Medical Xpress

New study reveals why we value things more when they cost us more

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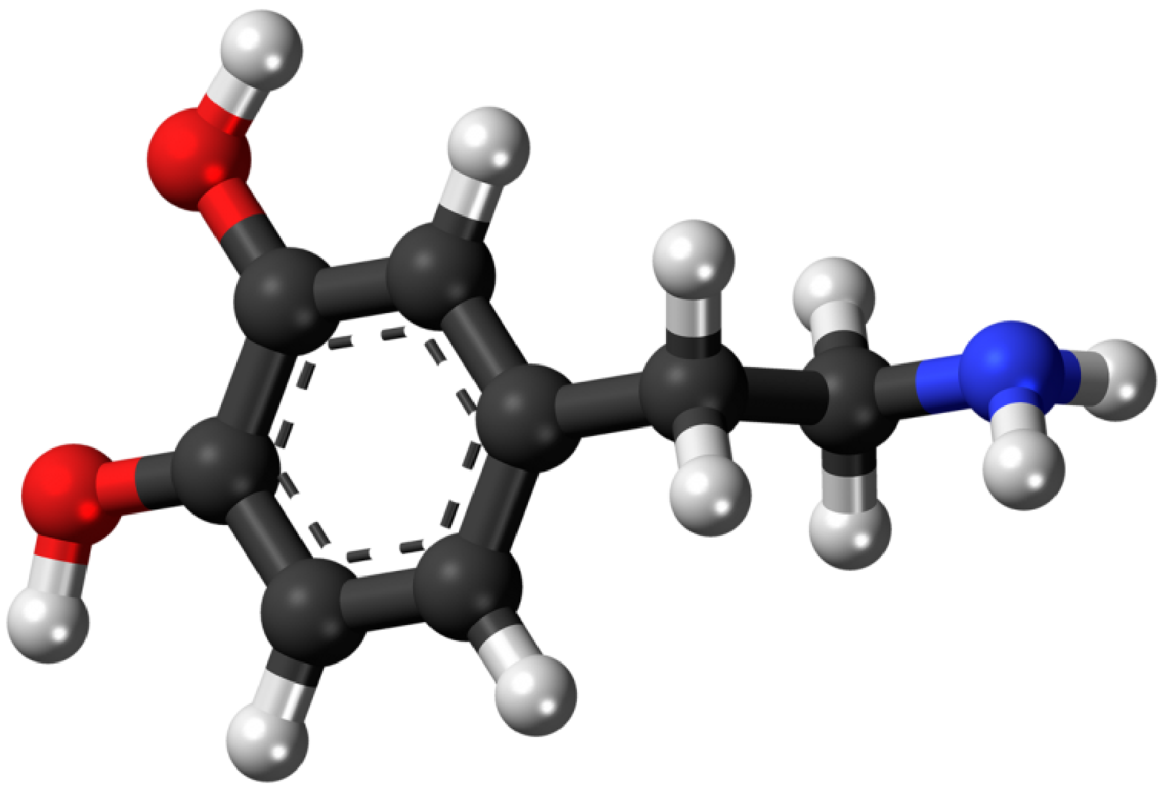

Ball-and-stick model of the dopamine molecule, a neurotransmitter that affects the brain's reward and pleasure centers. Credit: Jynto/Wikipedia

Ahab hunting down Moby Dick. Wile E. Coyote chasing the Road Runner. Learning Latin. Walking over hot coals. Standing in a long line for boba tea or entrance to a small, overpriced clothing retail store. Forking up for luxury nonsense.

What do these activities have in common? They're all examples of the overvaluation of what economists call "sunk costs," the price you've already irretrievably paid in time, money, effort, suffering or any combination of them for an item, an experience or a sense of self-esteem.

A study on this topic is published in the journal *Neuron*.

It's a phenomenon we all recognize. It affects our behavior in ways that can be irrational. But we do it.

