



Readers generalize adaptation to newly-encountered dialectal structures to other unfamiliar structures[☆]

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ARTICLE INFO

Article history:

Received 2 October 2015

revision received 11 May 2016

Available online 10 June 2016

Keywords:

Adaptation

Sentence processing

Dialect syntax

Implicit learning

Learning novel syntax

ABSTRACT

Growing evidence suggests that syntactic processing may be guided in part by expectations about the statistics of the input that comprehenders have encountered; however, these statistics and even the syntactic structures themselves vary from situation to situation. Some recent work suggests that readers can adapt to variability in the frequencies of known, but infrequent syntactic structures. But, the relation between adaptation to altered frequencies of familiar structures and learning to process unfamiliar, never-before-seen structures is under-explored. In two self-paced reading experiments, we investigated readers' adaptation to an unfamiliar structure used in some regional dialects of American English: the *needs*+past participle structure, such as using *The car needs washed* to mean *The car needs to be washed*. Study 1 used a novel Web-based recruitment method to target regions where participants were likely to be familiar (Ohio, western Pennsylvania) or unfamiliar (Colorado) with the *needs*+past participle structure. Participants unfamiliar with the structure initially read the structure more slowly, but over the course of the experiment came to read it more like the familiar participants. Study 2 further demonstrated that participants who have adapted to *needs*+past participle generalize this adaptation to a different, but related structure. These results suggest (a) that readers adapt to unfamiliar syntactic structures, (b) that, in doing so, they become more like existing users of those structures, and (c) that they can generalize this other structures that they may also be more likely to encounter. We discuss these results in the context of implicit learning accounts of exposure effects on syntactic processing.

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[☆] This work was supported by National Science Foundation CAREER award (IIS-1150028) and National Institutes of Health grant (NIHCD R01 HD075797) to T. Florian Jaeger. We thank the members of the Human Language Processing Lab for their comments and suggestions, Andrew Watts for programming and data collection, and Alison Trude and Martha Fraundorf for assistance with stimulus construction. Study 2, in particular, benefited from and was inspired by conversations with Julie Boland and Michael Kaschak at, and after, the CUNY 2014 and CUNY 2015 Conferences on Human Sentence Processing.

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Introduction

Understanding a sentence involves mapping the sentence's linguistic form onto the meaning the speaker intends to convey. But, the same meaning is not always expressed using the same structure: A speaker may say either *I gave him the book* or *I gave the book to him* to describe the same event. And, the meanings of newly encountered structures may be unclear (e.g., the use of *He be home* to mean *He tends to be home* in African American Vernacular English). A challenge for psycholinguistic

theories, then, is to account for why we can often quickly and accurately process the syntax of even unfamiliar sentences.

An increasing accepted view of syntactic processing is that language users acquire the relevant frequencies of particular syntactic structures based on experience with the input statistics (Arai & Keller, 2013; DeLong, Urbach, & Kutas, 2005; Dikker & Pykkänen, 2013; Hale, 2001; Jurafsky, 1996; Kamide, Altmann, & Haywood, 2003; Levy, 2008; MacDonald, 2013; MacDonald, Pearlmutter, & Seidenberg, 1994; McRae, Spivey-Knowlton, & Tanenhaus, 1998; Staub & Clifton, 2006). For example, English speakers may understand both the double-object (*I gave him the book*) and prepositional dative (*I gave the book to him*), but know that the double-object is more common (Bresnan, 2007). Knowing which structures are relatively likely enables fast and accurate comprehension because it allows comprehenders to rapidly interpret the unfolding input and perhaps even to predict upcoming structures (Levy, 2008; MacDonald, 2013; MacDonald et al., 1994; Smith & Levy, 2013), consistent with proposals of a broad role for prediction in language comprehension (Dell & Chang, 2014; Federmeier, 2007; for review, see Kuperberg & Jaeger, 2016).

