

Partial Support From a Nonreplication: Comment on Roma, Silberberg, Ruggiero, and Suomi (2006)

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A purported replication by P. G. Roma, A. Silberberg, A. M. Ruggiero, and S. J. Suomi (2006) of the authors' previous study (S. F. Brosnan & F. B. M. de Waal, 2003) claims to contradict their finding that capuchin monkeys (*Cebus apella*) refuse to exchange with an experimenter if their partner receives a superior reward. Roma et al. used no exchange task, however, or any other task. Roma et al. offered frustration as explanation of their findings, yet failed to statistically prove that the effect of frustration is stronger than that of inequity. They also misrepresented the dependent measure of the authors' study. Reanalysis of the authors' own data indicated no role of frustration, that is, no effect of previous experience with a superior reward. The authors conclude that Roma et al.'s study is not a replication and does not disprove the authors' findings.

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The article by Roma, Silberberg, Ruggiero, and Suomi (2006) entitled "Capuchin Monkeys, Inequity Aversion, and the Frustration Effect" has been presented as a replication of an earlier experiment by us (Brosnan & de Waal, 2003), yet it is not. There are major differences in both procedure and dependent measure that make it hard or impossible to compare results. Because of these differences, Roma et al. cannot claim to have disproven our main finding, which is that capuchin monkeys (*Cebus apella*) respond to inequity of rewards by refusing to continue the interaction. In fact, a reanalysis of our original data indicates that the frustration effect, which Roma et al. featured as an alternative explanation, was small or negligent in our study.

Roma et al. (2006) skipped (a) extensive training of their monkeys for separate testing and (b) the exchange task of our experiment. This made for a quicker study but sacrificed essential elements of our design (not to mention possible negative effects on the monkeys' attentional and motivational states). Instead of exchanging rewards for a token, as we had done, they gave their monkeys food for free. Thus, the food was not truly a reward for anything. An examination of our previous data indicates that the monkeys reacted differently to rewards given for free and those earned through exchange (see Effort Control in Brosnan & de Waal, 2003). This means that the dependent measure used by Roma et al. is quite different from ours. Moreover, in their article, Roma et al. compared their monkeys' rate of food refusal with our composite measure, which included food refusal plus refusal to exchange. They inaccurately provided a direct comparison between their single and our double measure, claiming a dramatic difference (see Figure 2 in Roma et al., 2006, p. 71). The differ-

ence, however, is largely explained by Roma et al. not having any exchange data. Specifically, in Phases 1 and 3 of their test, in which the model received a grape, the subject refused to accept cucumber about 15% of the time, which is not so different from what we observed during the Inequity Test of our study, in which the model received a grape. We found that subjects refused cucumber 25% of the time, not the 45% (double measure) that Roma et al. quoted.

The second major drawback is the absence of a condition directly comparable to our study. Roma et al. (2006) had no condition in which a model that had previously received grapes got cucumbers while observing another capuchin get grapes (none of their subjects who watched another receive a grape had ever themselves received a grape). This rendered the whole experiment nothing more than a comparison of frustration subjects with the control condition and a separate comparison of inequity subjects with the control condition.

In their own data, Roma et al. (2006) should at least have made a direct statistical comparison between the inequity effect and the frustration effect. Given the critical tone of their introduction and discussion and their favoring of the second effect over the first, why did they not conduct such a direct comparison? We think we know the answer: Given that the inequity response in their experiment was about 15%, with a large standard error bar, and the frustration response about 20%, it is highly unlikely that there was much difference between these two effects. The inability to statistically distinguish the two effects means that inequity may have played as large a role in their study as it did in ours. Best of all would have been if they had supplemented their reported study with a within-subject comparison to directly compare these two phenomena.