Here's my story: My glacial-blue '64 stick-shift Volvo station wagon had red, white and blue Colorado U.S. Bicentennial plates and a phalanx of three small bowling trophies for hood ornaments (I called it "the Bowlvo"). It was falling apart like a piece of overcooked chicken. (One day, I was shooting down Highway 25 in Colorado when the hood flew up in my face. Another time, as I was frantically downshifting into second gear while driving home at my usual unsafe speed on a winding mountain road, the shift lever came off in my hand.) I would have gone to the ends of the earth, or at least the end of my rope, to keep it in running condition. Or failing that, just to keep it.

For mysterious reasons, we are hardwired to value something more if we've put a lot of sweat equity—what we had to do to get (or in my case keep) that reward—into it. Neuroscientists are trying to figure out why we do that.

Shared stupidity

"We make fallacious decisions based on what we've invested in something, even if the probability of actually gaining an objective advantage from it is zero," said assistant professor of psychiatry and behavioral science Neir Eshel, MD, Ph.D. "And it's not just us. This has been shown in animals across the animal kingdom."

OK—all higher animals are hardwired to make dumb decisions. But why?

Blame dopamine, the "do it again, do it some more" brain chemical that's been much talked about in connection with pleasure, learning and habit formation.

There's a difference between wanting something and liking it, said Eshel, who focuses on how the brain motivates behavior: "You can want something very, very much even though you don't even like it very much. Or vice versa."

A few years ago, Eshel, his then-postdoctoral adviser Rob Malenka, MD, Ph.D., the Nancy Friend Pritzker Professor in Psychiatry and the Behavioral Sciences, and some Stanford Medicine colleagues began conducting experiments to learn more about wanting versus liking and what, if any, role dopamine secretion in the brain plays in each of these states.

"We looked at how much an animal likes something—how much it will consume if that something is cost-free—and how much it wants something—how much that animal's consumption is affected by the cost of getting it," Eshel said.

The dopamine connection

In the course of their study, the team came up with a possible neural mechanism for the longstanding psychological observation that we value rewards more if we worked harder for them: Dopamine release in the striatum, it turns out, is greatly influenced by the effort put forth to gain a reward.

"Now we may have found the neural basis for sunk cost," Eshel said. "Dopamine could explain it."

In their study of mice, the researchers defined "cost" as either the number of times the mice had to poke their noses into a hole in a box (anywhere between just once and nearly 50 times) or risk incurring mild to moderate foot shocks to get access to a "reward": either sugar water or instant direct stimulation of dopamine release in two centers in a structure in the middle of the brain called the striatum. These centers are well known for their role in motivation and movement (motion), their abundance of dopamine receptors, and their innervation by dopamine-secreting tracts originating in regions deeper in the brain. And for their involvement in learning, habit formation and addiction.

The researchers first determined the test animals' "cost-free consumption": how much a mouse will consume until satiation in a cost-free situation (all it had to do was stick its nose in the hole, and bingo!). That told the investigators how much the mouse "liked" something.

Then, in steps, they raised the cost of acquisition by increasing the number of nose-pokes, or the intensity of electric shocks to a mouse's feet, required to get the reward.

The researchers likewise methodically varied the amounts of reward (whether sucrose or direct stimulation of dopamine release in the striatum) animals got for a given amount of persistence or discomfort.

Dopamine release in mice's striatum was assessed as soon as each reward was earned.

Not too surprisingly, striatal dopamine release was influenced by the size of the prize. But, the scientific team learned, raising the reward's cost also triggered greater dopamine release in the striatum: There was a biochemical basis for the concept of sunk cost.

Sunk cost and survival

How does this make any evolutionary sense? To an economist, valuing something because of sunk costs is aberrant decision making.

One idea, Eshel suggested: "In an environment with limited resources (as most are), when we typically get rewarded only after really hard work, we may need high dopamine secretion to get us to do it again."

"Because dopamine reinforces previous behaviors, it may reflect sunk costs," he said. "The dopamine release we saw may enable you to pay those steep costs in the future."

More information: Neir Eshel et al, Striatal dopamine integrates cost, benefit, and motivation, *Neuron* (2023). DOI: 10.1016/j.neuron.2023.10.038

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