

# The Psychopathic Brain: New Insight

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Structural brain differences appear to distinguish psychopaths from individuals without psychopathic traits, new research shows.

Using MRI, researchers found that the striatum was about 10% larger on average in adults with psychopathic traits than in matched control persons and that this relationship was mediated by stimulation seeking and impulsivity.

The striatum is a subcortical region of the forebrain involved in the cognitive processing of reward-related information and motivational aspects of behavior.

"Our study's results help advance our knowledge about what underlies antisocial behavior such as psychopathy," co-author and neurocriminologist Olivia Choy, PhD, with Nanyang Technological University in Singapore, said in a news release.

"In addition to social environmental influences, it is important to consider that there can be differences in biology, in this case, the size of brain structures, between antisocial and non-antisocial individuals," Choy added.

The study was [published online](#) March 6 in the *Journal of Psychiatric Research*.

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## Antisocial, Egocentric

Individuals with psychopathic traits typically have an egocentric and antisocial personality. They generally lack remorse for their actions or empathy for others and often have criminal tendencies.

Some prior research suggests links between psychopathy and an overactive striatum, but it was unclear what role striatal volume plays in this behavior.

For the study, investigators assessed striatal volume using MRI in 120 adults living in the community, and they assessed psychopathy using the Psychopathy Checklist – Revised.

Correlational analyses showed that increased striatal volumes were associated with more psychopathic traits ( $P = .001$ ) in both men and women.

Volumetric increases were found for all subregions of the striatum in psychopathic individuals, after controlling for age, [substance dependence](#), substance abuse, antisocial [personality disorder](#), attention-deficit/hyperactivity disorder, social adversity, and total brain volume.

An analysis of 18 psychopathic individuals showed that striatal volumes were increased 9.4% compared with 18 propensity-matched control persons ( $P = .01$ ).

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## Abnormal Reward Processing

Stimulation seeking and impulsivity partly mediated the striatal-psychopathy relationship, accounting for 49.4% of this association.

These findings "replicate and build on initial studies indicating striatal enlargement in adults with psychopathy, yielding an updated effect size of  $d = 0.48$ ," the researchers note.

The results are "consistent with the notion that striatal abnormalities in individuals with psychopathy partly reflect increased sensation-seeking and impulsivity, and support the hypothesis of abnormal reward processing in psychopathy," they add.

"We have always known that psychopaths go to extreme lengths to seek out rewards, including criminal activities that involve property, sex, and drugs," co-author Adrian Raine, DPhil, Department of Criminology, Psychiatry and Psychology, University of Pennsylvania, Philadelphia, said in a news release.

"We are now finding out a neurobiological underpinning of this impulsive and stimulating behavior in the form of enlargement to the striatum, a key brain area involved in rewards," Raine added.

What causes striatal enlargement in individuals with psychopathy still needs to be determined.

In human development, the striatum typically becomes smaller as a child matures, suggesting that psychopathy is associated with differences in brain development, the researchers suggest.

"Because biological traits, such as the size of one's striatum, can be inherited to child from parent, these findings give added support to neurodevelopmental perspectives of psychopathy — that the brains of these offenders do not develop normally throughout childhood and adolescence," said Raine.

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## Larger Studies Needed

Commenting on the findings for *Medscape Medical News*, Terrie E. Moffitt, PhD, professor of psychology, Duke University, Durham, North Carolina, noted there is "general consensus among brain-imaging researchers that testing brain-behavior relations requires very large samples in the thousands, and also samples of research participants who represent the full extent of variation in the population as well as possible — from rich to poor, from well to unwell, from high IQ to low IQ, from strong mental health to mental illness, etc.

"It would be grand to see this study's provocative finding replicated in a large, representative sampling design," Moffitt said.

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