Brain network of psychopathic criminal functions differently

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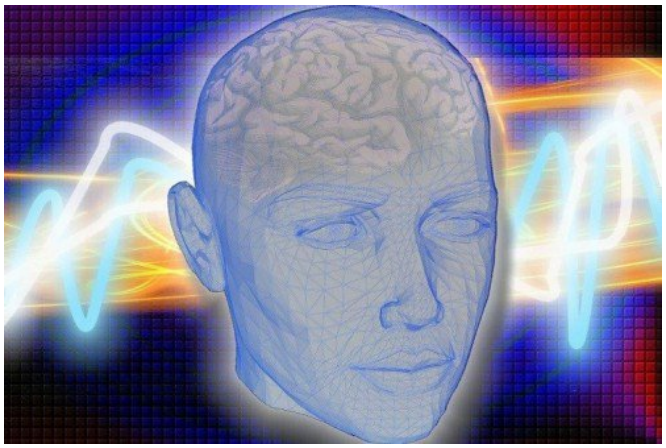

Credit: Radboud University

A strong focus on reward combined with a lack of self-control appears to be linked to the tendency to commit an offence. Brain scans show that this combination occurs in psychopathic criminals, say researchers from Nijmegen in an article in the journal *Social Cognitive and Affective Neuroscience*.

Many criminal offenders display psychopathic traits , such as antisocial and impulsive behaviour. And yet some individuals with psychopathic traits do not commit offences for which they are convicted. As with any other form of behaviour, psychopathic behaviour has a neurobiological basis. Researchers from the Donders Institute and the Department of Psychiatry at Radboudumc wanted to find out whether the way a psychopath's brain works is visibly different from that of a non-psychopath. And whether there are differences between the brains of criminal and non-criminal psychopaths.

Reward centre more strongly activated

Dirk Geurts, researcher in the Department of Psychiatry at Radboudumc: "We carried out tests on 14 convicted psychopathic individuals, and 20 non-criminal individuals, half of whom had a high score on the psychopathy scale. The participants performed tests while their brain activity was measured in an MRI scanner. We saw that the reward centre in the brains of people with many psychopathic traits (both criminal and non-criminal) were more strongly activated than those in people without psychopathic traits. It has already been proved that the brains of non-criminal individuals with psychopathic traits are triggered by the expectation of reward. This research shows that this is also the case for criminal individuals with psychopathic traits."

Little self-control and sensitivity to reward

Another interesting difference was discovered between non-criminal people with multiple psychopathic traits and criminal people with psychopathic traits. Geurts: "There is a difference in the communication between the reward centre and an area in the middle of the forebrain. Good communication between these areas would appear to be a condition for self-control. Our results seem to indicate that the tendency to commit an offence arises from a combination of a strong focus on reward and a lack of self-control. This is the first research project in which convicted criminals were actually examined."

Predictors of criminal behaviour

Psychopathy consists of several elements. On the one hand, there is a lack of empathy and emotional involvement. On the other hand, we see impulsive and seriously antisocial, egocentric behaviour. Professor of Psychiatry and coordinator of the research Robbert-Jan Verkes: "Especially the latter character traits seem to be connected with an excessively sensitive reward centre. The presence of these impulsive and antisocial traits predict criminal behaviour more accurately than a lack of

empathy. The next relevant question would be: what causes these brain abnormalities? It is probably partly hereditary, but abuse and severe stress during formative years also play a significant role. Follow-up studies will provide more information.

Brain scans in courtrooms?

So what do these findings mean for the free will? If the brain plays such an important role, to what extent can an individual be held responsible for his/her crimes? Will we be seeing brain scans in the courtroom? Verkes: "For the time being, these findings are only important at group level as they concern variations within the range of normal results. Of course if we can refine these and other types of examinations, we may well see brain scans being used in forensic psychiatric examinations of diminished responsibility in the future."

More information: Dirk E.M. Geurts et al. Neural connectivity during reward expectation dissociates psychopathic criminals from non-criminal individuals with high impulsive/antisocial psychopathic traits, *Social Cognitive and Affective Neuroscience* (2016). DOI: 10.1093/scan/nsw040