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## How fairly do chimpanzees play the ultimatum game?

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**H**umans can behave fairly, but can other species? Recently we tested chimpanzees on a classic human test for fairness, the Ultimatum Game, and found that they behaved similarly to humans. In humans, Ultimatum Game behavior is cited as evidence for a human sense of fairness. By that same logic, we concluded that chimpanzees behaved fairly in our recent study. However, we make a distinction between behavior and motivation. Both humans and chimpanzees behaved fairly, but determining why they did so is more challenging.

We recently played the Ultimatum Game (UG) with chimpanzees and found that the apes showed very similar responses to those shown by adult humans in previous studies, and indeed also responded very much like the young children tested with almost exactly the same paradigm in our own study. Our conclusion that this hints at fairness in the apes caused debate, with some arguing that a preference for fairness requires the rejection of unfairness (in this case, a rejection of the unfair offer). Without the latter, our critics said, the former cannot be considered demonstrated. This is, however, not a typical criterion used in human studies. The obvious issue is that all we can do is measure choices that are made. What is behind those choices is a separate question. Motivations for fair outcomes are open to interpretation, in humans as well as other species.

The UG, developed in economics, is a two-player game in which the first player, or Proposer, is given some amount of money that he/she can split with the second player, the Respondent, in any

way. If the Respondent accepts the offer, then both players leave with the proposed split. However, if the Respondent rejects the offer, neither player is rewarded. In humans, responses to the UG vary by culture,<sup>1</sup> but in most populations the majority of offers fall between 40–50% with a 50% split being the most frequent offer.<sup>2–4</sup> Thus, human behavior in this task is said to be “fair” as rewards are often distributed equitably between the partners. However, in a similar economic task, the Dictator Game (DG), in which Respondents cannot refuse offers, humans are more selfish than they are in UGs,<sup>3,4</sup> offering ~23% of the money.<sup>5</sup> Here, we discuss the components of UGs that are indicative of fair behavior and discuss this in light of our recent findings.

From the Proposer’s perspective in UGs, there seem to be two motivations, which may operate independently or in concert, for making equitable offers. First, Proposers could be acting out of self-interest.<sup>3,6</sup> That is, by making equitable offers they hope to ensure their offer will be accepted and thus avoid the possibility of receiving nothing (should the Responder reject the offer). However, it is also possible that Proposers act out of some altruistic urge, which makes them act generously or fairly toward their partner.<sup>3,5,7</sup> These motivations, which cannot be deduced from the actual choices, cannot be elucidated without explicitly asking the participants. However, self-reported motivations are notoriously inaccurate even with objectively measurable phenomenon, such as height.<sup>8</sup> Most of the human UGs report behavioral measures only, therefore, i.e., whether the *behavior* of the Proposer was fair or not.

**Keywords:** chimpanzee, ultimatum game, fairness, behavioral economics, primate

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In the chimpanzee version of this game,<sup>9</sup> we limited the offers to two possibilities. Proposers could either make an equitable offer that rewarded both chimpanzees equally, or a selfish offer favoring the Proposer him/herself. We found that in 72% of trials Proposers made equitable offers, a percentage very similar to humans that make equitable offers (76%).<sup>7</sup> Is this fair behavior? We believe so. For some reason the Proposers were motivated to achieve the same outcome as the one called “fair” in humans.

But what about Respondents? In that same 72% of trials there were no rejections, as there should be no reason to reject fair offers. In the remaining 28% of trials, we also did not see rejections, which is potentially more difficult to explain: aren't Respondents supposed to reject unfair behavior? In typical human studies, this is the case, but these studies differ from ours in two important respects. First, humans are explicitly told that refusing is an option. In our case, we could not give chimpanzees these instructions, so we withheld them from the children as well. Refusals would have had to be spontaneous. Second, and most importantly, in typical human studies, refusal is the *only* way to respond to the Proposer. Proposers and Responders typically interact in a one-shot, anonymous interaction with a stranger, leaving the Responder no other recourse. In our study, however, much as in real life, Responders and Proposers were members of the same social group, and had opportunities to interact in ways other than rejection. In humans, even the opportunity to write a note to the Proposer reduces the rate of rejections.<sup>10</sup> In our study, Respondents

showed behaviors, such as spitting water at proposers or hitting the barrier between them, which indicated dissatisfaction with selfish offers. Similarly, the young children also never rejected offers but would make statements such as “I want more.” None of these types of behaviors were directed toward the experimenter, indicating that both chimpanzees and children regarded the Proposer as the main agent. These observations are in sharp contrast to previous attempts to play the UG with apes,<sup>11</sup> in which the apes were not required to interact with each other, and indeed never did.<sup>12</sup>

Proposers behaved fairly, therefore. But, does the absence of rejections by Respondents suggest that they were indifferent to fair outcomes? We do not believe so. The communicative interactions that we observed among the children and chimpanzees suggest a preference for fair behavior, even if this preference never translated into rejections. However, we should note that fairness is likely not the only motivation at work here. If it were, both humans and chimpanzees would also play fairly in DGs, but they do not.<sup>5,9</sup> Given the similarities in behavioral outcomes between humans and apes, our working hypothesis is similarity in motivation even though this is an area in which we need more research on both humans and other animals.<sup>13</sup>

#### Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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