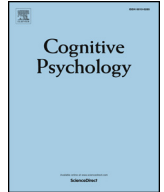


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# Learning homophones in context: Easy cases are favored in the lexicon of natural languages

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## ABSTRACT

Even though ambiguous words are common in languages, children find it hard to learn homophones, where a single label applies to several distinct meanings (e.g., [Mazzocco, 1997](#)). The present work addresses this apparent discrepancy between learning abilities and typological pattern, with respect to homophony in the lexicon. In a series of five experiments, 20-month-old French children easily learnt a pair of homophones if the two meanings associated with the phonological form belonged to different syntactic categories, or to different semantic categories. However, toddlers failed to learn homophones when the two meanings were distinguished only by different grammatical genders. In parallel, we analyzed the lexicon of four languages, Dutch, English, French and German, and observed that homophones are distributed non-arbitrarily in the lexicon, such that easily learnable homophones are more frequent than hard-to-learn ones: pairs of homophones are preferentially distributed across syntactic and semantic categories, but not across grammatical gender. We show that learning homophones is easier than previously thought, at least when the meanings of the same phonological form are made sufficiently distinct by their syntactic or semantic context. Following this, we propose that this learnability advantage translates into the overall structure of the lexicon, i.e., the kinds of homophones present in languages exhibit the properties that make them learnable by toddlers, thus allowing them to remain in languages.

## 1. Introduction

[Carey \(1978\)](#) has described word learning as starting with a process where children “flag “new word!” upon hearing a phonological sequence with no current lexical entry” (p. 272). Indeed, one feature of novel words is that they are often composed of unfamiliar sequences of sounds. Yet that does not have to be always the case: For instance, a child may already know that “bat” means bat-animals and be confronted with a sentence such as “aluminum bats are much easier to swing when compared to wooden bats”. How does the child determine that “bat” is used here to refer to a baseball-bat and not an animal-bat? Homophones, whereby a single phonological form is associated to several meanings, thus present learners with a unique word learning situation where they cannot rely on the signal alone to determine whether a phonological form is a candidate for entering the lexicon as a novel word.

Children have well-documented difficulties in learning homophones. Previous research showed that preschoolers perform poorly on tasks requiring them to assign a different, unrelated meaning to a known word form (e.g., learning that “snake” could also refer to a novel object that is not a snake) compared to learning a novel meaning for a novel word form (e.g., learning that “blicket” refers to a

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novel object) (Casenhiser, 2005; Doherty, 2004; Mazzocco, 1997). This suggests that the existing word interferes with the learning of a novel meaning for the word form. This could happen for two reasons: either children fail to realize that a novel word has in fact been presented, and therefore do not even attempt to attribute a second meaning to the well-known word form; or, children do attempt the construction of a novel lexical entry, but they do not succeed in attributing it a meaning, because of interference from the existing meaning already attached to that word form. In relation to children's difficulty with homophones, it has been proposed that children start with the assumption that a word form maps onto exactly one meaning (Slobin, 1985). Such a simplistic assumption on the lexicon predicts learning success in most learning circumstances where word forms and meanings are aligned, and failures in those cases that depart from this simplistic scenario, such as homophones.

Because homophones are difficult to learn, we expect that they should be absent or dispreferred in languages. In line with this idea, several studies revealed some diachronic pressures *against* homophony (André, 1955; Barkal, 1978; Li & Thompson, 1989; Wedel, Kaplan, & Jackson, 2013): For example, Wedel et al. (2013) showed that two sounds are less likely to merge if they result in a larger amount of homophony in the language. Yet, despite the presence of such pressures, and of children's learning difficulties, homophony is a common occurrence across languages (about 4% of word forms are homophones, see Dautriche, 2015), especially among shorter words which are the most frequently used part of the lexicon (Piantadosi, Tily, & Gibson, 2012). This fact seems to challenge theories arguing that the properties of language are shaped by biases and limitations on human cognitive systems (e.g., Bates & MacWhinney, 1982; Chomsky, 1965; Christiansen & Chater, 2008; Slobin, 1978).

