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How can studying psychopaths help us understand the neural mechanisms of moral judgment?

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Abstract

There is growing interest in the neural basis of human moral cognition, in hopes that neuroscience can help to explain the general process of moral judgment. The role of emotion and cognition in moral judgment has yet to be determined. The study of psychopathic traits may be able to give us some insight into this because of their deficits in emotional responding. Our recent publication in *Molecular Psychiatry* addresses this issue by examining how brain functioning during moral decision-making varies as a function of psychopathic traits.

Commentary text

Philosophers, legal scholars, and psychologists have long argued about the role of reasoning versus emotion in moral judgment. Although we tend to think of our decision-making as a deliberate, rational process, a number of studies have demonstrated that manipulations of emotion can influence the moral judgments that we make (Schnall *et al.*, 2008, Valdesolo and DeSteno, 2006, Wheatley and Haidt, 2005). The question of how these cognitive and emotional processes may interact in moral decision-making is one of growing interest, particularly with advances in brain imaging that may help to shed light on the matter.

In one of the first neuroimaging studies to examine moral decision-making, participants were scanned while they made decisions about classic moral dilemmas such as the trolley problem (Greene *et al.*, 2001). In this dilemma, a trolley is heading down the track toward five workmen who will die unless you flip a switch that will divert it onto another track where there is only one workman who will die instead. Most people agree that flipping the switch is a morally appropriate action. In another scenario, the only way to save the five workmen is to push a large bystander off a bridge that is over the tracks, in order to stop the train. In this circumstance, which requires that one physically push another person to his death, most people say that it is not morally appropriate to do so. Although both scenarios involve a cost-benefit analysis of one life to five, most people make a distinction between these two scenarios. Greene et al. found that during scenarios that are more up-close-and-personal, such as the one that requires pushing the man, parts of the brain associated with emotional processing become more active. He argued that the emotional aversiveness to pushing the man competes with the rational cost-benefit analyses oriented to saving the most lives, and in cases like these, emotion wins. In the case of flipping the switch, activity was observed in the dorsolateral prefrontal cortex (DLPFC), a region involved in rational

decision-making and also in “cognitive control” of emotion (Greene *et al.*, 2004), or the ability to guide attention and thought to overcome the prepotent emotional response.

Based on this data, Greene proposed a dual-process theory (Greene, 2007), suggesting that emotion and cognition play competing roles in moral judgment. In situations in which individuals make non-utilitarian judgments, their automatic emotional response has won out over cognitive cost-benefit analyses. When individuals make utilitarian decisions, cognitive processes were able to override the emotional response. Greene et al. found support for this argument in their 2008 study showing that when cognitive processes are disrupted by a cognitive load manipulation, participants’ moral decisions became less utilitarian (Greene *et al.*, 2008).

In our research on psychopathic traits, we saw an opportunity to address several questions related to theories on moral decision-making. First of all, psychopathic individuals tend to engage in higher rates of immoral behavior. We first wanted to examine whether the regions important in moral decision-making in normal individuals functioned differently in more psychopathic individuals. Secondly, psychopathy has been associated with deficits in emotional processing. Thus, we were able to provide a further test of Greene's dual-process theory by examining how moral judgments are affected when emotional processing (measured indirectly via psychopathy) is compromised. Finally, an inquiry by Tassy et al. (2009) suggested that we look specifically within the DLPFC to gain information about what happens to cognitive processing during moral decision-making when emotion is compromised.

We examined moral decision-making using the same set of dilemmas used by Greene et al. (2001, 2004). Our sample consisted of 17 individuals from the community with varying degrees of psychopathic traits. The term psychopathy refers to a set a personality and behavioral traits that can be observed on a continuum in the population. Psychopathic traits include callousness, manipulativeness, lack of guilt and empathy, stimulation seeking, impulsivity, and antisocial behavior. When making decisions about the more emotional scenarios, we found that individuals scoring higher in psychopathy demonstrated reduced activity in regions identified by Greene et al. that are associated with emotional processing, particularly the amygdala (Glenn *et al.*, 2009a). This finding was expected, as previous studies have found reduced functioning in this region when processing emotional information [reviewed in (Blair, 2008)].

Interestingly, psychopathic participants did not show any differences in the proportion of utilitarian moral decisions they made (Glenn *et al.*, 2009b). This lack of differences in moral judgment was recently replicated in a larger study of psychopaths and controls using the same stimuli (Cima *et al.*, 2010). This raises questions regarding the role of emotion in moral judgment; the reduced responding in emotion-related brain regions did not affect the moral judgment of psychopathic individuals. One interpretation may be that although previous research has shown that emotion is able to *influence* moral judgment, it may not be *necessary* for moral judgment. In the case of psychopaths, they may have learned to give judgments that correspond to societal standards. In other words, they may be able to use

non-emotional processes to carry out the relevant computation required to evaluate these moral scenarios (Cima *et al.*, 2010).

