of structural priming. What if there is more than one aspect that both input A and B share? In this case, the source of the priming effect remains ambiguous. Unfortunately, most evidence taken in support of structural priming has this source ambiguity issue – in particular, ambiguity between sequential and hierarchical relations. For example, although structural priming effects were reported in many studies of structural alternations without meaning change – e.g., alternations between prepositional/double-object sentences (henceforth, POs/DOs), passive/active sentences, different orderings of the auxiliary and main verb, and different positions of a particle in phrasal verbs (Bock 1986, 1989; Hartsuiker & Westenberg 2000; Konopka & Bock 2009; Messenger et al. (2012b); Pickering & Branigan 1998), the prime and target sentences in these studies shared both linear ordering and hierarchical argument structure (cf. Hare & Goldberg [1999] for discussion of potential semantic influences). Thus, in these cases, it is not clear whether structural priming effect arises due to linear or hierarchical relations.

B&P ambiguously state that syntactic representations that they assume are "shallow" and "monostratal" such that they "represent hierarchical and linear relations simultaneously" (sect. 2.1, para. 7, 8). Under this assumption, the priming effects found with PO/DO or passive/active alternations above would not have "source ambiguity" as distinction of linear vs. hierarchical relations becomes irrelevant, a notion with which we do not agree. An alternative account, however, is that priming is sensitive to cognitive computations of linear relations but may not be so sensitive to hierarchical relations of linguistic representation. Under this hypothesis, the priming evidence with the potential source ambiguity discussed above is accounted for straightforwardly in terms of priming of linear ordering, which is also consistent with the findings of Pickering et al. (2002), in which sentences that share hierarchical but not linear relations did not prime each other.

Word order is closely related to hierarchical argument structures; however, we believe that these two cannot be equated. Take sentences with a reflexive (e.g., "John$_i$ told Tom$_k$ to be kind to himself$_{*i/k}$" vs. "John$_i$ seemed to Tom$_k$ to be kind to himself$_{i/*k}$"; cf. Sturt & Kwon 2015). Although local proximity is a factor, these examples clearly illustrate that the proximity is defined in terms of hierarchical relations and not linear ordering (Reinhart 1983; cf. Langacker 1969). Thus, syntax cannot be reduced to simple sequential structure, and hierarchical relationships are an integral aspect of human language syntax. As such, we believe that we need clear evidence in support of priming of hierarchical relations for the proposal of B&P to work (cf. Scheepers et al. 2011).

Thus, while structural priming seems convincing with many replications in various languages and participant populations, its nature remains unclear, and therefore, the use of priming experiments in lieu of (or alongside) acceptability judgments is a limited approach to understanding grammatical structure. The proposed approach would benefit greatly from experimental results using various syntactic constructions with which the priming of hierarchical structure can be clearly evaluated independently of linear ordering. In short, clearer evidence of priming of hierarchical argument structure as well as word order is necessary before it can be argued that priming paradigms can be used to answer questions of structure, a core feature of human language syntax.

Considering experimental and observational evidence of priming together, syntax doesn't look so autonomous

doi:10.1017/S0140525X17000486, e300

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Abstract: We agree with Branigan & Pickering (B&P) that structural priming experiments should supplant grammaticality judgments for testing linguistic representation. However, B&P overlook a vast (corpus-) linguistic literature that converges with – but extends – the experimental findings. B&P conclude that syntax is functionally independent of the lexicon. We argue that a broader approach to priming reveals cracks in the façade of syntactic autonomy.

Branigan & Pickering (B&P) make a compelling case for the utility of experimental methods – in particular, priming – for understanding linguistic representation. We whole-heartedly support this position. As linguists, however, we must note that B&P have misrepresented the state of affairs within linguistics. The claim that linguists rely solely (i.e., "on a single method," "dominantly," "almost exclusively") on acceptability judgments is an exaggeration. Said judgments have indeed been prevalent in the work of some linguists, but – especially in the last two decades – this is far from the sole method used. A glance at the papers forthcoming in *Language* finds just one paper using acceptability judgments, but four using analyses of observational data or corpora and two using advanced statistical techniques. Furthermore, several major schools of linguistic thought have flatly rejected the validity of acceptability judgments for more than three decades (e.g., Bybee 2006; Chafe 1994; Givón 1983; Thompson & Mulac 1991).

