Learning language from within: Children use semantic generalizations to infer word meanings

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Abstract

One reason that word learning presents a challenge for children is because pairings between word forms and meanings are arbitrary conventions that children must learn via observation – e.g., the fact that “shovel” labels shovels. The present studies explore cases in which children might bypass observational learning and spontaneously infer new word meanings: By exploiting the fact that many words are flexible and systematically encode multiple, related meanings. For example, words like shovel and hammer are nouns for instruments, and verbs for activities involving those instruments. The present studies explored whether 3- to 5-year-old children possess semantic generalizations about lexical flexibility, and can use these generalizations to infer new word meanings: Upon learning that dax labels an activity involving an instrument, do children spontaneously infer that dax can also label the instrument itself? Across four studies, we show that at least by age four, children spontaneously generalize instrument-activity flexibility to new words. Together, our findings point to a powerful way in which children may build their vocabulary, by leveraging the fact that words are linked to multiple meanings in systematic ways.

1. Introduction

One reason that word learning presents a challenge for children is that the relation between a word form and its meaning is arbitrary (Saussure, 1916/2011). There is no principled reason, for example, that English speakers use the word “shovel” to label shovels, as opposed to hammers or combs: This is merely one among many conventions that children must learn, either through direct, ostensive evidence or indirectly through overhearing (Akhtar, 2005). Here, we explore whether, in some cases, children might bypass observation to learn from within, by spontaneously inferring new word meanings. In particular, we ask whether children can exploit lexical flexibility: The systematic use of words to encode multiple, related meanings (Barner & Bale, 2002; Copestake & Briscoe, 1995; Pustejovsky, 1995). For example, many of the same English root morphemes can be used to label instruments, as nouns, and activities involving those instruments, as verbs (e.g., shovel, hammer, mix/mixer, wash/washer; Adams, 1973; Clark & Clark, 1979; Jespersen, 1942; Marchand, 1969; see Table 1 for other examples of lexical flexibility). The present studies explore young children's use of semantic generalizations about lexical flexibility to bypass observational learning: Upon learning one meaning of a new word via observation (e.g., that dax labels an activity), can children spontaneously infer another possible meaning of the word that follows a generalization (e.g., that dax can label the instrument itself)?

Lexical flexibility characterizes most words of moderate to high frequency (Nerlich, Todd, Herman, & Clarke, 2003), and is widespread in English (Chomsky, 2001; Copestake & Briscoe, 1995; Lakoff, 1987; Nunberg, 1979; Ostler & Atkins, 1992; Pustejovsky, 1995, 1998) and in other languages (Kamei & Wakao, 1992; Peters & Peters, 2000; Srinivasan & Rabagliati, 2015; Youn et al., 2016). Flexible uses of words can take many different forms, including metaphor (the use of a word from one semantic domain to describe another; e.g., “Christmas is approaching”), metonymy (using a word to label an item or something associated with that item; e.g., the White House made an announcement), and morphological conversion (extending a word to another grammatical category; e.g., “She shoveled the snow”; Table 1). Although these various kinds of flexibility can be distinguished (see, e.g., Cruse,
Patterns of lexical flexibility in English.

<table>
<thead>
<tr>
<th>Patterns and participating words</th>
<th>Examples</th>
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| Instrument for Activity          | She has a shovel / 
| (shovel, hammer, wash/washer, etc.) | She shoveled the snow |
| Agent for Activity               | She is the new boss / 
| (nurse, boss, bake/baker, sing/singer, etc.) | She bossed her employees around |
| Substance for Transfer to Goal   | There water is warm / 
| (water, paint, salt, etc.)      | He watered the plants |
| Animal for Meat                  | The chicken is well-fed / 
| (chicken, lamb, turkey, etc.)   | The chicken is well-salted |
| Object for Representational Content | She spilled coffee on the book / 
| (book, magazine, newspaper)     | She thinks it is an interesting book |
| Space for Time                   | The table is long / 
| (long, on, around)              | The movie is long |
| Body Part for Object Part        | He broke his leg / 
| (leg, arm, back, etc.)          | That chair has a wooden leg |
| Material for Artifact            | There is broken glass on the floor / 
| (glass, tin, iron, etc.)        | He drank water from the glass |
| Object for Aperture              | They installed a new door / 
| (door, window, goal, etc.)      | The man walked through the door |
| Place for Institution            | The White House has been renovated / 
| (White House, Wall Street, City Hall, etc.) | The White House announced a new policy |

1 Of course, there are exceptions to these regular patterns: e.g., broom does not label an action involving brooms. Exceptions to patterns can be thought of as “irregular” words that block a regular pattern (see e.g., Pinker, 1991, for a similar argument in the domain of morphology). Flexible patterns can be blocked by synonymy (e.g., to broom is blocked by to sweep), and by homonymy (e.g., we can summer or winter in Paris, but we cannot spring or fall there because those words have other meanings; see e.g., Barner & Bale, 2002, 2005; Clark, 1987, 1993; Clark & Clark, 1979). The presence of exceptions does not preclude the need for explaining “regular” words, or the fact that regular patterns can be generalized to new words.

2 This account would predict that, in some cases, children will overgeneralize flexible patterns, e.g., such that broom is used to denote sweeping and cutter used to denote a knife. As we review below, such overgeneralizations have been documented both in production and comprehension. For example, the verb arms can label a body part or weapons, and board can label a physical object or administrative organization. Insofar as these words do not appear to fall into larger patterns, children would not be able to use semantic generalizations to acquire them.

3 Some flexible words (referred to as “irregular polysemy”: Apresjan, 1974) do not appear to participate in predictable, generalizable patterns. For example, the verb arms can label a body part or weapons, and board can label a physical object or administrative organization. Insofar as these words do not appear to fall into larger patterns, children would not be able to use semantic generalizations to acquire them.
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