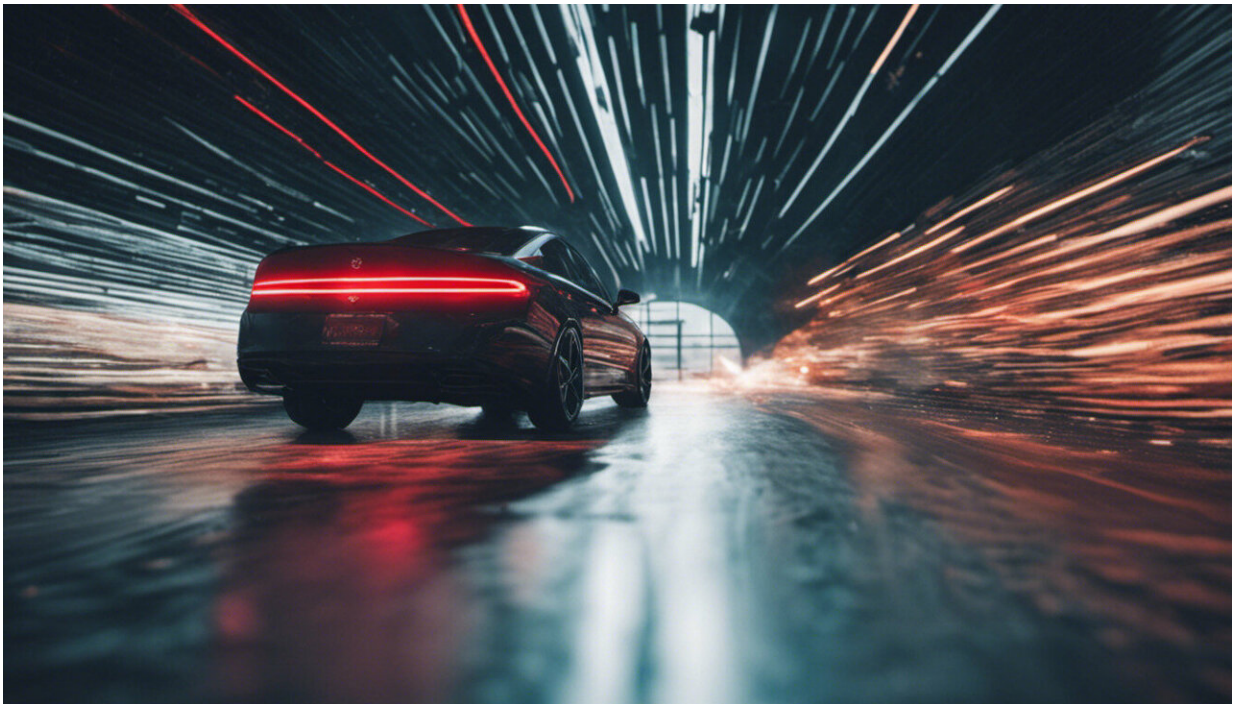


How signals from your body could be making you anxious

March 5 2023, by Jennifer Murphy, Geoff Bird and Kiera Louise Adams



Credit: AI-generated image ([disclaimer](#))

Where do emotions come from? This is a question that has interested scientists for centuries. Most of us would agree that when we experience an emotion, there is often a change in our body. We might be aware of our heart beating very fast when watching a scary film, or notice breathing heavily after a big argument.

As far back as the 1880s, [it was theorized](#) that physical changes in the body—such as a racing [heart](#) beat—would be sufficient to trigger an emotional experience. Though over the past 150 years, this has been hotly debated.

Now a new study, [published in Nature](#), provides fresh insight.

The researchers used a nonsurgical pacemaker to precisely raise the heart rate of mice and measured behavior that may indicate [anxiety](#). This included how willing mice were to explore parts of a maze and how they searched for water.

They found that raising the heart rates of mice led to more anxiety-related behavior, but only in "risky environments." For example, when there was risk of a mild shock, mice with elevated heart rates showed more caution in their search for water.

These findings are in keeping with the "[two-factor theory](#)" of emotion and evidence from [human studies](#). This theory states that while [physical changes](#) play a role in [emotional experience](#), the context is important too. Increasing the mouse's heart rate was not enough to cause anxiety. However, in a "risky environment" where they may expect to become anxious, increasing the heart rate triggered anxious behavior.

We can see this if we think about how we interpret changes in our bodies in different situations. A sudden increase in your heart rate when you are dancing with friends doesn't cause much concern. However, when walking home alone in the dark, a similar spike in heart rate might be interpreted as anxiety.

To get a better understanding of these effects, the researchers scanned the mice's brains during the experiment. They found that an area of the brain associated with perceiving and interpreting bodily signals, the

posterior insula cortex, was involved. When they inhibited this brain area, an increase in heart rate did not result in as much anxious behavior.

Ability versus experience

In humans, the insula is associated with a process called [interoception](#)—our perception of signals that come from inside our body. This includes being able to feel signals like our heart rate, how hungry we are or how badly we need to use the bathroom.

Many theories suggest that interoception may play a role in [emotion](#), particularly anxiety. However, despite a great deal of research, it is only recently that the field has gained attention and there are still few clear conclusions about exactly how interoception links to emotions such as anxiety.

As in the mouse study, most researchers agree that changes in the body—such as an increased heart rate or a change in body temperature—contribute to [emotional experience](#). A person who has difficulties perceiving such bodily signals or is extremely sensitive to small changes, may have difficulties with emotions. These [individual differences](#) in "interoceptive accuracy" have been of interest to many researchers.

It was originally thought that better interoceptive accuracy would cause more anxiety. In a number of studies, participants were asked to count their heartbeats. To determine if they were accurate, their count was then compared to the actual number of heartbeats. While it was thought that greater knowledge of one's [heart rate](#) increases might trigger feelings of [panic](#), evidence for this is not clear cut. In a [large study](#), where we pooled data from several studies, we found no clear relationship between anxiety and such accuracy.

Other aspects of interoception are therefore more likely to be relevant to anxiety. For example, evidence suggests that [anxious people](#) may pay more [attention](#) to their bodily signals. Whether an individual interprets their bodily signals as positive, negative or neutral may also be [key](#)—and their approach may be shaped by both genetics and life experiences.

[Newer research](#) suggests that particular combinations of interoceptive accuracy and attention may play a role in anxiety. For example, it seems like anxious individuals pay more attention to their bodily signals than others, but are also less able to accurately perceive them.

There's also been a lot of research on how well people understand their own [interoceptive profile](#). For example, do people who are good at perceiving bodily signals know they are? Do people who are overly focused on what's happening in their body know they have such focus? Are people who tend to interpret bodily signals in overly negative ways aware that they do so?

Understanding one's interoceptive profile might be relevant for anxiety. If people understand that their anxiety might be caused by them paying too much attention to bodily signals, or interpreting them in a negative way, then they may be able to do something about it.

So let us return to the question—where do emotions come from? Bodily signals seem to play a role, but interpretation of the context matters too. While we don't yet know how and why people differ in their processing of bodily signals, exploring these differences may help us understand and treat anxiety better in the future.

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