Abstract: In their target article, Branigan & Pickering (B&P) briefly discuss bilingual language representation, focusing primarily on cross-language priming between single-language sentences. We follow up on this discussion by showing how structural priming drives real-life phenomena of bilingual language use beyond the priming of unilingual sentences and by arguing that B&P's account should be extended with a representation for language membership.

In their target article, Branigan & Pickering (B&P) argue for structural priming as a key implicit methodology to probe the nature of linguistic representations. They provide extensive data supporting their model, ultimately arguing that structural priming provides a tool to understand the nature of language.

The authors also discuss the implications of their proposal for language representation in bilinguals, focusing primarily on cross-language structural priming between single-language sentences. This research has led to vital insights on cross-language activation at the syntactic processing level (cf., e.g., Hartsuiker & Pickering 2008), adding to the accumulation of evidence that language use in bilinguals involves ubiquitous cross-language activation at multiple levels of processing (cf. e.g., de Bot et al. 2009; Kootstra et al. 2009; Kroll et al. 2006). Importantly, however, everyday bilingual communication does not normally happen according to a scripted cross-language priming paradigm with primes in one language and targets in the other (cf. Fricke & Kootstra 2016). To truly understand the nature of language in all its respects, as is B&P's ambition, we propose that their model and approach should be further developed to explain a larger number of bilingual language scenarios as they occur in real life.

One such bilingual language scenario – and a true hallmark of bilingualism – is code-switching, i.e., the use of multiple languages within one single sentence. Code-switching is susceptible to exactly the same structural priming mechanisms as the production of unilingual sentences, in the sense that bilinguals' syntactic choices in the production of code-switched sentences are primed by those of their dialogue partner (Kootstra et al. 2010). But priming also occurs with dependent variables that are specific to code-switching, namely priming of the sentence position of code-switching (Kootstra et al. 2012), priming of the language of the inflected verb (i.e., matrix language; Fricke & Kootstra 2016; Kootstra et al. 2010), and priming of the actual choice to code-switch or not (Fricke & Kootstra 2016; Kootstra et al., in revision). Importantly, these findings are based on both experimental and corpus research. This indicates that structural priming is more than a method to investigate linguistic representations; it is a core mechanism of language use that, together with adaptive control processes (cf., Green & Abutalebi 2013), appears to guide bilinguals' linguistic behavior in real-life language use.

The critical implication of this code-switching evidence is that B&P's model should be extended with a representation of language membership. After all, for priming of linguistic elements from multiple languages to take place, these multiple languages must somehow be encoded within the representational system. In most models of bilingual language processing, this is implemented by assuming a language node that is linked to linguistic representations (e.g., Hartsuiker & Pickering 2008; Kroll et al. 2006). Based on the omnipresence of cross-language activation at all levels of processing, we assume this language node is linked to linguistic representations at all levels of processing (de Bot 2004; de Bot et al. 2009; Kootstra et al. 2009; 2010). Primed code-switching can then be explained in the form of persisting co-activation of language nodes from the recently experienced discourse (see Fricke & Kootstra 2016; Kootstra et al. 2010).

In addition to code-switching, the just-described extension of B&P's structural priming account also may serve to explain another fascinating bilingual language scenario: first language (L1) attrition (i.e., loss of or decreased access to L1 representations, mostly due to immersion in a second-language environment, leading to infrequent use of the first language [e.g., Schmid 2011]). Recently, a number of psycholinguistic paradigms have been used to study first-language attrition using offline, online, and neural measures of language comprehension and production (Rossi et al., in revision), but the mechanism of priming so far has not been used to study first-language attrition. Based on B&P's point that priming can be seen as evidence of access to linguistic representations, it can be predicted that, if L1 representations are completely inaccessible as a consequence of attrition, L1 structural priming should be nonexistent, whereas if L1 representations merely become less accessible as a consequence of attrition, rates of L1 structural priming may well be relatively strong. This would be consistent with inverse-frequency and surprisal effects found in structural priming studies (e.g., Bernolet & Hartsuiker 2010; Bock 1986; Ferreira 2003; Jaeger & Snider 2007; 2013). Another prediction that can be made is that structural priming can serve as a very sensitive measure of changing levels of access to L1 linguistic representations, thus making it possible to boost L1 activation for speakers who are undergoing L1 attrition, much along the lines of what has been proposed for aphasic speakers (Rossi 2013). To continue, under the assumption that structural priming boosts access to linguistic representations by easing the demands on cognitive abilities such as memory, structures that are difficult and/or cognitively taxing should benefit the most from structural priming. Interestingly, these predictions not only show how B&P's model and its bilingual extension can be utilized to further test existing issues in L1 attrition, but also showcase the intricate relation between structural priming and implicit language learning (e.g., Chang et al. 2006; Dell & Chang 2014; Ferreira & Bock 2006).

