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Selfish Impulse Set Free by Magnetic Pulse to Brain

The ultimatum game brings out conflicting impulses in human beings. In the game, a researcher offers two players a set amount of money and explains that if they agree on how to divvy it up they will keep that money for themselves. If they don't, neither will get anything. One player then offers the other a split. Our thirst for fairness dictates that most players will reject a patently unfair division--such as offering only \$4 out of a total of \$20. Yet, self interest would argue that even \$4 is better than nothing, which is what will otherwise result. Brain imaging studies have shown that the prefrontal cortex is engaged when players ponder an offer and now new research finds that damping down activity in that region can set free our selfish side.

Neuroscientist Daria Knoch and economist Ernst Fehr of the University of Zurich, along with colleagues, studied 52 young men as they mulled offers in the ultimatum game. The researchers specified the amounts that could be offered--ranging from four to 10 Swiss francs out of 20--and had computers randomly select some of the offers. This helped distinguish between the recipients demand for reciprocity--only applicable when another human being is in control--and a general resistance to unfair offers. Most importantly, the scientists divided the recipients into three groups: those who would receive transcranial magnetic stimulation (TMS) to suppress the right side of their prefrontal cortices, those who would receive the treatment on the left side and, as controls, those who would receive no stimulation at all.

TMS affects electrical activity in the brain, altering neuron firing in the area where it is applied. Because previous research had shown that the prefrontal cortex played an active role during the ultimatum game, the team thought that interfering with its activity would release an innate tendency either to reject unfair offers or to accept them. During subsequent tests, 44.7 percent of the young men who experienced TMS on the right side of their prefrontal cortex accepted the most unfair offers--a split of 16 to four compared with just 14.7 percent of those whose left side had been stimulated and 9.3 percent of the controls. Further, 37 percent of those who underwent right side stimulation accepted all unfair offers--judged as any split less than 10 to 10--whereas no one was so accepting in the other groups. And they made the decision to accept an unfair offer as quickly as a fair one, while their colleagues needed much longer to decide.

Despite being unable to resist the temptation of selfishness in order to enforce social norms of fairness, the students were no less aware that they were being cheated; subsequent surveys revealed that all subjects considered an offer of four Swiss francs to be woefully inadequate. This marks the first time that brain researchers have controlled a specific behavior by using TMS on a specific region of the brain, the researchers state in the paper presenting the findings published online in *Science* on October 5. But the technology is not likely to show up in salesrooms anytime soon, thankfully; it takes at least 15 minutes of direct application to the skull to induce the changes, Knoch notes, and they only last a short while.

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