Please stop calling dopamine the ‘pleasure chemical’

Dopamine is one of the most hyped brain chemicals, supposedly linked to everything from sex to gambling. It’s common to read, as *Business Insider* claimed last week, that dopamine is “the pleasure chemical” — but that’s not true, and the idea was overturned long ago.

“I have friends who have dopamine tattoos because they think it means pleasure,” says Arif Hamid, a Gray Fellow at the Howard Hughes Medical Institute and postdoctoral researcher at Brown University, who studies the role of dopamine in the brain. The truth is, dopamine might make you *pursue* something, but that doesn’t mean it’s responsible for the pleasure itself.

Business Insider, for example, claims that dopamine regulates pleasure, but that’s not the case. It might encourage us to keep checking our phones, as *Business Insider* says, but it’s not necessarily responsible for feelings of joy when we get a new notification. This myth is popular and long-lived, but it’s time all of us got our terms straight.

The Verge spoke to Hamid about the origins of the “pleasure chemical” myth, how it was overturned, and what dopamine actually does.

This interview has been lightly edited and condensed for clarity.

Where did we get the idea that dopamine is “the pleasure chemical”?

The earliest experiments that described dopamine function were

done in the 1950s and ‘60s by the researcher James Olds. He found that rats who had their brains electrically stimulated in a particular area would keep doing a given activity, like pressing a lever. Dopamine was involved, so the idea was that the animal must enjoy doing this.

Then, Roy Wise came up with a hypothesis that made a lot of sense at the time, called the anhedonia hypothesis. People with clinical depression tend to have low levels of dopamine in their brain. The idea is that dopamine is important for pleasure, and, therefore, if you have very little dopamine, you enjoy things in your life less. That hypothesis has been quite unequivocally overturned.

How was the anhedonia hypothesis overturned, and when?

It was overturned in the late 1980s. There are drugs that can lesion, or kill, dopamine cells in animals. If you do that, the animals are perfectly fine. They enjoy their sucrose [sugar] solutions if you squirt it in their mouths. One way to infer the amount of pleasure that animals experience is to use facial reactions, and the facial reactions of these animals show that they are still experiencing pleasure.

So what *does* dopamine do?

Dopamine plays a lot of roles in the brain. If you kill off the cells that produce dopamine, the animal is not motivated to go out and do things. It’ll still *enjoy* something — like the sucrose solution you squeeze directly into its mouth — because the pleasure systems are fine. But they won’t pursue it. If you perform an action and you get more dopamine, the consequence of that increased dopamine tends to be that you’re more likely to do that behavior again.

There are sort of two camps for how this works. One camp thinks that dopamine is a “prediction error,” meaning that you expected something from the environment, and you got something *better*. And then you go, “Oh, I’m going to do that again,

something better than expected happened!” It’s a reinforcement.

The other camp says that dopamine is a motivational signal. It invigorates and energizes you toward a distinct goal. Dopamine is actually involved in motor disorders — like conditions that cause tremors — and that would be very consistent with the motivational aspect of dopamine. Dopamine could be important to juice you up to promote actions. And this is supported by people who take cocaine or amphetamines, which increase dopamine a lot. This motivates them to do things. Of course, later on, this can lead to the probability of repeating things and then lead to addiction and gambling and other negative behaviors.

I’ve heard before that there’s this distinction between “wanting” and “liking.” Is that accurate, and what is the role of dopamine there?

To be clear, a lot of these studies are from psychology, and while psychologists are amazing at having a repertoire to describe a very specific set of psychological processes they’re talking about, sometimes we can get lost in the semantics of terms for a while. I generally prefer a computational framework that describes exactly what is happening in a brain area.

So, with that caveat, yes, that “wanting versus liking” paradigm is accurate. I think dopamine is a motivational process that is very distinct from liking or pleasure. Liking or pleasure comes from endogenous opioids [opioids our bodies naturally produce], and dopamine instead does reinforcement and motivation and learning. The details are still being debated, but at least we know it’s not pleasure.

https://www.theverge.com/2018/3/27/17169446/dopamine-pleasure-chemical-neuroscience-reward-motivation