The present work addresses this apparent discrepancy between learning abilities and typological pattern, with respect to homophony in the lexicon. We propose that (a) learning homophones is easier than previously thought, at least when the meanings of the same phonological form are sufficiently distinct; (b) this learnability advantage translates into the overall structure of the lexicon, i.e., the kinds of homophones present in languages exhibit the properties that make them learnable by toddlers, thus allowing them to remain in languages.

In particular, we propose that children's ability to learn homophones may crucially depend on the context they are presented in. Indeed, words are rarely uttered in isolation but are part of the broader context in which they are used: the sentence in which they are pronounced, the discourse, the speakers involved, the register of language, the surroundings, etc. Adults constantly form linguistic expectations based on the linguistic and extra-linguistic contexts (Altmann & Kamide, 1999; Creel, Aslin, & Tanenhaus, 2008; Federmeier & Kutas, 1999; Millotte, René, Wales, & Christophe, 2008; Nieuwland & Van Berkum, 2006; Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995). As a result, lexical access may be sufficiently constrained, with the consequence that homophones may not be detrimental for everyday speech comprehension, so long as only one member of a homophone pair is expected in a given context. The fact that adults hardly notice homophones proves the efficiency of such a context-dependent language processing system. Similarly, learning a novel meaning for a known word form may be easier if the novel and the known meanings appear in distinct contexts, and if children can capitalize on these different contexts. For instance, homophones may be easier to learn when their meanings are sufficiently distant syntactically (e.g. “an eat” may be a good label for a novel animal), or semantically (e.g. “a glass” as a new label for a novel animal), but not when they are close (e.g. “a cat” for a novel animal). In other words, presenting a known word form in a context that is distinct from its original use may eliminate the possibility that the original meaning was intended, and thereby boost the likelihood that a novel meaning is introduced.

In a series of experiments, we manipulated several sources of information that may help children to identify when they should postulate a novel meaning for a known word form. We manipulated the syntactic and/or the semantic distance between the known and the novel meaning, as well as the neighborhood density of the phonological form of the word. In these experiments, French 20-month-old toddlers were taught novel words that are homophonous to familiar words. We tested 20-month-olds, thus younger children than the population tested in previous studies testing homophone learning (Casenhiser, 2005; Doherty, 2004; Mazzocco, 1997), for several reasons: (1) Toddlers of this age already use the different sources of information that we propose to investigate here (noun vs. verb, e.g., Cauvet et al., 2014; semantic relations, e.g., Arias-Trejo & Plunkett, 2013; gender cues, e.g., Van Heugten & Christophe, 2015; neighborhood density, e.g., Newman, Samuelson, & Gupta, 2008) and (2) 20-month-olds have already acquired a certain number of homophone pairs (see de Carvalho, Dautriche, & Christophe, 2017) suggesting that learning lexical ambiguities should be possible at this young age.

We then used the results of these experiments to evaluate whether the dimensions that make homophones easier to learn have a visible impact on the distribution of these words in the lexicon: Specifically, we tested whether homophone pairs that are learnable by toddlers are over-represented in the lexicon of natural languages, relative to homophone pairs that are harder to learn (using 4 languages as a test case).

## 2. Experimental studies

### 2.1. Experiment 1 – syntactic and semantic distance

Words from different syntactic categories typically occur in different syntactic contexts (e.g., “You X the” is a felicitous context for a verb but not for a noun) and children have been shown to use such contextual information to recognize known words by the age of 18 months (e.g., Brusini et al., 2017; Cauvet et al., 2014; Kedar, Casasola & Lust, 2006; Zangl & Fernald, 2007). Learning a pair of homophones may thus be easier if the two members of the pair can be distinguished syntactically. One way to achieve this is to distribute members of a pair of homophones in different syntactic categories, such that the homophones will occur in different syntactic contexts. For instance, in English, “to train”, a verb, which designates an action, is homophonous with “train”, a noun, which designates an object. These two words, although they have the same phonological form, are thus distinct on the syntactic

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