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Report

Children, but Not Chimpanzees, Prefer to Collaborate

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Summary

Human societies are built on collaborative activities. Already from early childhood, human children are skillful and proficient collaborators. They recognize when they need help in solving a problem and actively recruit collaborators [1, 2]. The societies of other primates are also to some degree cooperative. Chimpanzees, for example, engage in a variety of cooperative activities such as border patrols, group hunting, and intra- and intergroup coalitionary behavior [3–5]. Recent studies have shown that chimpanzees possess many of the cognitive prerequisites necessary for human-like collaboration. Chimpanzees have been shown to recognize when they need help in solving a problem and to actively recruit good over bad collaborators [6, 7]. However, cognitive abilities might not be all that differs between chimpanzees and humans when it comes to cooperation. Another factor might be the motivation to engage in a cooperative activity. Here, we hypothesized that a key difference between human and chimpanzee collaboration—and so potentially a key mechanism in the evolution of human cooperation—is a simple preference for collaborating (versus acting alone) to obtain food. Our results supported this hypothesis, finding that whereas children strongly prefer to work together with another to obtain food, chimpanzees show no such preference.

Results and Discussion

Cooperative food acquisition might have been a key behavioral domain for the evolution of the cooperative tendencies we find in human societies [8]. Nonhuman great apes are mostly individual foragers. They may travel in small groups, but when they find a patch of food, each individual typically procures and consumes food on its own. The one exception is group hunting among chimpanzees, in which a small party of males surrounds and captures a monkey [9, 10].

In contrast, human societies depend on many kinds of collaboration, including, most basically, collaborative foraging [11, 12]. The large majority of documented human forager societies, both past and present, obtain/obtained at least part of their daily sustenance through collaborative efforts of one sort or another [13]. This raises the possibility that humans may have specialized cognitive and motivational mechanisms for collaboration, including collaborative foraging [14].

Humans' nearest great ape relatives, chimpanzees, have cognitive skills that enable them to solve some novel problems collaboratively. For example, they are able to inhibit going for food directly when they know they need a partner to obtain it, and, after some experience, they actively choose the best partner for their collaborative activity [7]. However, particular pairs of chimpanzees only collaborate well if they are tolerant of one another in food-sharing situations in general [6], and bonobos, which are generally more tolerant of one another around food, collaborate more readily than do chimpanzees [15].

This raises the possibility that one factor underlying humans' reliance on collaboration for foraging and other activities is motivation. Humans might therefore be especially motivated to do things, including procuring their food, through collaborative efforts with others. To test this hypothesis, in the current study, we directly compared chimpanzees and human children in their motivation to collaborate to obtain food (as opposed to obtaining it individually).

Study 1

We presented child (n = 24) and chimpanzee (n = 15) participants with a choice between two options, both leading to the same amount of food. On one side of the testing room, two ends of a rope led to a board laden with food outside the room. On the other side was one end of a rope leading to a board laden with food outside the room but with the other end extending into a neighboring room, with a conspecific partner (another chimpanzee or another human child) ready to pull (see Figure 1). For each of these two options, both ropes had to be pulled simultaneously for success. Pulling only one end simply threaded the rope through hooks on the board without moving the board at all. Ropes that were lost in this way were replaced to minimize any differences in reliability between boards. All subjects learned to use both boards successfully before the actual experiment. The choice for each individual was between a collaborative board—from which the subject could obtain food by pulling her rope simultaneously with the partner (whom she knew from previous experience was perfectly reliable)—and an individual board—from which the subject could obtain food by pulling both ends of the rope by herself. There was a small difference between children and chimpanzees in the individual board setup. Only on the children's individual boards the rope ends were knotted, so that only one rope had to be pulled for success. The amount of food available to the subject on the collaborative and individual boards was identical (the partner at the collaborative board and the individual board received the same amount as well), and the left and right placement of the boards was alternated across trials for each subject. Each subject participated in four consecutive trials. To design the task for both chimpanzees and children as equally as possible, we encouraged the children not to talk during the test trials.

We tested 15 semi-free-ranging chimpanzees from Tchimpounga Chimpanzee Sanctuary in the Congo Republic (11 males and four females aged 11–22 years). All of the

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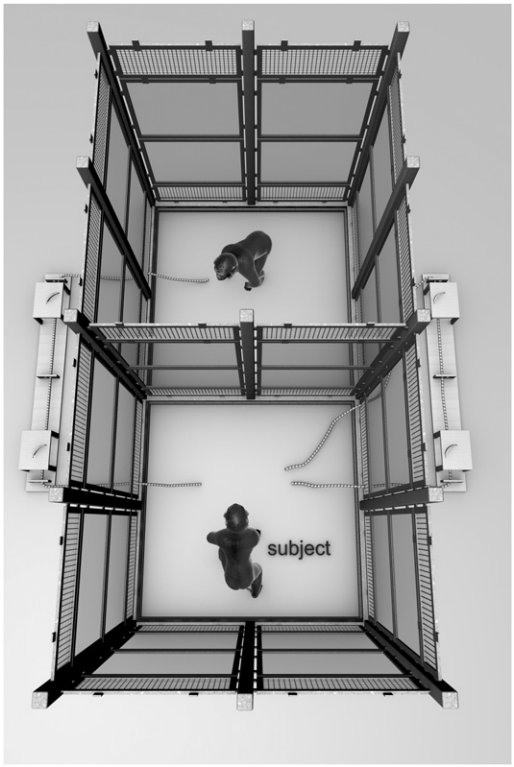

