What Representation Results from Feature Inference Category Learning?

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Introduction

Recently, a variety of research has been conducted in the feature inference category learning paradigm, the main results of which are summarized by Markman and Ross (in press). Participants learn about several perceptual categories by feature inference on the instances composing them--given the category label and several features predict a missing feature--rather than by a more typical classification procedure--given several features predict the category label.

Hypothesis

A central result of this research has been the hypothesis that feature inference learning encourages category representations which emphasize the features category members have in common (featural central tendency), while classification learning encourages representations which emphasize the features that differentiate the categories (featural diagnosticity). We have evaluated this hypothesis by fitting standard prototype and exemplar models (Nosofsky, 1986) to a data set from an experiment designed to differentiate these representations.

Experiment

Two sets of participants learned the classic 5-4 category structure from Medin and Schaffer (1978) in Table 1 by either standard classification (N=26) or feature inference (N=41).

Table 1: Category structure from Medin and Schaffer (1978)

Category	features on four stimulus dimensions
A	1 1 1 **2**
A	1 **2** 1 **2**
A	1 **2** 1 1
A	1 1 **2** 1
A	**2** 1 1 1
B	**1 1** 2 2
B	2 **1 1** 2
B	2 2 2 **1**
B	2 2 2 2

Following the procedure used by Yamauchi and Markman (1998), participants in the inference condition were trained across different trials to infer all of the features except the features which are exceptions to the modal category prototypes, A 1111 and B 2222, and are underlined in

Table 1. Following training, participants received a variety of novel classification and feature inference generalization trials that they responded to without corrective feedback.

Mathematical Modeling Results

Standard exemplar and prototype models were fit to each participant's transfer data individually, Table 2, minimizing root-mean-squared deviation (RMSD) between the data and model by adjusting the models' free parameters. Group-averaged data were also fit, Table 2 in parentheses.

Table 2: Average RMSD's for the Model Fits to Individual Participant Data for Each Condition

Classification transfer	Exemplar	Prototype
Classif. training (N=26)	0.259 (0.086)	0.294 (0.096)
Inference training (N=41)	0.287 (0.135)	0.229 (0.039)

Inference transfer	Exemplar	Prototype
Classif. training (N=26)	0.401 (0.108)	0.413 (0.116)
Inference training (N=41)	0.238 (0.140)	0.175 (0.030)

The results suggest that the category representations resulting from feature inference learning are better accounted for by the prototype model even though the exemplar model is here and elsewhere successful in accounting for many classification learning results. For this data set, but not in general, the prototype model is equivalent to integration across a set of feature inference rules based on the category labels. Further research will help to differentiate the prototype from a set-of-rules model.

Acknowledgments

References

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