But, expectations about syntactic distributions are only useful to the extent that they match the statistics of the linguistic input (Fine, Jaeger, Farmer, & Qian, 2013), and these statistics vary across situations, such as different dialects, idiolects, and sociolects (e.g., Bresnan & Ford, 2010; Finegan & Biber, 2001; Labov, 1969; Tagliamonte & Smith, 2005; Tagliamonte, Smith, & Lawrence, 2005; Weiner & Labov, 1983). This variability includes both differences in the relative frequency of structures (for instance, U.S. and New Zealand English differ in the frequency of the double-object structure; Bresnan & Hay, 2008) and in the presence of entirely different structures (such as the use of, e.g., *The car needs washed* to mean *The car needs to be washed* in western Pennsylvanian English; Doyle, 2014; Murray, Frazer, & Simon, 1996; Tenny, 1998). In the face of such variability, previously acquired knowledge about syntactic distributions may be useless or even misleading.

One potential way that the language comprehension system may cope with such variability is by *adapting* to the current situation. Work on structural priming in comprehension suggests that syntactic processing is indeed sensitive to which of several *known* structures has been recently encountered, a phenomenon that has been attributed to implicit learning about the distribution of syntactic structures. This account of structural priming implies that comprehenders should also be able to learn a distribution that contains entirely new structures. In two studies, we test how comprehenders adapt to, and *generalize*, experience with unfamiliar syntactic structures. We begin by summarizing what the literature has revealed about how exposure to known structures facilitates their subsequent processing and whether similar effects might emerge after exposure to novel structures. We then elaborate on the critical role of generalization during exposure to novel structures, which has received little to no attention in previous work.

Recent exposure can facilitate processing of known structures

Beginning with Levelt and Kelter (1982) and Bock (1986), numerous experiments have revealed that experience reading or speaking a particular structure biases speakers to *produce* it again (for review, Pickering & Ferreira, 2008). More recently, it has been shown that recent experience with a structure also speeds its subsequent *comprehension* (Arai & Mazuka, 2014; Fine et al., 2013; Thothathiri & Snedeker, 2008; Tooley & Bock, 2014; Tooley, Traxler, & Swaab, 2009; Traxler, 2008). This facilitation occurs with even just one exposure (Arai, van Gompel, & Scheepers, 2007; Branigan, Pickering, & McLean, 2005; Traxler, 2008) and accumulates with repeated exposure (Farmer, Fine, Yan, Cheimariou, & Jaeger, 2014; Fine, Qian, Jaeger, & Jacobs, 2010; Fine et al., 2013; see also Kamide, 2012).

Both types of facilitation have been attributed to *implicit learning* (Fine & Jaeger, 2013; Fine et al., 2013), building on implicit learning accounts of exposure effects in language production (Bock & Griffin, 2000; Chang, Dell, & Bock, 2006; Ferreira, Bock, Wilson, & Cohen, 2008; Jaeger & Snider, 2013; Kaschak, Kutta, & Jones, 2011; Reitter, Keller, & Moore, 2011). Alternative accounts attribute trial-to-trial facilitation, also referred to as *structural* or *syntactic priming*, to short-term boosts in the activation of recently processed structures (Pickering & Branigan, 1998; Traxler & Tooley, 2008); in these accounts, the cumulative effects observed in recent studies require another, different explanation (for further discussion, see Fine & Jaeger, 2016). One piece of support for the implicit-learning hypothesis comes from the observation that structural priming in comprehension seems to be sensitive to how unexpected the prime was: Less expected structures show greater priming in comprehension (Arai & Mazuka, 2014; Fine & Jaeger, 2013) and in production (Bernolet & Hartsuiker, 2010; Jaeger & Snider, 2013). Sensitivity to the unexpectedness (or prediction error) of a prime is expected under error-based and similar learning accounts (Chang et al., 2006; Dell & Chang, 2014; Jaeger & Snider, 2013). Specifically, there is some evidence that exposure to particular structures may lead comprehenders to implicitly adapt expectations about the distribution of syntactic structures (Farmer et al., 2014; Fine et al., 2010, 2013). Evidence that the facilitatory effects are indeed due to changes in expectations comes from visual world eye-tracking studies, in which exposure to talkers with different syntactic preferences leads to talker-specific expectations about upcoming syntactic structures (Arai & Mazuka, 2014; Kamide, 2012). Finally, repeated exposure can produce facilitation that is detectable several days later when comprehenders are assessed in the same environment (Wells, Christiansen, Race, Acheson, & MacDonald, 2009), consistent with the idea that implicit learning allows comprehenders to adapt their expectations for that environment.

Learning to process unfamiliar structures

Thus, it appears that comprehenders can sometimes rapidly adapt their expectations about the relative fre-

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