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Negative Affect in Depression May Affect Decision-Making Behavior

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Imagine you and a partner are asked to split a sum of money. You will only encounter this partner once. Your partner decides how much will be offered, and it is up to you to choose whether or not you will accept or reject the monetary offer. However, if you reject, neither you nor your partner will get anything. The preceding scenario is an example of an iteration of what is called the Ultimatum Game, which was first developed by Güth, Schmittberger, and Schwarze (1982). In this game, economic decision-making behavior can be tested by tweaking multiple different aspects of the scenario to see what factors play a key role in decision-making in the Ultimatum Game.

Rational thought, rooted in economics, would expect that all offers would be accepted, as the receiver has no money in the game, and regardless of the size of the offer, they will still come out with more than they had to begin with. Having \$1 is better than having \$0. However, the Ultimatum Game has been tested many times since its inception, producing robust results that contradict the rational expectations. Multiple studies have found that most proposers offer about 40-50% of the total sum of money available, and responders reject over half of offers they are given when they are less than 20-30% of the total sum of money (Falk & Fischbacher, 2006; Fehr & Gächter, 2000; Güth et al., 1982; Harlé & Sanfey, 2007; Haselhuhn & Mellers, 2005; Nowak, Page, & Sigmund, 2000; Pillutla & Murnighan, 1996; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003; Wout, Kahn, Sanfey, & Aleman, 2006). The results obviously go against the rational goal of maximizing one's monetary outcome, and these paradoxical results have led to numerous investigations as to why humans behave in this way in the Ultimatum Game.

One such example is a study conducted by Alex Chavez presented at a recent meeting of the Decision Consortium. Chavez presented data looking at social norms in the Ultimatum Game

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and how beliefs about other's expectations can affect their behaviors in the game. By varying the amount of information given to the players related to offers, this could be examined. Proposers were able to choose either a fair offer or an unfair offer, or they were able to let a coin flip decide. The responders had varying amounts of information about what the proposers chose. Chavez also distributed fairness questionnaires to underscore the idea of fairness, and induce it as a social norm. Chavez's work relates to the theory of reciprocity put forth by Falk and Fischbacher (2006). According to their theory, reciprocity is a behavioral response to perceived kindness or unkindness, where kindness includes both fairness of intention as well as fairness in the sharing of material goods. How people evaluate kindness thus depends upon the consequences of the action as well as the underlying intentions of the actor. This idea of intention comes in to play in the conditions in Chavez's study where subjects were able to choose a coin flip to determine the amount proposed, and responders were aware of the coin-flip option. Any rejections of coin-flip proposals could be looked at in relation to the intentions of the proposers. They want to seem fair by using the coin flip, but it may be a way to mask their desire to get a larger portion of the money. If responders interpret the intentions in this manner then a rejection of the offer would not be surprising.

Clearly, what appears to be a simple and straightforward game is actually much more complex. Many factors may play in to the decisions made in the Ultimatum Game. Recent studies have begun to explore the role of emotion in economic decision-making, as exemplified in the Ultimatum Game, producing interesting results. However, little work has yet to be done looking at how people with affective disorders behave in the Ultimatum Game, in particular, those with depression (major depressive disorder, MDD). I predict that those suffering from depression and engaging in ruminative thoughts will reject fewer offers in the Ultimatum Game,

even when they are obviously unfair. I will first briefly review some of the theories relating to the behavior seen in the Ultimatum Game as well as some of the literature looking at the role of emotion in economic decision-making. Finally, I will briefly review rumination and depression so as to provide support for my above hypothesis.

Fairness and Reputation in the Ultimatum Game

As previously mentioned, the robust results found across many studies of the Ultimatum Game stand in contrast to what rational economic theory predicts. However, it is actually quite common for people to punish one another in public goods experiments, of which the Ultimatum Game is one. Although punishments are costly at first to the punisher, it has an immediate impact on the contributions, and, in situations where punishment is an option in partner public goods games, there is a larger increase in the average contributions of players (Fehr & Gächter, 2000). Generally speaking, it seems that “free-riding” is unacceptable, and people will make a sacrifice in the short-term to prevent this unacceptable behavior in the long-term. But is punishing free-riders so that they behave in a more acceptable manner in future economic situations the only reason for the robust results found in the Ultimatum Game?

