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 **|   FEATURE   |**Anhedonia

**WHY STRESS STOPS YOU FEELING JOY – AND HOW TO OVERRIDE IT**

**When everything feels… well, ‘meh’, there’s complex chemistry at play in your brain. Experts explain the science of ‘anhedonia’ – and how to get the colour back in your life**

Have you ever been out to dinner with friends, or on a walk through your favourite park, and found yourself curiously unmoved by any of it? The atmosphere is great, the food is good, the weather is beautiful – but you find no pleasure in what should be a distinctly pleasurable experience.

The word for this is anhedonia, from the Greek words ‘an’ and ‘hedone,’ which collectively mean ‘without pleasure.’ Occasional instances of anhedonia are a normal part of the human experience. But longer-lasting anhedonic spells might mean something else is going on. Sometimes it has to do with a mental illness, but, for other people, higher than normal stress can be enough to suck the joy from your existence.

Recent research has begun exploring how stress, whether that’s from a difficult job, hectic family life or other things, actually changes the way our brain’s reward system functions, reducing our ability to feel sparks of joy in response to things we like. Some questions remain in this line of research, including how susceptibility can differ between people, and what exactly the best therapy is. But the basic takeaway at the moment is clear: stack up the stressors in your life, and you may be stealing your happiness away.

**LIFE WITHOUT PLEASURE**

In past decades, researchers defined anhedonia as simply the loss of the ability to feel pleasure. More recent work has slightly expanded that definition, says Prof Diego Pizzagalli, a neuroscientist at the University of California, Irvine, in the US. Today, we understand anhedonia to include both the lack of pleasure as well as an absence of motivation to even seek out pleasurable things in the first place.

Imagine considering whether to meet some friends for a movie. You’d think about the joy of being with people you like, or experiencing a good film. And then you’d consider the time it takes to get ready, the hassle of getting there, the money you’d need to pay. For many of us, it could be worth it. But in people with anhedonia, the perceived reward shrinks while the cost expands.

“It’s basically that the effort, literally the cognitive or physical effort, is just too large,” Pizzagalli says. “And so they actually will not initiate it.”

One big factor in anhedonia is dopamine, a molecule that’s released in anticipation of a reward. Dopamine release is impaired in people with anhedonia, blunting the brain’s reward system.

That impairment is sometimes due to a mental health condition like depression or schizophrenia, or because of substance abuse. However, for many people, chronic stress can also cause dopamine dysfunction. When faced with stress, studies in animals show the brain initially responds with a surge of dopamine, likely to help us cope, Pizzagalli says.

“But when the stressor becomes uncontrollable, chronic and sustained, then you get a really profound downregulation of dopamine,” he says. “That actually has been linked very clearly to anhedonic phenotypes [patterns of behaviour].”

So, an argument with a partner likely won’t tip you into anhedonia. But months of doing overtime at work might. Pizzagalli has studied people who reported themselves to be under high stress, but didn’t meet any of the criteria for anhedonia or depression. That could mean that stress can begin to eat away at our reward systems slowly, before we even realise it.

So, is there anything we can do about it?

**HAPPY MICE, SAD MICE**

That’s a question Prof Mazen Kheirbek, a systems neuroscientist at the University of California, San Francisco, set out to answer in recent research published in the journal *Nature*. He and his colleagues repeatedly put mice into an enclosure with a much larger, aggressive mouse. Once the mice were properly stressed by the rodent Goliath, the researchers conducted tests with sugar water to measure their ability to respond to rewards.

“Normal mice love sugar,” Kheirbek says, and will choose it every time. Anhedonic mice, by contrast, don’t really care what kind of water they drink.

The researchers found two kinds of mice: some that soon stopped choosing sugar water after being stressed, and others who seemed unaffected. They termed these ‘susceptible’ and ‘resilient’ mice, respectively. Then, they used electrical probes to measure the brain activity of both groups of mice, looking for things that set them apart.

They found two different brain activity signatures, one for each group, that they think help to pinpoint anhedonia. Both occurred in the amygdala – which is involved in generating emotional states – and the hippocampus, a brain region involved in memory storage and predicting future events.

In the resilient mice, “their brains basically were really [good at] saying that this is sucrose and this is water,” Kheirbek says. “The susceptible mice basically lumped together those two reward values.”

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In other words, the stressed mice susceptible to anhedonia could no longer see sugar water as a reward, sapping their desire to consume it, while the resilient ones continued to perceive extra value in the sweet stuff. Kheirbek says there could be a similar range of responses to stress in humans, too.

“Two individuals may have the same kind of stress, but one individual may come out and develop depression-related disorders and develop anhedonia and one individual may not,” he says.

Kheirbek says they also saw signs of a kind of ‘indecision state’ in the susceptible mice, which he thinks could be similar to the pattern of rumination often seen in people with depression.

“It’s interfering with your normal ability to go out, experience the environment around you and experience the high-value rewards,” he says.

The researchers also went a step further, using a technique called chemogenetics to alter brain cells in the mice’s hippocampi so they’d respond to a drug that increased the cells’ activity levels. This eliminated the indecision state the susceptible mice fell into, and they began choosing sugar water more frequently.

