Supplementary Material

Methods

Subjects

We tested five bonobos (three males: Kuno, Limbuko, and Joey; two females: Yasa, Ulindi) and five Western common chimpanzees (three males: Patrick, Robert, and Frodo; two females: Sandra and Pia). While subjects were not perfectly matched in age, there was no systematic age difference between the two groups (see Table 1).

Chimpanzee subjects were all part of a 17-member social group, one of two separately housed chimpanzee groups at the zoo. Bonobo subjects were all part of a six-member social group (the sixth, untested bonobo is an infant female). During the day, each group had access to both a smaller, indoor enclosure and a larger, outdoor enclosure, subject to the time and the weather. At night, they slept in group-specific indoor rooms, and both species made the transfer into and out of this room at approximately the same time. Chimpanzee and bonobo subjects both experienced regular enrichment, including foraging-specific enrichment. All had unrestricted access to water, even during testing. Subjects were tested between the hours of 08:30 and 12:30, with no subject's testing locked to a particular time within that frame. All subjects were born in captivity, were never food-deprived, and could stop participating at any time. While housing and rearing conditions for the two species were certainly not identical, they were quite similar, and were certainly much more alike than those experienced by these animals in the wild. In particular, the feeding regimens (highly relevant to these food-based choice tasks) for the two groups were essentially the same. Thus, observed differences between the two groups

are much more likely to be due to their evolutionary histories than differences in housing, although the latter is still a distinct possibility.

Apparatus

Subjects faced the experimenter through a Plexiglas panel with holes on either side through which subjects could reach to make choices by sliding a small Plexiglas barrier (60cm long and 9cm tall) to one side, uncovering the hole in front of that bowl. This barrier was used to prevent subjects from choosing both options, as sliding the barrier to one side blocked the opposite hole. Food rewards were placed on a plastic 73cm x 33 cm table attachment. Rewards were obscured by plastic colored bowls (diameter = 26 cm, height = 12 cm) and a 70cm x 27cm x 23cm occluder. This occluder was used to cover the bowls during baiting to ensure that subjects did not know how many items were available beneath the risky option. During sessions, the experimenter placed the options on a table (73cm x 33cm) that could be slid forward within the subject's reach. The side assignments for the options were counterbalanced within sessions.

Trial Structures

Both chimpanzees and bonobos chose between a safe reward (associated with a particular bowl shape and color) that always yielded four grape halves and a risky reward (under the other colored bowl) that yielded seven grape halves 50% of the time and one grape half the other 50% of trials. For all trial types, the inter-trial interval (time between end of one trial and beginning of another) was set at approximately 25 s. During the inter-

trial interval, the experimenter loaded the table with the appropriate food rewards and covered each side with a colored bowl. We counterbalanced the assignment of bowl color to option type (fixed versus risky) across subjects. All loading occurred behind an occluder. Reward options were randomized across trials. The experimenter always loaded the rewards from left to right, in case subjects attempted to infer amounts from body placement. At the end of the inter-trial interval, the trial began when the occluder was lifted. In choice trials, the subject then saw the two options for 4 s prior to making a choice. In introductory trials, only one option was available to choose. In number-discrimination trials, subjects saw the actual reward quantities for 4 s before the experimenter then covered them with the appropriate bowls in view of the subject. When the 4 s had passed, the experimenter pushed the table forward to allow the subject to make a choice. The subject then had 15 s to make a choice by sliding the Plexiglas barrier to one side. The experimenter then uncovered the food amount beneath the chosen bowl and handed it to the subject.

Discarding Data

If a subject did not make a choice (meaning did not slide the Plexiglas barrier to one side) within 15 s of being given access to the barrier, the trial was considered aborted. Additionally, if a subject failed to consume all the food, the trial was aborted. Aborted trials were appended to the end of the session. However, upon three aborted trials in a single session, the entire session was ended and the data discarded. Only one session had to be aborted in this way.

Criteria were also established to eliminate severely side-biased data. For mixed sessions, if a subject chose a single side nine or more times out of ten possible choice trials in a single session, plus chose incorrectly toward the side of the bias on a single number trial, the data from that session was discarded and the session repeated. For the later, choice sessions, if a subject chose a particular side on 18 out of 20 trials or more, that data was discarded and the session repeated. Only a single session was deemed biased based on these criteria, suggesting that the apes found the task and the reward contingencies highly salient.

Pretest Sessions

Prior to beginning the experimental sessions, all subjects completed two types of sessions: number-discrimination and introductory sessions. During the number-discrimination session, there were 20 number-discrimination trials, 10 of each comparison type. In order to progress to the introductory session, each subject had to choose the larger reward on 8 of 10 trials for each comparison type. Subjects repeated number-discrimination sessions until they reached this threshold. During the introductory session, subjects only had one possible option available to them. Of the 20 trials in an introductory session, 10 presented the risky option (split between one and seven rewards) and the other 10 presented the fixed option. In order to proceed from the introductory session to the mixed sessions, subjects had to choose the side with a reward available on 19 of 20 trials.

Results

A Shapiro-Wilks W test revealed that the data were not violating assumptions of normality, W = 0.952, p = 0.753 (chimpanzees), W = 0.898, p = 0.399, bonobos. The Levene's Test for Equality of Variances confirmed that the two data sets were sufficiently homogeneous, p = 0.56.

To determine whether this pattern could be attributed to species or individual differences in numerical discrimination, subjects also completed number-discrimination choices over the relevant quantities. Chimpanzees and bonobos did not differ in the number of sessions it took to reach criterion for discrimination, t(8) = 0.426, p = 0.68 (Levene's Test: p = 0.53), or on their overall performance on the number-discrimination trials dispersed through the first six experimental sessions, t(8) = .381, p = .71 (Levene's Test: p = .554). Furthermore, individual differences in number discrimination performance did not predict their risk preferences, r = -.013, p = 0.73, Pearson correlation. One additional possibility is that the chimpanzees and bonobos differed in their motivation to acquire the food. Three pieces of evidence suggest that this is not the case. First, chimpanzees and bonobos received equal amounts of food in the task overall despite their different choice strategies. Second, both species were highly successful at picking the larger reward on the number-discrimination trials, suggesting similar levels of engagement in the task. More importantly, if one of the species was unmotivated to acquire the food, then that species might have performed at chance in the choice trials due to lack of interest. Thus, differences in motivation cannot account for the strong, but divergent, preferences that both species exhibited.

The amount received from the risky reward in experimental choices could vary slightly from session to session and between individuals; however, on both an individual

and group level, subjects did not receive the larger or smaller reward from the risky option more often than chance, $t(9) = -1.37$, $p = 0.20$ (group-level analysis). In addition, these variations did not affect subjects' choices, $r = 0.157$, $p = 0.67$, and there was no difference between species in overall amount received, $t(8) = -0.114$, $p = 0.89$ (Levene's Test: $p = 0.23$). This precludes the possibility that the observed differences resulted from different reward amounts received rather than risk preferences.

An analysis of first-order transitions (run on the last three sessions only—this being the explicit reason for running the choice sessions) revealed that, on both individual and group levels, subjects were not more or less likely to switch to the fixed reward directly after receiving the small payoff from the risky reward than after receiving the large payoff, $t(9) = 1.527$, $p = 0.161$, two-tailed paired-samples t-test.