

We Have a Dopamine Problem

The neurochemical has become a boogeyman for people worried about addiction and indulgence. But the real story is a lot more complex.



By Dana G. Smith

June 30, 2023

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The neurotransmitter dopamine is eliciting a lot of panic these days.

According to books, articles and social media posts, our urge for a quick dopamine hit is why we crave cookies and spend too much time on Instagram. If we keep giving in to these desires, the rationale goes, we'll never be able to stop ourselves.

"We've transformed the world from a place of scarcity to a place of overwhelming abundance," Dr. Anna Lembke, a Stanford psychiatrist, wrote in her best-selling book "Dopamine Nation." Consequently, we're all at risk for "compulsive overconsumption."

A self-improvement trend often called "dopamine fasting" that emerged in 2019 revolves around abstaining from anything that causes the release of the chemical. The premise is that modern-day entertainments rewire the brain so that slower-paced pastimes are no longer pleasurable.

Videos tagged #dopamine, many claiming to teach viewers how to manipulate the brain chemical, have more than 700 million views on TikTok. One influencer offers a "free list of things that numb dopamine" so that you can "reclaim control over your life!"

Parents are even advised to prevent children from experiencing spikes in dopamine (meaning not to let them play video games or eat junk food) lest the insatiable need for the neurotransmitter increase bad behavior.

Scientists who study dopamine say these concerns have been blown out of proportion.

They “are not necessarily based on actual science of what we know about dopamine,” said Vijay Nambodiri, an assistant professor of neurology at the University of California, San Francisco.

Before you swear off dopamine — and the prospect of any joy in life — it’s important to understand the biggest misconceptions about the neurotransmitter and what the research shows.

Dopamine is not inherently good or bad.

The idea that dopamine produces feelings of pleasure came from early experiments in rodents, and later humans, that found the dopamine system was activated when animals encountered a reward. Food, sex, drugs and social interactions all set off releases of dopamine in the brain, suggesting the neurochemical is linked to any feel-good outcome.

But upon further study in the 1990s, scientists realized that dopamine is more closely related to the anticipation of a reward than to its receipt. Dopamine causes the wanting of something and the motivation to go and get it, not the enjoyment of it.

“What we think it maybe does is something like desire,” said Talia N. Lerner, an assistant professor of neuroscience at Northwestern University. “It teaches your brain how to predict your needs and try to align your behaviors with those needs.”

A neurochemical that controls desire can sound sinister, but pursuing rewards is not inherently a problem; it all depends on the context. Animals from honeybees to humans developed dopamine systems to motivate them to seek out food and sex in order to survive and procreate.

“It’s an important part of why we’re here today,” said Kent C. Berridge, a professor of psychology and neuroscience at the University of Michigan. “We wouldn’t have evolved and we wouldn’t have survived, our ancestors, without dopamine.”

Dopamine is also essential for learning. In this context, the key element that causes dopamine neurons to fire is surprise, regardless of whether the outcome is rewarding or disappointing.

“Dopamine tells you not when something is good or bad, per se, but when it’s better or worse than you expected it to be,” Dr. Lerner said. That surge of dopamine helps you update your expectations and potentially modify your behavior for the future.

A normal hit of dopamine isn’t going to rewire your brain.

Because of dopamine's role in motivation and learning, the worry is that highly stimulating activities will hijack the neurotransmitter system, such that it no longer works for smaller, everyday rewards. For someone hooked on video games, the thinking goes, Monopoly might be less rewarding.

This concern is partly based in science. Prolonged use of drugs that cause huge surges in dopamine, like cocaine and amphetamine, can cause the brain to shut off some of the receptors that the neurochemical acts on. This so-called tolerance means that more of the drug is required to achieve the same high.

Because video games and pornography can be habit-forming, some researchers — including Dr. Lembke — have hypothesized that they might cause similar signs of tolerance in the brain. However, in an interview with The New York Times, she admitted that this theory is inferred from studies of stimulant drugs and that there isn't currently evidence to back it up.

As a result, Dr. Berridge and others have critiqued the idea. One reason is that the amount of dopamine released in response to video games, pornography, social media and junk food is substantially lower than that released in response to addictive drugs.

And while, for some people, video games cause a greater dopamine response than board games do, that doesn't mean the board game causes a smaller dopamine release than it used to, and it isn't because of an inherent change in the dopamine system, Dr. Namboodiri said. It also doesn't mean that video game lovers will never want to play board games again. The same goes for eating candy versus eating fruit or watching YouTube versus reading a book.

Taking a break from video games or social media can be a good idea if you want to spend more time on other pursuits. But that's not because you need to reset your dopamine system, Dr. Namboodiri said. (There is reason to believe that our digital lives have shortened our attention spans, but that's a different story.)

"If the advice that someone's giving you about what you should do holds regardless of whether dopamine is in play, it's probably useful advice," Dr. Namboodiri said. But he noted that "as a field we are still pretty far from having a complete understanding" of dopamine and how to manipulate it in daily life.

Addiction is about more than dopamine.

Some rewarding behaviors can cause problems in people's lives. Although activities like gambling, watching pornography and playing video games don't stimulate as much

dopamine release as drugs do, they can lead to patterns of behavior similar to those seen in substance use disorder — namely, continuing the activity despite severe negative consequences.

But that is the exception, not the rule. Most people are not losing their jobs or relationships or experiencing negative health impacts because of these activities. Roughly 2 to 3 percent of people who watch pornography report being addicted to the behavior. Similarly, 2 to 3 percent of people who play online games qualify as having internet gaming disorder.

“For some people, yes, this is a problem,” Dr. Berridge said. “It’s not a problem for most people. We can function in the world and enjoy this reward-rich world.” As with most things related to health, the key is moderation. You don’t have to deny yourself pleasure to be a good or healthy person.

And while dopamine is involved in addiction, compulsions to use drugs or masturbate are more complicated than a single neurotransmitter. “To say that it’s only dopamine is an oversimplification,” Dr. Lembke said.

In fact, experimental attempts to treat addiction by altering dopamine activity in the brain haven’t worked. These types of compulsive behaviors are also often accompanied by other mental illnesses or extreme stress during childhood.

“Unless you’re using a drug like cocaine, which is probably blanketly unhealthy, there’s not necessarily a healthy or unhealthy way to use dopamine,” Dr. Lerner said. “It’s just about learning. And you can always learn something good, you can always learn something bad.”

Or, as Dr. Berridge put it, “dopamine is our friend, not just our enemy.”

Dana G. Smith is a Times reporter covering personal health, particularly aging and brain health.

A version of this article appears in print on , Section D, Page 7 of the New York edition with the headline: How Dopamine Influences Behavior