one that's nice, as it's hot, which helps with satiety as well, but you can also make great low kcal fruit flavored gelatins and an awesome granita with diet 7-Up, a bit of lemon juice and fresh mint leaves that you freeze.

The best macros for adherence

In several of the studies from the section above explaining most negative effects of dieting are psychological, the macronutrient ratio of the diet was also manipulated. There was no effect in any of the studies on the participants felt or mentally performed. This is in agreement with much of the literature that the macronutrient composition of your diet will only have a slight, highly situational effect on your brain and mood if you're healthy [1, 2, 3]. [High and low carb diets have similar effects on cognitive functioning](#). [One study](#) found switching from a 41% fat intake to a 25% fat intake resulted in a poorer mood, but since there was no group switching in the opposite direction, it may be that the change in diet rather than the decrease in fat intake per se was the culprit for the adverse mood effects.

[Research has also found that low carb and low-fat diets are equally effective at improving health related quality of life, given the same fat loss](#). It's mostly fat loss, not your diet composition, that improves your health, and as you learned, high and low carb diets are generally equally effective for fat loss for carb-tolerant individuals, given the same total energy and protein intake.

For adherence, low carb diets seem to perform better than higher carb diets, but these effects may largely be the result of higher protein intakes in the lower carbohydrate groups. [A systematic review with a total sample size of 1222 people found that low-carb diets have a significantly better attrition rate \(fewer drop-outs\) than low fat diets](#). [Another meta-analysis by Nordmann et al. \(2016\)](#) compared carbohydrate-restricted diets to fat and energy restricted diets. 6 Months into the diets, the low-carb diets had greater weight loss with a 70% vs. 57% success rate compared to the low-fat diets. At 12 months, there was no significant difference in either measure anymore, though the success rate was still 62% vs 54% in favor of low-carb diets. In non-isocaloric weight loss interventions, [low fat diets also tend to result in poorer](#)

[outcomes than higher fat diets according to a large meta-analysis from 2015 by Tobias et al.](#)

All in all, consuming enough protein and fat seems to be beneficial for adherence and wellbeing. Beyond that the precise macronutrient ratio of the diet doesn't matter much for most people. Any benefits of a specific carb:fat ratio are likely individual, such as in the case of carb intolerance.

Personal preference

Since the exact ratio of carbs to fats often doesn't matter within a certain range, it may seem intuitive to let personal preference decide whether you go higher or lower in carbs.

You'd be wrong. [Allowing people to self-select a low vs. high carb diet based on personal preference does not improve dietary adherence.](#) In fact, [giving people the choice of which diet to follow can reduce weight loss success.](#) [A 2018 meta-analysis](#) looked at all studies in which participants were either put in a certain diet group by the researchers or they were allowed to choose which diet to follow. People that dieted based on their personal preference on average lost significantly **less** weight than people without a choice. Diet attrition rates were similar between groups.

Clinical psychologists have long known that choice is overrated. [Choice of treatment has only a small and inconsistent effect on treatment success in clinical psychology.](#) Difficulty with diet adherence is in essence very similar to most psychological disorders in that they're behavioral problems. The solution to those is to change your behaviors and there can be a substantial difference between what you *prefer* to do and what you *need* to do to improve. People with a strong preference for a certain treatment, such as

a diet, may be more inflexible and unwilling to change. Being unwilling to change means being unwilling to improve. If you keep doing what you're currently doing, you'll keep getting the results you're currently getting. You should focus on the end goal, your ideal physique in the case of a diet, not the means to that end.

There's a good reason why for diet adherence in particular, choice is even less likely to be beneficial than for behavioral therapy in general. [People tend to choose their diets based on which foods they like](#), not the diet characteristics that are best for them. If you love eating starches, a high carb diet may be good for you in the sense that it allows you to keep eating them, but perhaps eating too many starches is exactly your problem. As you learned in the module on ad libitum dieting, palatability is a strong determinant of energy intake: people eat more of foods they enjoy. The key to lose weight for you may then be in large part to learn to reduce your starch intake, not find ways to keep eating it.

In conclusion, most people don't know what's good for them. They may think they should be on a low carb diet because all their friends do paleo or they may think they should be on a high carb diet because the big guy in their gym said you need carbs to fuel your workouts. Unless they've actually tried high and low carb approaches for a prolonged period of time, macronutrient intakes should be optimized first and foremost based on what's likely to work best from them based on nutritional and psychological science, not based merely on their personal preference.

Calorie cycling

The research is quite clear that calorie cycling results in superior or at least equal compliance compared to diets with a constant calorie intake. Depending on which study you look at, [calorie cycling results in greater adherence and higher diet satisfaction](#) [2] or at worst, [the compliance rate is the same as with linear diets](#) [2, 3, 4]. In a year-long study with [2 ~500 kcal PSMF days a week had similar adherence as a continuous ~25% daily energy restriction](#). In fact, [even complete alternate day fasting has an excellent compliance record](#). PSMF days should be much easier than complete fasting, so considering that poorly motivated, overweight individuals in studies can put up with complete fasting quite well, there's no reason why you cannot implement PSMF days.

People are willing to work for something that works. Short periods of aggressive fat loss are well tolerated because they make you feel like you're achieving results rapidly. And when things get tough, nicer meals are only a day away. The main reason people lose motivation on a diet is the constant drag, the feeling there's no end in sight to the food restriction. Adherence is mostly a long-term problem, not an acute one. Calorie cycling can reduce this feeling of endlessness. And in the end, you're consuming the same energy intake over time.

Calorie cycling also aligns well with our intuitions about reward. Eating a lot after your workouts feels right for many people. You've 'deserved' the calories. This provides an incentive structure to go train in the first place. If you go train, you get to eat more. Many people report they sometimes do extra training days so that they get to eat more. As long as total training volume is kept in a reasonable range, that is generally a good thing, definitely preferable compared to a binge episode.

[From an evolutionary point of view, calorie cycling is a much more natural way to diet.](#)

Humans evolved on calorie cycling diets, not meticulously controlled constant daily energy intakes.

Note that calorie cycling and PSMF days should still have consistent meal times, as you learned in the Lifestyle module. [People that eat at consistent times and don't snack throughout the day have significantly more success sustaining their weight loss.](#)

People that eat and snack whenever they feel like it across the day often end up yoyo-dieting.

Start big

Common wisdom tells us to ‘ease into a program’. Start small. Start with a moderate energy intake and gradually reduce it throughout the cut. Gradually build up the training volume.

The opposite often works best. [A 2021 meta-analysis supports that aiming for only small changes generally does not result in significant fat loss, although it can help prevent weight gain](#). If you want to change your physique, start big. [People who lose a lot of fat in the first phase of their diet often lose more fat and are better at sustaining their weight loss than people who use a more gradual diet strategy \[2, 3\]](#). The rapid initial results foster faith in the process and self-efficacy.

Starting big also reduces the perception of effort compared to starting small. This counter-intuitive finding is explained by psychophysics, specifically [range-frequency theory](#). This theory explains how we perceive magnitude: how big something appears, how painful a set of squats is or how much money \$5 is. Without going into the mathematics, which are needlessly complicated (but profoundly awesome if you’re interested in psychophysics), RFT shows that we rate magnitudes as their rank order in a comparable reference set from our memory. The key point is that we don’t perceive magnitude directly but rather we see it relative to our mental comparison set.

For example, [range-frequency theory explains what level of muscularity and BMI we prefer](#). How muscular or lean we find an individual depends on where that individual fits in our mental reference set. For an obese individual who has only obese friends, a moderately overweight individual can appear slim. For someone neck deep in the bodybuilding community, anyone without abs may appear fat and it may be hard to even tell the difference between the different classifications of obesity. You may have experienced this yourself when talking to people who don’t even lift. A classic is the

older family member who always tells you “I used to look like that.” and doesn’t realize you’ve gained 20 lb. of muscle since the first time he said that.

Range-frequency theory also explains why it’s so hard to gauge if someone may be natural or not if you’re natural yourself: you have no good reference of such a high level of muscularity. You see a modern fitness model and you just know they’re big but not Ronnie Coleman big. Only when you look at the objective data do you realize they’re in fact bigger than many of the early Mr. Olympia winners.

Another example: [the same total amount of pain is perceived to be less if you start big compared to starting small](#). You can easily verify this for yourself by taking a cold shower. If you start off with nice, warm water, every time you turn down the temperature even a little, you immediately feel it. By the time the water’s lukewarm, you’re already cold. You’ll be shivering by the time the water’s truly cold. In contrast, if you step under an ice-cold shower, you experience a shock, but you gradually get used to it and many people then have no problem standing under it for several minutes.

So when dieting, if you start with a moderate deficit and you progressively increase it, every decrease in energy intake will be felt harshly, because it’s always the highest point in the reference set. Whereas if you start big, things only get better.

Intuitively, starting small puts you in the mindset that “It’s only ever going to get worse.” whereas starting big uses the initially high motivation to achieve great results, making the rest of the program seem relatively tolerable.

There is a caveat to starting big. It specifically works for effortful tasks, not for behavioral change. Coping with a severe diet or tolerating a high training volume are

good examples of effortful tasks. The key here is to manipulate how difficult these things appear, not how to do them.

When it comes to more complex behavioral change, like teaching people how to change their food choices, to stop smoking or how to log their macros, a more moderate approach is warranted. [There is an optimum level of behavioral changes you can ask from a person.](#) If you ask too little, you patronize them and induce the Pygmalion Effect. If you ask too much, you overwhelm them and they won't be able to cope. The optimum level of behavioral changes depends on someone's motivation level. The more motivated they are, the more things they can change at once.

Most people thus do not fare best when overloaded with new information and tasks at the start.

On the other hand, even for people with very little motivation, it's still not the case that 'one step at a time' works best. [It's better to change someone's dietary and exercise habits at the same time than to try to focus on just one aspect of the fitness lifestyle at a time.](#)

Since someone's motivation level determines the amount of behavioral change they can successfully achieve at any time, we need to understand the psychology of human motivation.

Goal setting

Common wisdom says goals help you stay focused and increase motivation. A 300-pound bench press, 10% body fat, looking like Michelle Lewin, many people have concrete goals. But do these goals help?

