Short Report

The Value Heuristic in Judgments of Relative Frequency

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Estimating the relative frequency of a class of objects or events is fundamental in subjective probability assessments and decision making (Estes, 1976), and research has long shown that people rely on heuristics for making these judgments (Gilovich, Griffin, & Kahneman, 2002). In this report, we identify a novel heuristic for making these judgments, the value heuristic: People judge the frequency of a class of objects on the basis of the subjective value of the objects.

Why use object value as a cue to object frequency? A psychological and economic principle of valuation is that the scarcity of objects increases their value (e.g., Brock, 1968; Hirshleifer, Glazer, & Hirshleifer, 2006; McKenzie & Chase, in press). Two different theoretical perspectives led us to hypothesize that people use this relationship to heuristically—and inversely—infer the frequency of a class of objects from their value. Kahneman and Frederick (2002) proposed that heuristic judgments rely on attribute substitution: In assessing an attribute (the target attribute, e.g., the frequency of an object) that is less readily assessed than a related property (the heuristic attribute, e.g., the value of the object), people unwittingly substitute the simpler assessment of the heuristic attribute for the assessment of the target attribute. This can bias judgments when the heuristic attribute is not diagnostic of the target attribute. Yet our proposition is also consistent with Brunswik's (1952) notion of probabilistic functionalism. Subjective estimates of a distal variable rely on judgmental cues that are probabilistically related to it. Brunswik's concept of vicarious functioning denotes the ability to analyze several cues that are correlated with the distal variable (e.g., frequency) and to substitute one cue (e.g., value) for another (e.g., ease of recall), a process that yields valid alternative routes to the distal variable.[1]

If people use the value of a class of stimuli heuristically to infer the frequency of the stimuli, they will assess more valuable stimulus classes as being less frequent even when value is not diagnostic of frequency. To test this hypothesis, we manipulated the value of stimuli only after participants had encoded them; then, participants assessed the frequencies of the stimuli. A randomization procedure ensured that stimulus value could not be diagnostic of frequency.

METHOD

Thirty female and 38 male Sorbonne University undergraduates viewed a randomized sequence of 57 pictures of flowers and 57 pictures of birds presented on a computer screen. We did not reveal these frequencies. Participants then learned that they would receive 2¢ for each previously seen picture from one of the two categories (either birds or flowers). To determine the endowed category, respondents flipped a coin. Next, we asked them to estimate the number of pictures in each category. To provide an incentive for accuracy, we promised an additional €1.00 for each estimate that fell within 5 of the actual number. Finally, participants rated whether they believed the endowed category had been determined randomly (scale from 0, *not at all*, to 6, *very much*). Five participants were excluded from the analysis because they misunderstood which category was endowed.

RESULTS

Because frequency estimates varied considerably (between 10 and 110), we compared the two endowment conditions (birds endowed vs. flowers endowed) to determine whether they differed in how many participants provided lower, equal, and higher estimates of the number of endowed pictures relative to the number of nonendowed pictures (see Fig. 1).

As predicted, participants were more likely to underestimate the number of flower pictures relative to bird pictures when they expected payment for flower pictures (15 of 31 participants, 48%) than when they expected payment for bird pictures (8 of 32 participants, 25%). In contrast, they were more likely to underestimate the number of bird pictures relative to flower pictures when they expected payment for bird pictures (21 of 32 participants, 66%) than when they expected payment for flower

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[1]See Hammond (1990) for a theoretical integration of Tversky and Kahneman's (e.g., 1974) heuristics and biases program and Brunswik's (e.g., 1952) functionalism.

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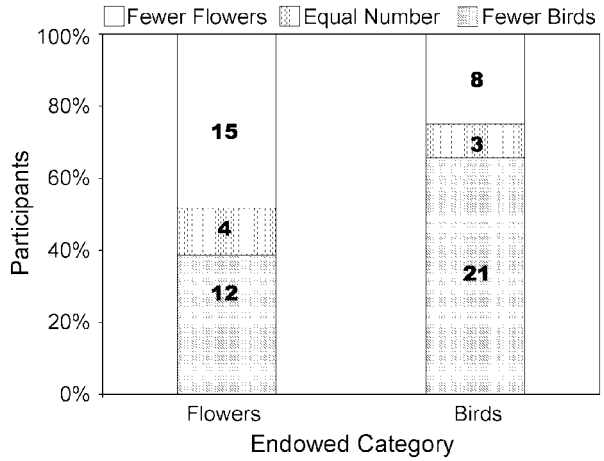

Fig. 1. Percentage of participants who estimated that there were fewer flower pictures than bird pictures, fewer bird pictures than flower pictures, and equal numbers of flower and bird pictures, as a function of which category was endowed. The numbers in boldface indicate the number of participants in each category.

pictures (12 of 31 participants, 39%), $\chi^2(1, N = 56) = 4.51, p = .037$, $p_{rep} = .93$, odds ratio = 3.28.[2] Underestimating the frequency of the endowed category was independent of perceiving the endowment procedure to be random. Participants' randomness ratings did not correlate with the ratio of their frequency estimates of the endowed and the nonendowed categories (Pearson's $r = -.047$, $N = 63$, $p = .712$).

To test the robustness of this effect of value on frequency estimates, we ran two additional experiments. In the first, we followed the same procedure to endow value randomly, but used simultaneously presented, meaningless letter combinations, rather than pictures, as stimuli. The results replicated those reported here. In the second experiment, participants underestimated the frequency of opposite-gender portraits relative to own-gender portraits when the portraits were attractive (so that opposite-gender portraits were intrinsically more desirable to look at), but not when the portraits were not attractive. The value heuristic is robust, regardless of whether stimuli are presented sequentially or simultaneously, or whether stimulus value is experimentally induced or intrinsic.

DISCUSSION

People use the value of a class of objects to infer the frequency of that class. Our results implicate a judgment process at the stimulus-retrieval stage, rather than at the encoding stage, because the value difference between the stimulus categories was induced randomly only after the stimuli were presented. This point is of theoretical importance because it implies that estimating the frequency of a class of objects on the basis of their value is not the result of biased frequency encoding, but rather reflects a new judgment heuristic.

Like other judgmental heuristics, the value heuristic may improve efficiency—greater value is often related to greater scarcity in everyday life, as it is the relative scarcity of objects that determines their market price. However, the value heuristic can also bias judgments. If people use their idiosyncratic valuations rather than market valuations to estimate the supply of goods, they may underestimate the supply of what they personally value, which will affect their search behavior and willingness to pay. Thus, the present demonstration of the value heuristic not only adds to the repertoire of known judgmental heuristics, but also suggests avenues for exploring biases in people's economic intuitions and in their understanding of market mechanisms.

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[2]To avoid expected cell frequencies of less than 5 (Siegel, 1956, p. 110) in the chi-square test, we excluded participants who estimated equal numbers of birds and flowers. Ordinal regression analysis including all cells yielded similar results.

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