

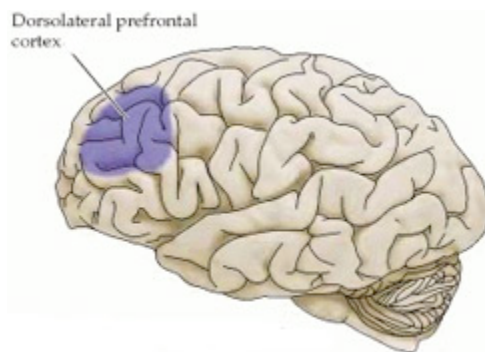
Just bad boys, or malfunctioning brains?

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Courtesy of the University of Colorado Denver
and World Science staff

Antisocial boys who abuse drugs, break laws and act recklessly aren't just "bad": many of them may have malfunctioning brains, according to a new study.

"Brain responses to everyday rewards and punishments gradually guide most youngsters' decisions to conform with society's rules," said Thomas Crowley, a psychiatrist at the University of Colorado School of Medicine and leader of the study.



A brain area known as the dorsolateral prefrontal cortex is associated with decisionmaking, after receiving information about rewards and punishments from an inner part of the brain. (Image courtesy US Nat'l Center for Biotechnology Info/NIH)

But "when these seriously troubled kids experience rewards and punishments... their brains apparently malfunction," he added. "Our findings strongly suggest that brain malfunction underlies their frequent failure to conform to rules, to make wise decisions, and to avoid relapses back to drug use and antisocial acts."

The scientists, from the University of Colorado at Boulder and the University of Maryland, studied 20 adolescent boys who on average had been on probation 139 of the previous 180 days.

Nineteen of the 20 had the psychiatric diagnosis of conduct disorder, and all had diagnoses of substance use disorder. They had been abstinent, however, an average of about five weeks when studied. They were compared with 20 other boys who did not have serious antisocial or drug problems, but who were of similar age, ethnicity, and home neighborhoods.

All were asked to play a computerized risk-taking game that repeatedly presented a choice between a cautious and a risky behavior: press the left button and always win one cent, or press the right button and either win five cents or lose ten cents.

Interestingly, the scientists said, the number of risky right presses was similar in the two groups. This might have occurred, they added, because the game forced the boys to deliberate for several seconds before pressing either button.

Yet there were dramatic differences in brain activity between the two groups of players, the researchers noted. They examined which parts of the brain were most active during play using a scanning technology known as functional magnetic resonance imaging.

Normally, a brain region called the the anterior cingulate cortex monitors changing rewards and punishments, and then sends that information to another brain region, the dorsolateral prefrontal cortex, which regulates one's choices among possible behaviors.

During decision-making, antisocial boys had significantly less brain activity than normals in both of

those regions, and also in other decision-making areas, the investigators found. On the other hand, there were no parts of the brain in which the antisocial youngsters showed more activation.

As predicted by others not associated with the study, the antisocial boys also had dysphoria, a chronic sad-anxious state, the researchers said. They also displayed “reward insensitivity”; in the game their brains showed less response than the comparison boys’ brains to wins. They additionally were found to have “punishment hypersensitivity,” with greater brain response to losses than comparison boys.

The study was published Sept. 22 online in the research journal *PLoS One*.