Original Article

Evidence of partner choice heuristics in a one-shot bargaining game

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ABSTRACT

Economists and psychologists have developed a variety of models to explain human behavior in the ultimatum game, but none can adequately account for all of the available data. Across two studies using a face perception paradigm, we provide evidence that people use evolved, specialized heuristics for long-term cooperative partner choice to calibrate their generosity toward ultimatum game partners. Men and women played one-shot ultimatum games for real incentives with partners represented by face photographs. Men were more generous toward partners who were stronger, and who appeared more attractive, more prosocial, more productive, healthier and higher in social status; the effect of strength was mediated by productivity, but not dangerousness, suggesting that men implemented heuristics designed for partner choice rather than the asymmetric war of attrition. Moreover, men reduced their earnings by cooperating selectively with valuable long-term partners. Women also gave better treatment to valuable-appearing partners, but appeared to prioritize partner choice less than men did, relative to game earnings and intrasexual competition. The results suggest that people treat the ultimatum game as though it were an opportunity to establish a cooperative relationship with a new partner, and implications are discussed for an evolved psychology of cooperative partner choice.

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Researchers have long used the Ultimatum Game (UG) to study human cooperation and bargaining (Camerer, 2003; Güth & Kocher, 2014). In the UG, a proposer offers a specific split of a fixed sum of money, and the responder either accepts the offer – in which case the proposed split is enacted – or rejects it, in which case both players receive nothing. Behavior in the UG is typically regarded as economically "anomalous" (Thaler, 1988), because people fail to pursue the income-maximizing strategies whereby responders accept any positive offer and prescient proposers therefore make the lowest possible offer. Instead, proposers in industrial societies typically offer 40%–50% of the endowment and responders frequently reject low offers (but see Henrich et al., 2005 regarding cultural differences). To explain these results, economists have developed a variety of models suggesting that people are averse to unequal distributions between the two players (reviewed by Camerer, 2003).

Exogenous to these models, however, is a body of research showing that people are sensitive to the traits of their UG partner, not merely to the structure of the game. For example, offers are more likely to be accepted if they are from a smiling proposer (Mussel, Göritz, & Hewig, 2013) or one described as generous (Marchetti, Castelli, Harlé, & Sanfey, 2011); more symmetrical responders receive higher offers (Zaatari, Palestis, & Trivers, 2009); and more attractive individuals receive higher

offers from proposers but responders also demand more from them in order to accept an offer (Solnick & Schweitzer, 1999). There is complementary evidence from other economic games as well, for example showing that attractive individuals are more likely to be trusted (Wilson & Eckel, 2006) and to have their trust reciprocated (Krupp, DeBruine, & Jones, 2011) in a trust game. These results suggest that people process economic games, including the UG, as though they are real-world social interactions, in which the biological and behavioral traits of their partners matter. Since humans have cognitive adaptations for social exchange relationships (see Cosmides & Tooby, 2005), we investigated whether behavior in the UG conforms to evolved heuristics for resource division.

We identified two adaptationist theories of how resources might be divided in the UG. First, there is evidence suggesting that people divide resources according to the logic of the asymmetric war of attrition (AWA; Hammerstein & Parker, 1982; Maynard Smith, 1979), in which resources are allocated based on the relative ability and willingness of each individual to inflict damage on the other. Physically stronger men feel more entitled to advantageous outcomes and are more willing to use force to resolve conflicts in their favor (Sell, Tooby, & Cosmides, 2009; see also Petersen, Sznycer, Sell, Cosmides, & Tooby, 2013). If resources are divided in the UG according to the logic of the AWA, then any cues of the likelihood of winning a violent conflict over resources (e.g., strength, aggressiveness) should lead to more advantageous treatment in the game.

The second theory is that people will treat the UG not as a conflict over an existing resource (in which the AWA would apply), but as an

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opportunity to initiate a long-term cooperative relationship. Humans evolved in a biological marketplace of long-term cooperative relationships, and therefore faced selection pressures to choose (and be chosen by) the most valuable available cooperators (Barclay, 2013; Baumard, André, & Sperber, 2013; Noë & Hammerstein, 1994, 1995). An individual's value in the biological market of cooperators is a function of their ability to create future benefits, their expected generosity in sharing those benefits, and their outside options for production and/or cooperation (Barclay, 2013; Baumard et al., 2013; Zaatari & Trivers, 2007). If mechanisms that evolved for partner choice (PC) govern behavior in the UG, then participants should offer advantageous treatment to partners who appear high in partner value, as a type of opening bid for the establishment of a cooperative relationship. On this account, any cues that a potential partner is more valuable than alternative possible partners should cause that potential partner to be treated better in the UG. As discussed further below, cues of health, strength, and prosociality, among other traits, likely predicted relative partner value in the ancestral environments in which PC mechanisms evolved. As such, on the PC model, players perceived to possess these traits should receive more generous treatment in the UG.

In the present research, we used face photographs that had been measured and rated for various traits as partners in the UG in order to test how perceived traits affect treatment in the game. We initially hypothesized effects consistent with the AWA – in which more threatening and formidable individuals should receive better treatment – but initial results suggested that cues of high partner value might be the stronger predictor of treatment in the game. Subsequent data collections were therefore designed to test between the AWA and PC models.

