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Learning Novel Names Extension by Comparison: What Research Tells us?

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Abstract

Most picture books targeted at children (young or in primary school) tend to be based on single picture presentations. One picture illustrates an entity or an action or a property and a word is associated to this picture. This mode of teaching novel words reduces word learning to an association learning task in which the word underlying concept would come up automatically. As we know, this is far from being the case: children produce numerous extension errors (e.g., under- or over-generalizations). There is now ample evidence that the opportunity to compare several exemplars to the same target category name (e.g., several apples rather than one apple) gives better results in terms of word extension (e.g., Augier & Thibaut, 2013). Comparisons promote extensions that are based on deep semantic commonalities rather than on superficial features. The central idea is that comparisons are invitations to align objects on many properties, starting on easily accessible ones and, later, with deeper conceptually based regularities. In this paper, we will review the evidence regarding the role of comparisons in novel word learning. We will also review several conceptions of comparison effects such as progressive alignment or concreteness fading. We will suggest in which learning situations these different comparison modes might be most effective. We will suggest how picture books devoted to word learning might be improved and implemented in e-learning.

Keywords: *Word learning, children, vocabulary, meaning, comparison, extension*

The Power of Comparison

One key aspect of language learning by young children is the ability to correctly generalize novel names to a set of objects. This means naming novel instances of a category according to adults' standards. Correct generalization means that one should undergeneralize (do not include all the entities included by adults) or overgeneralize the novel name (going beyond referents included by adults). In most learning situations, the child is presented with a limited number of exemplars, most often one, (or at least objects are introduced one by one on successive situations). Later, generalization is tested with stimuli that differ from the initial ones(s). One underlying difficulty is that novel name generalization involve in many occasions ignoring obvious and easily accessible dimensions in favor of less obvious properties (e.g., texture which is less salient than shape, or taxonomically related items, e.g., a banana for an apple, rather than items that are perceptually similar, e.g., a red Christmas ball).

In this chapter, we review and illustrate a hypothesis that has proved to be a powerful explanatory concept regarding conceptually-based generalization of novel names, the concept of comparison. There is now large evidence that the opportunity to compare several exemplars of a novel category that have associated with a common name promotes deep, conceptually-based generalization. These comparison situations would stand in sharp contrast to generalizations that would be grounded on salient perceptual properties such as their shape. According to this hypothesis, comparisons would help children to find deep commonalities between stimuli that are usually unnoticed when the objects are studied in isolation (Augier & Thibaut, 2013; Gentner & Namy, 1999; Namy & Clepper, 2010; Namy & Gentner, 2002; Son, Smith, & Goldstone, 2011; Thibaut & Witt, 2015).

What do we mean by comparisons? What are the ingredients of such a learning situation? In their seminal paper, Gentner & Namy (1999) opposed a taxonomic match and a perceptual match in a name extension procedure. In this kind of procedure, children are presented with either a single object (e.g. a bicycle, the single condition) or two objects from a familiar category (e.g. a bicycle and a tricycle, the comparison condition). Training objects received a novel label, a non-word (e.g. "this is a dax" in the single object condition or "this is a dax and this is also a dax" in the comparison condition). Young children had then to extend this label to one of two target objects, either a perceptually similar match (e.g. eyeglasses) or a perceptually different taxonomic match (e.g. a skateboard). A majority of the participants chose the perceptual target significantly more than chance in the single object condition whereas a majority of them selected the taxonomic option significantly more than chance in the comparison condition. According to Gentner and colleagues, comparisons of objects would start an alignment of the stimuli, using salient perceptual similarities. These early detected similarities would lead children to further explore the stimuli which would progressively reveal underlying structural similarities unifying the compared stimuli (see also Thibaut, 1991; 1995).

Recently, Graham et al. (2010) extended these studies to novel, unfamiliar categories, based on unknown shapes and textures. In this particular case, children could compare two objects that had the same non-word name. In this case, a majority of 4-year-olds generalized the name on the basis of texture which is a less salient property, thus less easily noticed, than shape when texture had to fight against the much more salient shape dimension. In the "single" object condition, by contrast, there was a majority of shape-based generalizations.