“By just manipulating a single cell type in this area, we can actually manipulate the behaviour,” Kheirbek says. “So that’s very exciting.”

That kind of approach won’t work in humans right now, but Kheirbek says their research does highlight a specific signature of anhedonia that might also be present in us, which could one day be targeted with drugs.

**FIGHTING ANHEDONIA**

So how can you counter these feelings? If you think you might be experiencing anhedonia, or even if the world just seems to have a little less colour in it, there are a few simple things you can do, Pizzagalli says. The first is simply to reduce the amount of stress in your life – though that’s easier said than done.

Not all stress is bad – the right kind, in the right doses, can be good for us. But harmful stress has three main components, Pizzagalli says: a lack of control over the situation, unpredictability and the potential for humiliation. Identifying things in your life that have some combination of these more toxic traits could be a place to start.

Then, there are simple ways to help your body and brain destress more effectively, including getting enough sleep and exercise. “Exercise… is a fantastic stress buffer for many people,” Pizzagalli says.

Exercise can also help to reduce inflammation in the body, a process that’s tied to both stress and directly to anhedonia itself. Inflammation is a key response from an overactive immune system – which is good if we’re fighting off a virus, but not so great if there’s no active threat. Pizzagalli says the lack of motivation people with anhedonia experience might be comparable to how we feel when we have the flu. Our body is conserving its energy so the immune system can get to work – and something similar could be happening when inflammation occurs for non-disease-related reasons, too.

Paying attention to diet is another great place to start for reducing inflammation in the body. Foods high in fat and sugar, or that are highly processed, tend to be pro-inflammatory, while fruits, vegetables and whole grains help rein inflammation in.

Another important component to moving past anhedonia is breaking its vicious cycle. When we don’t experience rewarding things we tend to forget how pleasurable they can be, which makes us less likely to choose them in the future.

A type of simple therapy called ‘behavioural activation’ seeks to reverse this cycle by having participants engage in rewarding activities, even small ones. That could mean going for a walk, or meeting a friend for coffee. The key, Pizzagalli says, is sticking to a specific schedule to make sure you’re consistently exposing yourself to positive stimuli.

“There are always potentially pleasurable cues in our environment,” he says.

Another simple psychological trick is to help the rewarding moments really sink in, what Pizzagalli calls ‘savouring.’ Take a few moments with your morning coffee to inhale the rich aroma and enjoy the first sip. Sit for a minute outside and watch the light play across the trees. Close your eyes when you are out for dinner for a moment and drink in the ambience. Those acts of presence may help embed the experience of pleasure more deeply in your memory.

Surprisingly, studies show antidepressants (like the selective serotonin reuptake inhibitors, or SSRIs) aren’t very effective at relieving anhedonia.

**THE FUTURE OF JOY**

Not everyone is likely to be at the same risk for anhedonia. Genetics likely predispose some people to developing the condition when exposed to stress, Kheirbek says.

“Some individuals may be particularly vulnerable, so that a single experience can actually produce anhedonia, whereas other individuals may require accumulated stress over the course of many experiences,” he says.

These genetic links aren’t very well studied at the moment, however – meaning we have little ability to tell anyone how susceptible they might be. It’s important to remember, too, that genes are not destiny. Our DNA is shaped by our environment and our experiences in complex ways, meaning two people with the same genes for any trait may end up quite different.

“That’s something that we’re very interested in: trying to figure out whether or not there are vulnerability signatures in the brain that we can identify,” Kheirbek says.

Another big question is how stress early in life versus stress later on might affect our odds of developing anhedonia. Pizzagalli conducted a study of young adults who’d experienced maltreatment as young children. Even though they didn’t meet the criteria for depression, he says their brains’ reward systems were less active when the participants were imagining a potential reward. This is a warning sign for anhedonia.

Given that some people may be more predisposed to developing anhedonia, there’s still a need for more powerful and targeted treatments to address it. One thing Kheirbek says he’s excited about is non-invasive brain stimulation, which uses small pulses of electricity or magnetism to directly manipulate brain activity. It’s already in use as a treatment for some types of depression, and Kheirbek sees similar potential for anhedonia. His most recent research is offering direction for these kinds of treatments, he argues, by beginning to identify areas of the brain and patterns of activity that might be targeted.

“If we can break that pattern through stimulation, it could be advantageous to some individuals,” Kheirbek says.

Pizzagalli, who recently moved to UC Irvine from Harvard to found a new lab there, is interested in identifying more personalised treatments for anhedonia. Research in recent years has indicated there may be more than one kind of anhedonia, which may require different types of treatment. By identifying biomarkers for these various flavours of anhedonia (like the patterns of brain activity Kheirbek is looking for) we may be able to target treatments specifically to individual patients, making them more effective.

For many experiencing a bout of anhedonia, the solutions are simpler. Cutting down on stress while stocking up on joyful experiences, and taking care to keep a healthy balance in your diet, exercise and sleep schedule are often all it takes to reinfuse your life with happiness. There is joy to be found all throughout our lives, if we’re only able to let it in.