



ELSEVIER

Contents lists available at ScienceDirect

Journal of Memory and Language

journal homepage: www.elsevier.com/locate/jml

Digging up the building blocks of language: Age-of-acquisition effects for multiword phrases

Inbal Arnon^{a,*}, Stewart M. McCauley^b, Morten H. Christiansen^{b,c}^a Department of Psychology, Hebrew University, Jerusalem 91905, Israel^b Department of Psychology, Cornell University, Ithaca, NY 14853, USA^c The Interacting Minds Centre, Aarhus University, 8000 Aarhus C, Denmark

ARTICLE INFO

Article history:

Received 21 December 2015

revision received 3 July 2016

Keywords:

Age-of-Acquisition

Multiword units

Language learning

ABSTRACT

Words are often seen as the core representational units of language use, and the basic building blocks of language learning. Here, we provide novel empirical evidence for the role of *multiword* sequences in language learning by showing that, like words, multiword phrases show age-of-acquisition (AoA) effects. Words that are acquired earlier in childhood show processing advantages in adults on a variety of tasks. AoA effects highlight the role of words in the developing language system and illustrate the lasting impact of early-learned material on adult processing. Here, we show that such effects are not limited to single words: multiword phrases that are learned earlier in childhood are also easier to process in adulthood. In two reaction time studies, we show that adults respond faster to early-acquired phrases (categorized using corpus measures and subjective ratings) compared to later-acquired ones. The effect is not reducible to adult frequencies, plausibility, or lexical AoA. Like words, early-acquired phrases enjoy a privileged status in the adult language system. These findings further highlight the parallels between words and larger patterns, demonstrate the role of multiword units in learning, and provide novel support for models of language where units of varying sizes serve as building blocks for language.

© 2016 Elsevier Inc. All rights reserved.

Introduction

Traditionally, words are seen as the basic building blocks of language learning and processing (e.g., Chomsky, 1965; Pinker, 1991). Recent years, however, have seen a shift away from this perspective. There is increasing theoretical emphasis on, and empirical evidence for, the idea that multiword units, like words, are integral building blocks for language. This idea is found in linguistic approaches that emphasize the role of constructions in language (Culicover & Jackendoff, 2005; Goldberg, 2006; Langacker, 1987) and is advocated in single-system models of language which posit that all linguistic material –

whether it is words or larger sequences – is processed by the same cognitive mechanisms (Bybee, 1998; Christiansen & Chater, 2016b; Elman, 2009; McClelland, 2010). The role of multiword units in language is also highlighted in usage-based approaches to language learning, which have been gaining prominence in recent years (Bannard, Lieven, & Tomasello, 2009; Christiansen & Chater, 2016a; Lieven & Tomasello, 2008; Tomasello, 2003). In such models, language is learned by abstracting over stored exemplars of various sizes and levels of abstraction (from syllables through words to constructions). Multiword units are predicted to play a role in learning by providing children with information about the distributional and structural relations that hold between words (Abbot-Smith & Tomasello, 2006; Bod, 2006, 2009; McCauley & Christiansen, 2014). Children are

* Corresponding author.

E-mail address: inbal.arnon@mail.huji.ac.il (I. Arnon).

expected to draw on both words and multiword units in the process of learning.

Accordingly, there is growing developmental and psycholinguistic evidence that children and adults are sensitive to the properties of multiword sequences and draw on such information in learning, production, and comprehension (e.g., Arnon & Cohen Priva, 2013, 2014; Arnon & Snider, 2010; Bannard, 2006; Bannard & Matthews, 2008; Bybee & Schiebman, 1999; Janssen & Barber, 2012; Jolsvai, McCauley, & Christiansen, 2013; Reali & Christiansen, 2007; Tremblay & Tucker, 2011). Adult speakers, for instance, are faster to recognize and produce higher frequency four-word phrases (Arnon & Cohen Priva, 2013; Arnon & Snider, 2010) and show better memory of them (Tremblay, Derwing, Libben, & Westbury, 2011), an effect that is not reducible to the frequency of individual substrings. This sensitivity is evident early on; young children (two- and three-year-olds) are faster and more accurate at producing higher frequency phrases (Bannard & Matthews, 2008), while four-year-olds show better production of irregular plurals inside frequent frames (e.g., *Brush your – teeth*, Arnon & Clark, 2011). Analyses of early child language also support the role of multiword chunks in early learning: up to 50% of children's early multiword utterances include 'frozen' chunks (sequences that are not used productively, Lieven, Behrens, Speares, & Tomasello, 2003; Lieven, Salomo, & Tomasello, 2009), a pattern that is also found in computational simulations of early child language (Bannard et al., 2009; Borensztajn, Zuidema, & Bod, 2009; McCauley & Christiansen, 2011; McCauley & Christiansen, 2014).

