The role of linguistic labels in inductive generalization

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ABSTRACT

What is the role of linguistic labels in inductive generalization? According to one approach labels denote categories and differ from object features, whereas according to another approach labels start out as features and may become category markers in the course of development. This issue was addressed in four experiments with 4- and 5-year-olds and adults. In Experiments 1 to 3, we replicated Yamauchi and Markman's findings with adults (*Journal of Memory and Language,* 1998, Vol. 39, pp. 124–148, and *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 2000, Vol. 26, pp. 776–795) and extended the paradigm to young children. In Experiment 4, we compared effects of labels with those of highly salient visual features. Overall, results of these experiments provide strong support for the idea that early in development labels function the same way as other features, but they may become category markers in the course of development. A related finding is that whereas categorization and induction may be different processes in adults, they seem to be equivalent in young children. These results are discussed with respect to theories of development of inductive generalization.

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Introduction

Induction, or generalizing knowledge from known to novel, is a critical component of learning and cognition; induction enables us to apply learned knowledge to new situations. Some examples of inductive generalization include (a) inferring a property of a novel item given that a known item has this property and (b) inferring a category of a novel item given category membership of a known item. The former is referred to as *projective induction*, and the latter is referred to as *categorization.* The term *induction* is often used to refer to both projective induction and categorization (Sloutsky & Fisher, 2004a).

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Induction may have humble beginnings; it has been well established that induction appears early in development (Gelman & Markman, 1986; Mandler & McDonough, 1996; Sloutsky & Fisher, 2004a; Sloutsky & Fisher, 2008). There is also much evidence demonstrating that even early in development linguistic labels may affect inductive generalization (Gelman & Markman, 1986; Sloutsky & Fisher, 2004a; Sloutsky, Lo, & Fisher, 2001; Welder & Graham, 2001). However, the mechanism underlying the role of labels in early induction is hotly debated. Do labels start out as category markers (i.e., symbols denoting the category), or do they start out as features and potentially become category markers in the course of development. In what follows, we consider both possibilities in greater detail.

Putative mechanisms underlying effects of labels on generalization

Some researchers have argued that from early in development, children expect linguistic labels (primarily in the form of count nouns) to mark categories (Waxman & Markow, 1995) and facilitate inductive generalization (e.g., Gelman, 2003; Welder & Graham, 2001). According to this view, a common label suggests a common category (e.g., if two items are called "dog," then they are likely to belong to the same kind), whereas a common category suggests that the items may share multiple properties. Therefore, when performing induction, people may first use a category label to identify the category to which the entity belongs and then generalize properties of that entity to other members of the target category. For example, in a series of experiments, Gelman and Markman (1986) presented young children with triads consisting of a target and two test items. One test item shared the label with the target but looked dissimilar from it, whereas the other test item looked similar to the target but had a different label. Children were informed that one test item had a particular hidden property (e.g., "hollow bones") and the other test item had a different hidden property (e.g., "solid bones"), and they were asked to decide which hidden property the target had. The results indicated that children were more likely to base their inference on the common label than on perceptual similarity (but see Sloutsky & Fisher, 2004a, Experiment 4, for diverging evidence and counterarguments). This and similar findings have been interpreted as evidence that children's induction is based on category membership, which is denoted by a particular label.

There is also evidence that count nouns are more likely to guide induction than other word forms. For example, Gelman and Heyman (1999) reported that young children were more willing to generalize properties of a person from one context to another when the person was referred to by a count noun (e.g., "carrot-eater") than when the person was referred to by a descriptive sentence (e.g., "likes to eat carrots").

These findings, however, do not lend unequivocal support to the idea that words are category markers. For example, some researchers have suggested that the contribution of linguistic labels is driven by attentional rather than conceptual factors (Napolitano & Sloutsky, 2004; Sloutsky & Napolitano, 2003). There is also evidence that labels contribute to the overall similarity of compared entities (Sloutsky & Fisher, 2004a; Sloutsky & Lo, 1999) and, thus, to both categorization and induction. In one experiment using items that had been previously used by Gelman and Markman (1986), Sloutsky and Fisher (2004a) demonstrated that similarity computed over labels and appearances can accurately predict young children's responses, whereas a model that assumes reliance only on labels fails to predict children's performance. Proponents of this view have also argued that early in development labels may function like other features (e.g., shape, color, size), although they may become category markers as a result of development (Deng & Sloutsky, 2012; Sloutsky, 2010; Sloutsky & Fisher, 2004a; Sloutsky & Lo, 1999; Sloutsky et al., 2001).

In short, according to one approach, labels start out as category markers; even early in development they denote categories and, as such, differ from other features. In contrast, labels may become category markers as a result of development, whereas early in development labels do not qualitatively differ from other features.

Experimental distinction between labels-as-features and labels-as-category-markers

In an attempt to distinguish between labels being features and category markers, Yamauchi and Markman (1998, 2000) developed an innovative paradigm potentially capable of settling the issue.