Relating Category Coherence and Analogy: Simulating Category Use with a Model of Relational Reasoning

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Inductive inference is among the most important functions supported by categorization. Much of the work on category-based inference has examined the relations among the categories (e.g., Osherson et al., 1990) or the relation between the category and the property being inferred (Heit & Runbenstein, 1994; Ross & Murphy, 1999). However, a variety of research on categories and their role in thinking has argued that the internal category structure is critical (e.g., Murphy & Medin, 1985; Sloman, 1997). In this project, we examine how the structure of the category might influence inductive inferences.

Highly coherent categories—that is, categories with a rich internal relational structure—more readily support novel inductive inferences than do less coherent categories. For example, Patalano, Chin-Parker & Ross (2006) told subjects that skydivers (a highly coherent category) typically prefer Coke over Pepsi, whereas dog owners (a less coherent category) typically prefer Pepsi over Coke. The subjects then heard that Bill is both a skydiver and a dog owner, and were asked whether they thought Bill would prefer Coke or Pepsi. 66% of the subjects responded that Bill would prefer Coke, applying the inference suggested by his membership in the skydiver category over the inference suggested by his membership the dog-owner category. Why does coherence lend credibility to novel inductive inferences, and more generally, what is the mechanism by which it operates?

Supporting inductive inferences is also cited as a major function of reasoning by analogy. Hummel and Holyoak's (1997, 2003) LISA model has been used to simulate numerous phenomena in the literature on analogy and inductive inference, but it has never been applied to the problem of simulating the effects of category coherence. We used LISA to simulate the data of Patalano et al. (2006), exploring the relation between category use and relational reasoning. We will describe several simulations exploring the origins of coherence effects. The central assumptions underlying our initial simulations were (a) that the characteristic features and relations of a coherent category are connected to more higher-order (e.g., causal) relations than the central features/relations of less coherent categories (Rehder & Hastie, 2004), (b) that facts related by higher-order propositions tend to be thought about in a systematic fashion (e.g., in a particular order; Hummel & Holyoak, 1997), and (c) that the features/relations of more coherent categories, by virtue of their rich, interconnected internal structure, are more easily related to new facts (e.g., liking Coke) learned about the category. Our simulations of Patalano et al.'s data constitute a bridge relating phenomena in the domain of category coherence and use to phenomena in and processes of relational reasoning.

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