Psychologists call these kinds of goals ‘goal intentions’: you have the intention to achieve something. The problem with these goals is that’s all they are: desire. They’re empty. Everybody wants everything. Every guy would probably like a harem with 10 Victoria’s Secret models, a pet dragon and an office in the White House. Maybe you’re a proponent of never giving up on your dreams, but dreams are exactly what these are. The problem with goals is that they don’t have to be realistic. Even if they are realistic, they are just the expression of desire. In economic terms, they are a wanted benefit, but they are missing the second component of any rational choice: the cost. And even if the goal is a result of a deliberate cost-benefit analysis, they are often not actionable. If something is not actionable, it doesn’t change your behavior. And if something doesn’t change your behavior, what’s the point? It’s just neural activity in your brain with no effect on the world. Take fat loss, for example. [There is no relation between people’s weight loss goals and how much weight loss they thereafter actually achieve](#), according to a meta-analysis of the literature on weight loss goals.

Unrealistic goals can even backfire: in a minority of studies, [the more ambitious someone’s weight loss goals, the less likely they are to stick with the diet](#) [2].

Unrealistic goals may reduce satisfaction with your achievements. Moreover, [thinking about outcome goals can undermine goal pursuit by reducing presence](#). When you’re focused on a future goal, you lose presence in the now and you often enjoy the activity less, which over time reduces motivation to do what you have to do to achieve the goal. Think of running a marathon while you’re constantly thinking of the distance to

the finish line. Or staring at a clock in the waiting room for your dentist appointment: it seems to make time go by slower, not faster.

To achieve change, we don't just need goals or intentions. We need action. [A 2022 meta-analysis on goal setting in athletes](#) found that process-oriented goals were the most effective type of goals, followed by competition-oriented goals (here called performance goals), whereas outcome-focused goals did not improve performance. Moreover, only short-term goals improved performance; long-term goals did not, presumably because the short-term goals were more actionable. So [rather than set goal intentions, psychologists have come up with a much more successful way to achieve our goals: implementation intentions](#). Implementation intentions are rules you create for yourself in the format of: if situation X arises, I will perform action Y. For example, "Straight after I leave the office, I'll go to the gym." Implementation intentions have a similar structure to habits: a cue triggers a behavior. Mentally, implementation intentions are comparable to an implanted habit and their strength is similar in nature. The benefit of forming an association between the trigger situation and the behavior is that your brain's associative system 1 can help store the information. You're then no longer reliant on conscious thought to execute the behavior. When the situation arises, it triggers the association with the behavior, reminding you of your intention. Moreover, your intention is now the default option in your mind, meaning that without further deliberation, you'll do it without requiring self-control.

In other words, implementation intentions are action plans. They're informally sometimes also known as 'action triggers'. Their strength lies in being 100% actionable. They are specific and they are concrete. [Implementation intentions are significantly more effective than goal intentions to achieve a wide range of goals, including dieting, exercising and stopping procrastination](#). Implementation intentions are also far more effective than the traditional approach to focus on motivation. For

example, according to one study, [having people make implementation intentions to exercise is almost 3 times as effective as instructing people of the benefits of exercise](#).

Implementation intentions are similar to the highly popular SMART goals, which are goals that are Specific, Measurable, Action-oriented, Realistic and Time-bound.

SMART goals may sound, well, smart, but it's mostly just a catchy acronym with [poor scientific support as a method to stimulate behavior change](#). Implementation goals are more evidence-based.

When making implementation intentions, you shouldn't ignore the 'why'. Traditionally, implementation intentions centered only on the when, where and how of a behavior. Modern research has found that for complex behavior change, including changing your diet, [it's important to not only have an action plan but also know the reason for it](#). For example, understanding why strength training, not cardio, is the ticket to most people's dream physique has fueled the 'strong, not skinny' revolution of the past years. Similarly, understanding how fat loss is governed by energy balance is highly helpful to decide which foods are worth it and make better food choices.

So whenever you have a goal (intention), turn it into an implementation intention. Specify the when, where, how and why. Take for example the following goal: "I'm going to take better care of myself." Good for you, but this is a rather useless goal intention. You'll still have to rely on your willpower to make the decisions that will make you better off. Instead, you should use implementation intentions that specify your action plan in detail. For example, if you're prone to miss breakfast at home and end up getting calorie bomb sandwiches and 400-Calorie Starbucks coffees on the go, here's an implementation intention to improve your breakfast. "I will set my alarm at 06:00 h daily. After my morning shower, I'll mix a pack of Greek yogurt with half a pack of mixed berries with sweetener to have for breakfast." Let's say your exercise adherence

could also use a boost. You sometimes have to work late and then you have to rush home for dinner with the family without any time left to get to the gym. In that case, you could add another implementation intention: “On Sunday, Tuesday and Thursday evening I’ll pack my gym bag so that on Monday, Wednesday and Friday morning after breakfast, I can go straight to the gym in time before work.”

We’ve previously discussed why meal planning is so successful at promoting diet adherence. Meal planning is essentially an extensive implementation intention. [Using implementation intentions while dieting has been found to double weight loss compared to group counseling and increase fruit and vegetable consumption by over 50% \[2\]](#). A meal plan specifies exactly the what (the food ingredients), when and where (the day and time), how (the recipe) and why (it fits your macros or diet principles) of your diet.

For best effect, combine implementation intentions with visualization. In the above breakfast example, picture yourself waking up and having breakfast in vivid detail, like a movie. In which cupboard is the bowl? What’s the brand of Greek yogurt you buy? Things you forget to prepare will show up as missing details. For example, you may realize during the visualization you normally only turn on the dishwasher when you go to work, so there won’t be a clean bowl unless you also get into the habit of activating the dishwasher at night before you go to bed. The vivid details from visualization help you nail down the specificity you need in your implementation intentions to achieve your goals.

What implementation intentions will not help you do is give you long-term direction, but for this too traditional goal intentions are not ideal.

Performance goals vs. a growth mindset

Traditional goals are called performance goals. A double bodyweight squat, fitting in size 6 clothing, they are concrete achievements. The problem with them is again that they're not realistic or directly actionable. If you're 5'5" and you want to be the next Michael Jordan, good luck! Performance goals are ego motivated. It is no more than the expression of a desire. These goals are empty. Everyone wants these things, some people just more than others. People with such a goal will be willing to do something for it, but as soon as things get hard and they start failing – and everyone fails in fitness – they lose motivation. They're focused on the endpoint and failure makes you lose sight of that.

Being motivated only by how well you're fulfilling your performance goals is particularly problematic when it comes to fat loss, because [people tend to have unrealistic expectations of how much fat they can lose in a short time](#) [2, 3].

It's much better to focus on improving yourself than to work towards some arbitrary endpoint. Psychologists call this a growth mindset: this perspective [focuses on the process and self-improvement rather than the endpoint](#). 'The joy is in the journey'. A popular version of the growth mindset in sports is [coach John Wooden's success rule: "Do your best to become the best you are capable of becoming"](#). [A wide range of studies in academics, sports and the corporate world show that people with a growth mindset outperform people with performance goals](#) [2, 3, 4]. Specifically relevant to gym goers is that [performance goals and other forms of extrinsic motivation to exercise do not predict how often people are actually willing to go to the gym, whereas intrinsic goals do significantly predict gym attendance](#).

Moreover, [when you're focused on the future goal, you lose 'presence' in the now and you enjoy the activity less, which over time reduces motivation](#).

Your mindset also influences your success by affecting how your diet adherence changes after your training sessions. [People that perceive their workouts as 'chores' they need to perform in order to get to their goals are more likely to 'reward' themselves with snacks afterwards and tend to eat more than people that perceived the activity as fun.](#) Now, heavy strength training isn't really 'fun' in the traditional sense. 'Fulfilling' is arguably a more appropriate term. However, with a growth mindset you don't need to view your training sessions as anything: it's a routine in your lifestyle.

Flexible dieting

Many people think maintaining a muscular, sixpack lean physique year-round requires active suffering, an enormous amount of discipline and a rigidly controlled lifestyle. There is truth to this in the sense that a lot of planning, experience and hard work in the gym are invariably required for a person with average genetics to achieve the body of their dreams. However, the idea that successful dieters have a robotically rigid approach to their nutrition is completely wrong. Research finds [that flexible control, not rigidity, is predictive of successful fat loss and diet satisfaction](#) [2, 3, 4]. [People with a rigid, all-or-nothing mindset often end up yoyo-dieting, regaining any fat they lost.](#)

Emphasis on flexible **control**. Flexibility here does not mean you eat whatever you want, whenever you want. [Excessive flexibility predicts poor diet adherence](#). That's how people get fat. They don't have a plan and just eat. In our times of abundance and highly caloric processed food, our ancestral drive to eat whatever's readily available to prevent starvation can rapidly result in overshooting our energy requirements. Voila, an obesity epidemic.

So control is needed. [Research has categorized dietary control into 2 styles: rigid and flexible control](#). The styles are not necessarily mutually exclusive or even strictly opposites on the same continuum, but they provide a useful framework of thought.

To understand the difference between the 2 forms of control, it is crucial to first understand the difference between control itself and the attitude towards this control. Control of a diet generally comes in one of the following 2 forms.

1. Restriction of food choices. Paleo diets, for example, typically limit non-paleo foods like dairy and bread.

2. Restriction of macronutrient intake. You have a schedule to eat X grams of fat, Y grams of carbohydrate and Z grams of protein planned for every meal of the day. A simpler version is only prescribing daily totals or only prescribing a total calorie intake, not an intake for each individual macronutrient. For example, during a typical if-it-fits-your-macros (IIFYM) diet, someone has a daily target intake of fat, carbohydrate, protein and as a result total calorie intake. Weightwatchers is a modified/simplified form of this with 'points' rather than 'calories' that you track.

Fully rigid control is characterized by high disinhibition, restraint and dichotomous thinking. This means you see foods outside of your planned diet as 'bad' and other foods as 'good'. You never eat the bad foods, only the good foods. This is all-or-nothing. If your diet says you can't eat gluten, you also cannot drink normal beer or dip your sushi into soy sauce with trace elements of wheat. If your diet specifies macronutrient targets, you have to hit those regardless of whether you have a family dinner, a business lunch or you're having a meal by yourself at home. You have to abide by the rules of the diet. No exceptions.

