# Determining responsibility and assigning punishment governed by different brain systems

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A new study reveals that humans use different neural mechanisms for determining criminal responsibility and assigning an appropriate punishment. The research, published by Cell Press in the December 11th issue of the journal *Neuron*, provides fascinating insight into brain systems that may explain how thousands of years of reliance on human sanctions to enforce social norms gave rise to our current criminal justice system.

Impartial "third-party" decision making is used in our legal system for assessing responsibility and determining an appropriate punishment. "Despite its critical utility in facilitating prosocial behavior and maintaining social order, little is known about the origins of, and neural mechanisms underlying, our ability to make third-party legal decisions," offers co-senior study authors Dr. René Marois, a neuroscientist from the Department of Psychology, and Owen Jones, a professor of Law and Biological Sciences at Vanderbilt University in Nashville, Tennessee.

To explore the neural mechanisms associated with these processes, Marois and Jones, along with graduate neuroscience student Joshua Buckholtz, used functional magnetic resonance imaging to scan subjects while they made decisions about appropriate punishments for crime scenarios that varied both in perpetrator responsibility and crime severity. The researchers found that activity within key brain regions associated with social and emotional processing tracked punishment

magnitude for a range of criminal scenarios. "These results accord well with prior work pointing to social and emotional influences on economic decision making and moral reasoning and provide preliminary neurobiological support for a proposed role of emotions in legal decision making," explains Dr. Marois.

Interestingly, activity in the right dorsolateral prefrontal cortex (rDLPFC) appeared to play a key role in deciding whether or not to punish perpetrators on the basis of criminal responsibility. Previous work implicated rDLPFC activity in a second-party punishment system, such as when subjects decide whether or not to punish a partner by rejecting an unfair economic deal proposed by that partner.

These results suggest that a common neural mechanism may be involved in punishing unfair economic behavior in a two-party interaction and deciding whether or not to punish someone based on an assessment of criminal responsibility in a third-party interaction. "On the basis of the convergence between neural circuitry mediating second-party norm enforcement and impartial third-party punishment, we conjecture that our modern legal system may have arisen by building on preexisting cognitive mechanisms that support fairness-related behaviors in two-party interactions," suggests Professor Jones.

Source: Cell Press