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Numerical morphology supports early number word learning: Evidence from a comparison of young Mandarin and English learners



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ABSTRACT

Previous studies showed that children learning a language with an obligatory singular/plural distinction (Russian and English) learn the meaning of the number word for one earlier than children learning Japanese, a language without obligatory number morphology (Barner, Libenson, Cheung, & Takasaki, 2009; Sarnecka, Kamenskaya, Yamana, Ogura, & Yudovina, 2007). This can be explained by differences in number morphology, but it can also be explained by many other differences between the languages and the environments of the children who were compared. The present study tests the hypothesis that the morphological singular/plural distinction supports the early acquisition of the meaning of the number word for one by comparing young English learners to age and SES matched young Mandarin Chinese learners. Mandarin does not have obligatory number morphology but is more similar to English than Japanese in many crucial respects. Corpus analyses show that, compared to English learners, Mandarin learners hear number words more frequently, are more likely to hear number words followed by a noun, and are more likely to hear number words in contexts where they denote a cardinal value. Two tasks show that, despite these advantages, Mandarin learners learn the meaning of the number word for one three to six months later than do English learners. These results provide the strongest evidence to date that prior

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knowledge of the numerical meaning of the distinction between singular and plural supports the acquisition of the meaning of the number word for one.

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1. Introduction

Word learning is a hard problem (e.g., [Quine, 1960](#)). One might think that number word learning would be an exception. Unlike most words, number words are part of a structure, namely verbal counting, which, when understood, directly reveals their meaning ([Gelman & Gallistel, 1978](#)). This means the problem of number word learning might reduce to learning to count, which English-learning middle class children do shortly after their second birthday. However, a large body of evidence shows that it is not so; number word meanings do not come for free upon learning to count. Rather, children learn the meanings of the number words for the first four numbers (“one” through “four” in English) in a drawn out process that takes over a year, and acquire the meanings of these four number words before they figure out the numerical significance of counting ([Fuson, 1988](#); [Le Corre, Van de Walle, Brannon, & Carey, 2006](#); [Sarnecka & Lee, 2009](#); [Wynn, 1990, 1992](#)). Thus, as children do not deduce the meaning of the first three or four number words from their understanding of counting, the meanings of “one” through “four” must be achieved simply by hearing the words used to refer to cardinal values of sets.

Many studies have shown that syntax and/or morphology contribute to acquiring the meanings of words such as nouns, verbs and adjectives (e.g., [Gleitman, 1990](#)). Likewise, it may be that syntax and morphology provide information that constrains the acquisition of number words. Indeed, [Bloom and Wynn \(1997\)](#) proposed that English-learning children infer that each number word denotes a unique, exact numerosity from the fact that it is the only meaning that is consistent with the syntax and semantics of the different types of phrases where number words occur (see also [Barner, Libenson, Cheung, & Takasaki, 2009](#); [Syrett, Musolino, & Gelman, 2012](#)).

Even more simply, number word learning may be supported by numerical morphology. In many languages, number is morphologically marked on various parts of speech, most commonly on nouns and verbs ([Corbett, 2000](#)). To see how numerical morphology could help children learn number word meanings, consider the English singular/plural distinction. First, in many (though not all) contexts, singular nouns are used to refer to a single individual and plural nouns are used to refer to more than one (see [Spector, 2007](#) for example). Thus, whether English noun are marked with a plural could, in principle, convey numerical information, provided that one can identify the contexts where this is so. Moreover, since, for some tenses, some verbs take on different forms depending on the number of the noun that acts as their subject, they too can potentially convey numerical information. Second, there is a regular contingency between number words and singular/plural morphology – namely, when “one” modifies a noun, the noun must be in singular form, whereas when a noun is modified by a number word that denotes a number greater than one, it must be in plural form. Now, suppose that, at least in some contexts, before they begin to learn number words, children interpret singular nouns as referring to a single individual and plural nouns as referring to more than one. They might thus be able to use the regular contingency between number words and nominal and verbal numerical morphology to learn that the semantic distinction between “one” and other number words is a numerical distinction, and/or to learn that “one” denotes the cardinality of collections of one element.

Accumulating evidence suggests that this “morphological bootstrapping” hypothesis is plausible. English learners learn the meaning of “one” sometime between 24 and 36 months ([Le Corre et al., 2006](#); [Sarnecka & Lee, 2009](#); [Wynn, 1990, 1992](#)). Various studies have shown that, a little prior to that – namely, between 18 and 30 months – English learners know that, in some contexts, the presence or absence of a plural marker on a noun and/or the presence or absence of a pluralized verb that agrees with a noun indicates whether the noun refers to one or more than one individuals ([Davies, Xu](#)

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