The other mindset has flexible control. With this view, the prescriptions of the diet are seen as guidelines or targets, not do-or-die rules to live by. Disinhibition and restraint are low, meaning you accept 'diet failure' when it just so happens to pan out. For example, [research by Smith et al. \(1999\)](#) found that a successful form of flexible calorie control is to set a daily quota or 'budget' of calories, but when you exceed your target, there is no need to despair or need to aggressively compensate for it afterwards: just continue with your diet as planned the next day and focus on the long run.

People with a flexible diet control strategy have been found to be more successful, at least in the long run, than people with a rigid diet control strategy to get and stay lean. Moreover, [high dietary restraint is associated with binge eating and eating disorders \[2\]](#).

As an example of a rigid dieting mindset, [one study investigated how not being allowed to eat bread affected diet adherence](#). Turning bread into a forbidden fruit (no pun intended) increased the diet drop-out rate by over 3-fold compared to an otherwise identical diet with bread on the menu. These results are particularly striking considering bread is not exactly a good fat loss food. Bread is quite caloric and not very satiating, so it's very easy to overeat on bread. Many people have noticed it's easier to get lean when not eating bread, which is the main reason for the whole 'Wheat Belly' craze a few years ago and many people's positive experience with paleo and keto diets. There is 1 crucial difference between these diets and the no-bread diet group: choice. *Choosing* not to eat bread instead of not being *allowed* to eat bread makes all the difference. One is a rigid dieting mindset with poor chances of success. The other is deliberate, goal-directed behavior.

Another example of a rigid control mindset is the 'clean eating' practice of bodybuilders. Many bodybuilders have been taught that their diet for a physique competition should consist of nothing but unseasoned white rice, chicken breast, broccoli and oatmeal without dairy. This can be an effective way to keep hunger at bay: you forego the pleasure of eating for the sake of having a simple but effective diet. Food becomes nothing but fuel. In the long run, however, this mindset almost inevitably backfires. Just look at the unhinged binge eating episodes that typically occur in the evening and days after a physique competition. Like most rigid diet control strategies, 'clean eating' has short term effectiveness. It is generally only somewhat sustainable as a lifestyle for pro bodybuilders who literally make bodybuilding their life.

The positive findings on flexible control have led the more evidence-based fitness community to embrace ‘flexible dieting’ as the ideal dieting method. While this is certainly a major improvement over the ‘clean eating’ days, the name ‘flexible dieting’ misrepresents the underlying psychological science. The flexibility in flexible control refers to the mindset of the dieter, not the diet itself. It is crucial to distinguish between the extent of control in the diet and the individual dieter’s attitude towards this control.

- The extent of control is an objective characteristic of the diet: a more controlled diet has a more detailed specification of the macronutritional targets to hit or it limits more food choices.
- In contrast to the objective nature of the diet’s restrictions, flexible control refers to someone’s subjective attitude towards the diet’s restrictions: their dieting mindset.

Your mindset is the more important issue. [The relation between restrained eating, rigid control and difficulty with maintaining weight loss is fully mediated by dichotomous thinking](#). That means it is not the restrictions of the diet itself but the all-or-nothing approach to dieting and the black-or-white view of food as either ‘good’ or ‘bad’ that is the problem. When you can keep the big picture of the diet in perspective, notably long-term energy balance, control is not a bad thing. If you want to get sixpack lean, a considerable amount of control *will* be required. [Not having any food restrictions for yourself is associated with unhealthier food choices and higher self-selected energy intakes](#). [A 2019 systematic review strongly supports that people that don’t cut out unhealthy food choices from their diet often have great difficulty maintaining their weight loss](#), whereas fruit and vegetable consumption is strongly predictive of sustainable weight loss. This shouldn’t come as a shock to anyone but the most misguided IIFYM proponent, but healthy diets make fat loss much easier. The problems arise when dietary control turns into obsession.

A flexible mindset teaches you that your diet is a tool, not the goal. You shouldn't blindly follow your diet when it's not contributing to your goals. For example, many people that 'do flexible dieting' try to hit their daily macros with very high precision. If they haven't hit their macros by the end of the day, they force-feed to make sure they hit their macros. The very point of the diet is to reduce energy intake, so force-feeding is practically always counterproductive in the short-term, as it increases energy intake, as well as in the long term, as it reduces your ability to intuitively stop eating when you're fully. Similarly, if you always compensate for overeating one day by undereating the next, that is not a flexible control mindset. The flexible solution is, again, to proceed as planned and focus on the long run. The term flexible dieting puts the emphasis on the diet and this creates the opposite of a flexible control mindset.

Tangentially, excessive focus on the rules instead of the underlying principles to achieve a goal is also the fundamental problem of bureaucracy. We get lost in the system when we start enforcing rules without remembering what they're there for.

You'll also need *psychological* flexibility rather than diet flexibility when things don't go as planned. Life has a way of messing up your neat diet plans. A common problem is how to deal with social eating events when you can't track your macros. These situations often lead to panic rather than enjoyment in engrained calorie-trackers. [A flexible mindset significantly improves coping success in unfamiliar situations](#). We'll get to concrete tips on how to deal with 'cheat meals' later.

First, to adopt a flexible control mindset, here are several concrete tips.

Diet tip: Failure is a learning experience

Whenever you deviate from your diet or training plan, don't focus on its failure. Consider it a learning experience. Reflect on why you failed. What does this teach you that you can change in the future?

For example, if you find yourself often skipping workouts after dinner because you're too tired, you may be inclined to think: "I was weak, but I'll put in more effort and tomorrow I'll work out for sure." That's a nice thought, but it's not a plan and more importantly, it doesn't change that you'll end up in this same scenario again in the future. Instead, you'll probably be better off training straight after work before you've gone home and had dinner.

Diet tip: Adopt a sustainable lifestyle perspective

Think of the long term. If you exceeded your planned calorie target for the day, focusing on what you can learn from this is more important than correcting the damage immediately. Correcting the damage is great if you can make it work with low effort, but don't let it disrupt your routines, habits and meal plan. If you already prepped food for the coming days, stick with the plan. It's often risky and not worth the effort to revisit the plan.

The use of cardio is also something to consider with a lifestyle perspective. If you rely on cardio to get lean, is it something you enjoy, something you're going to continue doing for the rest of your life? If not, how are you going to stay lean?

This goes for everything you do in your diet. Don't think of its short-term use. Think of whether it fits into a sustainable lifestyle.

Diet tip: View your calories as a budget

Think of your calories as money. You get a certain number of calories every day: your energy expenditure plus/minus your desired energy deficit or surplus. You can spend these calories on foods you like at your discretion, or you can invest in the future (fat loss). Over the long run, you can't keep accumulating debt, as you'd get fat. A good diet that makes you happy involves making smart consumption and investment decisions.

Diet tip: You don't always have to spend everything

Many people that learned to track their macros fall into this trap: tunnel vision on hitting their macros. It's rarely ever problematic to undereat when your goal is fat loss. If you're full and you got your protein and essential nutrients in for the day, stop eating, at least if you're trying to lose fat. This generally doesn't apply to a bulk where you're trying to put on weight. When you're trying to lose fat, you should take any 'free deficit' you can get. Very few people systematically undereat and if this happens, you'll notice it soon enough and you can correct for it then. [Learning to eat intuitively and to stop eating when you're satiated is a strong predictor of diet adherence, maintenance of a lower body fat level and higher wellbeing. Intuitive eating is an even better predictor of diet adherence and wellbeing than a flexible mindset.](#) Force-feeding yourself to hit your daily targets is thus a very bad habit to get into.

Diet tip: Think outside the lunchbox

Menno: "When I worked at a client as a business consultant, I always brought my own lunch and it was generally a hot meal, such as this [chicken in Asian sweet-sour sauce](#) or this [Tex-Mex bowl](#). Having a big plate of warm food for lunch, especially exotic recipes by Dutch standards, was considered highly irregular, not to say frowned upon, by many of my colleagues. It also required asking the cafeteria staff to heat up my meal

without me ordering anything. (Most cafeterias, like hotels, provide mediocre food with above market prices, as they rely on their convenience and you not having any alternative.) Doing these kinds of things often doesn't feel right. There is something that prevents us from acting out of order, from not fitting in."

That feeling is conformism. It's the same feeling why you may be hesitant to eat a full carton of eggs because it's "just too much" and why you may be reluctant to videotape yourself in the gym to evaluate your exercise technique because "what will others think?". Conformism is the feeling that prevents us from deviating from social norms, from being different, even if we have good reason to be different. It is the social glue that turns groups of individuals into a herd.

Do you know that feeling?

Screw that feeling. If you spend your life acting like the average person, you will look like the average person, which in most societies these days means being overweight.

Food cravings

A successful flexible dieting mindset is not the same as thinking you can eat whatever you want in moderation. To understand why, we have to delve into the psychology of cravings. A food craving is formally defined as “[an intense desire to consume a particular food \(or type of food\) that is difficult to resist](#)”. You just *need* to have those pancakes. Everyone is familiar with cravings and few people doubt the existence of cravings for specific foods.

Why you get food cravings is much more controversial. A common theory is that you crave certain foods because your body registers you need their nutrients. When you're hungry, this theory may sound like a solid argument to give in to your urge to eat that chocolate, but how good is our intuition really at selecting the foods we need?

[Sodium deficiency indeed tends to increase our cravings for salty food because salt contains a lot of sodium](#). However, sodium is an exceptionally tightly controlled micronutrient in the human body and still salt cravings are not necessarily indicative of sodium deficiency. For example, [men experience more cravings for salty food than women, yet they don't have higher rates of sodium deficiency](#). In fact, [a preference for salty food also commonly results from habitual salt consumption](#), causing excessive sodium consumption. Sodium deficiency is exceptionally rare, much more rare than excessive sodium intake in modern societies. So if you experience a craving for French fries, it's quite unlikely that's because your body knows it will thrive on its nutritional value. Moreover, our intuitive consumption of salt does not increase when we actually need more of it. [The intuitive salt intake of athletes has no relation with their sodium losses during exercise. Athletes that actually need a lot of sodium are thus at significant risk of sodium deficiency \(hyponatremia\)](#).

Many other micronutrient deficiencies don't alter our appetite and [trace mineral deficiencies, such as zinc deficiency, often cause a loss of appetite](#), not an increase [2].

