

The Impact of Induced Emotion and Clinical Depression on Economic Decisions

Katia M. Harlé, Alan G. Sanfey, and John J.B. Allen

Psychology Department, University of Arizona, Tucson, AZ

BACKGROUND

Recent dual models of decision-making suggest that emotion plays an important role in the way we make economic decisions. The impact of **incidental emotions** (i.e. emotions unrelated to the immediate situation) on decision-making, however, remains poorly explored. In addition, specific emotional states have been shown to influence people's attitudes, framing, confidence levels, and, ultimately, their goals. Therefore, assessing the potential modulating effects of induced emotions on decision-making is an important research question with obvious clinical implications.

We investigated this question with two studies:

•**Study 1** focused on inducing basic emotional states in participants, namely those of amusement and sadness, and compared decision-making performance in these situations to that of a neutral emotional state.

•**Study 2** looked at the effect of a clinical trait levels of depression on decision-making performance.

In both studies, decision-making was assessed using a well-studied social task, the **Ultimatum Game (UG)**. In this game, participants are told they will be dividing a sum of money with a partner who will propose how this money (\$10 in our experiments) should be split. Once the proposal is made, the participants can accept the offer, in which case the money is split as proposed, or they can reject the offer, in which case neither person receives any money. We were particularly interested in how participants respond to unfair offers, that is when the proposer keeps a greater share for him- or herself.

METHOD

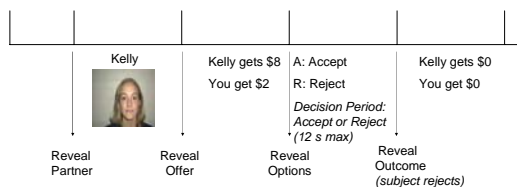
Decision-making performance was assessed by subjects' average acceptance rates in the UG. Subjects played the UG as "responders", with 24 "virtual" partners. Offer types ranged in fairness levels, including unfair (\$1-\$3) and "fair" (\$4-\$5) offers. Subjects were **paid with real money** upon completion of the task, based on a proportion of their actual accumulated earnings. Within both studies, all subjects saw the same set of offers, and were thoroughly instructed as to how to play the Ultimatum Game.

Study 1: A total of 119 psychology undergraduate students from the University of Arizona were randomly assigned to either of two emotional state conditions or a neutral state control group (about **40 subjects per condition**), following which they played the UG. To induce discrete emotions, we used **short movie clips** (3-5 min long). We piloted 20 clips, some of which had already been tested and used in previous research (Gross & Levenson, 1995). Two induced emotions (**amusement and sadness**) were chosen for this study in order to have variability in valence and matched arousal states.

Study 2: A total of 45 subjects (**about 20 normal controls and 15 clinically depressed**, e.g. BDI >15), initially selected from the pool of psychology undergraduate students from the University of Arizona, volunteered to participate in this study. Psycho-physiological measures (including baseline heart rate variability and EEG) and various questionnaire data (BDI, BIS/BAS) were collected prior to the UG task.

TASK DESIGN

In the Ultimatum Game, subjects received a series of offers in which they had to accept or reject money from different "proposers" who decide to split an amount of \$10 between the two. We used a computerized version of the Ultimatum Game, where subjects saw the name and face of their partner for that round on the screen. For each offer, subjects first saw the picture of the proposer (6s), followed by the offer. They then had a maximum of 12 s to make their decision to either accept or reject the offer.



RESULTS – Study 1

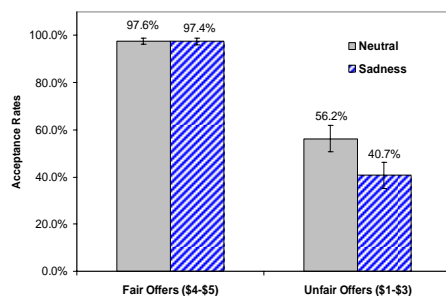


Fig. 1 Acceptance rates of unfair offers (\$1-\$3) were significantly lower in the sadness group than in the neutral condition. Acceptance rates of fair offers (\$4-\$5), however, did not differ between conditions.

