Bilingualism: Language and Cognition 16 (4), 2013, 737–739 © Cambridge University Press 2013 doi:10.1017/S1366728913000242

Bilingual strategies from the perspective of a processing model

ROBERT J. HARTSUIKER
Ghent University
Robert.Hartsuiker@ugent.be

Muysken argues for four general "strategies" that characterize language contact phenomena across several levels of description. These strategies are (A) maximize structural coherence of the first language (L1); (B) maximize structural coherence of the second language (L2); (C) match between L1 and L2 patterns where possible; and (D) use universal language processing principles. These strategies are seen as choices that bilingual speakers make, individually and collectively, and that are influenced by multiple social, individual, and linguistic factors. This account has the clear advantage of unifying a seemingly very diverse set of language contact phenomena using a limited set of principles. One such phenomenon is CROSS-LINGUISTIC STRUCTURAL PRIMING, the tendency of bilingual speakers to copy grammatical structures from a language recently used to another language (e.g., Hartsuiker, Pickering & Veltkamp, 2004), which Muysken considers an example of "bilingual interference".[1] In this domain, I will explore how these strategies can be realized in terms of a psycholinguistic processing model, and whether these strategies can be reduced to even more basic principles.

According to Muysken, the four strategies play out as follows in the domain of cross-linguistic priming: (A) L1 patterns influence L2, so that speakers are more likely to produce a particular structure in their L2 when they are primed with that structure in their L1 (e.g., Hartsuiker et al., 2004). (B) L2 patterns influence L1. Indeed, several studies have demonstrated structural priming from L2 to L1 (e.g., Kantola & Van Gompel, 2011; Schoonbaert, Hartsuiker & Pickering, 2007). (C) Searching for correspondences. Several studies have shown cross-linguistic priming effects of structures that are NOT the same across languages (e.g., different in word order). Bernolet, Hartsuiker and Pickering (2009) observed priming between Dutch verb-final and English by-phrase final passives, despite the difference in word order. Note that this differs from the earlier conclusion of Bernolet, Hartsuiker and Pickering (2007) that priming REQUIRES word order overlap. Bernolet, Hartsuiker & Pickering (in press) found priming between Dutch and English genitives, despite differences in their realization (a gender-marked pronoun vs. a suffix; see below). (D) Universal principles. As mentioned in the target article, Vasilyeva, Waterfall, Gámez, Gómez, Bowers and Shimpi (2010) found cross-linguistic priming from Spanish to English but not the other way around, and attribute this to a universal principle (markedness).

The structural priming literature provides numerous examples of each of the four strategies, but how can one characterize such strategies at the level of the PROCESSING SYSTEM? I will argue that these strategies fall out fairly naturally from existing processing models. My starting point is Hartsuiker et al.'s (2004) processing model (Figure 1), which is a bilingual extension of Pickering and Branigan's (1998) model of the representation of verbs in the monolingual lexicon.[2] Hartsuiker et al.'s model assumes layers of representation for lexical concepts (e.g., HIT [X, Y]) and for words (e.g., *to hit*). Each word is connected to a unit denoting its grammatical class (e.g., verb) and to so-called "combinatorial" units denoting the syntactic combinations the word can take part in (e.g., passive or active transitive). If the speaker is a Dutch–English bilingual, the model further contains Dutch words (e.g., *slaan* "to hit") and language-specific combinatorial units (e.g., for passives that place the verb after the by-phrase). These language-specific units are only connected to words from the languages that allow these constructions, in this case only the Dutch word units. However, units for constructions that are possible in both languages (e.g., passives with the by-phrase at the end) are connected to words from both languages. Finally, all words from each language are connected to their corresponding "language-node" (e.g., Dijkstra & Van Heuven, 2002) for Dutch or English, indicated by a Dutch and a British flag in Figure 1. Thus, the language(s) to which a structure belongs follows from the language(s) of the words it connects to. Importantly, whenever a structure is similar enough in each language, this similarity is captured in the form of a language-independent combinatorial node that is connected to words from both languages.

[1] I find it odd to call this "interference", which is often taken to mean that one cognitive process hinders another one. Structural priming does NOT typically hinder the speaker and can even help brain-damaged patients to produce complex syntax (Hartsuiker & Kolk, 1998).

[2] There are alternative accounts of structural priming (e.g., Chang, Dell & Bock, 2006) based on error-based implicit learning, but these have not been worked out for bilingualism.

