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## Invited reply

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## Animal behaviour

What's in a frame? Response to  
Kanngiesser & Woike (2016)Christopher Krupenye<sup>1</sup>, Alexandra G. Rosati<sup>3</sup> and Brian Hare<sup>1,2</sup><sup>1</sup>Department of Evolutionary Anthropology, and <sup>2</sup>Center for Cognitive Neuroscience, Duke University, Durham, NC 27708, USA<sup>3</sup>Department of Human Evolutionary Biology, Harvard University, Cambridge, MA 02138, USA

We recently reported a study [1] where chimpanzees and bonobos faced decisions between a 'framed' option that provided either one or two pieces of fruit, and an alternative option that always provided a constant number of peanuts. We found that apes (especially males) chose the framed option more when it was presented as a gain—apes initially saw one piece of fruit, but sometimes got two after making a choice—than when it was framed as a loss—apes saw two fruits, but sometimes received only one. We argued that the apes showed human-like framing effects, because they judged the fruit option as more desirable when it was presented as a gain than as a loss, despite equivalent payoffs. In a commentary, Kanngiesser & Woike [2] claimed that the apes actually exhibited a pattern opposite of that typically seen in humans. They further highlighted important differences between human and non-human animal decision-making tasks.

We believe that the commentary missed a critical aspect of our methodology, as they interpreted our results in terms of risky choice framing—or the *reflection effect*—whereas our task was designed to probe *attribute framing*. The reflection effect is a phenomenon where people tend to be risk-averse for gains but risk-seeking for losses. Critically, this shift hinges on both the risky and safe options being framed as gains or losses. For example, in the classic 'Asian disease' problem [3], people prefer a risky treatment plan for dealing with a deadly outbreak when options are presented in terms of the number of people who would die (losses) compared to the number who would be saved (gains). In the loss frame, the risky course of action could result in no deaths (or in everyone dying), yet the alternative is the certainty that some subset of people will die. In this situation, people choose risk to avoid certain losses. By contrast, people prefer to play it safe in the gain frame so that at least some people are saved, rather than risk the possibility that no one will be. Some non-humans also exhibit this reflection effect. For example, starlings prefer risk more often when they have been accustomed to higher payoffs, such that all options represent a relative loss, than when available options appear to be relative gains [4]. Similarly, capuchins prefer to trade tokens with a 'risky' experimenter over a 'safe' experimenter when both trading partners decrease their initial options, but prefer the 'safe' person when both augment their rewards [5].

Crucially, our study is not capable of measuring the reflection effect, and it is not analogous to those studies as it lacks a critical feature—that both the risky and safe options must be framed as gains or losses. In our study, only the framed option was manipulated across conditions; the constant alternative option rather served as a consistent reference point against which preferences for the framed option could be assessed. Accordingly, our study is comparable to previous work on *attribute framing*, or how people judge the attractiveness of options based on whether positive or negative attributes are highlighted. We found that apes assessed the framed option as more desirable in a gain frame than a loss frame. Importantly, humans (and some non-humans) show both the reflection effect and attribute framing effects. For example, people

are more likely to make a favourable judgement about a risky gamble when it is described in terms of its positive attributes (75% chance of winning) versus its negative attributes (25% chance of losing) [6], much like our ape results. Similarly, capuchins—who show the reflection effect [5]—also prefer to trade tokens with an experimenter who offers gains (e.g. augments their initial offer) rather than one who offers losses (decrements it), even though the monkeys' payoffs are identical [7]. Attribute framing and the reflection effect both address how the presentation of equivalent options alters our preferences and judgements, and both can come into play in risky choice contexts, but they are distinct expressions of framing phenomena.

However, we do agree with the commentary's second point: it is critical for psychologists to grapple with differences between studies of human versus non-human cognition. The commentary points out that people respond differently to decisions made from description versus

experience, but this is just one of the many divergences between typical human and animal studies. For example, humans tend to be risk-averse in one-shot decisions about monetary rewards, but there is increasing evidence from ourselves [8] and other groups [9] that humans are more risk-prone when faced with iterated, experience-driven choice for food rewards—the sorts of tasks used with animals. We have further argued that such methodological differences can lead to faulty biological inferences about the phylogeny of human cognitive traits. Given that we cannot test animals on verbal tasks, more matched comparisons of humans and animals on experiential tasks—including studies of framing—are needed. Only by understanding the diversity of human choice behaviour across contexts can we probe the evolutionary origins of human economic behaviour.

**Competing interests.** We declare we have no competing interests.

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