Much of what we discuss below relies on corpus data. Pickering and Branigan (1999) argue that such data cannot speak to the nature of priming, given their relatively low level of control compared to well-controlled experimental designs. This assumption reflects a common prejudice among experimental psychologists: That the "found data" nature of corpora makes them unsuitable for disentangling target effects from confounds. Modern statistical techniques now enable distinguishing the influences of many confounding variables. In fact, many variables important to priming are more difficult to control for in experimental paradigms than in corpus studies (e.g., distance effects between prime and target, beta-persistence [Szmrecsanyi 2006]; effects of non-variable structures on variable contexts, cumulative priming effects [Jaeger & Snider 2013]).

B&P argue that syntactic representations are independent of semantics and lexicon. This assertion is ambiguous (Croft 1995). We all agree that syntactic aspects are (explicitly or implicitly) represented in the mind. However, saying that syntax is functionally and/or representationally encapsulated apart from lexicon and semantics is more contentious. B&P support this claim by showing that abstract clausal templates (e.g., prepositional-object [PO] or double-object [DO]) are primed even without lexical overlap between the prime and target. Further, semantically dissimilar but syntactically similar structures prime each other. For example, intransitive + locative-PP constructions prime passives. However, these intransitives and passives have more in common than acknowledged by the authors. For instance, ergative languages align such structures along both syntactic and semantic dimensions (Keenan 1984). Moreover, semantic similarity beyond lexical overlap has been found to drive syntactic choice of PO/DO, even in the absence of syntactic similarity (Hare & Goldberg 1999).

Another strong indicator of the semantic properties of clausal constructions is the statistical association between verbs and constructions (Goldberg 2006; Ellis & Ferreira-Junior 2009; Stefanowitsch & Gries 2003). These associations co-determine the magnitude of priming (e.g., Gries 2005). Importantly, they do not merely boost priming but may actually resist priming (and these relationships may change depending on context [Jaeger & Snider 2013]). Lexical choices also often dictate syntactic choices, both in production and in comprehension (e.g., Jaeger

2010; Novick et al. 2003). Importantly, such choices may be influenced by syntactic information that prima facie should be irrelevant to the syntactic alternation under consideration (Wasow et al. 2011). Furthermore, words – even syntactically impoverished bare nouns – are never processed in isolation from the entirety of their syntactic distributional information, and may prime each other via such distributions (Lester & Moscoso del Prado Martín 2016; Lester et al. 2017).

B&P survey clear evidence of priming among words, syntactic structures, and semantic structures. They also explain how simultaneous overlap between any two of these levels results in increased priming (the so-called boosts). One can account for these findings in two ways: (1) relationships among syntax, semantics, and lexicon are captured by additional interfaces whose only job is to combine information from separate modules (e.g., Jackendoff 2013); or (2) the relationships constitute connection weights between words and structures, which are directly related in memory (Diessel 2015). B&P appear to prefer the first option. However, short of undisputed neuropsychological evidence for the separation between these representational levels (which is not known to us), there is no way of distinguishing among three separated levels with connections between them, and a single level of representation with different degrees of overlap. Considering that priming effects are very similar in the three levels, and that overlap among them interacts, it seems more parsimonious to assume a single layer of representation, rather than positing three such encapsulated layers plus interconnections.

B&P's arguments rely on binary choices (such as PO/DO). However, it is unlikely that these choices could benefit from structural overlap in phrasal constituents; the critical variable depends only on where those phrases are placed. If there is no additional reason to adjust structures to accommodate the accessibility of subclausal units, then why would one? Whether there may be a task-driven confound remains a question for further study. However, notice that chronometric studies show that the locus of priming may not always be the clause, even when clause-structural overlap is present (Smith & Wheeldon 2001). Further, more comprehensive models of linguistic reproduction exist, which make distinctions beyond simple identity priming. Consider Dialogic Syntax (Du Bois 2014; Du Bois et al. 2014), which distinguishes among framing resonance, the locus of syntactic priming, and focal resonance, the aligning of meanings within syntactic alignment.

