

Categories among Relations

Levi B. Larkey (larkey@mail.utexas.edu)

Lisa R. Narvaez (grimmlr@mail.utexas.edu)

Arthur B. Markman (markman@psy.utexas.edu)

Department of Psychology, University of Texas at Austin

1 University Station A8000, Austin, TX 78712 USA

Introduction

Much research has been devoted to the way that categories are represented. Two of the most influential theories argue that concepts are represented by prototypes (e.g., Rosch & Mervis, 1975) or exemplars (e.g., Medin & Schaffer, 1978). While these views are typically analyzed in terms of their differences, they share the assumption that category coherence is a function of intrinsic features of category members.

In contrast, recent theories have proposed role-governed categories (Markman & Stilwell, 2001; Gentner & Kurtz, in press). Members of role-governed categories cohere because they fill similar roles within a relational structure. Role-governed categories differ from feature-based categories in that membership is determined according to external relations between categories rather than intrinsic features.

One reason for the prevalence of feature-based categories in the literature is that typical laboratory tasks are well matched with this type of category. The majority of categorization experiments employ artificial categories that are composed of entities isolated from any relational context. A critical problem with this approach is that it may not capture the essence of categorization outside of the laboratory; natural categories occur in relational contexts. We present an experiment that addresses whether artificial role-governed categories can be learned and manipulated in the lab.

Method

The experiment consisted of a learning phase and two transfer phases. Each trial, subjects were shown two objects that varied in size (big or small), color (blue or orange), shape (circle or square), and relational role (object that pushed or was pushed). After one of the objects was briefly highlighted, one of the objects moved across the screen and pushed the other object. In all phases, the task was to classify the highlighted object as type F or G. Subjects were given feedback in the learning phase, but not in the transfer phases. The learning phase lasted until subjects correctly classified 10 consecutive objects or 50 trials had been given. Each transfer phase was 10 trials. Taken together, the transfer phases were constructed to control for the presence of non-relational spatial and temporal cues.

There were two between-subjects conditions. In the first condition, categories were defined by a Shepard Type I rule (i.e., a unidimensional rule) involving a relational role and a redundant Type I rule involving a feature dimension (cf. Shepard, Hovland, & Jenkins, 1961). For example, an

object could be classified as type F based on being a pusher or based on being blue. In the second condition, categories were defined by a Type I rule involving a relational role and a redundant Type II rule involving two feature dimensions. In the transfer phases of both conditions, the Type I rule involving the role was reversed such that subjects using the role would reverse their classifications while subjects using the features would not. In other words, the rule involving the role and the rule involving the features were deconfounded.

Results and discussion

In the Type I condition, 20 out of 39 subjects (51%) used the role, 11 (28%) used the feature, and 8 (21%) did not meet the learning criterion or could not be clearly classified. In the Type II condition, 28 out of 41 subjects (68%) used the role, 4 (10%) used the features, and 9 (22%) did not meet the learning criterion. In addition, subjects were more likely to use relational roles when the rule involving the features was more complex (51% for Type I versus 68% for Type II).

These data suggest that artificial role-governed categories can be learned and manipulated in the lab. The majority of subjects (51% in the first condition and 68% in the second condition) used relational roles to classify the objects. This manipulation sets the stage for a systematic set of laboratory studies to explore the acquisition of feature-based and role-governed categories.

References

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