# The value of a smile: Facial expression affects ultimatum-game responses

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**Abstract**

Abstract: In social interaction, the facial expression of an opponent contains information that may influence the interaction. We asked whether facial expression affects decision-making in the ultimatum game. In this two-person game, the proposer divides a sum of money into two parts, one for each player, and then the responder decides whether to accept the offer or reject it. Rejection means that neither player gets any money. Results of a large-sample study support our hypothesis that offers from proposers with a smiling facial expression are more often accepted, compared to a neutral facial expression. Moreover, we found lower acceptance rates for offers from proposers with an angry facial expression. Keywords: decision-making, emotions, facial expressions, ultimatum game.

## 1   Introduction

An important aspect of social behavior is facial expression, as it contains valuable information that may influence an interaction (Fridlund, 1994). From the facial expression of an opponent, one may infer not only emotional states (Ekman, 1982) but also information regarding intentions, personality and complex social characteristics (Horstmann, 2003). For example, from a smiling expression of an opponent, intentions such as trust, cooperation, or affiliation might be inferred, therefore facilitating approach behavior (Krumhuber & Manstead, 2009; Reed, Zeglen, & Schmidt, 2012; Seidel, Habel, Kirschner, Gur, & Derntl, 2010; van't Wout & Sanfey, 2008). By contrast, an angry facial expression might be interpreted as threatening, spiteful, or malicious and associated with intentions such as rejection or causing damage, which subsequently might facilitate avoidance behavior (Hess, Blairy, & Kleck, 2000; Horstmann, 2003; Seidel et al. 2010). Therefore, we expect that facial expressions have a direct influence on decision-making (Scharlemann, Eckel, Kacelnik, & Wilson, 2001) such as in economic bargaining.

A typical paradigm investigating bargaining in economic research is the ultimatum game. Here, a proposer divides a certain amount of money (i.e., the pie) into two

parts, one for him- or herself, the other for a responder (Güth et al., 1982). The responder has the choice to accept or reject the offer. If the offer is accepted, both players receive the amounts of money as suggested by the proposer. However, if the offer is rejected, neither of them gets anything. According to rational choice theory (Neumann & Morgenstern, 1944), responders should accept any proposal, as even little money is better than no money. This assumes that decisions are made on rational grounds, given that individuals have complete information about the costs and benefits of all possible behavior options. Therefore, they will strive to maximize their utility, preferences, or values, such as maximizing monetary outcome in an economic decision-making context. However, research shows that instead of maximizing personal gain, individuals tend to reject unfair offers.

Given that the ultimatum game is a social interaction between two agents, it is reasonable that decision making is influenced by aspects other than monetary outcomes. Recent research has thus far mainly focused on emotional variables as moderating factors. For example, incidental emotions, that is, emotions unrelated to the interaction, have been found to predict decisions made in the dictator game (Mellers, Haselhuhn, Tetlock, Silva, & Isen, 2010) and the ultimatum game (Bonini et al., 2011; Harlé & Sanfey, 2007; Martinez, Zeelenberg, & Rijsman, 2011; Pillutla & Murnighan, 1996; Moretti, & di Pellegrino, 2010). Furthermore, trait-related affect has been found to affect decision-making in the ultimatum game (Dunn, Makarova, Evans, & Clark, 2010; Harle & Sanfey, 2010). Additionally, negative affect elicited by unfair offers has been shown to increase the rejection rate (Hewig et al., 2011). However, little is known about the influence of social interaction with the other player.

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Figure 1: Task timeline for the ultimatum game.
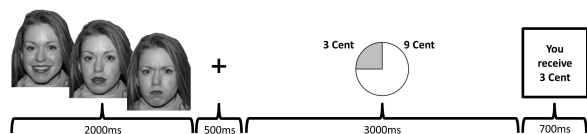


In the present study, we ask whether facial expression, an important aspect of social interaction, affects decision-making in the ultimatum game. The facial expression of proposers was manipulated on three levels: smiling, neutral, and angry. As outlined above, facial expression contains information that is used to formulate beliefs about emotional states and intentions of an opponent, such as the proposer in the ultimatum game. A smiling proposer might be perceived as friendly, leading to the attribution of positive intentions and hence approach behavior. Thus, we expect that responders will accept offers more often from a smiling proposer than from one with a neutral facial expression. By contrast, a proposer with an angry facial expression might be perceived as unfriendly, accompanied by attributed negative intentions (such as purposely causing harm by making an unfair offer), resulting in avoidance behavior. Correspondingly, we expect that fewer offers are accepted from an angry looking proposer than from a proposer with a neutral facial expression.

