Journal of Experimental Child Psychology 123 (2014) 1–14

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Conceptually coherent categories support label-based inductive generalization in preschoolers

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ARTICLE INFO

Article history:
Received 4 October 2013
Revised 12 January 2014
Available online 12 March 2014

Keywords:
Inductive generalization
Inductive inference
Preschoolers
Conceptual knowledge
Causal information
Causal knowledge

ABSTRACT

Why do words support inductive generalization in preschoolers? The current study provides evidence that they do so, at least in part, by working with conceptual knowledge to establish kind membership. A sample of 30 4-year-olds learned new labels for novel items, sometimes along with additional non-obvious information, and were then asked to generalize a novel object property to a target item based on either visual similarity or shared label. Children were more likely to generalize properties based on shared labels (over perceptual similarity) if they initially learned causally coherent properties of items referenced by those labels than if they initially learned non-causal properties of those items or learned no properties at all. This finding suggests that novel words best support inductive inference when they are known by children to reference conceptually coherent categories. Therefore, conceptual information permeates the process of inductive inference in young children. Results are discussed with respect to their implications for the "word-as-feature" and "knowledge-based" accounts of early inductive inference.

Introduction

Inductive inference is a key cognitive process by which semantic information can be efficiently generalized beyond the context in which it was initially acquired. It is particularly useful to the extent

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http://dx.doi.org/10.1016/j.jecp.2014.01.007
0022-0965/

that it unfolds in accordance with the organization of the learner's conceptual backdrop. That is, generalizations that are consistent with category boundaries are more likely to be accurate and, therefore, to facilitate understanding, appropriate expectations, and advantageous courses of action. It is clear that adults weigh categories heavily in their inductive generalizations (Deak & Bauer, 1996; Fisher, 2010; Sloutsky & Fisher, 2004). Considerable controversy, however, surrounds the developmental origins of this conceptual orientation. Much of this controversy has focused specifically on the role of words in supporting early inductive generalization. In the current study, we contribute to the ongoing discussion by seeking new evidence regarding the conditions under which shared labels take precedence over visual perceptual similarity in guiding children's generalization of newly learned information.

Words have figured prominently in this debate since its inception. For example, in Gelman and Markman's (1986) groundbreaking work on children's inductive inference, marking stimuli with shared labels served as the primary manipulation. In their study, 4-year-olds were first taught contrasting non-obvious properties of two pictured animals (e.g., a brontosaurus and a rhinoceros). They were then asked to judge which of these two non-obvious properties could be generalized to a third animal that was perceptually quite similar to one of the original standards but was actually drawn from the same category as the other standard (e.g., a triceratops that looked very much like the rhinoceros but was actually a dinosaur like the brontosaurus). The key finding was that children's patterns of generalization were guided more heavily by labels than by visual similarity (e.g., children were more likely to generalize from the brontosaurus than from the rhinoceros to the triceratops). Based on this finding, Gelman and Markman advocated for a "knowledge-based" account of early inductive inference. They concluded that, by acting as cues to kind membership, labels provide children with a reliable conceptual framework for extending newly learned information. This study opened the floodgates to opinion and research articles aimed at supporting or disconfirming this conclusion.

Naysayers championed more traditional conceptions of the child as concrete and perceptually oriented (e.g., Jones & Smith, 1993), whereas defenders extended Gelman and Markman's initial finding to ever younger ages (e.g., Gelman & Coley, 1990; Gelman & Markman, 1987; Welder & Graham, 2001). Perhaps the strongest challenge to the knowledge-based account of early inductive inference originated with the "word-as-feature" alternative (Sloutsky & Lo, 1999; Sloutsky, Lo, & Fisher, 2001). Proponents of this account argue that shared names guide inductive inference in young children because names are salient perceptual features in and of themselves and, thus, will increase the overall perceptual similarity between identically named items. It is this perceptual similarity that is thought to be the primary determinant of inductive generalization patterns in preschoolers. Labels are thought to be particularly powerful in children's similarity assessments because they are perceived through the auditory modality, which some recent research has identified as dominant in children's perceptual processing (Robinson & Sloutsky, 2004; Sloutsky & Napolitano, 2003; but see Noles & Gelman, 2012b).

The knowledge-based and word-as-feature accounts make a number of distinct predictions about the conditions under which labels should and should not guide inductive generalization (and other related cognitive processes) in preschoolers. The literature addressing these divergent predictions is already considerable but remains contentious (see, e.g., Gelman & Davidson, 2013; Gelman & Waxman, 2007; Graham, Booth, & Waxman, 2011; Hayes & Heit, 2004; Heit & Hayes, 2005; Noles & Gelman, 2012a; Sloutsky, 2008; Sloutsky & Fisher, 2005, 2012; Sloutsky, Kloos, & Fisher, 2007a; Waxman & Gelman, 2009; Wilburn & Feeney, 2008). In hopes of providing a new angle on the debate, here we focus on divergent theoretical predictions specific to circumstances under which children have no familiarity with either the items or the labels involved. These conditions can be particularly revealing because they most purely reflect children's tendencies to weigh broad types of information (e.g., labels, visual appearance) independent of their knowledge of specific words and/or categories.

According to the word-as-feature account, shared novel labels should be equivalent to shared familiar labels in their contribution to the similarity of items and, therefore, should be equally supportive of preschoolers' inductive generalization. Consistent with these assertions, some studies have demonstrated an effect of novel words on preschoolers' inductive generalization (e.g., Gelman & Davidson, 2013; Graham et al., 2011; Sloutsky & Fisher, 2004; Sloutsky et al., 2001). Of particular