

Brain's 'social enforcer' centers identified

October 3 2007

Researchers have identified brain structures that process the threat of punishment for violating social norms. They said that their findings suggest a neural basis for treating children, adolescents, and even immature adults differently in the criminal justice system, since the neural circuitry for processing the threat of such punishment is not as developed in younger individuals as it is in adults. The researchers also said that their identification of the brain's "social norm compliance" structures also opens the way to exploring whether psychopaths have deficiencies in these structures' circuitry.

Manfred Spitzer, Ernst Fehr, and colleagues published their findings in the October 4, 2007 issue of the journal *Neuron*, published by Cell Press.

"In this study, we sought to uncover the neural circuits involved in forced norm compliance," wrote the researchers. "This question touches the very foundations of human sociality because the establishment of large-scale cooperation through social norms is a unique feature of the human species. Norm compliance among humans is either based on people's voluntary compliance with standards of behavior that are viewed as normatively legitimate or on the enforcement of compliance through punishment. Although much compliance is voluntary, there can be little doubt that social order would quickly break down in the absence of punishment threats because a minority of noncompliers can trigger a process that leads to widespread noncompliance due to the conditional nature of many people's compliance.

"To our knowledge, this is the first study that examines the brain

processes involved in humans' behavioral response to the threat of punishment for social norm violations," wrote the researchers.

In their experiments, the researchers instructed one person to decide how much money from a shared pot to give to a second recipient. In a control condition, the second person was merely a passive recipient of whatever amount the first person decided. However, in the punishment condition, the recipient could decide to punish the first person by spending all or part of another pot of money, which would reduce the first person's earnings.

During the control and punishment conditions, the first person's brain was scanned using functional magnetic resonance imaging. This widely used scanning technique involves using harmless magnetic fields and radio signals to measure blood flow in brain regions, which reflects brain activity.

The researchers found that the scanned subjects showed activation of specific areas of the prefrontal cortex while they were making decisions that they knew could bring punishment. The areas that were activated were known to be involved in control of decision-making related to fairness and evaluation of punishing stimuli.

To establish that the activated brain areas were specifically involved in social punishment, the researchers also tested the subjects' brain responses when a computer and not a person meted out the punishment. The researchers found that such nonsocial punishment produced significantly less activation in the brain areas.

The researchers also tested whether "Machiavellian" personality traits—selfishness and opportunism—affected people's responses on the tests. To assess the subjects' Machiavellian leanings, the researchers gave them a questionnaire that determined those tendencies.

The researchers found that people who scored higher on Machiavellism transferred less money during the control condition and more during the threat of punishment. The Machiavellians also showed higher activation of key brain areas involved in social norm compliance, found the researchers.

“Therefore, Machiavellian subjects earned the highest incomes because they earned most in the control condition and were best at escaping punishment in the social punishment condition,” they wrote.

The researchers said their findings could have implications for understanding the basis of psychopathic behavior, since people with lesions in the prefrontal areas show an inability to behave in appropriate ways, even though they understand social norms.

Thus, a dysfunction in the areas involved “might also underlie certain psychopathological disorders characterized by excessively selfish tendencies and a failure to obey basic social norms,” they wrote.

Identification of the brain’s social norm compliance circuitry “might have implications for the criminal justice system,” concluded the researchers. “As these brain areas are not yet fully developed in children, adolescents, or even young adults, our results are consistent with the view that these groups may be less able to activate the evaluative and inhibitory neural circuitry necessary for the appropriate processing of punishment threats. Thus, our results might provide support for the view that the criminal justice system should treat children, adolescents, and immature adults differently from adults,” they wrote.

Source: Cell Press

Citation: Brain's 'social enforcer' centers identified (2007, October 3) retrieved 10 April 2024 from <https://medicalxpress.com/news/2007-10-brain-social-centers.html>

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