These findings of no differences in moral judgments are not in line with findings from patients with lesions to the ventromedial prefrontal cortex (VMPFC), who also demonstrate deficits in emotional responding. VMPFC patients do show differences in moral judgment – specifically increased utilitarian judgments about the more emotional moral dilemmas (Ciaramelli *et al.*, 2007, Koenigs *et al.*, 2007). Several possibilities may help to explain this discrepancy. First, in our study, we were unable to measure activity in the ventromedial cortex due to issues with artifacts in the images for that region. Thus, we do not know if there was reduced functioning in this region in more psychopathic individuals during moral decision-making, although previous studies have observed reductions in the VMPFC (Blair, 2008). It may be that there is something about the VMPFC in particular that affects moral decision-making. For example, Moll & Oliveira-Souza (2007) have suggested that the VMPFC is important in moral judgment because it is necessary for the experience of prosocial moral sentiments, which emerge from the integration of cognitive and emotional mechanisms. Another possibility is that the deficits in patients with physical brain injury are much more severe than the reduced functioning observed in psychopathy. Finally, Cima et al. (2010) suggest that although psychopaths share some of the same emotional deficits as VMPFC patients, other emotions may be relatively preserved, and these may be most important for moral understanding. Future research is necessary to understand the differences between VMPFC patients and psychopathic individuals during moral decision-making.

Finally, in response to the inquiry by Tassy et al. (2009), we examined activity in the DLPFC. Greene (2007) suggests that the DLPFC is involved in the “cognitive control” of emotional responses, as well as abstract reasoning about the dilemma. Tassy et al. suggested that if the DLPFC is indeed involved in the cognitive control of emotion during moral decision-making, then since there is less emotion-related brain activity in psychopathic individuals, one would expect there to be less DLPFC activity, as less cognitive control is required. We did not find this. We found the opposite – more DLPFC activity in psychopathic individuals during emotional moral dilemmas.

The fact that we did not find reduced functioning in the DLPFC in individuals with reduced emotional responding does not rule out the hypothesis that there is cognitive control of emotion during moral decision-making. It is possible that this processing was not captured in the region of interest we defined, or that we did not have the power to detect it. Future studies will be required to explore this further.

With respect to the finding of increased DLPFC activity, we suggest that psychopathic individuals may be using an alternate method for making moral judgments – one involving more abstract reasoning processes. Since the question being asked is whether a particular action is “appropriate,” or not, they may be reasoning about whether the action would be acceptable to societal standards compared to the lower-scoring individuals who may be relying on their own emotional responses to the dilemma. This interpretation is, of course,

speculative; questions regarding cognitive processing and the role of the DLPFC still remain.

It should be noted that the process we study here is moral judgment rather than moral action. The fact still remains that psychopathic individuals tend to engage in higher rates of immoral behavior. It may be that the deficits in emotional responding become more critical when it comes to having the motivation to translate one's moral judgments into moral actions.

In sum, although our study provided support for the hypothesis that emotion-related brain regions would be compromised in psychopathy during moral decision-making, the study also raised several new questions regarding the role of emotion and cognition in moral judgment, as much is still unknown. In addition, the nature of the emotional deficits observed in psychopathy is still unclear. The study discussed here was limited by a small sample size (17 participants), so results should be regarded as preliminary. However, since publication, the behavioral findings have already been replicated in a larger study by Cima et al. (2010). Future studies could examine more specifically how psychopathic individuals are able to make normal moral judgments despite differences in brain functioning, how the processing of moral dilemmas differs in psychopathic individuals and VMPFC patients, and most importantly, how brain differences in psychopathic individuals might affect moral action,.

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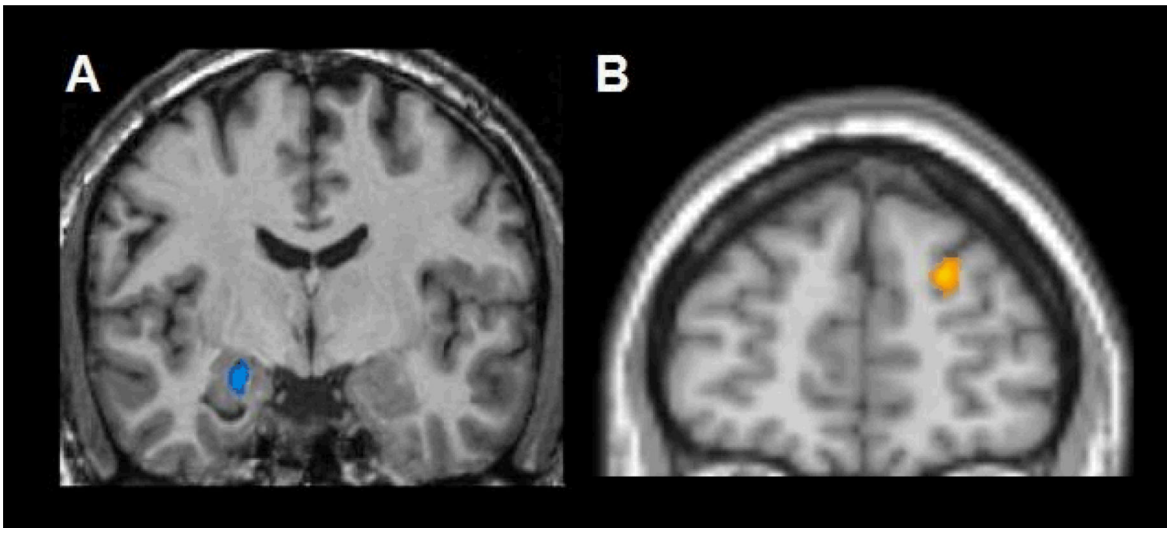

Figure 1.

A summary of the findings by Glenn et al. (2009a, 2009b). Psychopathy scores were negatively correlated with activity in the amygdala during emotional moral decision-making (A), but positively correlated with activity in the dorsolateral prefrontal cortex (B).