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Learning-Based Constraints on Graded Structure in Category Representations

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Introduction

Research addressing the internal structure of categories has shown that some category members are consistently thought of as more typical (i.e., more representative; higher in 'goodness') than others. On one view, this typicality gradient reflects the correlational structure of the environment – the central tendency of the category and frequency of individual examples (Rosch & Mervis, 1975). Variation in typicality across contexts and judges (Barsalou, 1985) suggests a significant role for the interaction between the category examples themselves and the learner/judge in determining graded structure. Specifically, *ideals* or extreme points on goal-relevant dimensions mediate typicality judgments in goal-derived (Barsalou, 1985) and taxonomic categories. While prior research has dealt primarily with graded organization of established natural categories, Levering and Kurtz (2006) found that the internal structure of novel artificial categories depended on the number and nature of contrast categories during classification learning. Specifically, a target category of lines (varying in length) showed a central tendency organization when learned in isolation, but showed an ideal-based organization when learned as a category of “longer lines” or “shorter lines” relative to one or more contrast categories.

In the present study, we further investigate the constraints that arise *during category learning* on the structure of category representations. Specific aims of the current experiment are: (1) to test for the emergence of ideal-based category organization via classification learning with more complex stimuli; and (2) to compare contrast-based ideals with the traditional notion of ideals grounded in relevance to a goal. What is the theoretical relationship between categories that cohere around goals and categories that cohere based on a classification boundary?

Method

Stimuli were images of 3D cylinders created to vary continuously across two dimensions – radius and height. The two-dimensional stimulus space was divided along a diagonal to create a target category and a contrast category with ten examples in each. Participants learned the target

category under one of three learning conditions: (1) A single-category learning task in which they were asked to view each example to become familiar with the target category, (2) a traditional classification task in which they learned the target category by distinguishing between its examples and those of the contrast category, and (3) through evaluating each example of the target category in reference to a particular task. The degree of task completion in this condition corresponded to the distance from the contrast category in the classification condition

Results and Discussion

Typicality ratings after single-category learning were organized around the central tendency of the target category. After traditional two-way classification however, the internal structure of the target category was graded in such a way that the example furthest away from the target category (representing the *contrast-based ideal*) was rated as being more typical than the example representing an average value on both dimensions (the *central tendency*). Examples closest to the values of the contrast category were considered the least typical. Ratings for the single-category goal condition were organized in a similar pattern; the more an example successfully completed the task (the closer it was to the *goal-based ideal*), the higher the typicality rating.

Results from this experiment support the hypothesis that typicality ratings are affected by contrast-based ideals created during category learning. These contrast-based ideals appear to affect typicality gradients in a similar way as those created through consideration of a goal or task.

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