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The Effects of Mechanistic and Functional Explanations on Categorization

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Explanation and Conceptual Structure

In a 1985 paper, Murphy and Medin suggested that concepts are coherent by virtue of the theories in which they're embedded, where theories are "any of a host of mental 'explanations'" (Murphy & Medin, 1985). The idea that explanation and categorization are intimately related has since received direct empirical support: explanatory knowledge facilitates category learning, influences typicality judgments, and makes for more 'coherent' categories (see Lombrozo, 2006 for review).

Recent work also suggests that causal beliefs influence categorization. One proposal, the "causal status hypothesis," is that causally 'deep' features are more important than their effects for category membership. For example, if members typically have F_1 and F_2, and F_1 causes F_2, then an item with F_1 but not F_2 is more likely to be judged a member than an item with F_2 but not F_1 (Ahn & Kim, 2000). While this effect and its interpretation are controversial, it provides a basis for exploring the role of explanation in mediating the influence of causal beliefs on categorization. In the experiments below, I find a relationship between explanatory construal—that is, whether a category's features are explained mechanistically (by appeal to proximate causes) or teleologically (by appeal to functions)—and categorization judgments.

Exp 1: Explanations Correlate with Categorization

Ninety-six undergraduates completed the study in exchange for course credit. They were taught about a novel category (biological kind or artifact) with features F_1 and F_2 (e.g. eats blueberries, has blue fur), where F_1 causes F_2 and F_2 subserves a function (e.g. camouflage). Participants were then asked to explain why category members have F_2, and to estimate the probability that items missing one feature (F_1 or F_2) were category members. These probabilities were subtracted to yield a difference score with positive differences reflecting a causal status effect, and negative differences its reversal. The prediction is that participants who provide a mechanistic explanation in response to the "why?" prompt ("category members have F_2 because they have F_1") should show a greater causal status effect than those who provide a teleological explanation ("category members have F_2 in order to bring about the function"). As predicted, participants who provided a mechanistic explanation had significantly higher difference scores than participants who provided a teleological explanation (main effect of condition, $F(1, 92) = 12.09$, p < .05; main effect of domain *n.s.*, interaction *n.s.*, see Fig. 1A). This finding demonstrates a relationship between explanation and

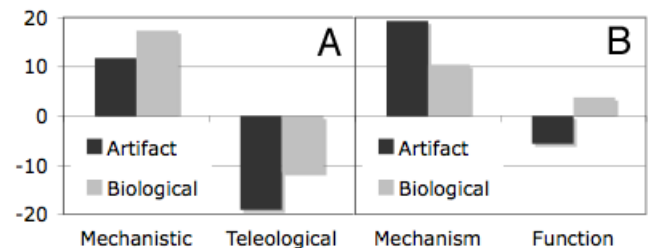categorization, but can explanatory construal causally influence categorization?

Figure 1: Y-axis = P(item w/ F_1 & not F_2 is a member) − P(item w/ F_2 & not F_1 is a member). **A**, Difference scores as a function of explanation in Exp 1. **B**, Difference scores as a function of condition in Exp 2.

Exp 2: Explanations Influence Categorization

One-hundred-ninety-two undergraduates completed the study in exchange for course credit; half each in the *mechanism* and *function* conditions. The task was identical to Experiment 1, but participants were not told the function of F_2, and those in the *function* condition were prompted to generate a function by answering whether F_2 might have a purpose. This manipulation successfully increased teleological explanations from 1% in the *mechanism* condition to 81% in the *function* condition. And as predicted, participants in the *mechanism* condition exhibited a stronger causal status effect than those in the *function* condition (main effect of condition, $F(1,188) = 8.27$, p < .05; main effect of domain *n.s.*, interaction *n.s.*, see Fig. 1B), suggesting that explanatory construal is not merely correlated with categorization, but causally affects categorization.

Conclusions

These findings demonstrate that explanations influence categorization. Because participants were provided with the same information across comparisons, the effects cannot be reduced to differences in the causal relationships between features. Rather, the findings suggest that explanations influence the interpretation and use of causal information to determine which relationships are conceptually central.

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