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Is susceptibility to cross-language interference domain specific?



Anat Prior*, Tamar Degani, Sehrab Awawdy, Rana Yassin, Nachshon Korem

University of Haifa, Israel

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ABSTRACT

The ability to overcome interference from the first-language (L1) is a source of variability in second language (L2) achievement, which has to date been explored mainly in same-script bilinguals. Such interference management, and bilingual language control more generally, have recently been linked to domain general executive functions (EF). In the current study, we examined L2 proficiency and executive functions as possible predictors of susceptibility to L1 interference during L2 processing, in bilinguals whose languages do not share an orthographic system. Seventy Arabic-Hebrew bilingual university students performed two tasks indexing cross-language interference (from L1 to L2). Lexical interference was assessed using a cross-modal semantic similarity judgment task in Hebrew, with false-cognates as critical items. Syntactic interference was assessed using a self-paced reading paradigm and grammaticality judgments on Hebrew sentences whose syntactic structures differed from those of Arabic. EFs were examined using spatial and numerical Stroop tasks, to index inhibitory control, and a task switching paradigm, to index shifting abilities. We found significant L1 interference across the lexical and syntactic domains, even in proficient different-script bilinguals. However, these interference effects were not correlated, and neither type of interference was related to domain general EF abilities. Finally, offline susceptibility to syntactic interference, but not lexical interference, was reduced with greater L2 proficiency. These results suggest at least partially independent mechanisms for managing interference in the two language domains, and raise questions regarding the degree to which domain general control abilities are recruited for managing L1 interference.

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1. Introduction

The two languages of bilingual speakers are simultaneously active, requiring bilinguals to continuously manage potential interference from the non-target language (Kroll, Bobb, & Hoshino, 2014). Such interference is pervasive, and has been documented in language production (Hermans, Bongaerts, De Bot, & Schreuder, 1998) and comprehension (Dijkstra & Van Heuven, 2002) for single words and in sentence context (Libben & Titone, 2009). Critically, most previous research examined bilinguals who use two languages that share the Roman alphabet, such as English-Dutch or Catalan-Spanish. The extent to which such interference is characteristic of bilinguals who speak languages which differ in orthography is less well established (Giezen, Blumenfeld, Shook, Marian, & Emmorey, 2015; Hoshino & Kroll, 2008; Morford, Kroll, Piñar, & Wilkinson, 2014; Sunderman & Priya, 2012). Thus, the first goal of the present study is to examine to

what degree cross-language interference is evident in proficient bilinguals who use different-script languages (Arabic-Hebrew).

Further, interference from the first-language (L1) while processing the second-language (L2) is evident in different aspects of language processing, including accent, lexicon and grammar (MacWhinney, 2005), but these domains have mostly been investigated independently in the past. In the current study we examine the ability of individual bilinguals to manage interference in both lexical and grammatical processing. Our second goal is therefore to adopt an individual differences approach to probe to what extent interference management is a generalized ability of the linguistic system. Namely, is interference management in the lexical domain tied to interference management in the grammatical domain? Further, we test whether greater L2 proficiency is associated with improved interference management across these two language domains.

Finally, cross-language interference management has recently been linked to domain-general executive function abilities (Blumenfeld & Marian, 2013; Pivneva, Mercier, & Titone, 2014). Our third goal, therefore, is to examine whether individual differ-

* Corresponding author at: Faculty of Education, University of Haifa, Mount Carmel, Haifa, Israel.

E-mail address: aprior@edu.haifa.ac.il (A. Prior).

ences in interference management are linked to individual differences in domain general control mechanisms.

1.1. Cross-language interference

1.1.1. Lexical domain

To examine cross-language interference, studies typically capitalize on words that might create competition, such as false-cognates (also called interlingual homographs or homophones) which overlap in form but not in meaning across languages (Dijkstra, 2005). For same-script bilinguals, false-cognates typically share both orthographic and phonological form. For different-script bilinguals, in contrast, only the phonological form is shared across the two languages, arguably creating less potential for cross-language interference. Most previous research examining cross-language interference has focused on same-script bilinguals, and provided evidence of activation of the non-target meaning of false-cognates (for a review, see Degani & Tokowicz, 2010). However, much less is known regarding cross-language interference in processing false-cognates in the two languages of different-script bilinguals.

In same-script bilinguals, presenting false-cognates in writing allows for bottom-up meaning activation in both languages (but see e.g., Friesen & Jared, 2012). To create a similar situation for different-script bilinguals, in the current study false-cognates were presented aurally, thus providing bottom-up activation for both languages. We probed cross-language interference utilizing a semantic decision task, in which the activation of the non-target language (L1) unequivocally interferes with task performance (in the L2). In a recent study, Friesen and Jared (2012) showed that the meaning of interlingual homophones (overlapping in phonology and not orthography) in the non-target language interfered with bilinguals' semantic category decision. Specifically, French-English bilinguals were more likely to erroneously verify category membership of an interlingual homophone visually presented in English (shoe as a vegetable) when the French meaning of the word belonged to the probed category ("chou", which shares pronunciation with "shoe", means cabbage in French). We are unaware of parallel research in different-script bilinguals demonstrating semantic interference as a result of meaning activation of false-cognates in the non-target language (for phonological effects in masked priming in the absence of orthographic overlap see Kim & Davis, 2003, for Korean-English; Dimitropoulou, Duñabeitia, & Carreiras, 2011, for Greek and Spanish; Nakayama, Verdonchot, Sears, & Lupker, 2014, for Japanese English).