[Even extreme cases like pica, which is a disorder where people eat earth and dirt, do not seem to be consistently associated with mineral deficiencies or cured by them.](#)

While it may seem plausible that these individuals crave substances like earth because it contains minerals they're deficient in, the cravings are often for non-nutritive substances that don't contain the micronutrients they're deficient in, [such as ice in the case of iron deficiency](#). [Pica is also commonly associated with mental retardation](#). So strong cravings for ice – we're talking bricks of frozen water here, not Ben & Jerry's – are probably better thought of as a [psychiatric symptom of iron deficiency](#) than an evolutionary adaptive, functional behavior.

So no, our cravings are generally not caused by some inner sense in our body that knows we nutritionally need these foods. This idea is often nothing more than a rationalization to justify to ourselves why we're allowed to indulge.

Our bodies have not evolved miraculous nutrient sensors attuned to our nutritional status. Our bodies have mostly just evolved to eat everything that's available. We are not very selective. Actually, that's not true. We are selective but in the completely opposite direction of nutritious food: we are wired to prefer high calorie foods, which in modern times tend to be very low in nutrients. We evolved on whole food diets that were naturally nutritious. Throughout evolution, there has been little need to crave nutritious foods, because all foods available to us were nutritious. Rather, any evolution that has taken place has generally been in the direction of our body accommodating our environment's food availability, such as the development of lactose, alcohol and wheat tolerance, not our body trying to change our diet. We did not evolve a sophisticated appetite regulation that allowed us to select foods rich in zinc or

molybdenum when needed. We evolved to eat enough of whatever was available to prevent death by starvation.

To see which type of foods we do crave, researchers have developed the [Food-Craving Inventory \(FCI\)](#). The FCI has uncovered 3 key dimensions of food that make it crave-worthy: a high fat content, a high carbohydrate content and a sweet taste. Cognitive neurosciences confirm that [high-carbohydrate, high-fat foods result in the greatest activation of our brain's reward pathways](#). If you think about it, these findings are obvious. When is the last time you heard someone say: “God, I’m just dying for some asparagus right now.”?

No, we don’t crave nutritious foods. Food manufacturers understand very well what makes our taste receptors tick: lots of fat, lots of carbs, preferably both. Micronutrients don’t enter into it.

Put simply, we just crave tasty food. That’s why everyone ‘craves’ the same foods. It’s always highly palatable and energy dense food that is rich in carbs or fat, usually both, and the food is almost always sweet or salty; rarely sour, bitter or umami. You simply like certain foods better than others and you want to eat what you like. No mystery, no magical fix.

In line with this sobering idea of food cravings, [science refutes the idea that foods are addictive in the sense addictive drugs are \[2, 3, 4\]](#). [Some scientists argue you can become addicted to the behavior of eating itself, but you cannot become addicted to a particular type of food or even macronutrient \[2\]](#). [Classical addiction syndrome is a pharmacological effect characterized by 3 aspects:](#)

1. Compulsion to seek and take the drug.
2. Loss of control in limiting intake.

3. Emergence of a negative emotional state (dysphoria, anxiety, irritability, etc.) reflecting motivational withdrawal syndrome when access to the drug is prevented.

These effects occur because the drug in question, such as cocaine, sensitizes dopamine pathways in the brain (amongst other effects). Dopamine is the neurotransmitter responsible for the feeling of 'wanting'. The result of this change in brain chemistry is that you develop a strong desire to take the drug and you feel poorly without it. Food doesn't have this effect, or at least any similar effect is trivial compared to that of addictive drugs. Drug addiction also typically causes serotonergic desensitization, causing you to require progressively greater doses to experience the same pleasure as before. With food, people actually tend to like foods that they frequently eat more, not less, and this occurs for all types of foods, including vegetables (discussed in more detail later).

And yes, this includes chocolate. Chocolate addiction is a myth. In scientific experiments, researchers have cleverly manipulated pieces of dark and white chocolate, cacao capsules and placebos to ascertain whether it's the actual chemicals in chocolate, like polyphenols, or just the taste of chocolate that we crave. [Cacao capsules or enriching white chocolate with all the pharmacologically active compounds in chocolate had no effect on the sensation of chocolate craving](#). Only chocolate that looked like dark chocolate reduced chocolate cravings. This demonstrates there are no inherently addictive compounds in chocolate. People just like eating chocolate.

And yes, even chocolate cravings during pregnancy seem to be an entirely psychological effect. [Research has found no support for a role of hormonal changes or nutritional deficiencies during pregnancy on food cravings](#). The severity and frequency of food cravings does not correlate with estradiol or progesterone concentrations and

the foods that are craved are generally not at all rich in the nutrients whose requirements increase during pregnancy. For example, protein requirements increase significantly during pregnancy, but high protein foods like meat are among the most common food aversions during pregnancy. Most pregnant women just crave the same junk foods everyone else likes as well.

Similarly, [peri-menstrual chocolate cravings are not hormonally driven](#). They're a cultural phenomenon that exists almost exclusively in North America, not in many other countries [like Spain](#). If you'd tell someone from Spain that your menstrual cycle gives you chocolate cravings, they'd probably look at you like you're loco loco, chica.

Rather, scientists have concluded that pregnancy seems to function as a good excuse to indulge in tasty and highly caloric foods, because weight gain during pregnancy is deemed socially acceptable, even suggestive of being a good mother sometimes. The specific foods that are craved are largely culturally determined. In the US, pregnant women typically crave sweets and chocolate, yet in Egypt chocolate cravings are almost unheard of. In Japan, pregnant women typically crave rice, whereas Indo-Ceylon women commonly develop an aversion to rice during pregnancy, because it supposedly reminds them of housework. Nigerian mothers-in-the-making tend to crave fruit, vegetables and cereals, because they believe this is good for them. Interestingly, pregnant Tanzanian women most commonly crave meat, fish, vegetables, fruit and grains. The World Health Organization would be proud of them. Unsurprisingly based on these cultural differences in cravings, American women gain much more weight than women in most other cultures.

The whole idea of food cravings and addiction are very much a North American construct: [83% of languages do not even have a word for 'craving' and many do not](#)

[have a word for ‘addiction’ either outside of the narrow referral to pharmaceutical drugs.](#)

The reason many languages don’t need words for ‘craving’ or ‘addiction’ is that there is no objective underlying physiological process that takes place during the experience of food cravings or supposed food addiction. They are self-created concepts in the brain, triggered by sociocultural cues from the environment. Specifically, the idea of a craving tends to start with actual hunger, causing a desire for food. [This general desire for food then takes the form of specific foods when certain food representations in the brain are triggered.](#) This food’s representation in the brain can be triggered directly by sensory input of the food – you see or smell the food – but it can also be triggered more indirectly by an advertisement, talking about the food or even just thinking about the food.

You’ve probably experienced this yourself. As you’re walking through a street, the smell of bread gets your attention. You look to see where the smell comes from and the pastries and cakes in the window look incredible. Suddenly you’re hungry and you have ‘a craving’. This craving may haunt you for some time afterwards as it stays active in your memory.

The knowledge that food cravings are entirely in our mind means we should look towards psychology, not physiology, to rid ourselves of food cravings. Common wisdom says that you get rid of a craving by satisfying it and not restricting this food to yourself. Common wisdom is wrong. If you want to get rid of a craving, you don’t satisfy it. You kill it. Specifically, you starve it. Let me explain.

A craving is born when 2 forces meet to conceive it. Hunger is the craving’s mother, the egg waiting to be fertilized. The craving’s father is a passer-by, some food cue that

fertilizes the hunger and gives it form and direction. To prevent cravings, we need to address both forces that give rise to it: the hunger and the food cues.

Hunger during dieting is strongly associated with cravings, unsurprisingly, as it is the fundamental cause of all desire for food. [Cravings increase when hungry and decrease when you're full](#). So successfully starving a craving requires consuming a diet that is sufficiently satiating. For example, [late night snacking and binge eating can be countered successfully by consuming a satiating meal at night](#). Even [bariatric surgery to reduce your stomach size reduces food cravings](#), because it reduces your appetite.

While appetite management is very effective to reduce food cravings, it alone does not always help get rid of cravings completely, because cravings are driven not just by physical hunger but also by a psychological desire for pleasure. This brings us to the second cause of cravings: food cues.

After a certain food representation has been activated in your brain because you started thinking about it, it is effectively a memory. You can't crave food you don't remember. Food cravings are highly correlated with exposure to the food. [While most modern cultures mainly crave junk foods, different cultures vary strongly in which specific foods they crave based on which foods they're most exposed to](#).

As such, getting rid of a food craving is similar to getting rid of a memory. This poses a problem. Let's say you have a craving for pizza. Actively thinking about having pizza will only strengthen the memory, yet 'not thinking about pizza' isn't going to work. Think of the classic example of trying to not think about a pink elephant. Of course, you now immediately thought about a pink elephant. Our brains are incapable of conscious ignorance. So what do you do? Research has found 2 cognitive therapies or 'brain tricks' that you can employ.

Mindfulness training

The first [successful method of coping with a craving is mindfulness training](#) [2, 3, 4].

Mindfulness comes down to acceptance of the food craving without acting on it.

Whenever you get a major food craving, take a moment to reflect and realize that you have the craving. Then accept the craving for what it is, a tasty food you want to eat that has been triggered in your memory. Then move on with your day. [Being mindful but non-judgmental of your feelings can help reduce emotional eating](#) and [reduce mental fatigue](#). Effectively, mindfulness makes you more rational.

Episodic future thinking

Dr. Dan Gilbert proposed that one of the defining features of humanity is our ability to simulate the future. Imagining different scenarios helps us make better long-term choices. We can also use this ability to cope with acute food cravings. In cognitive behavioral therapy, this strategy is called [episodic future thinking \(EFT\)](#). EFT is thinking about the future in a very specific manner: you visualize yourself in a hypothetical future scenario and experience what it's like. You 'sample' the future. By virtually experiencing the future, you make it more visceral and you engage system I, which otherwise has no concept of hypothetical future events. If system I 'enjoys' the simulation, it takes less effort to override its desire for immediate gratification. Concretely, in the case of a food craving, you should actively and intensely visualize eating a meal other than what you're craving that will satisfy your hunger. It's best to think of the next planned meal that you really like or a close substitute of the craved food that can displace the craving. [Loading your visual memory reduces food cravings](#) [2] and [EFT helps people make smarter long-term food choices with fewer calories](#) [2].

