



Short communication

Unfairness sensitivity and social decision-making in individuals with alcohol dependence: A preliminary study



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ABSTRACT

Background: Altruistic punishment is an evolutionary-based mechanism aimed at maximizing the probability of reciprocity in cooperative exchanges, through the deterrence of non-cooperators. In economic games, humans will often punish others for non-cooperation, even if this punishment is costly to the self. For instance, in the Ultimatum Game paradigm, people refuse offers considered as unfair even though they are disadvantaged financially by doing so. Here, we hypothesize that, due to an impulsive decision making style, individuals with alcoholism will display an heightened unfairness sensitivity that leads them to reject advantageous offers more frequently on the Ultimatum Game.

Methods: Thirty recently detoxified alcohol-dependent individuals and 30 matched healthy control participants performed the Ultimatum Game task, in which participants had to respond to take-it-or-leave-it offers ranging from fair to unfair and made by a fictive proposer.

Results: Alcohol-dependent participants decided to reject unfair offers more frequently during the Ultimatum Game, as compared to controls.

Conclusions: In situations of social frustration or irritation, such as unfair Ultimatum Game offers, alcohol-dependent individuals may have more difficulty than controls regulating their emotional impulses, and respond aggressively or retributively (i.e., by rejecting the unfair offer).

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1. Introduction

Addicted people are often impaired in their ability to make self-advantageous decisions in situations that require the exercise of the reflective self-regulation system in order to overcome the impulsive emotional automatic response (for a review, see Noël et al., 2013). However, the influence of interactions in social contexts on decision making in substance abusers is not very well known (Rilling et al., 2008).

Emotions induced by interpersonal interactions may bias decisions differently than those in nonsocial contexts do (Rilling et al., 2008). Indeed, in social contexts, decisions are based upon strategic choices that must be tailored and updated to the particular mental state of another human being. For example, in a nonsocial context, if a person is offered the choice of gaining a reward versus gaining nothing, the usual decision is to choose the reward. However, in the context of particular social interactions, evolutionary psychology

has shown that non-cooperators will be punished in order to enhance reciprocity in cooperation transactions, even at personal costs to the punisher (Fehr and Fischbacher, 2003; Trivers, 1971) and that punishing non-cooperators activates reward systems in the brain (de Quervain et al., 2004). The effects of social interaction on decision-making have been investigated via behaviors in economic games. In the Ultimatum Game, two players (a proposer and a responder) have to divide a sum of money in a single trial. If the responder accepts the offer made by the proposer, the deal is validated. On the other hand, if the responder rejects the offer, neither player gets anything. The only way to maximize profits is for the responder to always accept offers. However, whereas apes may behave rationally as if there were no sense of fairness (Jensen et al., 2007; but see Proctor et al., 2013 for whom humans and chimpanzees show similar preference regarding reward division), children and adult humans refuse offers financially advantageous but considered as unfair (e.g., Guth et al., 1982).

Thus, in the Ultimatum Game, participants have to respond to unfair take-it-or-leave-it offers that can trigger frustration. In this context, Ultimatum Game related decisions may involve a competition between impulsive emotional processing (e.g., anger and frustration) and higher-level controlled or deliberative processing that bias decision-making in opposite ways (Rilling et al., 2008).

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More specifically, receiving an unfair offer during the Ultimatum Game is associated with negative emotions (evidenced through brain activation within the anterior insular cortex and through higher skin conductance activity for unfair offers; Sanfay et al., 2003; van't Wout et al., 2006) and these negative emotions predict the rejections of unfair offers. Unfair offers during the Ultimatum Game are also associated with activation in brain areas involved in affective (ventrolateral prefrontal cortex; Shamay-Tsoory et al., 2012) and cognitive (dorsolateral prefrontal cortex; Sanfay et al., 2003) regulation of emotions. Hence, during the Ultimatum Game, subjects are more likely to accept unfair offers when the balance between emotion and reflection processes in decision-making is biased toward the latter (Rilling et al., 2008). In other words, high rates of rejection of unfair monetary offers during the Ultimatum Game may reflect poor regulation of triggered emotional frustration (Moll and de Oliveira-Souza, 2007).

Alcohol-dependent individuals are often impaired when automatic emotional, cognitive and motor responses are to be suppressed (for reviews, see Noël et al., 2010, 2013). Thus, we hypothesized that, as compared with a group of healthy control participants, alcohol-dependent participants would exhibit an abnormally high rate of rejection of unfair monetary offers during the Ultimatum Game.

2. Methods

2.1. Participants and recruitment

All subjects were adults. Demographics for the two groups are presented in Table 1.