There is indirect evidence supporting the notion of language non-selective semantic activation via phonology. Lagrou, Hartsuiker, and Duyck (2013) demonstrated that aurally presented interlingual homophones activated their meanings in both languages of Dutch-English bilinguals. This cross-language activation was modulated but not eliminated by semantic constraint and speaker accent. In different-script bilinguals, Marian and Spivey (2003b) demonstrated that in a single language context, phonological input activated concepts across the two languages of Russian-English bilinguals, using a visual world paradigm (see also Marian & Spivey, 2003a). Thus, phonological input in one language likely leads to non-selective activation of lexical and semantic information in both languages of different-script bilinguals.

In the current study we examine this issue using a cross-modal semantic decision task on L2 word pairs. In critical trials, the aurally presented first word is a false-cognate between L1 and L2 of different-script Arabic-Hebrew bilinguals, and the second word is related to the meaning of the false-cognate in the non-target language. Thus, we examine whether the L1 meaning of a false-cognate presented aurally in the L2 can interfere with semantic decisions in the L2.

1.1.2. Grammatical domain

Cross-language interference in the grammatical domain has been investigated by examining how bilinguals process structures that are similar or different across the two languages. Interference is presumed when cross-language differences hinder processing (e.g. Nitschke, Kidd, & Serratrice, 2010; for a review see Kotz, 2010). For example, in an ERP grammaticality judgment task, Tokowicz and MacWhinney (2005) showed that L2 learners of Spanish were more error prone on grammatical structures not shared with their L1 English (unique to the L2) than on structures that exist in both languages. In the same study, ERP data showed greater sensitivity to violations that occurred in structures that were similar across the L1 and the L2 than in structures that differed cross-linguistically. Sabourin and Stowe (2008) investigated the sensitivity of L2 learners of Dutch to grammatical gender violations in Dutch, using ERPs. They found that L1 speakers of German, which has a similar grammatical gender system to Dutch, processed violations in a manner similar to that of native Dutch speakers, whereas L1 speakers of Romance languages, which differ in the grammatical gender system, did not. Further, Dussias (2003) found that English-Spanish bilinguals demonstrated syntactic parsing preferences in the L2 Spanish that were similar to the preferences prevalent in English, the L1, supporting the notion of transfer in the syntactic domain (MacWhinney, 2005). Similarly, Roberts, Gullberg, and Indefrey (2008) found evidence supporting the influence of L1 Turkish on pronoun resolution in L2 Dutch.

Tokowicz and Warren (2010) examined a similar question using a self-paced reading task. They found that English speaking beginning adult L2 learners of Spanish showed online sensitivity to grammatical violations in the L2 only in structures that are similar to those of the L1, but not in L2-unique structures. In contrast, in a second sentence reading study, Tuninetti, Warren, and Tokowicz (2014) reported no evidence for cross-language influence because participants' performance in English (L2) was not influenced by the status of the violation in their L1 (Arabic or Chinese). Notably, participants in the Tuninetti et al. (2014) study were more advanced L2 learners than participants in Tokowicz and Warren (2010), and also had L1s that differed in script from the tested L2. Thus, proficiency and/or script overlap might have led to the observed differences in performance. In addition, the later study investigated a highly salient grammatical structure (word order), and the L2 participants were very accurate in identifying violations, possibly masking L1 influences on performance.

In the current study we employ a similar paradigm to investigate cross-language influence in grammatical processing, using a self-paced reading task, with proficient bilinguals of different-script languages. Participants read sentences in the L2, half of which included grammatical structures that are similar across L1 and L2, and others with grammatical structures that differ across the two languages. Similar-structure and different-structure sentences could be either grammatically correct or include a grammatical violation. We employed a wide variety of grammatical violations in the L2, not all of which are highly salient, because less salient structures might be more sensitive to interference from the L1, especially in proficient bilinguals.

As detailed above, cross-language interference has been less investigated in different-script bilinguals. Moreover, findings from same-script bilinguals might not necessarily generalize to different-script bilinguals for two reasons. First, differences in script could theoretically reduce cross-language activation when processing written words by cuing bilinguals to the target language (Gollan, Forster, & Frost, 1997, but see Thierry & Wu, 2007). Second, even when processing spoken language, cross-language activation may vary with script overlap because the language system of different-script bilinguals may have evolved slightly differently (Sunderman & Priya, 2012), with greater sepa-

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