For example, let's say you're at work in the office and somebody brought a chocolate birthday cake. To engage episodic future thinking, you can visualize eating [this lean Tex](#)

[Mex bowl of awesomeness](#) that you planned to eat tonight. Think of how you're going to enjoy this meal and how much better it is for your physique and health than the chocolate junk.

The best meal to visualize is what economists call a dominant option. A dominant option is an option that is superior to another choice in all regards. For food you rarely have a truly dominant option that is also lower in calories as well as more nutritious, but many options can come close. Here are some options of foods that have good lean alternatives.

- Cheesecake: For a single slice of typical cheesecake calorie bomb, you can eat a whole lot of this [low-calorie, high protein cheesecake](#).
- Ice cream: You can make frozen yogurt or protein ice cream recipes with a fraction of the calories that are almost as good.
- Pasta and noodles: Glucomannan 'miracle' noodles and zoodles (spiralized zucchini) give a similar texture for literally less than a tenth of the calories.
- Pizza: You can make great egg white or cauliflower crust pizzas yourself with tastier and lower-calorie cheeses and sauces. This can easily remove two thirds of the calories.
- In general, lower-fat versions of products are often an easy way to save calories. [In research, when people eat a full-fat vs. a low-fat lunch without knowing which, they can't tell the difference](#). While you can probably taste the difference between full-fat and zero-fat options, you can easily save a lot of calories by going for low-fat options.

For best results, you can combine episodic future thinking with implementation intentions. [Research](#) has found that the implementation intention to 'think of dieting' when confronted with palatable foods can reduce unplanned energy intake. Rather than just thinking of your cutting or health goals, it may be more effective to create a

rule of episodic future thinking for yourself: whenever I get tempted by foods I shouldn't eat, I will imagine my next meal to keep me focused on my goals. This rule combines goal affirmation, implementation intentions and episodic future thinking.

Crucially, all scientifically successful therapies to deal with cravings share the common trait that they do not involve giving in to your cravings. They do not feed the craving. They starve it.

The forbidden fruit effect

You may wonder: won't restricting the craved foods result in a 'forbidden fruit effect' where you only end up craving the foods even more? [A study from the University of Vermont](#) sought to address this question. They compared a relatively moderate 1100-Calorie diet which allowed all foods in moderation to an aggressive 400-Calorie protein-sparing modified fast with practically nothing but lean protein foods in the diet. Common wisdom would predict the aggressive diet group would go mad with cravings due to the enormous restriction of their diet. In reality, cravings greatly decreased during both diets with a trend for *better* craving management in the aggressive diet group, especially for high protein and high carbohydrate foods. "There was no evidence to support the belief that restricting intake of certain foods leads to increased craving for these foods or that the magnitude of weight loss is related to food cravings."

[A different study on the effect of a 1200-Calorie diet vs. an 800-Calorie liquid diet](#) confirmed these findings. Throughout the entire course of the 3-month diet, the 800-Calorie group experienced consistently greater decreases in cravings. Moreover, this study included a 5-week refeeding period to check for how lasting the effects were. The lower cravings in the aggressive diet group persisted without any rebound effect when they resumed solid food consumption.

Other research confirms that [consuming craved foods less frequently decreases your cravings for these foods](#) and [restricted dieting can be a very effective method to reduce cravings](#). Crucially, only the frequency of consumption, not the amount of consumption, influences cravings. It doesn't matter if you give in to your cravings a little bit or a lot. The event reinforces the presence of the craved food in your memory all the same. So portion control does not reduce cravings. You have to stop consuming the foods you crave or at least reduce the frequency of consumption. In support of this, research that compares successful and unsuccessful dieters finds that [a key characteristic of successful weight loss is not giving in to your cravings](#).

The theory that giving in to a craving will satisfy it and get rid of it has never been more than wishful thinking. It's like when you're hungover and you proclaim you'll never have alcohol again. After you've eaten a double Happy Meal, you may feel like you have profoundly satisfied your craving for McDonald's, but this feeling lasts about as long as your fullness. The next day, or maybe even a couple hours later already, when your hunger returns, so does the craving.

Instead, several scientific studies have found that successful weight loss diets reduce cravings by "reduction to exposure to the palatable foods that evoke craving", including [a 95 participant 6-month study performed at 4 different locations](#) [2].

However, the forbidden fruit effect is not a myth. [Viewing foods as 'forbidden' can increase cravings for them and result in binge eating](#). For example, [needlessly restricting chocolate consumption without a corresponding diet can increase chocolate cravings](#). [Prohibiting bread from weight loss diets has also been found to make diet adherence more difficult and result in study drop-outs](#).

The key problem with excluding foods from your diet lies in seeing foods as *forbidden* rather than as foods you *choose* not to eat. If you feel like you can't eat a certain food against your will, you'll probably only want it more. However, if you decide that a certain food is not worth it for you, you shouldn't have any cravings for it anymore. You should always keep in mind that food restriction is a form of control that serves a purpose. The mindset of thinking of "Chocolate is bad. I can never eat chocolate again." is excessively rigid and will probably backfire. You should instead think "Chocolate consumption is not worth its calorie cost for me during this period." As long as you keep in mind that not eating the food is a conscious choice on your end, you won't create any forbidden fruits.

How to teach yourself to like healthy, low-calorie foods.

In terms of evolutionary psychology, it makes perfect sense that we stop craving foods we rarely eat. Our sense of taste adapts to the food available in our environment. Let's pretend you're a hunter-gatherer from our evolutionary past. You live in an area where the only available meat is rabbit. Then you better learn to like rabbit. You're not exactly in a position to go: "No, thanks, I'm more of a steak person." Yet when you now do get access to steak, rabbit quickly becomes less palatable.

Concretely, [your liking for salty and sweet foods is influenced by how much you eat them](#) [2], though [one study](#) found that only the intensity but not the pleasantness of sugar was affected by how much sugar people consumed. This isn't just a case of people with a genetic disposition for a sweet tooth eating more sugar. [Your preference for sweet foods can grow over time with increased sugar consumption](#) and [your preference is not always correlated with your ability to taste sweetness](#). Also, [former weight loss dieters have been found to have a reduced sweet tooth compared to non-dieting individuals](#). Think of coffee: if you learn to drink it black, you may be disgusted by coffee with sugar. Yet if you normally drink it sweetened, black coffee

becomes ‘ugh, bitter’. Same for chocolate and tea. In fact, that’s exactly why we say some things have an acquired taste: most people do not naturally like them. You only learn to appreciate them if you consume them frequently enough. This particularly goes for alcohol.

Psychophysics has come very close in predicting exactly how we perceive taste. Our sense of taste and thereby how pleasant we find food follows a [range-frequency model](#) [2]. Range-frequency theory (RTF) explains how we perceive magnitude, such as how large a person appears, how painful a set of squats is or how much money \$5 is. Without going into the mathematics, which are needlessly complicated (but profoundly awesome if you’re interested in psychophysics), RFT shows that we rate magnitudes as their rank order in a comparable reference set from our memory. We don’t perceive magnitude directly but rather we see it relative to our mental comparison set. We have no scale in our head that measures sweetness: we just know when something tastes sweeter or less sweet than other things we’ve tasted in our memory. Since human memory is fallible and finite, we don’t remember everything we’ve ever tasted, mostly just the recent foods we’ve eaten (the [recency effect](#)). As such, how we perceive something’s taste is strongly affected by what we ate before it, both acutely and over the long term. Your habitual diet changes your perception of taste: it becomes the reference by which you perceive any new taste.

Your regular diet’s effect on your sense of taste goes deep. It is not just the experience of taste or even the pleasantness of the food but also how rewarding your brain perceives the food to be. [Low-calorie diets have been found to increase the activation of the brain’s reward circuitry in response to low-calorie food consumption; at the same time, the sensation of reward from high-calorie foods decreases](#) [2]. Correspondingly, [diets with a low energy density also decrease your liking and wanting for energy dense foods](#). And [high-fat, high-sugar foods increase brain reward activation while eating](#)

[while decreasing your preference for leaner foods](#). In other words, the more you eat healthy and low-calorie foods, the more you'll get to like them and the less you'll miss higher-calorie alternatives.

You may have experienced the effect of your habitual diet on your sense of taste yourself. Most of Menno's clients live a healthy lifestyle and are used to eating minimally processed whole foods; almost all of them love [this high protein cheesecake recipe](#). However, individuals with a more conventional modern Western diet (read: people that eat like crap and therefore tend to become overweight) have found the cheesecake very lackluster. Their frame of reference is real cheesecake with 3 times the calories, not Greek yogurt. The same goes for almost all light or healthier versions of commonly liked high-calorie dishes. You can learn to love them and not feel deprived of the real thing at all. Unless you're still eating the real thing.

Thus, [if you always eat a certain selection of healthy, low-calorie foods, your liking for these foods increases](#) [2]. [You grow to like the type of food you regularly eat](#). Moreover, [the activation of brain reward pathways in response to seeing high-calorie foods decreases during a weight loss diet without these foods](#) and [your cravings for food you never eat disappear](#) [2]. In general, when you stop consuming a particular kind of food, you stop liking its taste, you find the food less pleasant to eat and even your brain's reward activation decreases when you do eat it. Eventually, the food disappears from your active memory, your mind's internal menu, just like words disappear from your active vocabulary when you stop using them. And so the craving disappears. Starving your cravings is thus not only a very effective way to get rid of them, it can also increase your overall diet enjoyment.

As an illustration of how your taste and cravings are affected by your diet, [a 2-year study compared the effects of a high- vs. a low-carbohydrate diet](#). Importantly, people

were randomly assigned to one diet: they could not choose themselves. The high-fat, low-carbohydrate group developed a preference for higher-fat foods and experienced fewer cravings for high-carbohydrate foods. The high-carbohydrate, low-fat group experienced exactly the opposite: they developed a preference for high-carbohydrate foods and experienced fewer cravings for high-fat foods.

These findings may explain why we see such a polarization of low- vs. high-carbohydrate diets. When people try either diet approach, they come to like it and no longer see the appeal of the other approach. As a result, people form into camps, pro-carb vs. anti-carb, and both groups' experiences confirm their own beliefs.