Forty alcoholic dependent participants were recruited for this study from the Alcohol Detoxification Unit of the Brugmann University Hospital (Brussels). They were tested in their third week of alcohol detoxification. They all received complete medical, neurological and psychiatric examinations at the time of the selection. Alcohol-dependent participants were all diagnosed with alcohol dependence according to DSM-IV-TR (APA, 1994) criteria and confirmed by the Alcohol Use Disorders Identification Test (Saunders et al., 1993). We excluded any subjects who reported a lack of comprehension of French language, or who had evidence of schizophrenia and other psychotic disorders, bipolar disorders, polysubstance-related disorders, pathological gambling and overt cognitive dysfunction.

Forty control participants, similar for sex, age, and educational level, were recruited by word of mouth from healthy community members; they were not paid for their participation. Exclusion criteria were a present Axis I psychiatric diagnosis; substance-use disorder during the year before enrollment in the study; or consumption of more than 4 standard alcoholic drinks per day for longer than one month.

Table 1
Demographic data means and standard deviations for AD and controls.

	AD	Controls
<i>n</i>	40	40
Age (years)	46.47 (11.72)	43.70 (11.01)
Gender (M/F)	27/13	27/13
Education (level 1/2/3)	15/12/13	14/13/13
Duration of alcohol abuse (years)	18.80 (11.47)	–
Mean alcohol use (standard drinks/day)	17.15 (8.93)	0.70 (1.34) ^{****}
Number of prior hospitalizations for alcohol detoxification	3.05 (3.95)	–
Tobacco use (number of cigarettes per day)	18.56 (16.47)	6.75 (8.88) ^{****}
AUDIT	30.30 (6.44)	3.52 (4.21) ^{****}
BDI	12.82 (7.97)	3.35 (3.93) ^{****}
STAI S	42.92 (13.37)	32.20 (10.97) ^{****}
STAI T	48.18 (11.68)	35.20 (10.81) ^{****}
PANAS+	32.47 (8.71)	32.32 (6.49)
PANAS–	22.47 (10.37)	13.13 (3.89) ^{***}

Note: Values shown are the mean and standard deviation on each measure. Level of education was coded as follows: level 1 = completion of the first 3 years of secondary school or equivalent; level 2 = completion of secondary school or equivalent; and level 3 = post-secondary school training. AUDIT = Alcohol Use Disorders Identification Test, BDI = Beck Depression Inventory, STAI S = State subscale of the State-Trait Anxiety Inventory, STAI T = Trait subscale of the State-Trait Anxiety Inventory, PANAS+ = Positive Affect subscale of the Positive and Negative Affect Schedule, PANAS– = Negative Affect subscale of the Positive and Negative Affect Schedule.

^{***} $p \leq 0.001$.

^{****} t -Test $p \leq 0.0001$.

2.2. Current clinical status

Current clinical status of depression and anxiety levels were rated with the Beck Depression Inventory (Beck et al., 1961) and the Spielberger State-Trait Anxiety Inventory (Spielberger, 1983). The Positive and Negative Affect Schedule (Watson et al., 1988) was also administered in order to control for the influence of positive or negative mood state on acceptance rates during the Ultimatum Game task (e.g., Harlé and Sanfay, 2007).

2.3. The Ultimatum Game

The version of Ultimatum Game used here was adapted from the protocol described by Crockett et al. (2008). Participants played as responders in a series of 54 single round trials of the Ultimatum Game via computer interface. Before the game started, participants were given detailed verbal explanations, and confirmed verbally that they understood the game. No real monetary amount was awarded to the participants. The participants saw a photograph of the proposer for 1500 ms. Then, they saw the amount of the stake for 1500 ms. Next, they saw the amount proposed by the partner for 3000 ms. During this time, while the offer was on the screen, they indicated whether they accepted or reject the offer by pressing one of two buttons (labeled 'accept' or 'reject') on a button box. Intertrial interval was 500 ms. Photographs of 54 faces (27 male, 27 female, Caucasian, with a neutral expression) were randomly matched with the offers. There were 18 fair offers (proposition of 40, 45 or 50% of the stake to the responder), 18 medium-fair offers (proposition of 27, 30 or 33% of the stake to the responder) and 18 unfair offers (proposition of 17, 20 or 22% of the stake to the responder). During each session, the order of the offers was randomized. Dependent measures were the proportion of offers accepted at each level of fairness.

2.4. Procedures

All participants provided informed consent. The study was fully approved by the Ethics Committee of the Brugmann University Hospital. For the alcohol-dependent group, medical histories were obtained by interview by a board-certified psychiatrist. All participants were asked to complete current clinical status and affective states measures before the Ultimatum Game.

3. Results

3.1. Current clinical status

Independent samples t -tests revealed that alcohol-dependent participants had higher scores of depression, state and trait anxiety and negative affectivity prior to testing. These results are shown in Table 1. However, we found no correlation (Spearman rank, $N = 80$) between performance on the Ultimatum Game and the measure of current clinical status. There was also no relationship between performance on the Ultimatum Game in the alcohol-dependent group and duration of consumption or mean consumption per day.

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