Our willingness to help others is governed by a specific brain region pinpointed by researchers in a study of patients with brain damage to that region.
Learning about where in the brain "helping" decisions are made is important for understanding how people might be motivated to tackle large global challenges, such as climate change, infectious disease and international conflict. It is also essential for finding new approaches to treating disorders of social interactions.

The study, published in *Nature Human Behaviour*, was carried out by researchers at the University of Birmingham and the University of Oxford, and shows for the first time how a region called the *ventromedial prefrontal cortex* (vmPFC) has a critical role in helping, or "prosocial" behaviors.

Lead author Professor Patricia Lockwood said, "Prosocial behaviors are essential for addressing global challenges. Yet helping others is often effortful and humans are averse to effort. Understanding how effortful helping decisions are processed in the brain is extremely important."

In the study, the researchers focused on the vmPFC, a region located right at the front of the brain, which is known to be important for decision-making and other executive functions. Previous studies using *magnetic resonance* imaging (MRI scanning) have linked the vmPFC to choices that involve a trade-off between the rewards available and the effort required to obtain rewards. However, these techniques cannot show whether a part of the brain is essential for these functions.

Three groups of participants were recruited for the study. 25 patients had vmPFC damage, 15 patients had damage elsewhere in the brain, and 40 people were healthy age and gender-matched control participants. These groups allowed the researchers to test the impact of damage to vmPFC specifically.

Each participant attended an experiment where they met another person anonymously. They then completed a decision-making task that
measured how willing they were to exert physical effort (squeezing a grip force device) to earn rewards (bonus money) for themselves and for the other person.

By enabling participants to meet—but not see—the person they were "working" for in advance, researchers were able to convey the sense that participants' efforts would have real consequences, but hide any information about the other person that could affect decision-making.

Each choice the participants made varied in how much bonus money for them or the other person was available, and how much force they would have to exert to obtain the reward. This allowed the researchers to measure the impact of reward and effort separately, and to use advanced mathematical modeling to precisely quantify people's motivation.

The results of the study clearly showed that the vmPFC was necessary for motivation to help others. Patients with vmPFC damage were less willing to choose to help others, exerted less force even after they did decide to help, and earned less money to help others compared to the control groups.

In a further step, the researchers used a technique called lesion symptom mapping which enabled them to identify even more specific subregions of the vmPFC where damage made people particularly antisocial and unwilling to exert effort for the other person. Surprisingly, damage to a nearby but different subregion made people relatively more willing to help.

Co-lead author Dr. Jo Cutler said, "As well as better understanding prosocial motivation, this study could also help us to develop new treatments for clinical disorders such as psychopathy, where understanding the underlying neural mechanisms can give us new insights into how to treat these conditions."
"This region of the brain is particularly interesting because we know that it undergoes late development in teenagers, and also changes as we get older," added Professor Lockwood. "It will be really interesting to see whether this area of the brain can also be influenced by education—can we learn to be better at helping others?"

**More information:** Human ventromedial prefrontal cortex is necessary for prosocial motivation, *Nature Human Behaviour* (2024). [DOI: 10.1038/s41562-024-01899-4](https://doi.org/10.1038/s41562-024-01899-4)

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