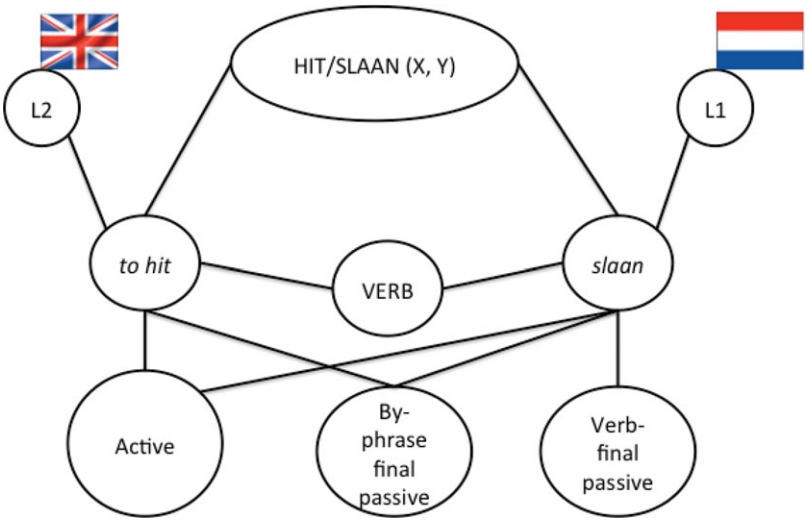

Figure 1. (Colour online) Fragment of Hartsuiker et al.'s (2004) model of lexical-syntactic representations in bilingualism.

How can Muysken's four types of cross-linguistic interference be captured in this shared-syntax model?

(A) PRIMING FROM L1 TO L2 takes place because of residual activation of a language-independent combinatorial node (e.g., for the passive) as a result of processing the relevant structure in L1. When the speaker next needs to choose between producing an active or a passive in L2, residual activation of the language-independent passive unit improves the passive's chance of selection. It is noteworthy that in experiments the speaker is explicitly instructed to use L2. One can assume that both such an extrinsic instruction and an intrinsic intention to use a particular language can be captured by assuming that the L2 language node exerts top-down control on word selection (Cai, Pickering, Yan & Branigan, 2011).

(B) PRIMING FROM L2 TO L1. Priming in this direction also takes place because of residual activation of a language-independent combinatorial unit. It is possible that the magnitude of L2 to L1 priming differs from that of L1 to L2, for instance because of markedness of the structure in the response language.

(C) SEARCHING CORRESPONDENCES. There are two mechanisms promoting structural priming between similar (but not identical) structures. First, priming does not only take place at the level of combinatorial units, but also at a level concerned with thematic role ordering (e.g., Bernolet et al., 2009). On such accounts, structural priming is possible between structures with different word order because of similarities at such higher levels.

Second, Bernolet et al. (in press) recently found evidence for generalization across similar structures in the course of second language acquisition. L2 learners with varying levels of proficiency took part in a priming study with (Flemish) Dutch and English genitives. Both languages have an "of" construction ("the hat of the nun") but have slightly different "-'s" constructions (*the nun's hat*; *de non haar hoed* lit. "the nun her hat"). If the two slightly different "-'s" constructions use a single combinatorial node, then one would expect cross-linguistic priming involving these structures. But interestingly, Bernolet et al. (in press) found that the priming effect increased linearly with L2 proficiency, with the least proficient participants hardly showing any priming at all.[3] This suggests that L2 learners start with separate combinatorial nodes for their second language and only "collapse" them with the L1 representation after sufficient L2 experience. Thus, the shared syntax view advocated by Hartsuiker et al. (2004) is an end point in an L2 learning trajectory, with language-specific syntax at earlier points.

(D) UNIVERSAL PRINCIPLES. Muysken mentions markedness as one universal that determines the feasibility of using a particular structure (e.g., a Spanish passive). Psycholinguistic studies have identified many other influences on structural choices, such as conceptual accessibility (e.g., Bock, 1986), attention (e.g., Tomlin, 1995), and spatial collocation of objects in visual scenes (e.g., Griffin & Bock, 2000). Such effects cannot be easily captured in Hartsuiker et al.'s (2004) model, except for (trivially) assuming that particular combinatorial units (e.g., for passive) have a higher activation in particular contexts (e.g., animate patient). Note that

[3] For simplicity's sake, several further conditions of that study are not discussed here.

https://doi.org/10.1017/S1366728913000242 Published online by Cambridge University Press

Bock and Levelt (1994) presented a model that does account for such findings (but which is beyond the scope of this comment).