Comparison and contrast

For the vast majority of studies, "comparison" refers to comparison of stimuli belonging to the same category (e.g., both stimuli are "daxes"). However, contrasting stimuli might uncover previously unnoticed unifying dimensions. For example, Clark (1992) hypothesized that children use contrastive dimensions to shape the meaning of novel words When said "X is a *dax* and Y is a *blicket*" children can compare them in order to find featural differences between categories that define each category, the underlying reasoning being that "if X and Y belong to different categories, common salient features do not ground their category membership". In a similar way, Waxman, Lynch, Casey, & Baer (1997) preschool children successfully used contrasting information about different subordinate categories to correctly restrict their inferences to the relevant subordinate category (see also Hammer, Diesendruck, Weinshall, & Hochstein, 2009).

Recently, within the Gentner & Namy (1999) comparison framework, Namy & Clepper (2010) compared "contrast" and "no contrast" conditions in "single" and "comparison" conditions. For example, the comparison-contrast condition featured a pair of stimuli ("blickets") and a contrast object (a "non blicket"). The contrast object and the two standards had the same shape (e.g., a bicycle and a tricycle; the contrast was barbells). The main analysis showed no effect of contrast in the single (i.e., one dax and one non dax item) and the compare conditions (except in a consistency analysis which revealed more taxonomically consistent profiles in the compare/contrast condition than in the compare/no contrast condition).

Comparisons and executive functions

Augier and Thibaut (2013), Thibaut and Witt (2015) followed another explanatory alley and linked the effectiveness comparisons with executive functions. By executive controls, we refer to control processes which have been located in the prefrontal cortex (see Zelazo et al., 2014). According to Miyake and colleagues, there are three fundamental executive functions (inhibition, cognitive flexibility, and updating information in working memory) They hypothesized that young children's less developed executive functions might influence the integration of the stimuli into a consistent conceptual representation, in the sense that younger children, with less developed executive functions might have difficulties integrating all the available information when the number of stimuli to compare increased. They studied children's use of within (comparisons) or between categories comparisons (contrast categories) in a novel name generalization task based on the non-salient texture dimension rather than shape. They manipulated three factors: number of standards (one, two, four), the presence of a contrast item and age (Three-to-four and five-to-six). Their results revealed an interaction between the number of standards and age, in the sense that younger children did not benefit from an increased number of stimuli (4 versus 2), whereas older children did (see Figure 2). All the results converged on the idea that more evidence in favor of texture (i.e., more stimuli with the same texture) did not linearly increase texture-based evidence in the same way for younger and older children. According to the authors, this meant that adding more stimuli also increase the load of comparisons. Following the same reasoning, Thibaut and Witt (2015) studied relational words such as "the knife is the dax of the apple". Typically, the relation was illustrated with two stimuli, such as a knife and an apple. They varied the number of pairs illustrating the relation. Results showed that there was an optimal number of pairs beyond which performance decreased. This suggests again that the best might be the enemy of the good.

Thus, this executive function approach focused on the processing load of comparisons. Indeed, comparing and integrating several items gives more converging evidence regarding the relevant properties for generalization but they also generate cognitive costs. Thibaut, French, & Vezneva (2010) showed, with analogy tasks, that adding salient distractors had a detrimental effect on analogy making for younger children. Younger children fail to integrate all the activated information because of less developed executive functions, that is when distractors had to be inhibited.