Surely, it would be unfair to presume that people are only rejecting unfair offers in the Ultimatum Game to punish their partners. When one considers this from an evolutionary perspective reputation and emotion are also important factors to consider. It has been proposed that if people get information about previous interactions, as might be the case in social animals like humans, then one may build a reputation (Nowak et al., 2000). One will reject what they perceive to be an unfair offer even though this behavior is costly because they want to build a reputation for only accepting fair offers, in case they are faced with a similar situation in the future.

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The hypothesis of Nowak et al. (2000) is somewhat related to what is known as the wounded pride/spite model (Pillutla & Murnighan, 1996). According to this theory people who are presented with unfair offers may take the offers personally and feel angry. This feeling of anger could then lead them to reject the offers out of spite. Although this model does not account for the building of reputation, it does take into account the idea of fairness and the feelings associated with an unfair proposal. The Nowak et al. (2000) theory seems to be a logical extension of the wounded pride/spite model, as it accounts for the fact that those in social groups will be able to garner information about how one responds to an unfair proposal. Rejection due to anger and spite in the Pillutla and Murnighan (1996) model could then also serve to build reputation, as others do not know the reasons for which an unfair offer is rejected.

The importance of fairness has been investigated and supported by a transcranial magnetic stimulation study (TMS) (Knoch, Pascual-Leone, Meyer, Treyer, & Fehr, 2006). Using low frequency repetitive TMS (rTMS) to the right dorsal lateral prefrontal cortex (DLPFC) subjects' willingness to reject partners' intentionally unfair offers in the Ultimatum game was decreased. The rejection rate for unfair offers went down with rTMS to the right DLPFC. However, despite not rejecting the offers, they were still judged as being unfair to the responders. The authors suggest that the right DLPFC is important for implementing fairness and overriding the self-interested impulses associated with the economic gain in the Ultimatum Game. Self-interest and fairness are in conflict, and they claim a causal role of right DLPFC activity in implementing motives of fairness during this conflicting circumstance (Knoch et al., 2006). Thus, in those people with normally functioning frontal cortex, the tendency will be to reject unfair offers, but in frontal pathology, this may not be the case. Regardless, it can be concluded that fairness is an important factor in the Ultimatum Game.

Emotion and Decision-Making in the Ultimatum Game

Emotion is also an important factor to consider when one examines decisions to reject or accept offers (particularly unfair offers) in the Ultimatum Game. These decisions are not made devoid of any emotion on the part of the responder, and they may indeed relate heavily to the idea of fairness. Receiving an unfair offer will most likely elicit a very different emotional response than receiving a fair, or extremely beneficial offer. Imaging research related to the Ultimatum Game has provided some evidence in support of the role of emotion in decision-making in this scenario. In a study looking at the neural correlates of decision-making in the Ultimatum Game, Sanfey et al. (2003) found activation in the bilateral anterior insula, the DLPFC, and the anterior cingulate cortex (ACC). This activation was found to increase when subjects were faced with unfair offers. They also compared activation across conditions in which offers were presented by a computer or by a human being. They found more activation when these unfair offers came from other people as opposed to computers. Of greatest interest in relation to emotion was the activation in the anterior insula. This area is commonly associated with negative emotional states, in particular disgust. They found stronger activation in the anterior insula was correlated with more rejections (Sanfey et al., 2003). These results showing activation in an area commonly associated with emotion highlight the important role emotion plays in decision-making in the Ultimatum Game. The authors posit that physical and emotional disgust may have similar neural underpinnings (Sanfey et al., 2003), so one can extrapolate to assume that the feeling of disgust may be experienced when presented with an unfair offer, thus resulting in a rejection in the Ultimatum Game.

Not only does it appear that brain areas associated with emotion are engaged when making decisions in the Ultimatum Game, but one's emotional state while participating in the

game also seems to be important. It has been found that inducing subjects into a sad mood using the presentation of videos reduces the rate of acceptance for unfair offers (Harlé & Sanfey, 2007). However, mood had no effect on the acceptance rates of fair offers. The authors hypothesize that these results may be due to general enhanced processing because of the sadness, so subjects are more likely to focus on the threatening aspects of unfair treatment, therefore leading to rejection.