## 2   Method

*Sample.* A total of 7,319 individuals were contacted via *WiSo-Panel*, a web-based respondent pool with people from all walks of life that offers monetary and non-monetary compensation in return for survey participation (Göritz, 2009). Individuals were briefly informed about the purpose and content of the study. A total of 1,326 individuals agreed to participate and, subsequently, were directed to an online administered experiment taking approximately 20 minutes. Participants were, on average, 39 years old ($SD = 12.9$); 61 % were female. The sample comprises a wide range of educational levels, with 9 % reporting 9 years of school as highest educational degree, 26 % O-levels, 34 % A-levels, 27 % a university degree and 2 % a doctoral degree.

*Task and procedure.* Each participant played the ultimatum game repeatedly in a series of 42 one-shot trials as a responder. Participants were told that they would receive offers by participants who had played the ultimatum game previously. If they decided to accept the offer, they both would get paid real money according to the offer. However, if they decided to reject the offer, both would receive nothing. Pictures of the proposers were taken from two validated sets of facial expression stimuli (Lundqvist, Flykt, & Öhman, 1998; Tottenham,

Borscheid, Ellertsen, Marcus, & Nelson, 2002)[1]. We used pictures from 42 proposers—half of them female. For each of the 42 proposers, three pictures were used, one with a smiling, one with a neutral, and one with an angry facial expression. As the ultimatum game was played as a one-shot game, each proposer made only one offer to any participant, either with a neutral, a smiling, or an angry expression on their face. Therefore, three sets were created by randomly assigning the three facial expressions of each proposer to one of the three lists, with equal number of male and female proposers in each set. Thereby, we controlled for the offer of the proposer; that is, each proposer always made the same offer (e.g., 4 Cent), regardless of facial expression. One of the three sets was randomly assigned to each participant. All analyses reported below were repeated using set as additional factor; we found no main effect for set, nor any interaction with other variables.

Each trial began with a picture of the proposer (see Figure 1). After a fixation cross (500ms), the offer (a share of 12 Cent) was displayed, graphically illustrated using a pie chart. Offers differed in fairness on seven levels, which ranged from 7 Cent (overly fair) to 1 Cent (very unfair), with 6 Cent being a fair offer (i.e., half of the money to the proposer and half of the money to the responder, respectively). The order of the 42 offers was randomized separately for each participant. Participants decided whether to accept or reject the offer while the offer was displayed. After the decision, feedback was given regarding the amount of money earned by the responder. Participants were paid according to their decisions in the ultimatum game; that is, they actually received the money from accepted offers, with a maximum of € 1.68 (if all offers were accepted).

*Statistical analyses.* Main analyses were conducted using repeated measure analyses of variance (ANOVA). Critical alpha level was set at .05. As with a large sample an alpha level of .05 might lead to the interpretation of negligible effects, we refrain from interpreting results that account for less than 1 % of variance. In all ANOVAs, *p*-values were adjusted using the Greenhouse Geisser correction if the Mauchly-test indicated a violation of sphericity-assumption. In such cases uncorrected degrees of freedom are provided. For significant effects in ANOVAs, partial eta-square ($\eta^2$) values are reported. Missing values occurred when participants did not respond within the 3-second time frame. Missing values

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[1]Amateur actors served as models; they prepared for the photo shooting by rehearsing the different emotions and corresponding expressions for 1 hour before coming to the photo session. Actors were told that they should try to evoke the emotion and to express it the way that felt natural to them. While the pictures have been validated and successfully applied in various settings, it should be noted that emotions expressed by amateur actors may differ from those that result from real emotion.

Figure 2: Effects of offer (1 Cent to 7 Cent) and facial expression (smiling, neutral, angry) on acceptance rate in the ultimatum game; significant post hoc tests ($p < .01$) for smiling vs. neutral (above) and neutral vs. angry (below) are marked by an asterisk.
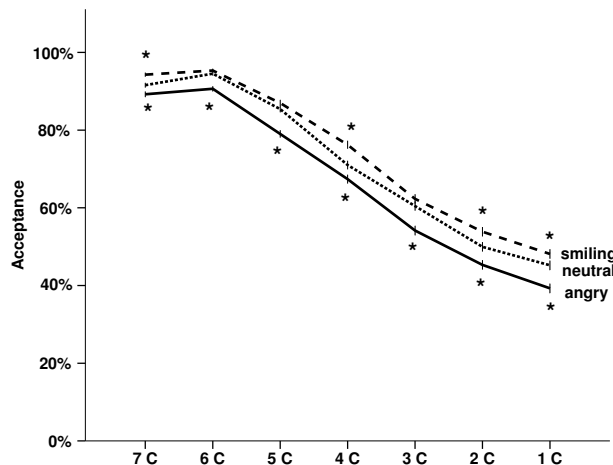


occurred in less than 1 % and were substituted by mean values computed across the responses of the same participant and the same offer.