In short, we like what we eat and we crave what we like, so we crave what we eat. If you have an undesirable food craving, be mindful that the craving is just a form of hunger given the shape of food by some trigger in your brain (mindfulness and acceptance training). Look for a better option to satisfy your hunger and visualize yourself eating it (episodic future thinking). Once you've coped with a few cravings without acting on them, things get much easier. By starving your cravings and eating healthier, lower-calorie foods that you can sustainably eat as much as you want of, your whole sense of taste and food enjoyment will change. You will develop a liking for whole foods, perhaps even start craving them, and you will no longer miss the higher-calorie foods you once craved. Starve your cravings; nourish your body.

Cheat meals

Cheat meals are commonly thought to keep cravings in check, but based on the psychology of food cravings, you should now understand that the opposite is often true. Cheat meals are often the very trigger that cause your cravings. By overeating on high-calorie foods that you don't normally consume in your diet – let's define this as a cheat meal for now – you activate its representation in your memory, you develop a further liking for its taste and your brain's reward activation from eating it increases. The next time you get hungry, this can manifest as a craving for the foods you had with your cheat meal. For example, [indulging your chocolate cravings has been shown to increase subsequent chocolate cravings](#). Feeding a craving makes it stronger.

Think about which foods you sometimes crave. We already established there is a huge cultural component to this. How did you develop the craving for this food? By eating it. You don't crave foods you've never eaten. Indeed, [there is a significant correlation between how often people consume a particular food and how often they crave it](#); moreover, changing how frequently you consume a certain food changes how often you crave it [2]. Every time you have French fries, you activate its representation in your memory, making French fries more salient in your memory. The next time you get hungry and you think about food, French fries are more likely to pop up in your mind. And so a craving is born.

Crucially, [there isn't much of a correlation between the amount of food eaten and the strength of your cravings for it](#). Going to Burger King more often will probably make you crave burgers more often, but it doesn't seem to matter if you had the small or the extra-large burger. This is perfectly in line with the idea that cravings are entirely in your mind. When you eat a meal, the food's representation in your mind is activated. Having a bigger portion size doesn't further activate the food representation.

Knowing that portion size control doesn't help reduce cravings has a profound implication for successful dieting. 'Everything in moderation' may not be such a good idea. Indeed, we saw this in 2 of the studies mentioned earlier. The study by Harvey et al. (1993) compared a "balanced low-calorie diet" in which everything was allowed in moderation with a more aggressive and restricted diet consisting of almost nothing but protein. [The more restricted diet group lost weight faster while the more moderate diet group suffered more from cravings.](#) Martin et al. (2006) compared a regular, balanced low-calorie diet with an "extremely restrictive" diet consisting of nothing but meal-replacement shakes and bars. Again [the more restricted diet group lost weight faster and experienced a greater reduction in cravings.](#)

Inducing cravings and worsening your food preferences aren't the only problems with having a cheat meal. [Using food as a reward teaches you to consume that food when experiencing emotional stress. Most research does not support that emotional stress leads to eating more.](#) In fact, stress is normally acutely appetite suppressive.

Self-medicating your sorrows away with comfort foods is not a biological reaction to negative mood states. It's a learned behavior, a bad relationship with food.

Unfortunately, the common practice of parents trying to cheer their children up with candy when the children feel sad is probably setting the children up for an unhealthy relationship with food. Cheat foods become comfort foods. Guess what happens when the dieting gets hard? You turn to the comfort food. This is fundamentally toxic to lifestyle change and it is probably why [people self-report that processed foods are more addictive than whole foods:](#) they have become comfort foods. Changing your lifestyle can be hard. It requires self-control, which can induce mental depletion and negative feelings. These negative feelings can lead you to consume comfort foods, which then trigger cravings, which make dieting even harder, and so you can enter a negative spiral ending in obesity and unhappiness.

In fact, [many cheat meals in fitness circles objectively qualify as binge eating episodes. Rigid dietary restraint followed by meals without any restraint is a hallmark characteristic of many eating disorders.](#)

In sum, cheat meals come with several psychological problems.

- Cheat meals can change your taste perception, making the other foods in your diet less tasty.
- Cheat meals can induce a forbidden fruit effect and cravings for the consumed foods.
- Cheat meals can turn into comfort foods that you're prone to self-medicate on when you feel poorly.

Certain people, often those that become obese, are particularly prone to the dangers of cheat meals. [A subset of the population experiences an increase in neural sensitization and behavioral reinforcement when consuming cheat meals \(snacks\).](#) which is essentially a light version of what happens in the brain when you take cocaine or other addictive drugs.

Unsurprisingly based on the above problems, people with cheat days in their diet are less successful at losing weight and, more importantly, keeping it off than those who focus on consistent lifestyle change. [Diet consistency is strongly predictive of successful weight loss maintenance](#) [2, 3]. On average, people with a consistent diet across the week are 1.5 times more likely to maintain their weight loss than people who eat differently in the weekends, even if they compensate by dieting more strictly during the midweek.

Furthermore, [most people who have successfully lost weight and kept it off have learned to avoid certain foods in their diet](#), as opposed to learning how to fit them into their macros.

At this point, you may be wondering: “Hey! I thought you were going to teach me how to have my cake and eat it too? I want to get ripped eating ice cream and chocolate! Can’t I have cheat meals?” Many people will be happy to sell you what you *want* to hear, but this course teaches you what you *need* to hear. Going without any cheat meals is certainly not a bad idea. In fact, it may very well be in your best interest, even if you don’t want to hear it. That said, fortunately, getting and staying lean doesn’t require living like a monk. Here are concrete tips to have your cake and eat it too.

IIFYM

“If it fits your macros.” (IIFYM) has become a go-to response on bodybuilding message boards in response to the question: “Can I eat food X?”. Due to the ‘clean eating’ mentality in traditional bodybuilding circles, it was common for bodybuilders to ask which foods they could eat (clean foods). However, research over the past decades has conclusively demonstrated that getting lean is primarily a matter of energy balance, not food choices. As we discussed before, physics dictate that the presence of an energy deficit in the body requires the body to burn body mass to make up the deficit in energy requirement. It doesn’t matter if your diet consists of Twinkies and burgers or broccoli and chicken breast: as long as you’re in energy deficit, you’ll lose energy. Normally, your body will primarily burn off fat rather than lean body mass to make up the difference between energy intake and energy expenditure (the energy deficit). It’s theoretically possible to only lose muscle mass and no fat mass, but this in practice only occurs during muscle wasting diseases. In any case, which tissue your body burns for energy is largely determined by your activity level, not the composition of your cheat meals.

One other nuance we'll ignore here is that different food choices can differentially affect your energy expenditure and energy intake. As you learned, not all energy is absorbed. Dietary fiber in particular is often only partly absorbed into the body and can largely pass through the body undigested. Moreover, different foods have a different thermic effect. Certain foods, like fish and coconut oil, require more energy to absorb, digest, burn or store than others, like butter. However, in the practical context of 2 diets with the same macronutrient composition that both implement all the advice from this course, it's safe to assume that any difference in energy balance will be no more than a few percent.

With the above caveats in mind, we can say that the composition of a cheat meal is largely irrelevant for its effect on your fat loss and only its energy content matters. As such, if you fit a meal into your diet's planned macronutrient composition, whether it's ice cream, McDonald's or nasi goreng, it is not really a cheat meal. It may not be ideal for your health, but it won't acutely hinder fat loss. [In a study on diabetics, allowing up to 10% room for sugary sweets to be fit in their calories did not harm diet adherence or health markers.](#)

So if you really want to have a certain 'cheat meal', fit it into your macros and you can enjoy it guilt-free. Just keep in mind the psychological side-effects.

Diet tip: Think about food like an economist

Think of your planned energy intake as a 'calorie budget' that you can spend on foods. This is not only a useful analogy for the IIFYM-principle, it also gets you in the mindset of an economist. An economist makes any decision based on a cost-benefit analysis. This requires mindfulness and deliberation, which we have previously seen can help you cope with food cravings. From a purely rational perspective, a certain food **is** either worth it or it's not. Either its benefits outweigh the costs or they don't. You analyze its

macros, health benefits, satiety index, etc. and thereby determine its value (utility, as economists call it). If the value is high compared to other foods, you fit it into your macros. If not, you don't.

Importantly, in this cost-benefit analysis you should consider not just the physical qualities of the food but also the psychological costs of consuming foods that aren't part of your habitual diet, such as inducing cravings and comfort food and changing your taste perception.

So at any time, a rational person should eat only a certain selection of worth-it-foods and never eat other not-worth-it-foods. While the perfectly rational 'homo economicus' is a myth, in this case economics and psychology converge in the conclusion that you should carefully consider which foods you make a part of your diet.

Thinking like an economist may seem to conflict with the idea of IIFYM and having a flexible dieting mindset. There are important nuances here. IIFYM only considers physics, not psychology. While having a scoop of Ben & Jerry's ice cream every day can absolutely be fit into your macros without physically impairing your fat loss, in practice it may not be in your best interest to have a tub of Ben & Jerry's waiting for you in the freezer all the time. There is likely to come a time when 1 scoop doesn't satisfy you or you come home exhausted after work and your self-control is inadequate to make the decision to eat something else. An imminent ice cream binge will obviously hinder fat loss. While the mechanism by which bingeing on ice cream will impair your fat loss is 'simply energy intake', the fact is that you may have been better off not having made Ben & Jerry's a part of your diet. In theory, as long as you keep total energy intake in check, cheat meals won't harm fat loss, but in practice, for every ripped Youtuber you see eating ice cream, there are a thousand fat people wondering why they've never been able to see their abs.

IIFYM is a theoretical principle to illustrate the paramount importance of energy intake in the grand scheme of dieting. For a successful diet, you should not just think about this day's energy intake but rather your energy intake in your overall lifestyle. For that reason, I don't like to use the IIFYM acronym. Rather than think 'if it fits my macros', I recommend you think: 'if it fits my lifestyle'. This emphasizes the importance of long-term sustainability instead of battling new challenges every day. It also makes the principle applicable to *ad libitum* diets that don't have set macronutrient or calorie targets.

Thinking like an economist and having a flexible dieting mindset are not mutually exclusive, but just like for IIFYM, this combination requires nuance. Recall that a flexible dieting mindset refers to the mindset, not the diet itself. A diet will have rules, forms of control over what you eat. The flexible mindset comes into play mainly in realizing that your diet's restrictions are the means to an end, not the end goal itself, and it's not all-or-nothing. The goal of any fat loss diet is to restrict energy intake to achieve the desired energy deficit. It should be readily apparent that certain foods are more conducive to limiting your energy intake than others.