Physiological measures of emotional arousal have also been looked at in the context of the Ultimatum Game. Wout et al. (2006) recorded the skin conductance response (SCR), a measure of emotional arousal, when subjects were presented with unfair offers and during the subsequent rejection of such offers. Unsurprisingly, they found a typical pattern of an increase in the rejection of unfair offers as the offers became more and more unfair. However, the variable of interest was SCR. They found higher SCR for unfair offers which indicates more emotional arousal for rejections of unfair offers (Wout et al., 2006).

Taken together, these studies underscore the importance of emotion when responders make decisions in the Ultimatum Game. The choices that are made are not purely rational according to traditional economic theory; they are instead swayed by emotion and desire to maintain a reputation for only accepting fairness. Although this strategy is not economically beneficial in the short term, in the long term, building a reputation for only accepting fairness will be economically beneficial, as one will not be presented with unfair offers. That being said, it is important to note that the above studies of emotion and decision-making in the Ultimatum Game have been done on healthy subjects only. Affective disorders have not been examined or discussed, and they may result in very different decisions in the Ultimatum Game.

Depression and Decision Making in the Ultimatum Game

When one thinks of affective or emotional disorders, depression often comes to mind. Depression is characterized by persistent sadness, a loss of interest in everyday activities, weight fluctuations, changes in sleep, as well as negative cognitions and rumination. People with depression have also been shown to have differences in baseline frontal electrophysiological function, such that those who suffer from depression show decreased left prefrontal activity (Davidson, 2003). However, how the symptoms of depression affect decision-making still remains unclear. As previously discussed, emotion plays an important role in decision-making in the Ultimatum Game. In their study looking at sadness and the Ultimatum Game, Harlé and Sanfey (2007) go so far as to suggest that although different, transient sadness such as was the case in their study, may have some overlapping neural correlates with the persistent sadness seen in depression. Given the effect of sadness on decision-making in the Ultimatum Game (Harlé & Sanfey, 2007), decision-making may then change in depression. However, little work has been done in this field, and nothing specifically with the Ultimatum Game.

More generally, it has been found that patients with major depressive disorder (MDD) have altered sensitivity to reward and punishment (Must et al., 2006). The study was undertaken to look at decision-making and cognition more broadly in MDD and used two versions of the Iowa Gambling Task (IGT) – ABCD with advantageous decks having small immediate reward and even smaller later punishment, and EFGH where advantageous decks have large immediate punishment but even larger later reward. It was found that subjects performed poorly on the ABCD version because of increased sensitivity to reward. However, the authors do note that this result may be due to more general blunted emotional activity as decks with higher emotional valence were chosen (Must et al., 2006). Although this study does not use the Ultimatum Game,

it is one of the few looking at decision-making in depression and shows that there are differences in performance on the IGT, and this may generalize to other decision-making tasks.

A further component often seen in depression is rumination. Rumination is a cognitive process that deals with how one thinks, and it interacts strongly with negative cognition, which relates to what one thinks (Ciesla & Roberts, 2007). These two components are necessary for depression, and could potentially play a role in decision-making in the Ultimatum Game. When a subject with MDD is presented with an unfair offer, if rumination is a main component of their depressive symptoms an unfair offer may trigger negative cognitions. The responder instead of getting angry and rejecting the offer (Pillutla & Murnighan, 1996), or being concerned about their reputation (Nowak et al., 2000), may have negative cognitions as a result (“I am worthless and deserve a low offer”; “I do not deserve a fair offer because I have nothing to offer to others”) and begin ruminating over these negative cognitions. Instead of rejecting the offer, subjects will ruminate negatively related to themselves, and this will continue on through multiple iterations of the game. Also, if the subjects are already suffering from a sad mood, rumination will make the mood worse (Thomsen, 2006). This added component of rumination may be the key difference between the sadness in (Harlé & Sanfey, 2007) and that in depression, meaning that results seen in depressed subjects may then differ from induced sadness in healthy individuals.

One further point that is important to consider is the theory of rumination that claims that the process may be due to discrepancies between goals and the actual state of things, although this is more likely when one perceives a lack of control (Thomsen, 2006). This theory of rumination is especially relevant to the Ultimatum Game when one receives an unfair offer given that the ultimate goal is to make money. Responders have no control over the offers they are presented with, and unfair offers are discrepant with their goals. Thus, those playing in the

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Ultimatum Game with MDD will be more prone to rumination about unfair offers, particularly if they are experienced early on when playing the game (even if it is a one-off situation). As one continues playing with different partners, the rumination about negative thoughts due to the offers will continue, thus making someone less inclined to reject an unfair offer as they may be ruminating on how they “are unworthy of a large offer and do not deserve it” or something along similar, negative, self-directed lines.