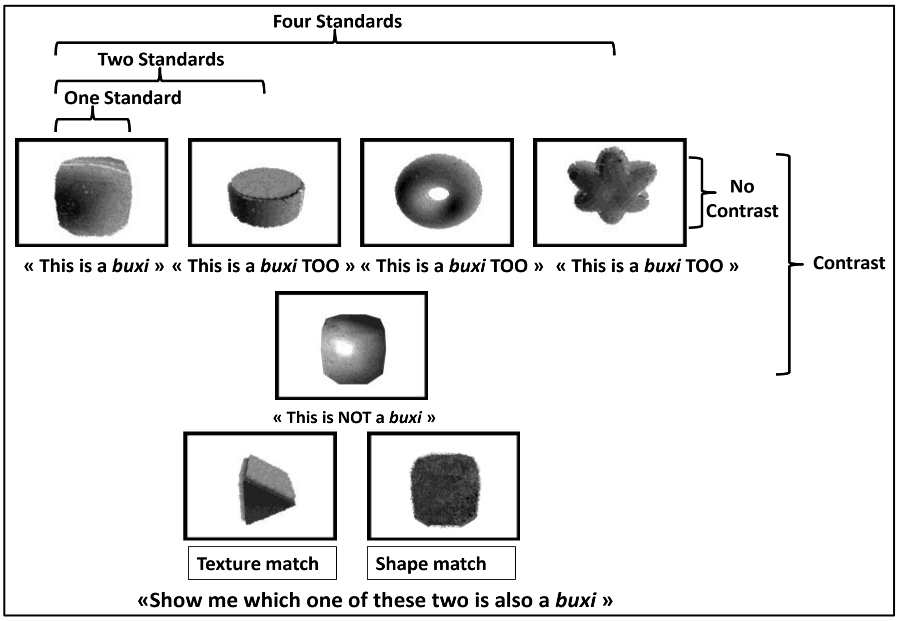

Fig. 1. A stimulus set and instructions. The six experimental conditions crossed two factors: Number of standards (1, 2 or 4 standards) and Contrast (0 or 1 contrast), resulting in : 1 Standard-No Contrast (1-0), 1 Standard -Contrast (1-1), 2 Standards-No Contrast (2-0), 2 Standards-Contrast (2-1), 4 Standards-No Contrast (4-0), 4 Standards-Contrast (4-1).

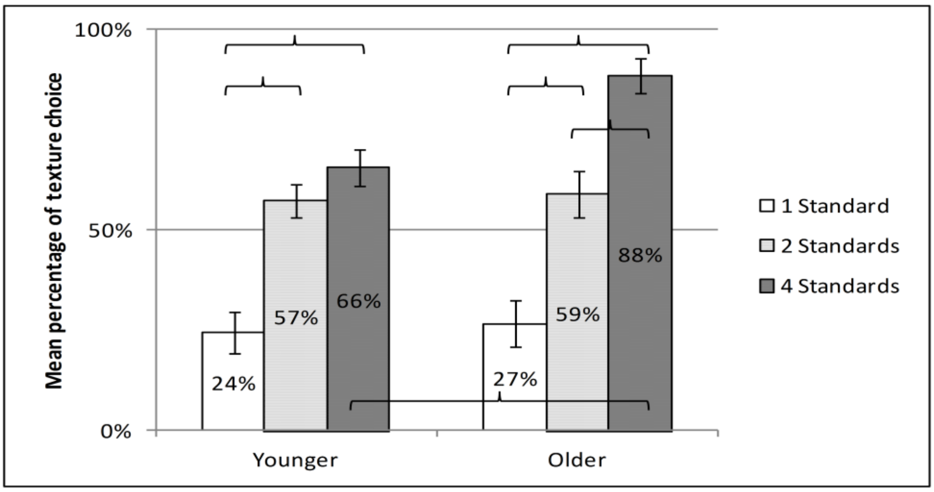

Fig. 2. Mean percentage of texture-based responding as a function of Number of standards and Age. Braces show significant differences between columns (Tukey HSD, $p < .05$).

Conclusion

This positive role of comparisons has been documented for a wide variety of stimuli and situations in both adults and children. In the case of children, this has been shown for object names, names for parts, action verbs, adjectives, or perceptual categories (e.g., Thibaut, 1991, see Augier & Thibaut, for references). Most studies show that the most usual types of presentations (single presentation, such as the ones used in picture books) are not the most efficient to convey optimal information regarding word extension. This has deep consequences for book designs, which should take these recent studies into account.

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