Figure 1. Experimental setup for chimpanzees in study 1

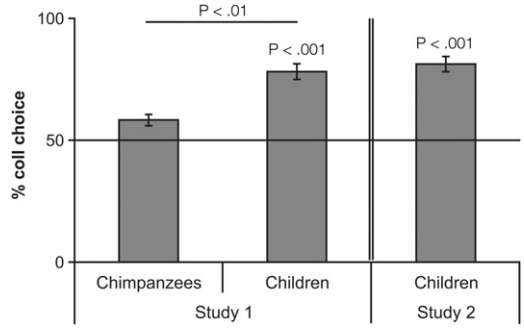

Figure 2. The Percentage of Trials of Study 1 and Study 2 in which the Subjects Chose the Collaborative Board

Error bars indicate standard error of the mean.

chimpanzees were wild-born, unrelated orphans. At the time of testing, all chimpanzees lived in social groups and had food and water freely available at all times throughout the tests. Subjects had participated previously in studies investigating their social cognitive abilities but were naive to the kind of apparatus and setup used in this study. All subjects could choose to stop participating at any time. In addition, 24 3-year-old children participated (12 males and 12 females aged 2 years and 10 months to 3 years and 4 months). They were tested at kindergartens in Leipzig, Germany. All were native German speakers and came from heterogeneous socioeconomic backgrounds.

Chimpanzee cooperative partners lived in the same social group as the subjects. Individuals were tolerant of one another. Child subjects and cooperation partners were both from the same kindergarten. Both child and chimpanzee cooperative partners participated in multiple sessions. (See Supplemental Experimental Procedures for full methodological details.)

Human children chose the collaborative board (78.13%) significantly more often than did the chimpanzees (58.33%) ($U = 88.0$, $p = 0.005$, Mann-Whitney U exact test). Children's choice of the collaborative board was also more frequent than would be expected by chance alone ($p < 0.001$, binominal exact test), whereas the chimpanzees chose between the two boards randomly (Figure 2) (see also Supplemental Experimental Procedures for individual performances and additionally analyses).

These results suggest that human children, but not chimpanzees, have a preference to work together with a partner (as opposed to alone) to obtain food. One alternative explanation is that the two different kinds of actions—collaborative versus individual—might not be equally effortful. Therefore, we measured the time children and chimpanzees needed to obtain the reward using each of the two boards. Chimpanzees needed significantly more time on the individual board (mean 8 s) than on the collaborative board (mean 3.7 s; $p < 0.001$, three ties, Wilcoxon exact test) to obtain the reward. So, although chimpanzees were faster in obtaining the reward on the collaborative board, they did not show a preference for this board. In contrast, human children needed the same amount of time (mean 6 s) to obtain the reward on both boards (p = not significant [ns], two ties, Wilcoxon exact test). So the preference for the collaborative board could not be explained by a difference in the difficulty of the two boards.

A second alternative explanation might be that children avoid scenarios that allow others to free ride. In the present study, the partner received a reward regardless of which board the subject chose. This makes the partner a "free rider" if the participant chose the individual board. Children's preference for the collaborative board thus might have been caused by a preference to not allow the partner to free ride. To test the validity of this alternative explanation, we conducted a second study with human children only.

Study 2

The method of study 2 resembled the method of study 1, with the one difference being that now the potential partner never received a reward, neither on the collaborative nor on the individual board. The amount of food available to the subject on the collaborative and individual boards was identical to study 1. After the trial was completed, the partner secretly received a reward in absence of the subject. We recruited 12 3-year-old children from the same population as in study 1 (six males and six females aged 2 years and 10 months to 3 years and 4 months).

Again, subjects chose the collaborative board significantly more often than would be expected by chance (81.25%; $p < 0.001$, binominal exact test) (Figure 2). Again, no significant difference in the amount of time needed to obtain the reward was found (mean time needed on the collaborative board = 8 s, mean time needed on the individual board = 10 s; p = ns, one tie, Wilcoxon exact test).

Taken together, the results of study 1 and study 2 are consistent with the hypothesis that children are motivated to engage in collaborative over individual activities [2, 16], specifically in the current study, to obtain food. Collaborative foraging may well have been a key behavioral domain in which humans evolved a suite of new proximate mechanisms, both cognitive and motivational, for collaborating with others in

ways that eventually led to the many complexities of modern human societies.

Future research should compare cooperative motivation across different primate species to attempt a reconstruction of the evolutionary history of the trait [17]. Especially interesting would be other cooperative-breeding primates or one of our other close phylogenetic relatives, the bonobos, which have both previously been argued to closely match some of the human prosocial motivations [15, 18–20].

Supplemental Information

Supplemental Information includes three tables and Supplemental Experimental Procedures and can be found with this article online at doi:10.1016/j.cub.2011.08.066.

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