

Anxiety can kill your social status

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Mitochondria in the neurons of the nucleus accumbens. Credit: Graham Knott (EPFL)

Neuroscientists at EPFL identify a brain region that links anxious temperament to low social status. The researchers were able to tweak social hierarchy in animals by using vitamin B3.

There are important differences in how individuals approach life. While some people are relaxed and calm, others often see situations as

threatening, making them worried and tense. This kind of "trait" anxiety has significant consequences on a person's social life, undermining their confidence to compete for social standing. In our competitive world, high-anxious individuals have a disadvantage and can feel overlooked and rejected; as a result this can lead to what psychologists call "social subordination". Publishing in *PNAS*, neuroscientists at EPFL have pinpointed an area of the brain related to motivation and depression that could link [trait anxiety](#) to social subordination.

Trait anxiety and low social status: chicken and egg

Both animals and humans establish social ranks through competition, which in turn determines the hierarchy of a social group. The ability to compete depends on different features including size, age, and previous social experience. Some research shows that social competition is also influenced by personality traits, but this has not been explored in depth.

There is a growing suspicion among social scientists and psychologists that when individuals present high anxiety as a personality characteristic, it might actually predispose a person to perform poorly in social competition, trapping them in a vicious cycle of trait anxiety and low social status. However, we know very little about the neuroscience behind this cycle, which could be the key to breaking it.

Rat revelations

The lab of Carmen Sandi at EPFL now brings biological evidence to bear upon the field. The researchers performed a series of experiments to identify the brain areas involved in trait anxiety and [social competition](#). The experiments involved categorizing [rats](#) on a spectrum of trait anxiety, from low-anxious to high-anxious rats, which model trait anxiety.

The animals underwent several behavioral tests that required high-anxious rats to compete socially with their low-anxious counterparts, and their performance was quantified and analyzed statistically. In addition, the researchers examined the brains of the rats to identify changes in biological function.

The experiments highlighted an area of the brain known as the "[nucleus accumbens](#)", which has been long-associated with motivation, reward and depression – in humans too. When competing socially, most of the high-anxious rats took on a lower social status – technically described as becoming "socially subordinate".

The nucleus accumbens of these particular rats showed a reduced energy metabolism. This involves the mitochondria, which are the cell's organelles that are in charge of breathing and energy production. The researchers found that the high-anxious rats showed lower mitochondrial function than more relaxed ones.

Reversing social status with drugs?

The scientists confirmed their findings with pharmacological manipulation: they gave the nucleus accumbens of rats drugs that either block or enhance mitochondria – one of the drugs was a part of the common vitamin B3 (niacin). When rats received blocking agents, their social competitiveness dropped, taking their social status with it.

On the other hand, when high-anxious rats were given enhancers, rats performed significantly better socially, thereby achieving higher social status. But the effects were not permanent: when the drugs wore off, the rats generally returned to their original rung of the social ladder.

The study confirms that trait anxiety can actually predispose an individual to a lower [social status](#). This could mean that pharmacological

manipulation of mitochondria in the nucleus accumbens could potentially influence the social rank of a person. The study is also the first to relate that brain energy metabolism influences the establishment of social hierarchies.

Carmen Sandi remains cautious, since the study involved rats rather than humans; after all, brain function is just one of the many elements that influence social dynamics. "Social interactions are immensely complex," says Sandi. "They involve so many factors that it is difficult to examine the impact of each in isolation. However, this is an exciting finding that shows a brain mechanism whereby anxious personality affects social competitiveness - and this points to very promising directions in this field."

More information: Fiona Hollis et al. Mitochondrial function in the brain links anxiety with social subordination, *Proceedings of the National Academy of Sciences* (2015). [DOI: 10.1073/pnas.1512653112](https://doi.org/10.1073/pnas.1512653112)

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