Summarizing, in cross-linguistic priming, each strategy can be captured by the behavior of a processing model, that has the properties that (i) speakers strive towards an economy of representation, so that in the course of second language acquisition, they will more and more share what is similar or identical across languages; (ii) speakers in a conversation align their grammatical (and lexical and phonological) choices, which is a natural consequence of priming (Pickering & Garrod, 2004); (iii) speakers use language nodes to control the target language.

In fact, the principles of alignment and syntactic sharing allow us to derive predictions about other language contact phenomena. One prediction is based on the fact that English passives have *by*-phrase–final word order, German passives have verb-final order, and Dutch has both orders. A Dutch L1 speaker whose most frequently used L2 is English will encounter *by*-phrase–final passives relatively often (all the passives heard in English), but a speaker whose most frequent L2 is German, will encounter verb-final passives more often (all the passives heard in German). Because the L2 representations are shared with their Dutch counterparts (Figure 1), and because of systematic priming of particular structures during contact with L2, it follows that the word order most often encountered in L2 should be relatively frequent IN THE L1. To the extent that groups of people (e.g., in particular regions) have a similar profile of L1 and L2s, such mechanisms at the individual level can then affect distributional properties (e.g., frequency of each type of passive) at the level of groups of speakers. An interesting prospect, then, is that basic principles from one level of description (the individual speaker) can explain outcomes at a higher level of description (a group of speakers).

References

Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (2007). Shared syntactic representations in bilinguals: Evidence for the role of word-order repetition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33,* 931–949.

Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (2009). Persistence of emphasis in language production: A cross-linguistic approach. *Cognition, 112,* 300–317.

Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (in press). From language-specific to shared syntactic representations: The influence of second language proficiency on syntactic sharing in bilinguals. *Cognition*.

Bock, J. K. (1986). Meaning, sound, and syntax: Lexical priming in sentence production. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 12,* 575–586.

Bock, J. K., & Levelt, W. J. (1994). Language production. Grammatical encoding. In M. A. Gernsbacher (ed.), *Handbook of psycholinguistics*, pp. 945–984. San Diego, CA: Academic Press.

Cai, Z. G., Pickering, M. J., Yan, H., & Branigan, H. P. (2011). Lexical and syntactic representations in closely related languages: Evidence from Cantonese–Mandarin bilinguals. *Journal of Memory and Language, 65,* 431–445.

Chang, F., Dell, G. S., & Bock, K. (2006). Becoming syntactic. *Psychological Review, 113,* 234–272.

Dijkstra, T., & Van Heuven, W. J. B. (2002). The architecture of the bilingual word recognition system: From identification to decision. *Bilingualism: Language and Cognition, 5,* 175–197.

Griffin, Z. M., & Bock, K. (2000). What the eyes say about speaking. *Psychological Science, 11,* 274–279.

Hartsuiker, R. J., & Kolk, H. H. J. (1998). Syntactic facilitation in agrammatic sentence production. *Brain and Language, 62,* 221–254.

Hartsuiker, R. J., Pickering, M. J., & Veltkamp, E. (2004). Is syntax separate or shared between languages? Cross-linguistic syntactic priming in Spanish–English bilinguals. *Psychological Science, 15,* 409–414.

Kantola, L., & Van Gompel, R. G. P. (2011). Between- and within-language priming is the same: Evidence for shared bilingual syntactic representations. *Memory & Cognition, 39,* 276–290.

Pickering, M. J., & Branigan, H. P. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language, 39,* 633–651.

Pickering, M. J., & Garrod, S. (2004). Towards a mechanistic theory of dialogue. *Behavioral and Brain Sciences, 27,* 169–226.

Schoonbaert, S., Hartsuiker, R. J., & Pickering, M. J. (2007). The representation of lexical and syntactic information in bilinguals: Evidence from syntactic priming. *Journal of Memory and Language, 56,* 153–171.

Tomlin, R. S. (1995). Focal attention, voice, and word order: An experimental, cross-linguistic study. In P. Downing & M. Noonan (eds.), *Word order in discourse*, pp. 517–554. Amsterdam: John Benjamins.

Vasilyeva, M., Waterfall, H., Gámez, P. B., Gómez, L. E., Bowers, E., & Shimpi, P. (2010). Cross-linguistic syntactic priming in bilingual children. *Journal of Child Language, 37,* 1047–1064.

https://doi.org/10.1017/S1366728913000242 Published online by Cambridge University Press