1. Study 1a

1.1. Study 1a: Introduction

Since humans form rich impressions of others based on limited exposure to faces (e.g., Willis & Todorov, 2006), we used a face-perception paradigm to test the effects of various cues on treatment in the UG. In an initial study using male participants, we predicted on the basis of the AWA that cues of the likelihood of escalating and winning a violent conflict over resources would lead to more generous treatment in the UG. Recent research suggests that men's facial-width-to-height ratio (fWHR) may be a cue of formidability. Men with greater fWHRs are judged as more aggressive (Carré, McCormick, & Mondloch, 2009), dominant (Alrajih & Ward, 2014) and intimidating (Hehman, Leitner, & Gaertner, 2013), and are in fact more aggressive both in the laboratory and in real-world settings (Carré & McCormick, 2008). Similarly, men with wider faces are trusted less and are less trustworthy in an economic task (Stirrat & Perrett, 2010). Men with wider faces are more likely to be violent (Christiansen & Winkler, 1992), but less likely to die in fights (Stirrat, Stulp, & Pollet, 2012). In sum, there is evidence to suggest that men with wider faces may be calibrated to a more aggressive, exploitative interpersonal strategy, and are perceived as such. Therefore, the logic of the AWA predicts that men with a higher fWHR will receive more generous treatment in the UG.

1.2. Study 1a: Materials and methods

1.2.1. Design

We tested this prediction using stimulus faces drawn from a sample of men who participated in a study on mating psychology and behavior. These men had been measured for physical strength, and photos of their faces were measured for fWHR and rated for health, attractiveness, dominance, and prosociality. We then used these pictures to represent UG partners (hereafter "targets") for a new set of male participants. The above measurements and ratings were initially made because of their relevance to the larger project on mating psychology, but they also allowed us to test predictors of treatment in the UG. On the basis of the AWA, we

predicted that fWHR would positively predict generosity received in the UG; the other traits were also examined because prior findings suggest that facial traits may be influential in the UG (see Introduction).

We employed the strategy method of the UG (see Güth & Kocher, 2014). In the strategy method, the responder states the minimum offer they would accept from the proposer, rather than accepting or rejecting a specific offer. We refer to this as the responder's "demand." This method allows all subjects to play as both proposer and responder with all possible partners, and elicits continuous measures of UG behavior. During session 1, participants played a series of one-shot ultimatum games (with a $10 endowment) with multiple same-sex partners ("targets") who were represented by a facial photograph. Participants saw a picture of a target's face and were asked to state either an offer or a demand for that target, and this was repeated for all targets (participants were instructed to skip any targets they recognized). Participants were randomly assigned to play first as the proposer toward all targets and then as the responder toward all targets, or vice versa. Targets were presented in a random order. These targets had previously played a single, one-shot UG for real money using the strategy method with an anonymous partner (i.e., their partners were not identified to them, nor they to their partners, in any way beyond knowing that they were all participants in the same study). These recorded UG decisions allowed us to pay our study 1a participants based on the actual outcomes of their games.

Session 2 occurred a few weeks after session 1. During session 2, subjects rolled a die. If the die came up 6, one of their UG decisions from session 1 was chosen at random, and compared to the corresponding decision of their target from that round. Participants were then paid their earnings for that round in cash. As such, all participant decisions were incentive-compatible, and there was no deception. All targets, photograph raters, and participants were students at UCSB, who gave informed consent to participate or have their picture used for research.

1.2.2. Male target stimuli

Facial photographs of 83 male students were used as stimuli ("targets") in study 1a. They were 18–26 years old (mean = 20.0, s.d. = 1.85). Thirty-five self-identified as Caucasian, 20 as Asian, 16 as Hispanic, and the rest as multiracial or "Other." All gave permission for their photographs to be used for research purposes.

Photographs were taken directly facing the camera under standardized lighting conditions, and were digitally rotated so that the pupils were aligned on a horizontal axis. fWHR was measured as the distance between the left and right zygion (the outermost edge of the face, before the ear) divided by the distance from the top of the upper lip to the upper edge of the eyelids. Measurements were made independently by two research assistants; there was high agreement between the two sets of measurements ($r = .95$), and their mean was used in analysis. Photographs were then cropped with an oval around the face. Strength was measured as the composite of grip and chest strength (measured with a dynamometer) and flexed bicep circumference (see Sell et al., 2009).

1.2.3. Raters

Due to the design of the study from which these target stimuli were drawn, the target face photographs were rated in two batches. Sixty-nine students (42 female) rated 39 of the male targets; these raters were 17–22 years old (mean = 18.6 years, s.d. = 0.99). Forty-eight students (19 female) rated the other 44 male targets; these raters' ages ranged from 18 to 22 years (mean = 18.6 years, s.d. = 0.99). Target photos were rated for attractiveness (3 items; alpha = .980), health, dominance (3 items; alpha = .946), and prosociality (3 items; alpha = .974). Items were presented in a random order, and target faces were randomized within items. Full wording of all items and their intra-class correlations are presented in Appendix A.

1.2.4. Male ultimatum game participants

Ninety-nine men played the UG with the target face photographs as partners. None of these men were among the participants who had