Chimps play fair in the ultimatum game

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Imagine you are given $100.00. You have to propose how to share the money with another person, who can accept, in which case both earn as you have proposed, or reject your offer, in which case neither player gets anything. If both are rational maximizers, the proposer offers one cent, which the responder accepts; one cent is more than nothing and *Homo economicus* goes for it. This so-called Ultimatum Game (UG) (1) played with humans in many societies (2) usually reveals unexpected fairness. Proposers offer about 40% and responders reject offers below about 20%. A study with chimpanzees, our closest relatives, found them to be pure rational maximizers (3). Proposer chimps offered the smallest amount and responders accepted almost all offers. Is human fairness in the UG unique? In PNAS, Proctor et al. (4) show that both chimpanzees and young children playing the UG split rewards equally. However, in a dictator game (DG), where the partner has no say and simply gets what the proposer proposes, both chimps and children preferred to be selfish. Are chimpanzees fair or selfish?

Which differences in the experimental approach of the two chimpanzee studies led to the contradictory results? Jensen et al. (3) adapted an UG design that had been used for humans (5), interacting with an anonymous partner only once in each of four games. In each game the proposer could choose between two allocations: one always being 8 points for self and 2 points for responder, the other consisting of one of four allocations dividing 10 points in various ways. This second option included a fair allocation (5 points for self and 5 points for the responder) and a very unfair one (10 points for self and 0 points for the responder). The human proposers usually offered the fairest allocation and responders rejected unfair offers, especially when the alternative allocation had been fair.

In Jensen et al.'s study (3), chimpanzee proposer and respondent sat in adjacent cages. Outside the cages were two sliding trays: one was baited with eight raisins vis-à-vis the proposer and two vis-à-vis the responder, the other was baited with, for example, five and five raisins, as in ref. 5. Proposers could first choose one of the trays by pulling it halfway to the cages; respondents could accept the offer by pulling the proposed tray the remaining distance (via the rod that came into reach as a result of the proposer's pull) or could reject it by not pulling at all within a 1-min time frame. All four games were played within a single session, the sequence balanced across subjects. Contrary to human proposers (e.g., refs. 2 and 5), chimpanzees offered the most selfish offer, whereas respondents tended to accept any offer. Surprisingly, even most unfair offers, 10 vs. 0 (i.e., 0-gain for the respondent), were accepted more than 50% of the time. Unlike human responders, who report being angry (6) when confronted with unfair offers, chimpanzee respondents showed almost no signs of arousal (3). Obviously, proposers did not appear to take outcomes affecting the respondent into account and respondents did not care. The authors conclude that this species does not share with humans a sensitivity to fairness.

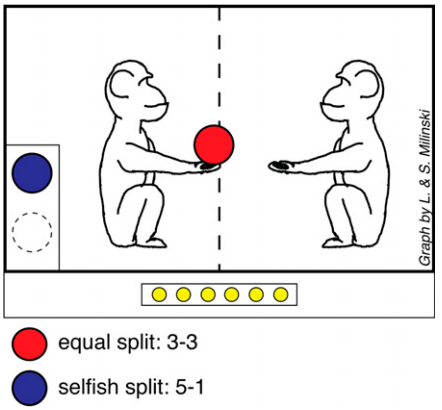

Fig. 1. The proposer chimp has chosen the "equity" token and offers it to the respondent chimp. If the respondent accepts the offer, the six banana slices on the tray outside the cages are visibly divided according to the token selected and the reward made available to the chimps (see commentary text and ref. 4) for details).

Smith and Silberberg (7) repeated the chimpanzee study (3) with humans in two different treatments. When the responder chose to reject the proposer's offer, she had to wait for 1 min (or 5 min) until the trial was terminated and the next started. The likelihood of the responder rejecting an offer decreased from 52 to 18% as the period of waiting required to reject an offer was increased. Contrary to previous human studies, rejection in the chimpanzee study (3) was defined by withholding a response for 1 min in a repeated-trials design, which lowers the rate of raisins consumed per session. The responder chimp could start the next session immediately by accepting the offer, which thus paid off even if it was a zero offer (7). Smith and Silberberg argue that if species differences in time horizons are accommodated, Jensen et al.'s (3) ape data are reproducible with humans. However, we still do not know whether chimpanzees can be fair in the UG.

