

Basing everyday decisions on risk of pain or loss linked to increased anxiety

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Scientists have shone new light on how the human brain uses past experiences and generalizes them to future events, helping us safely navigate the world around us, a study in *eLife* reveals.

Our ability to 'generalize' is an important survival technique, but over-

generalizing from bad events could explain why some people fear and then avoid scenarios that are not actually dangerous. This over-avoidance has been identified as a significant factor in anxiety, obsessive-compulsive disorder, chronic pain and depression.

"If eating a particular food in the past has made you ill, it is likely you will want to avoid eating similar-looking or smelling foods in the future," says lead author Agnes Norbury, Research Associate at the University of Cambridge, UK. "We wanted to look at how people decide whether or not to avoid particular situations, how this information is represented in the brain, and whether people who generalize more from [negative events](#) tend to be more anxious."

Norbury and her team took two groups of people—26 did a test in the lab while having an MRI scan of their brain, and 482 did the test online. Both groups were presented with different flower-like shapes on a screen, some of which were 'safe' and some of which were 'dangerous'.

To avoid a dangerous shape, the participants could hit an 'escape' button. If they didn't do this, those in the lab group would receive an electric shock, and those doing the test online would lose some of their online cash stake. However, hitting the escape button also came at a cost—of receiving additional shocks at the end, or losing more money.

This test allowed the researchers to see when people were over-generalizing and hitting the escape button too much. They then used mathematical models to reconstruct how people decided to avoid the situation when faced with images similar to those they associated with pain or loss, and combined this with the brain scans and questionnaires about psychological symptoms.

They found that people were more likely to generalize from negative events, compared to safe or neutral outcomes. In addition, different parts

of the decision-making process were linked to activity in different brain regions, including areas involved in vision, fear response and safety learning. They also found that those people who generalized more from the negative events (pain or loss) reported a greater experience of anxious feelings and intrusive thoughts (negative thoughts that enter your mind against your will and are hard to get rid of).

"We hope that these findings will contribute to a greater understanding of the thought processes that underlie anxiety in some people," said senior author Dr. Ben Seymour, Clinical Research Associate at the University of Cambridge. "Our results show the benefits of analysing complex behavioral processes such as generalization into separate components that can be examined and linked back to [brain](#) activity and symptoms. By better understanding what causes these symptoms in different cases, we might be able to tailor treatments more effectively to people with anxiety in future."

More information: Agnes Norbury et al, Value generalization in human avoidance learning, *eLife* (2018). [DOI: 10.7554/eLife.34779](https://doi.org/10.7554/eLife.34779)

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