

'Warrior gene' predicts aggressive behavior after provocation

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Individuals with the so-called "warrior gene" display higher levels of aggression in response to provocation, according to new research co-authored by Rose McDermott, professor of political science at Brown University. In the experiment, which is the first to examine a behavioral measure of aggression in response to provocation, subjects were asked to cause physical pain to an opponent they believed had taken money from them by administering varying amounts of hot sauce. The findings are published in the *Proceedings of the National Academy of Sciences*.

In addition to McDermott, the research team included Dustin Tingley of Princeton University, Jonathan Cowden of the University of California-Santa Barbara, Giovanni Frazetto from the London School of Economics, and Dominic Johnson from the University of Edinburgh. Their experiment synthesized work in psychology and behavioral economics.

Monoamine oxidase A is an enzyme that breaks down important neurotransmitters in the brain, including dopamine, norepinephrine, and serotonin. The enzyme is regulated by monoamine oxidase A gene (MAOA). Humans have various forms of the gene, resulting in different levels of enzymatic activity. People with the low-activity form (MAOA-L) produce less of the enzyme, while the high-activity form (MAOA-H) produces more of the enzyme.

Several studies have found a correlation between the low-activity form of MAOA and aggression in observational and survey-based studies.

Only about a third of people in Western populations have the low-activity form of MAOA. By comparison, low-activity MAOA has been reported to be much more frequent (approaching two-thirds of people) in some populations that had a history of warfare. This led to a controversy over MAOA being dubbed the "warrior gene."

The PNAS paper is the first experimental test of whether MAOA-L individuals display higher levels of actual behavioral aggression in response to provocation. A total of 78 subjects took part in the experiment over networked computers (all were male students from the University of California-Santa Barbara). Each subject (A) first performed a vocabulary task in which they earned money. Then they were told that an anonymous partner (B), linked over the network, could choose to take some of their earnings away from them. The original subject (A) could then choose to punish the taker (B) by forcing them to eat unpleasantly hot (spicy) sauce — but they had to pay to do so, so administering punishment was costly. In reality, the "partner" who took money away was a computer, which allowed the researchers to control responses. No one actually ingested hot sauce.

Their results demonstrate that

- Low-activity MAOA subjects displayed slightly higher levels of aggression overall than high-activity MAOA subjects.
- There was strong evidence for a gene-by-environment interaction, such that MAOA is less associated with the occurrence of aggression in the low-provocation condition (when the amount of money taken was low), but significantly predicted aggression in a high-provocation situation (when the amount of money taken was high).

The results support previous research suggesting that MAOA influences aggressive behavior, with potentially important implications for

interpersonal aggression, violence, political decision-making, and crime. The finding of genetic influences on aggression and punishment behavior also questions the recently proposed idea that humans are "altruistic" punishers, who willingly punish free-riders for the good of the group. These results support theories of cooperation that propose there are mixed strategies in the population. Some people may punish more than others, and there may be an underlying evolutionary logic for doing so.

Source: Brown University

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