So while it's all fine and dandy that you can fit some candy into your macros without it impairing your results and there is strictly speaking no such thing as 'unhealthy food', you should have a list of foods you deem worth it and foods that are not. [A mindset with restricted food choice permissions is associated with lower energy intake and healthier diets.](#)

Just remember it's a choice. [Not being allowed to eat a certain food can increase cravings and feelings of deprivation](#), so you should remember that you're not eating certain high-calorie foods because you don't **want** to. You **can** eat the not-worth-it foods, but it's in your own best interest not to, so you should **decide** not to eat them.

As such, from a psychological perspective [it can be helpful to associate good things with low-calorie food and bad things with high-calorie foods](#) [2]. The power of association is harnessed by many diets, such as the paleo diet ('paleo = good, non-paleo = bad'), the Atkins diet ('high carb = bad, rest = good') and clean eating in bodybuilding. These diets can be very effective in the short term. The problem is that all too often these diets ignore the reality of energy balance and people focus excessively on the rules of the diet rather than energy intake. It doesn't matter if you have no carbs in your diet: eat enough bacon and sausages and you will get fat. It doesn't matter if that cookie is 100% paleo: it's still 400 calories. By maintaining a flexible control mindset and focusing on what primarily matters in the diet – energy intake over time – you can harness the success of having a frame of reference for which foods to eat and which not to eat without becoming dogmatic. Thinking in terms of 'good' and 'bad' food can easily result in obsession and missing the forest for the trees, but building a reference of foods that are 'worth it' and 'not worth it' can help you be consistent and build food choice habits that are healthy in every sense of the word.

Diet tip: Learn to prepare low-calorie comfort foods

Recall that cheat meals don't just induce cravings. They also risk making the food you eat a comfort food, something you have positive associations with and turn to when you're feeling unhappy. Fortunately, comfort food needn't be fattening. With a little creativity, you can make delicious foods that are very low in calories. On the following websites you'll find some examples:

<https://www.sanneleenman.com/recipes>

<https://mennohenselmans.com/category/recipes/>

Learning to cook is a skill that will immensely benefit you for the rest of your life.

How to fit indulgent cheat meals into your lifestyle

Some cheat meals just cannot be fit into your macros or daily calorie budget. Social events with a lot of alcohol, all-you-can-eat buffets and massive birthday cakes often have more calories by themselves than your entire daily energy expenditure. You may still be able to fit these kind of cheat meals into your lifestyle, but it requires some deliberation.

Let's consider the scenario in which you consume more calories than planned by eating more of the food than you planned to eat. Is this ok? The essence of a flexible mindset is that overeating is entirely up to your discretion. Overeating will inherently reduce your fat loss progress. Your diet should be at a certain energy intake that corresponds with a certain energy balance that results in the desired rate of fat loss. Eating more than this planned energy intake will thus necessarily reduce how much body mass you lose. This is fundamental physics, thermodynamics: the energy balance principle. But it is up to you personally to decide whether this is worth it: the choice is up to you, not the diet.

To make the decision on whether it's worth it, you must weigh the amount of calories you overeat by (the cost) against the pleasure of the cheat meal (the benefit). If you think this pizza is worth going over your calorie budget for by 1000 calories, eat the pizza. Just keep in mind that if you want to reach a certain level of leanness, those 1000 calories will have to come off again at some point. (In fact, due to the greater metabolic downregulation in negative energy balance than the upregulation in positive energy surplus, you'll have to undereat by a bit more than what you overate by to achieve the same net energy balance, so you'll have to reduce energy intake by more than 1000 calories in the coming period to achieve the same net energy deficit.)

If you've made the mindful decision to fit a cheat meal into your week that cannot be fit into your daily macros, you can compensate for this by reducing energy intake in the surrounding day(s). This way, even though you may have overeaten one day, over the course of the week you can still achieve your desired state of energy balance.

The common approach to compensate for a cheat meal's high energy intake is to minimize energy intake beforehand to save up as many calories as possible. Say you've got a family barbeque coming up, which basically comes down to all-you-can-eat spare ribs. So you just have a very light breakfast and lunch. Many people at first try the protein shake route, where they basically consume nothing but a protein shake in their earlier meals. This approach sets you up for failure. More specifically, this approach sets you up for a massive binge. You'll arrive at dinner starving with low willpower. This is the worst possible state you can be in when you need to make mindful decisions about your diet.

Consider the following meal plan for a fit man.

Breakfast: Omelette with 2 apples.

Lunch: Steak with 500 g potatoes.

If you opt to take out the apples and the potatoes to save up calories for later, you'll save about $5 \times 80 + 2 \times 100 = 600$ calories. That probably means you're starving by the time you get to the barbeque. What you saved in terms of calories is about a third of a rack of spare ribs with sauce that you can eat, which is next to nothing if you have a serious appetite. Or it's 4 extra beers, which you now ended up drinking because people shoved them into your hands and you were too mentally depleted to resist the social pressure. There's a very good chance you end up consuming more calories in total. Then not only did you starve yourself for nothing, you also exacerbated the damage.

Here's a better approach. Don't starve yourself beforehand. Instead, make sure you arrive at the barbeque extremely well satiated. Just keep your calorie intake beforehand as low as possible. For example, if you eat your normal breakfast and replace the potatoes at lunch with zucchini soup, you can eat a whopping full kilo of zucchini and still save over 200 calories. Then you end up at the barbeque fully satiated with no need to gorge and you can enjoy some ribs as you like purely for their taste. You'll almost certainly eat less than you normally would, as you were already full, and you've got an additional 200 calories buffer.

If you do overeat, which is very realistic during all-you-can-eat ribs however you prepare, it anecdotally works better to compensate the day(s) afterwards. Not only do you reduce the chance you end up bingeing, after pigging out on ribs (no pun intended) you'll be naturally motivated to lose fat. This isn't just a mental effect from guilt or a sense of balance. [Significantly overeating for a day produces a ~40% increase in the appetite suppressing hormone leptin](#). This can make restricting energy intake the day afterwards easier so that you can still end up at your intended weekly energy balance and lose fat.

Cheat meal tip: Eat out

The most acute psychological problem of a cheat meal is the creation of a craving or comfort food. That's very problematic for your adherence, unless you have no way of eating the cheat food again. As such, eating out at a restaurant is often psychologically better for your diet than having a cheat meal at home. Plus, it'll probably be a more memorable experience.

For example, Menno's personal favorite cheat meal is fresh sushi. Since you can't store it, you always have to make an effort to get it by either ordering it or going to a restaurant for it. This barrier helps you make a rational choice of whether you really

want to eat sushi. In contrast, if your favorite cheat meal is Ben & Jerry's ice cream, and this is right there in your freezer, it's far more difficult to resist the temptation. Preparing a wholesome dish is more work than just grabbing the ice cream out of the freezer, so there is now a barrier to make the leaner choice of food. Hunger and mental depletion can make you incapable of surmounting this barrier, which ends up as a Ben & Jerry's binge in front of the TV. Not exactly a memorable experience for such a massive calorie intake.

As a general rule, don't purchase more than 1 serving size of any food that's not part of your regular diet. If you really want that Ben & Jerry's ice cream, you'll have to go to the supermarket to get it. Then you buy 1 serving of it, not a huge tub, and you fit it into your macros.

Take a lesson from Japanese sushi etiquette

Speaking of sushi, traditional Japanese sushi etiquette has you eat sushi in a specific order. You essentially start with the least flavorful types of fish, including most white fishes, and then you work your way up to tuna and then the more flavorful and fatty types of fish, like salmon. Then you finish with the tamago sweet egg sushi. This order improves the taste experience. Remember that your taste perception is significantly affected by what you ate previously. By eating foods in order of their palatability, you ensure you will like every dish you eat instead of only the tastiest ones. Moreover, this Japanese order of consuming your food can help you avoid inducing a craving during a cheat meal.

Recall that food cravings begin when hunger takes the shape of a certain trigger food. In other words, [cravings can be “a conditioned expression of hunger that is acquired by repeated experience of eating the craved food in a hungry state.”](#) This means you induce your own cravings by giving in to them when you're hungry, because you create

an association between the experience of hunger and the cheat food as a means of satisfying that hunger.

You can avoid this detrimental conditioning effect by having your cheat foods when you are no longer hungry. For example, [a study on chocolate cravings](#) found that chocolate cravings increased when the participants consumed chocolate when they were hungry; however, when the participants only consumed the chocolate when they were already full, their cravings decreased.

So you should consume filling food before you indulge in a cheat food. This not only prevents you from inducing a craving for the cheat food, it also makes it much easier to exercise self-control and avoid binging on the cheat food. It can also be liberating to know you've already gotten in your essential nutrients, especially protein, before you indulge in a cheat food. This ensures you never have to force-feed yourself after the cheat meal because you still have to get your protein in for the day. The reverse order is again also much less palatable. You may enjoy a hearty soup to start your meal when you're hungry, but if you've already started eating pizza and ice cream, you're probably not going to enjoy soup anymore after that.

If we go back to the example of wanting to fit Ben & Jerry's ice cream into your lifestyle, after you've bought your 1 serving size of it, you should not consume this right away. Instead, consume it after a filling, low-calorie meal. In other words, we could say the tradition of having dessert, just like the Japanese sushi sequencing, is evidence-based.

Diet breaks

Diet breaks are a popular recommendation by non-psychologists based on the intuitive appeal to ‘some downtime’ or ‘relief from the dieting’. As you should be able to predict by now, psychological science has something different to say about diet breaks.

[Wing & Jeffery \(2003\)](#) studied the effect of diet breaks on compliance with weight loss dieting. They divided people into 3 groups.

- The control group went on a 14-week weight loss diet without breaks.
- The short break group went on the same diet with 3 2-week diet breaks in between.
- The long break group went on the same diet with a single 6-week break midway through the diet.

In contrast to popular wisdom, the researchers hypothesized that the diet breaks would be disruptive to diet compliance, because when people fall off the diet wagon, they often don’t get back on. However, that’s not what happened. Most people did not have major problems with getting back on the diet after the break, regardless of the break’s length. This led the flexible dieting crowd to herald this study as the vindication of diet breaks.