Such findings highlight the parallels in processing words and larger sequences, and undermine a strict representational distinction between words and phrases. However, the existing findings do not provide conclusive evidence for the role of multiword units in learning. Finding that higher frequency phrases are easier to process means that adult speakers are sensitive to distributional information about multiword sequences, but does not attest to their role in learning. Similarly, the presence of multiword chunks in children's production does not necessarily mean such units were used as building blocks for learning, especially since most of children's early productions are single words and not multiword sequences. Moreover, since children's receptive vocabulary is typically much larger than their productive one (Clark & Hecht, 1983; Grimm et al., 2011) it is hard to identify early linguistic representations based on their early productions (e.g., children show a preference for sentences with grammatical forms even when such morphemes are omitted in their own speech; Shi et al., 2006). A similar comprehension-production asymmetry has also been observed in a computational model that uses multiword sequences as its building blocks (Chater, McCauley, & Christiansen, 2016; McCauley & Christiansen, 2013).

In this paper, we address the challenge of identifying children's early linguistic units by turning to adult processing as a window onto the early units of learning. We provide novel evidence for the prediction that multiword units serve as building blocks for language learning by showing that, like words, multiword phrases show age-

of-acquisition (AoA) effects: multiword phrases that were acquired earlier in childhood show processing advantages in adult speakers, after controlling for adult usage patterns. The finding that AoA effects are not limited to single words has consequences beyond the role of larger units in learning: such a finding provides additional evidence for the parallels in processing and representation between words and larger phrases, and expands our understanding of the linguistic information speakers are sensitive to.

Lexical Age-Of-Acquisition effects

Words that are acquired earlier in childhood show processing advantages for adult speakers in a variety of lexical and semantic tasks, including lexical decision, picture naming, word naming, sentence processing, and more (Ellis & Morrison, 1998; Juhasz & Rayner, 2006; Morrison & Ellis, 1995). Early-acquired words tend to be responded to faster than later-acquired ones, after controlling for adult usage patterns (the frequency of the word in adult language). For instance, despite having similar frequency in adult language, adults would be faster to recognize the early-acquired *bell* compared to the later-acquired *wife* (AoA and frequency taken from Kuperman, Stadthagen-Gonzalez, & Brysbaert, 2012). These AoA effects have been found in numerous studies across different languages and tasks (see Johnston & Barry, 2006; Juhasz, 2005, for reviews). One of the major challenges in studying the effect of AoA on processing is separating the effect of order of acquisition from that of other factors that are naturally correlated with it, like cumulative frequency (early-acquired words have been known longer), frequency trajectory (early-acquired words tend to have a high-to-low frequency trajectory across the life span), concreteness (early-acquired words tend to be more concrete), and length (early-acquired words tend to be shorter).

While the precise mechanism that gives rise to AoA effects is still debated (e.g., Ghyselinck, Lewis, & Brysbaert, 2004; Marmillod et al., 2012), there is substantial evidence that AoA does affect processing and is not just a proxy for other factors, or a frequency effect in disguise. AoA effects are found after controlling for other factors known to affect lexical processing (e.g., Brysbaert & Ghyselinck, 2006). They are particularly robust in tasks such as picture naming or lexical decision where such effects persist after controlling for frequency, cumulative frequency (Ghyselinck et al., 2004; Moore & Valentine, 1998), and frequency trajectory (Perez, 2007; Maermlod, Bonin, Meot, Ferrand, & Paindavoine, 2012). For instance, AoA effects are found even when adult frequencies are higher for the late-acquired words, as in the comparison between high-frequency/late-acquired words like *cognition* (for psychologists) and low-frequency/early-acquired words like *pony* (Stadthagen-Gonzalez et al., 2004). More importantly, AoA effects do not increase with age, as would be expected if they simply reflected cumulative frequency (Kuperman et al., 2012; Morrison, Hirsh, Chappell, & Ellis, 2002; but see Catling, South, & Dent, 2013), and are also found in artificial language learning, where both frequency and cumulative frequency (as well as other word properties) can be tightly controlled

Download English Version:

<https://daneshyari.com/en/article/931748>

Download Persian Version:

<https://daneshyari.com/article/931748>

[Daneshyari.com](https://daneshyari.com)