Proctor et al.'s study (4) with chimpanzees used a different design. As in all previous human studies, Proctor et al. used a kind of money: colored tokens that cannot be consumed but must be traded for something of value. "We chose to use tokens representing food rather than food directly to prevent their choices from being influenced by prepotent responses to seeing food" (4). Again, two chimpanzees were placed in two adjacent testing rooms separated by a mesh panel. Each time, six rewards, banana slices, were lined up on a tray in front of the chimpanzees. The proposer was presented with a choice of two tokens, one representing an equal split of the rewards (3/3) and the other an unequal split favoring the proposer (5/1). The proposer passed the selected token to the respondent through the mesh panel (Fig. 1). The respondent either returned the token to the experimenter to accept the offer or did not return it for 30 s, hence rejecting the offer. On acceptance, the six banana slices were visibly divided on the tray according to the token selected. The tray was then pushed within reach of the chimpanzees so that each could collect its reward. Chimpanzees received two test sessions of 12 trials each on two different days. Although proposers had a significant initial preference for the selfish token, they overall preferred the equitable (5/5) token in 75% of the trials. Interestingly, also in this study, respondents accepted all offers.

The results of the UG were compared with those of a preference test that all individuals had to perform before the UG. This test resembled a DG, where the respondent could not influence outcomes. In the DG, human "proposers" usually maximize their own gain. Each chimpanzee was paired with a "foil" partner, who was naïve to the conditions of the task. As in the UG, the rewards were lined up in a tray. The subject chimpanzee was given the choice between the two tokens to return to the experimenter (it had not yet

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learned to pass it to its neighbor chimpanzee). As in the UG, the rewards were then divided and made accessible to the chimpanzees. In this DG, subjects chose the selfish token in about 90% of the trials. Each of these chimpanzees made a more equitable offer in the UG.

When both tests were performed with children (ages 3–5 y), the children also preferentially selected the selfish token in the DG and chose the equitable offer significantly more often in the UG than in the DG.

Before testing, it was necessary to make sure that all subjects had understood the procedure. Chimpanzees had to: (*i*) be able to pass a token to another chimpanzee; (*ii*) have no initial preference for the tokens; (*iii*) be able to discriminate between the reward quantities; (*iv*) be trained on the value of the tokens with a naïve and passive partner, who was rewarded according to the token selection; and (*v*) show that they preferred the token that brought them the larger reward (indicating understanding of the token values) when a passive and naïve partner was present.

The results of the two chimpanzee studies differ mainly in the behavior of the proposers. In Jensen et al.'s study (3), chimpanzee proposers preferred the selfish offer; in Proctor et al.'s study (4) they prefered the equitable, fair offer in the UG, but prefered the selfish offer in the DG. It is notable that in the latter study proposers started selfish and changed to fair over the trials. The authors report that respondents occasionally intimidated proposers, threatened them, spat water, or hit the mesh barrier. Such intimidation did not occur in Jensen et al.'s study (3). Obviously, only in Proctor et al. (4) respondents were angry about unfair proposals and disciplined initially unfair proposers through both intimidation and perhaps more subtle communication. This form of punishment seems cheaper than losing time by rejecting unfair offers.

We share our ability to be fair with chimpanzees and potentially other animals.

How do these results relate to what is usually found in anonymous one-shot UGs with humans? Are we just fair? No. In the DG and other games humans are selfish, and they switch immediately to cooperative behavior when they know they are being observed and their reputation is at stake (8–12). In real life, it is always likely that one will meet the present interaction partner again. If we are told that the game is a one-shot, we might unconsciously behave as if the game is repeated (13–15) and try to discipline the proposer. Disciplining the current selfish partner works in anonymous UGs only through rejecting the offer (16), which is more costly to the proposer than to the responder. Proctor et al.'s (4) chimpanzees achieved the same disciplining result more directly through communication, as did the children in their experiment by shouting, "You got more than me" or "I want more stickers." Fairness needs to be enforced. We share our ability to be fair with chimpanzees and potentially other animals.

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