In sum, we propose to extend B&P's account with the notion of a language node connected to linguistic representations at all levels of processing. This extended account makes it possible to capture the dynamics of real-life bilingual language use beyond cross-language priming of unilingual sentences, explaining the processes of both cross-language interactivity (e.g., code-switching) and language accessibility (e.g., L1 attrition). Given that more than half of the world's population is bilingual (e.g., Grosjean 2010), this extension is by no means trivial; it is relevant and necessary, and strengthens the generalizability of B&P's account.

What structural priming can and cannot reveal

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Abstract: The nature of mental representations of linguistic expressions in relation to the time course from intention to articulation is a major issue. We discuss Branigan & Pickering's (B&P's) proposal to use structural priming to tap into this process. We show that their interpretation of their findings cannot be maintained. We reinterpret these results and suggest a revision of their conclusions.

How can we determine the mental representation of linguistic expressions in relation to the time course from intention to articulation and vice versa (Levelt 1989)? A new experimental technique to tap into this process like Branigan & Pickering's (B&P's) contribution is very welcome. Their review of priming experiments shows that expressions with a particular linguistic structure can facilitate the use of other expressions with a certain structural similarity. From this, they draw strong conclusions. Their interpretation is not compelling, however, and occasionally reflects a misanalysis (e.g., the Mandarin topicalization in section 2.4 shows only that

an (A'-bound) empty object is visible for priming). We suggest an alternative interpretation of their findings.

Under mainstream generative accounts, B&P argue, passives involve movement of the underlying object to subject position (leaving an NP trace/copy), whereas intransitive (active) locatives do not. Hence, the two sentence types involve different representations. B&P, however, report experiments in which intransitive locatives prime passives. The mainstream account is – they conclude – incompatible with this result.

They also discuss the unergative-unaccusative contrast, which is captured standardly by assuming that the unaccusative argument is first inserted in the DO position and next moved to the canonical subject position. Unergatives don't exhibit such movement. B&P show that, nevertheless, intransitive sentences with unergatives and unaccusatives prime each other. Hence, B&P argue, their difference is not syntactically represented. Syntactic representations, then, must contain much less detail than generative approaches assume: There is no syntactic movement, and syntactic representations do not contain copies/traces.

However, B&P mistakenly infer that anything you cannot see with structural priming is "inaccessible" (not used) in processing (sect. 1.1). As is well known, all experimental techniques aren't sensitive to the same processes. If a property established by one technique is not observed with another technique, it is a fallacy to conclude more than that there is a discrepancy to be explained. Crucially, there is abundant evidence that certain properties that, according to B&P, are not visible for priming are, in fact, visible to the processor.

For example, B&P's claim that the contrast between unaccusatives and unergatives is purely semantic and not syntactically encoded is untenable. First of all, the original tests from Perlmutter (1978) and Burzio (1981) show that, unlike the subject of unergatives, the subject of unaccusatives shares *syntactic* properties with direct objects. Second, these verb types display a difference in processing that is independent of semantic roles (e.g., Agnew et al. 2014; Koring et al. 2012). It follows from a difference in the structural representation, which, consequently, must be visible to the processor, contra B&P.

A second misconception concerns their claim that structural priming reveals the exact nature of syntactic representations. As B&P point out themselves, priming displays similarities in representation of a pair of sentences A and B relative to the pair A and C (pp.19–20). As such, this measure cannot tell us directly what the representation of a sentence looks like. A priming effect can tell us at most that particular sentences share some aspects of their representation, but this does not entail that their representations can be identified.

