Centrality and Property Induction

Constantinos Hadjichristidis
(constantinos.hadjichristidis@durham.ac.uk)
Dept. of Psychology, University of Durham,
Durham, DH1 3LE, UK
Rosemary J. Stevenson
(rosemary.stevenson@durham.ac.uk)
Human Communication Research Center,
University of Durham, Durham, DH1 3LE, UK
Steven A. Sloman
(steven_sloman@brown.edu)
Dept. of Cognitive & Linguistic Sciences, Brown University,
Box 1978, Providence, RI 02912, USA
David E. Over
(david.over@sunderland.ac.uk.)
School of Social Sciences, University of Sunderland,
Sunderland, SR1 3SD, UK

Introduction

We address why some properties are more generalizable than others. In search for a determinant of projectibility, we make the general and weak assumption that concepts involve features embedded in networks of asymmetric relations. We take mutability to be a structural aspect of representations that measures the extent to which a feature is integral to the coherence of a concept. Following Sloman, Love, and Ahn (1998) we take a feature to be central to the extent that other (central) features depend on it. We note that centrality is concept-relative. "Roundness", for instance, is central for Basketballs but not for Cantaloupes (cf. Medin & Shoben, 1988). We thus hypothesize that the more central a feature in a category's representation, the higher its projectibility among concepts that share common structure.

Methods. Participants (N=24) were informed that an animal (base) had two properties: one upon which lots of its functions depend (central property), and one upon which few of its functions depend (non-central property). Participants were then presented with a new animal (target) and had to estimate the likelihood of that animal having each of the two properties. As a surrogate of the extent to which two animals share common structure, we manipulated the physiological similarity between the base and target animals. Out of 18 items, 6 involved animals from the same superordinate and highly similar (SS-HS), 6 from the same superordinate but lowly similar (SS-LS), and 6 from a different superordinate and lowly similar (DS-LS). The assignment of animal pairs to similarity conditions was controlled by a separate group of participants. Consider a sample item from the SS-HS condition:

Many of a squirrel's physiological functions depend on the enzyme amylase, but only a few on the enzyme streptokinase.
Please rate the likelihood of the following statements:
A. Mice have amylase. _____%
B. Mice have streptokinase. _____%

Results. Table 1 summarizes the results. Central properties were more projectible than non-central ones. This effect was proportional to the base-target similarity.

Table 1. Mean inductive strength estimates. Underneath each column is the two-tailed level of significance.

	SS-HS	SS-LS	DS-LS
Central	75	53	44
Non-central	55	47	47
	$p<.001$	$p<.07$	$p>.40$

Discussion

The results confirm both parts of our hypothesis since: (i) central features were more projectible than non-central ones, and (ii) the more structure the base and target categories shared, the higher the preference to project the central feature.

There is much evidence that can be said to corroborate our hypothesis. Gelman (1988) found that young children prefer to project properties that are intrinsic/stable (e.g., "has a spleen") rather than extrinsic/unstable (e.g., "is cold"). To the extent that people believe that lots of properties depend on intrinsic features (Medin & Ortony, 1989), but only a few on extrinsic ones, the former are more central than the latter. The advantage of our theory is that it predicts violations of such general biases; e.g., even an enzyme that seems pretty intrinsic and stable is not highly projectible when it is stipulated that only few of the animal's functions depend on it.

Importantly, our results cannot be accounted for by current models of categorical inference. Models based on feature-similarity (e.g., Osherson, Smith, Wilkie, Lopez, & Shafir, 1990) appeal only to the relations among categories to predict inductive strength; centrality has no place in their equations. Also, models based on structural alignment (e.g., Lassaline, 1996) fail to account for such effects because for such models to work predicates, as well as their relation to other predicates, must all be clearly specified. Since the dependencies of the predicates in the current study were left vague, it is unclear how such models could apply.

References

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