Another potential problem may have been with the choice of food rewards. In our study, grape and cucumber were chosen to fill two criteria: (a) Both were readily consumed by subjects in baseline situations (in our study, all of the monkeys consumed the cucumber at least 95% of the time in the baseline condition, the

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Equity Test), and (b) the higher value grape was preferred, at minimum, 80% of the time to the cucumber. In fact, all subjects chose the grape 90–100% of the time. Reward preferences differ between both individuals and groups of monkeys, and Roma et al. (2006) provided no evidence that their subjects showed an equally strong preference for grapes over cucumbers. Clearly, if grapes were not greatly preferred, neither inequity nor frustration would show large effects.

We have been able to reanalyze part of our own data for evidence of the frustration effect. As part of our within-subjects design, our monkeys served as both models (receiving grape) and subjects (receiving cucumber). However, of our five subjects, three acted as subjects in the Inequity Test (watching a partner receive a grape) for one session before they ever received a grape themselves in the experiment (i.e., were a model). Thus, we have been able to do a between-subjects analysis comparing these three subjects' reactions with those of the remaining two subjects, which received a grape prior to being a subject. We have also been able to do a within-subjects analysis comparing these three subjects' reactions in their first session (when they had not yet received a grape) with those in their second session (in which they had been a model and had received a grape). For these analyses, we have used a composite measure of our data, which includes both refusals to exchange and refusals to accept the cucumber, because the composite measure is more comparable to our previous results (Brosnan & de Waal, 2003).

Given our small sample size with the data presented in this way (five subjects total, three with no prior experience receiving the grape, two with prior experience receiving the grape, two sessions each), statistics are not meaningful. However, it is possible to get an idea of the direction of the data. We have found no difference between the two groups of monkeys on their first test (see Figure 1), indicating that the initial reaction to distributional inequity was independent of whether or not the subject had previously received grapes in a similar situation. Moreover, the refusal rates for both sets of subjects stayed the same from Session 1 to Session 2, indicating that within the same subject, the response did not differ between experiencing distributional inequity without having ever received the grape and experiencing distributional inequity with prior grape receipt. Both these results are counter to the frustration hypothesis. Thus, reanalysis of our original data indicates that the frustration effect played only a small or negligible role in our monkeys' responses, certainly less than the effect of inequitable reward distribution.

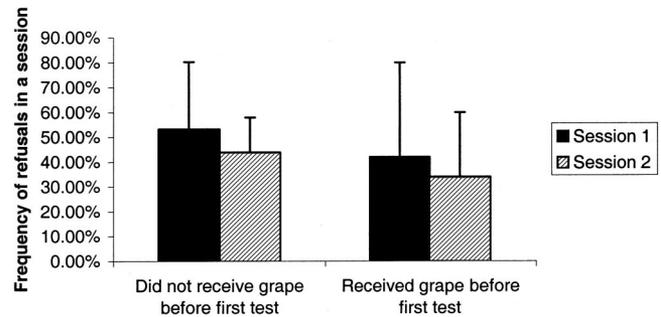


Figure 1. Frequency of refusals dependent upon prior grape receipt during the Inequity Test. A reanalysis of the original data from Brosnan and de Waal (2003) discriminated the mean (\pm SEM) rate of refusal (e.g., reward refusal plus refusal to exchange) for those capuchin monkeys (*Cebus apella*) that had never received a grape prior to watching their partner receive a grape from the mean (\pm SEM) rate of refusal of those that had received a grape (i.e., acted as a model) prior to watching a partner receive a grape. There are three subjects in the first category and two in the second. Individuals that were naïve to grapes were not more likely to respond to the inequitable distribution after having seen a grape, rendering it unlikely that frustration played a large role in their reactions. Note also that monkeys in the first category, those that did not receive a grape before their first test, received a grape (acted as a model) between their first and second sessions yet showed no drop in response.

We conclude that Roma et al.'s (2006) study is not a replication of our study and hence cannot disprove our results. Although the frustration effect may play a role in some responses, Roma et al.'s study in fact lends support to inequity aversion in capuchin monkeys and fails to statistically distinguish such aversion from the frustration effect. Thus, their study is at least partially supportive of our previous results.

References

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