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The effect of a tactile-to-visual shift on young children's tendency to map novel labels onto novel objects



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ABSTRACT

When taught a label for an object and then asked whether an exemplar of that object or a novel object is the referent of a novel label, children favor the novel object. Preschool-aged children tend not to show this so-called disambiguation effect, however, when the test objects are presented in a different sense modality than the original object. The current experiments used a touch-to-vision paradigm to test two explanations for this unexpected pattern. Experiment 1 asked whether children might fail to retrieve the original label and found that additional label training benefitted 3-year-olds but not 4-year-olds. Experiments 2 and 3 asked whether children's reaction to discovering the cross-modal match might interfere with how they process the request for the novel label and found that being allowed to share their discovery of the match benefitted 4-year-olds but not 3-year-olds. These findings support the proposal that the chief obstacle to cross-modal disambiguation changes during early childhood from difficulty in retrieving the known label to disruption caused by the discovery of the cross-modal match.

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Introduction

From an early age, children show adaptive biases in their interpretation of novel words. For example, if taught a label for an object and then tested for whether they think this object or a novel object is the referent of a novel label, they favor the novel object (de Marchena, Eigsti, Worek, Ono, & Snedeker, 2011; Diesendruck & Markson, 2001; Scofield & Behrend, 2007; Suanda & Namy, 2013; Xu, Cote, & Baker, 2005). This result is one example of the *disambiguation effect* (Merriman & Bowman, 1989), or the tendency for children to map novel labels onto novel objects rather than objects that have known labels. When the testing paradigm is administered within the visual modality, as is typical, the disambiguation effect is both highly robust and reliable.

However, children tend not to show this effect when the testing paradigm is administered across different sensory modalities. On each of four trials, Scofield, Hernandez-Reif, and Keith (2009) taught 2- to 5-year-olds a label for an object (e.g., “zav”) that was presented either tactually (Experiment 1) or visually (Experiment 2). At test, children were presented with both an exemplar of this object and a novel distractor object in the opposite sense modality. On some trials, children were asked for the referent of the originally trained label (e.g., “Which one is a zav?”) In response, 3-, 4-, and 5-year-olds readily chose the exemplar. On other trials, children were asked for the referent of a novel label (e.g., “Which one is a tigg?”). Surprisingly, children on these trials did not respond by choosing the novel object (i.e., they did not show the disambiguation effect). Instead, they chose the exemplar. This result constituted a rare instance in which preschool-aged children failed to show the disambiguation effect.

According to two leading accounts, successful disambiguation requires children to realize that they know the name of one of the objects and then shift focus to the other object. For the *mutual exclusivity* account (Markman & Wachtel, 1988; Merriman & Marazita, 1995), knowing the name of an object allows children to eliminate that object as a candidate for the novel label because one object does not usually have two different names. For the *pragmatic contrast* account (Clark, 1990; Diesendruck & Markson, 2001; Gathercole, 1989), knowing the name of an object allows children to eliminate that object as a candidate for the novel label because speakers do not usually use a novel label to refer to a known object. With one object eliminated, children shift focus to the other (novel) object.

For both accounts, retrieving a label for one of the objects leads children to map the novel label to the other object. One hypothesis, then, is that children have more trouble with cross-modal disambiguation because the modality shift disrupts their ability to retrieve a label for the original object. This hypothesis is based on changes in the way that an object is decoded when it is encountered in a new sense modality. The salience of certain features may change. For example, a shift from vision to touch might lower the salience of an object’s color but raise the salience of its texture (Bushnell & Baxt, 1999; Kalagher & Jones, 2011; Lederman & Klatzky, 1987).

A second hypothesis is that children’s reaction to discovering that one of the objects in the new sense modality matches the training object disrupts their tendency to focus on the novel object. Their interest in this discovery could cause them to stay focused on the matching object rather than shift to the novel object. Surprise or excitement over the discovery might also support continuing to focus on the matching object. A common consequence of surprise is disruption of ongoing processes and reallocation of resources to the surprise-inducing stimulus (Reisenzein, 2000; Roseman, 2013), which in this case would be the cross-modal match.

Wall, Merriman, and Scofield (2015) evaluated these hypotheses using the vision-to-touch cross-modal paradigm where label training occurred in the visual modality but testing occurred in the tactile modality. Experiment 1 tested the failed label retrieval hypothesis with 3- and 4-year-olds. The procedure closely followed that of Scofield et al. (2009, Experiment 2) with one exception: To help increase the likelihood of retrieval, children received additional label training. Results showed that disambiguation improved compared with Scofield et al. but that neither age group disambiguated at levels above chance. Experiment 2 tested both hypotheses. Here Wall et al. inserted a discovery prompt immediately after the modality shift but before testing. In the *labeled match* condition, children were asked to select the referent of the trained label. In the *unlabeled match* condition, children were asked simply to select the object that was “like” the training object. Children chose the cross-

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