## 3   Results

Acceptance rates were analyzed using a 7*3 repeated measures ANOVA, with the two factors "fairness" of the offer at 7 levels (1, 2, 3, 4, 5, 6, 7 Cent) and "facial expression" at three levels (smiling, neutral, angry). Results revealed a strong effect of fairness on acceptance rates: $F(6,7950) = 848.1$; $p < .01$; $\eta^2 = .39$. In line with the ultimatum literature, fair offers (6 Cent) and overly fair offers (7 Cent) were generally accepted (93 % and 92 %, respectively). As offers became more and more unfair, the acceptance rate decreased to 44 % for offers of 1 Cent; offers of 2 Cent were accepted in half of the cases.

Furthermore, a significant effect of facial expression was found: $F(2,2650) = 139.9$; $p < .01$; $\eta^2 = .10$. Offers from proposers with a smiling expression were more often accepted compared to neutral facial expression, and the latter were more often accepted than offers from proposers with an angry expression. Post hoc tests revealed that all levels differed significantly at $p < .01$, therefore confirming our first hypothesis. Finally, a small but significant interaction effect was found between fairness and facial expression, $F(12,15900) = 4.4$; $p < .01$; $\eta^2 < .01$: effects of facial expression were more strongly pronounced for unfair (1, 2, and 4 Cent) and overly fair (7 Cent) offers (see Figure 2). Specifically, post hoc tests

for facial expression within the seven levels of fairness showed that neutral and smiling faces did not differ for offers of 3, 5 and 6 Cent, whereas all other comparisons were significant at $p < .01$.

## Discussion

The present results connect with prior findings regarding behavior in the ultimatum game: The majority of individuals reject offers despite the personal cost accompanying this behavior, and rejection rates are a function of the fairness of the offer, that is, the more unfair an offer, the more likely it is rejected (Güth et al., 1982; Sanfey, 2007). However, the present results also extend prior research: Our novel hypothesis regarding a moderating effect of proposer's facial expression was confirmed. Specifically, higher acceptance rates occurred for smiling compared to neutral facial expression, and for neutral compared to angry facial expression. This pattern of results is also evidence for the notion that valence of the facial expression, rather than just arousal, accounts for the results, as effects for smiling and angry proposers are opposite in direction. We also found that this effect was moderated by the size of the offer. Particularly, the effect was largest for unfair and overly fair offers. We speculate that individuals consider attributes of the social interaction especially in situations that are unusual or unexpected, whereas in situations that are clear and expected (such as half the money for the proposer, half for the responder) such attributes might be less important for decision-making.

While the present research highlighted an important factor influencing decision-making in the ultimatum game, future research is needed to shed light on the mechanisms underlying this effect. We speculate that attributes of the social interaction account for the observed effect of facial expression on decision-making. However, other factors might also be considered. For example, hedonic tone has been found to impact decision-making, and facial expression might affect hedonic tone[2]. Additionally, aspects such as trustworthiness or reliability of the proposer might be considered in future research. However, there are methodological challenges in assessing potential mediators of the effect of facial expression

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[2]Recent research indicates that incidental emotions (i.e., emotions elicited by stimuli unrelated to the task) such as pictures, videos, or smells might influence decision making in the ultimatum game. However, findings are inconsistent. Indeed, several studies have found positive emotions such as amusement, joy, serenity, or happiness to be related to higher acceptance rates and negative emotions such as sadness, disgust, or anger to higher rejection rates (Andrade & Ariely, 2009; Harle & Sanfey, 2007; 2010). In contrast, other studies have found higher acceptance rates after the induction of sadness (Moretti and di Pellegrino, 2010), disgust (Bonini et al., 2011), or anger (Harle & Sanfey, 2010), which has been attributed to the motivational or moral component of these emotions.

on decision-making: As such intervening variables are typically assessed after each trial their explicit measurement might itself influence subsequent decision-making. For example, asking participants after each offer whether they had rejected the offer because the proposer was unfriendly might shift participants' attention to attributes of the proposer. Therefore, it was important to first establish the general effect that facial expression influences decision-making in a methodologically uncompromising manner before moving on to the investigation of mediating variables.

In sum, the present research has identified an important factor that influences economic decision-making. Relying on a large and heterogeneous sample, using pretested and standardized stimuli, controlling for confounding factors by randomization and counterbalancing, and implementing contingent and real-life consequences due to paying actual money we established that a proposer's facial expression affects a respondent's willingness to accept an offer. Our results show that bargaining behavior is not purely rationally driven, but that social cognitions need to be taken into account to more fully explain and predict behavior in economic bargaining, and likely in other decision-making contexts. In our study, a smile increased the likelihood of successful bargaining and, therefore, the monetary payoff for both parties.

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