Conclusion

Decision-making in general is a complex process that can be mediated by many factors, one of which is emotion. The Ultimatum Game, an economic game played that allows one to study decision-making, is useful for exploring the factors involved in decision-making more broadly. What seems to be a simple game, is actually quite complex as reputation (Nowak et al., 2000), fairness (Knoch et al., 2006) and emotion all play roles in the outcome of the game (Harlé & Sanfey, 2007; Haselhuhn & Mellers, 2005; Pillutla & Murnighan, 1996; Sanfey et al., 2003; Wout et al., 2006). These factors are particularly pertinent for the responder. It is important to consider such factors, as the Ultimatum Game shows that people do not behave in a purely rational way, as predicted by standard economic theory. Given that emotion plays such a key role in making these decisions, it is surprising that there has not been more work looking at decision-making in the Ultimatum Game in people with affective disorders, specifically, depression. People suffering from MDD experience negative affect and a pervasive sadness, which may change how they respond to offers in the Ultimatum Game. Of particular interest is the concept of rumination, particularly over negative cognitions, which may separate the transient sadness due to emotional induction (Harlé & Sanfey, 2007) from the more pervasive sadness in depression. Instead of sadness increasing the number of rejections as previous research has

shown, depressed patients over several iterations will ruminate over receiving unfair offers, and internalize their feelings about the offers (low self-esteem). However, this research has yet to be undertaken, and would likely be quite complex due to the need for self-report data to gauge the role of rumination, as well as the need for controlling medications in depressed patients. Despite this, research in this direction would not only further elucidate what is going on when one makes decisions in the Ultimatum Game, but it would also help in clarifying changes in decision making capabilities in those suffering from MDD and potentially highlight one of the underlying causes for this change, rumination.

References

- Ciesla, J. A., & Roberts, J. E. (2007). Rumination, negative cognition, and their interactive effects on depressed mood. *Emotion*, 7(3), 555-565.
- Davidson, R. J. (2003). Affective neuroscience and psychophysiology: Toward a synthesis. *Psychophysiology*, 40, 655-665.
- Falk, A., & Fischbacher, U. (2006). A theory of reciprocity. *Games and Economic Behavior*, 54, 293-315.
- Fehr, E., & Gächter, S. (2000). Cooperation and punishment in public goods experiments. *The American Economic Review*, 90(4), 980-994.
- Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior and Organization*, 3, 367-388.
- Harlé, K. M., & Sanfey, A. G. (2007). Incidental sadness biases social economic decisions in the ultimatum game. *Emotion*, 7(4), 876-881.
- Haselhuhn, M. P., & Mellers, B. A. (2005). Emotions and cooperation in economic games. *Cognitive Brain Research*, 23, 24-33.
- Knoch, D., Pascual-Leone, A., Meyer, K., Treyer, V., & Fehr, E. (2006). Diminishing reciprocal fairness by disrupting the right prefrontal cortex. *Science*, 314, 829-832.
- Must, A., Szabó, Z., Bódi, N., Szász, A., Janka, Z., & Kéri, S. (2006). Sensitivity to reward and punishment and the prefrontal cortex in major depression. *Journal of Affective Disorders*, 90, 209-215.
- Nowak, M. A., Page, K. M., & Sigmund, K. (2000). Fairness versus reason in the ultimatum game. *Science*, 289, 1773-1775.

- Pillutla, M. M., & Murnighan, J. K. (1996). Unfairness, anger, and spite: Emotional rejections of ultimatum offers. *Organizational Behavior and Human Decision Processes*, 68(3), 208-224.
- Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (2003). The neural basis of economic decision-making in the ultimatum game. *Science*, 300, 1755-1758.
- Thomsen, D. K. (2006). The association between rumination and negative affect: A review. *Cognition and Emotion*, 20(8), 1216-1235.
- Wout, M. v. t., Kahn, R. S., Sanfey, A. G., & Aleman, A. (2006). Affective state and decision-making in the ultimatum game. *Experimental Brain Research*, 169, 564-568.