However, if you logically think about the study results, using them to support flexible dieting or diet breaks doesn’t make any sense. Diet compliance was similar in all diet weeks in all 3 groups. So no, the diet breaks did not cause people to fall off the wagon, but they didn’t help either. Thus, the diet breaks were a waste of time.

Moreover, a closer inspection of the results reveals detrimental effects of the diet breaks. “...lasting differences occurred after the third break of the short-break group

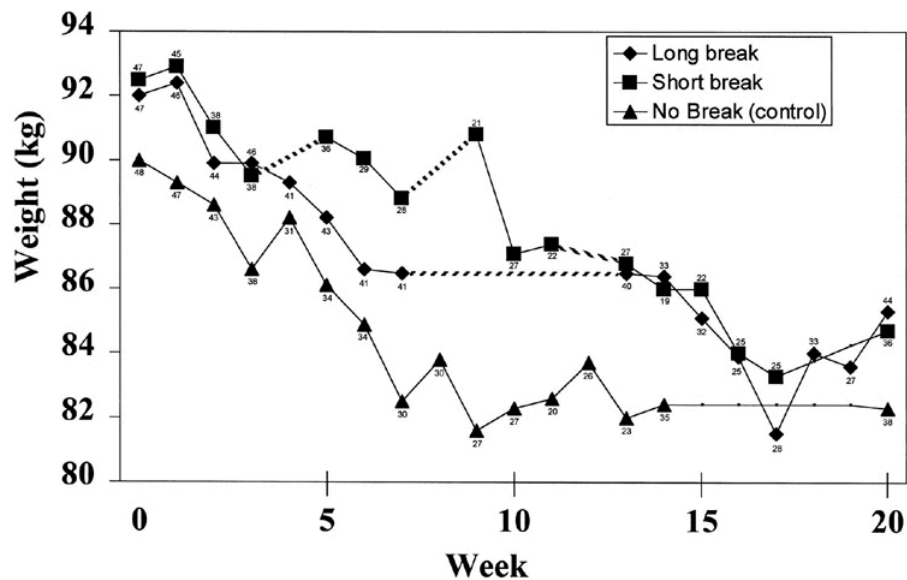
when participants reported less frequent self-monitoring, less frequent self-weighing, and a trend toward greater consumption of restricted foods.

The long break group also had a trend toward greater consumption of restricted foods for the week after the break.”

The greater difficulty with food restrictions after the diet breaks is exactly what you’d expect from the psychology of cheat meals and food choices. After a diet break your mind’s internal menu is filled with foods that are not conducive to your fat loss goals. As a result, you have more difficulty not eating these foods any more.

The greater difficulty with self-monitoring after a diet break is also not surprising. Weighing yourself and other forms of progress tracking are very much a matter of routine and habit. Breaks by definition break your habits.

The researchers somewhat dismissed these concerns because in the long run, weight loss was similar between the 3 groups. However, take a look at their data plotted below. The no-break group achieved a level of weight loss in 7 weeks that the groups with the diet breaks took about 16 weeks to achieve. If these were strength trainees, the no-break group could have spent those last 9 weeks bulking.



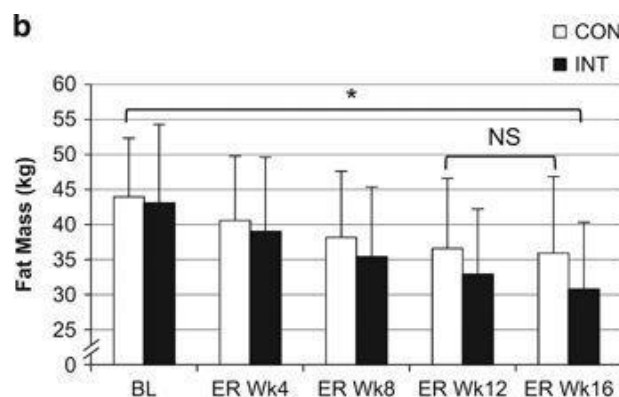
[Arguin et al. \(2013\)](#) similarly found that interspersing 15 weeks of energy restriction with 2 5-week diet breaks did not affect body composition change, resting metabolic rate or any health biomarker, compared to doing the cut in one go. At follow-up a year later, there were again no significant differences between groups, indicating the diet breaks did not make the fat loss more sustainable.

[Byrne et al. \(2017\)](#), AKA the [Matador study](#), found more favorable effects of taking diet breaks. Plural in this case. The researchers compared 16 weeks of cutting in one go or with a 2-week diet break at maintenance energy intake every 2 weeks. Even though the planned energy deficit was supposed to be 33% for both groups, the diet break group lost 4.3 kg more fat. This could not be explained by improved nutrient partitioning, as there was no significant difference in fat-free mass (FFM) loss between the groups. In fact, the diet break group lost a non-significant 0.6 kg more FFM.

The authors attributed the better fat loss in the diet break group to a reduction in adaptive thermogenesis. When corrected for body composition changes, the diet break group had a smaller decrease in resting energy expenditure (REE). However, this

explanation is very contentious. Even if we take the authors' estimate at face-value, the difference in REE amounted to 89 kcal/d, which could not even come close to explaining the 4.3 kg greater fat loss, especially not if you also factor in the 0.6 kg greater FFM loss. As per the modules on energy and fasting, other research finds the pattern of energy restriction does not influence metabolic adaptations: only the final body composition change influences our metabolism.

With neither nutrient partitioning or energy expenditure as a possible explanation for the difference in fat loss, that leaves energy intake, i.e. adherence. These were obese men put on a diet and as usual, the attrition rates were horrendous. Of the 51 subjects still in the study after the screening process, only 36 completed the study 'per protocol'. 'Per protocol' was leniently defined as 'not gaining weight while supposed to be losing weight'. So lack of adherence was only detected if the subjects actually overate so majorly they ended up in significant energy surplus rather than in their planned 33% energy deficit. Looking at the fat loss data over time below, you can see the continuous dieting group stopped losing a significant amount of fat after week 12, indicating they were no longer in their planned 33% energy deficit. If they had continued as planned with the diet, the results between the groups would likely have been equivalent.



As such, the most plausible explanation for these study findings, like in many studies on sedentary, obese individuals, is that the difference between the groups was because of adherence. This is a positive finding for the use of diet breaks, but when you factor in the enormous loss of time spent on the diet breaks in this study, *doubling* the duration of their cut, strength trainees could have much better spent this time bulking after the shorter cut in the continuous group. So even taking these results at face value, the time-effectiveness of the diet breaks was still poor.

[Peos et al. \(2021\)](#) conducted a much better controlled and analyzed study on diet breaks, and this time in strength trainees experienced with tracking their macros. The trainees performed the same fat loss diet program either in one 12-week stretch or as 4 3-week stretches with 1-week diet breaks in between with maintenance energy intake. At the end of the study, there were no significant differences between groups for an overwhelming battery of tests, including body composition, muscle strength, energy expenditure, levels of testosterone, thyroid hormone and leptin, behavioral measures (incl. physical activity, energy intake, diet adherence and attrition) and psychological responses to the diets (incl. sleep quality, irritability, mood states and eating disorder behaviors). In other words, the diet breaks didn't achieve any hard benefits, despite this group performing 3 more weeks of strength training at maintenance energy intake. Interestingly, these results stayed the same when comparing the groups across the full 15-week study period, meaning the constant diet group was doing a 3-week maintenance phase at the end that achieved nothing. These findings strongly suggest both diet breaks and maintenance phases are a waste of time, at least purely physically speaking. However, the diet breaks did achieve 1 benefit: they resulted in lower levels of hunger and desire to eat with greater food satisfaction, as well as higher levels of the satiety hormone peptide YY. This benefit was not consistent, however, because there were no differences in ratings of fullness or prospective consumption or in levels of the hunger hormone ghrelin. It also didn't lead to a difference in behavioral consequences

of hunger, actual energy intake or overall diet adherence, so it's questionable how practically relevant the difference in appetite sensations was.

Similar findings were reported by our own study, [Siedler et al. \(2023\)](#), in strength-training women. We recruited 54 strength-trained women to perform a 6-week fat loss diet with a 25% energy deficit. All participants consumed a high protein diet with at least 1.8 g/kg/d protein and 60% of remaining calories from carbs; 40% from fat. All the women trained 3x per week. The regular diet group performed the cut in one go. The diet break group took 2 diet break weeks with maintenance energy intake after weeks 2 and 4. At the end of the study, there were no significant differences between the groups for changes over time in their body composition, resting metabolic rate, or seven of the eight measured eating behavior variables, including ease of sticking to the diet, hunger and motivation to continue the diet. The diet breaks did significantly reduce disinhibition, which could improve long-term diet adherence. However, this is quite speculative. The chance of a statistical type I error is large, considering how many measurements we did and how many questions we asked the participants. Even if there really was a difference between the groups, it's questionable if this matters, as it didn't result in any change in actual eating behaviors, diet adherence or perceived effort. And even if it did, it almost certainly wasn't worth spending 33% more time on the diet for.

Conclusion

Overall, diet breaks seem to largely be a waste of time. Any time spent on them could be more productively spent either cutting more slowly or starting a lean bulk phase earlier. When not properly implemented, diet breaks may also cause you to fall out of your routines and break your habits. When it comes to diet adherence, consistency is a great virtue. In fact, the word diet comes from Latin via Greek (*diaita*) and originally meant 'way of life', not 'unsustainable period of self-deprivation resulting in short-term fat loss'. If you feel like you need a diet break, you should probably take a long, hard look at your lifestyle. If your lifestyle is not something you can sustain for weeks or months, how are you going to sustain it for the rest of your life? You need to address the problems, not run away from them and come back to see if they're still there.

Managing social eating events

Having a good physique does not mean you have to shy away from every wedding, Christmas dinner or birthday party. Here's how to maintain your physique while eating out.

➤ Guide

[How to manage social eating events](#)

How to deal with social pressure [bonus]

Ever been peer pressured to eat unhealthy food or drink alcohol? Ever been fit-shamed for going to the gym too much? The following video will help you navigate these situations. Its contents will not be tested during the exam, but many students report that they're highly valuable.

➤ Lecture

[How to deal with social pressure](#)