B&P's appeal to parsimony in their argumentation also fails due to inaccuracies in their exposition (including references to obsolete concepts like Deep Structure). Moreover, the absence of explicit mapping rules between syntax and semantics makes their preferred alternative impossible to assess. In generative theory (see Chomsky 1986; 1995; 2001; also 1955/1975), the role of grammar is not so much to characterize what is grammatical as opposed to ungrammatical, but to characterize the relation between forms and their interpretations. Due to the phase-based organization of derivations, B&P's reference to levels misses the point. Properties reflecting steps in this derivational process are accessible to the processor, as shown by a variety of experimental techniques currently employed in addition to grammaticality judgment tasks (which B&P fail to acknowledge) (e.g., Bever & Sanz 1997; Brennan & Pylkkänen 2016; Crain & Thornton 1998; Friedmann et al. 2008; Koornneef et al. 2011; Sprouse et al. 2016).

Unlike what B&P presume, (Narrow) Syntax is independently characterized, namely as involving operations subject to restrictions (e.g., locality constraints) that are independent of intended meaning. Consider resumptive pronouns in *wh*-questions. The formation of *wh*-questions is subject to locality conditions. Interestingly, *wh*-questions that violate a locality condition can be "saved" by using a resumptive pronoun. The resumptive pronoun does not contribute to the meaning but makes an otherwise ungrammatical dependency licit. This shows that the interpretation itself is not blocked, but a particular syntactic derivation to realize that interpretation (for a similar contrast in binding dependencies, see e.g. Reuland 2011a; 2011b; Koornneef & Reuland 2016). Therefore, B&P's argument that there is no level of detailed syntactic representation because the priming tool does not track that level is misguided.

Yet, we share B&P's concern "[to identify] which aspect of structure that priming taps into" (sect. 1.4, para. 7). We suggest that the method of structural priming tracks no more, but also no less, than a particular aspect of detailed linguistic representations – namely, what is visible to the external systems. Phase theory helps us identify this aspect. Phase theory hypothesizes that, once the derivation of a relevant chunk – a propositional structure, a DP/PP – is complete, it is handed over to the realization and interpretation systems. Its internal structure – copies/traces – becomes inaccessible at that point. Hence, at this handover point, what is accessible in unergative and unaccusative structures will be quite similar, yielding the priming data unsurprising. The same applies to passives. What is visible of their internal structure will lack detail at the handover point, making them sufficiently similar to locatives for priming. Finally, given that scope marking is structurally represented, and the scope marker is external to the core proposition, the latter's internal structure, but not the scope marker, will have become inaccessible at the handover point. This reinterpretation in terms of phases provides a straightforward account of B&P's findings. In short, phase theory can help understand what structural priming shows.

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On the nature of structure in structural priming

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Abstract: Like Branigan & Pickering (B&P), we agree that processing evidence is important for linguistic theorization; however, without much evidence of priming of hierarchical argument structure independent of linear ordering, the nature of "structure" in structural priming remains unclear. Consequently, it is an empirical question whether structural priming and acceptability judgments tap into cognitive processes of a similar nature.

In the Chomskyian tradition, a clear distinction is made between competence and performance (Chomsky 1965), and linguistic theorization has been primarily concerned with native speaker's metalinguistic judgments of sentences. Branigan & Pickering (B&P) depart from this tradition and argue that grammar is directly accessed during language processing, so processing evidence is as relevant for linguistic theorization as acceptability judgments are. To be specific, B&P argue that *structural priming* can be taken as evidence for linguistic representation. We agree with B&P that structural priming is a useful tool in the study of language; however, we would like to point out that structural priming also has the issue of "source ambiguity" (similarly to acceptability judgments noted by B&P; Chomsky 1977), crucially in the context of structural representation assumed in the proposal.

When the processing of input A affects the processing of input B, which shares an aspect of linguistic structure with input A but otherwise is unrelated, the phenomenon is viewed as an instance