Harlé & Sanfey, *Emotion*, 2007

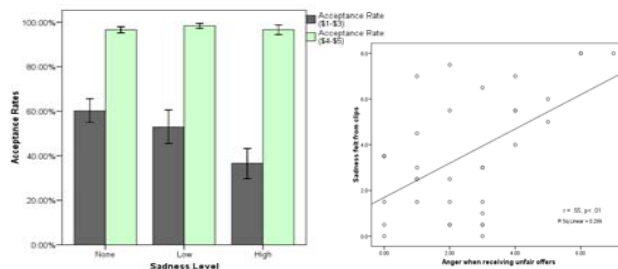


Fig. 2 Experienced sadness (from the clips) interacted with the fairness level of UG offers, in that the sadder participants were, the more they tended to reject unfair offers (\$1-\$3). Increasing sadness ratings did not affect acceptance rates of fair offers (\$4-\$5). Sadness felt from the clips was positively correlated with reported anger when receiving unfair offers.

RESULTS – Study 2

Acceptance Rates by Offer Amount (Normal vs Depressed)

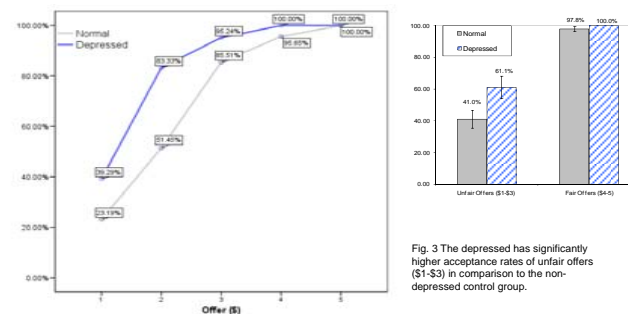


Fig. 3 The depressed has significantly higher acceptance rates of unfair offers (\$1-\$3) in comparison to the non-depressed control group.

Participants' Emotional Response to Unfair Offers

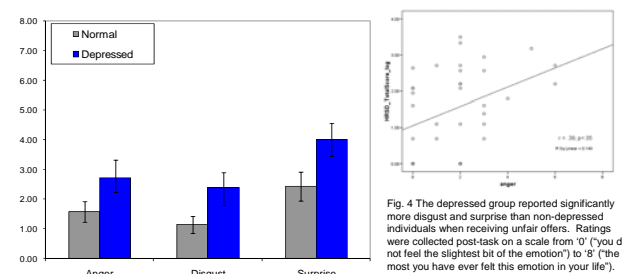


Fig. 4 The depressed group reported significantly more disgust and surprise than non-depressed individuals when receiving unfair offers. Ratings were collected post-task on a scale from '0' ("you did not feel the slightest bit of the emotion") to '5' ("the most you have ever felt this emotion in your life").

CONCLUSIONS

- Induced sadness resulted in lower acceptance rates of unfair offers (\$1-\$3) in comparison neutral and amusement conditions, *demonstrating that transient and subtle mood states may bias decision-making*.
- Clinically depressed individuals showed an opposite pattern, with depression resulting in *higher* acceptance rates across a wider range of unfair offers (\$1-\$4). However, their emotional reaction to unfair offers was significantly more negative than normal controls, showing a similar pattern than healthy individuals in a sad mood (see study 1).
- These findings suggest that a sad mood may have different cognitive and behavioral consequences, whether it is experienced as a transient mood state in healthy participants or as a continuous background emotion in clinically depressed individuals
- We now need to identify the underlying neural and physiological mechanisms that may bias such decisions in an induced sadness state and in depression. An fMRI study investigating the impact of induced emotions on UG performance is underway to address this question. Additionally, we will look at how baseline heart rate variability and EEG asymmetry may mediate or moderate such decisions.