We emphasize that we are not advocating the position that syntactic priming is reducible to lexical, semantic, or pragmatic effects. To truly understand linguistic representation on the basis of processing, we must consider all possible sources of information from processing across all levels that are brought to bear on language use, including data from both experimental and observed contexts. This trend is already well underway in several major branches of linguistics. B&P's bold proposal to establish "a new basis for understanding the nature of language" stands to benefit from a full partnership with researchers drawing on a broad range of evidence to account for a system that dynamically responds to linguistic, cognitive, and interactional contexts.

Structural priming, action planning, and grammar

doi:10.1017/S0140525X17000498, e301

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Abstract: Structural priming is poorly understood and cannot inform accounts of grammar for two reasons. First, those who view performance as grammar + processing will always be able to attribute psycholinguistic data to processing rather than grammar. Second, structural priming may be simply an example of hysteresis effects in general action planning. If so, then priming offers no special insight into grammar.

Branigan & Pickering (B&P) argue that structural priming methods have "reached maturity" (target article, para. 2) to the point that they can inform not only language production and comprehension processes, but also the nature of grammar, as typically studied by linguists using different analytical tools and methods. This view appears overly optimistic; structural priming remains widely used but poorly understood, with little consensus about why the effect is observed or exactly what production and comprehension processes are promoted from prior exposure to a sentence. Moreover, the larger class of priming methods, to which B&P link structural priming, has been the target of extensive criticism and reassessment of what can be gleaned from the tasks (Cesario 2014). Here, we consider two perspectives on the nature of structural priming and their consequences for B&P's claims for grammar.

One perspective is that structural persistence is a strongly syntactic phenomenon: Encountering/producing a sentence somehow biases the language processing system to expect or produce a similar syntactic structure. B&P's logic is that, because the processing system draws on the grammar, patterns of priming must reveal the nature of the grammar. This thinking raises the classic issues of the competence-performance distinction. If language use is grammar + processing, there is a credit assignment problem for psycholinguistic data: Any linguistic behavior might reflect the grammar, processing mechanisms, or some combination. B&P make exactly this criticism of other psycholinguistic methods – for example, that Franck et al.'s (2010) studies of subject-verb agreement production might illuminate the nature of the grammar, or alternatively they might reflect production or comprehension processes and be uninformative about grammar. Crucially, this assignment problem applies equally to priming. Haskell et al. (2010) used priming to study agreement production and found that subject-verb agreement is sensitive to the statistical patterns in prior usage (the primes). These results could support a graded grammar in which statistical patterns shape grammatical representations (Bybee 2006). Researchers rejecting this approach, however, could instead attribute these priming data to processing, leaving the grammar untouched by the statistics of usage. Thus, given B&P's assumption of usage=grammar + processing, structural priming is just as much subject to interpretive uncertainty as any other measure.

Even more interpretive uncertainty arises from an alternative view of structural priming – that it is not strictly syntactic but rather a language example of a more general tendency to repeat prior actions. Cognitive models of motor planning suggest these reuse effects (termed *hysteresis effects*) arise because it is easier to recall a previously executed motor sequence than to generate alternative plans *de novo* (Rosenbaum et al. 2006). Our own research investigates the link between structural priming and domain-general plan reuse, and we have developed parallel tasks that yield reliable structural priming for dative sentence structures and priming of nonlinguistic manual actions in the same participants (Koranda et al. 2016). We also observed a parallel effect of priming strength in both domains: Preferred sentences and movements are more easily primed than unpreferred ones, a phenomenon previously observed in structural priming (Bock 1986). These findings raise the possibility that plan reuse may be a domain-general property of action planning. MacDonald (2013) suggested that a general plan reuse bias would ground patterns of language use in basic planning mechanisms, and the existence of a general plan reuse bias may also explain why some nonlinguistic motor sequences such as stacking blocks appear to prime sentence structure choices in language