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Beyond Transfer: Language Processing in Bilinguals is Shaped by Competition and Regulation

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Abstract

In the history of psycholinguistics, there are traditional accounts that have been told about language learning and processing. These accounts revolve around the constraints imposed by the age of language learning and by universal principles that are assumed to be natively given. The contribution of Brian MacWhinney and his collaborators has been to challenge the fundamental principles on which these traditional accounts rest. By taking an emergentist approach that assumes that variation in learning will better inform foundational mechanisms than fixed constraints, they shifted the focus from language development in monolingual speakers to a broader consideration of cross-linguistic and cross-language contexts. We have been beneficiaries of this shift. In this paper, we describe research on bilingualism that examines two key mechanisms within the MacWhinney framework: Competition and transfer. We argue that what we have learned about bilingual language processing supports the central role of competition and its broad consequences. We claim that one of these consequences has been to reframe questions of transfer to consider the requirement that bilingual speakers regulate their two languages. The dynamic nature of cross-language interactions across languages and across varied language environments reflects the deep plasticity associated with language and its cognitive and neural bases.

Keywords: *Bilingualism, Cross-Language Dynamics, Language Regulation, Language Processing*

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¹Introduction

In the last 30 years, there has been a radical shift of focus in studies of language learning and language processing to recognize that most speakers in the world use two or more languages. The resulting scholarship is flourishing, exploiting a broad range of tools that include experimentation, computational modeling, and neuroscience and bridging linguistics across the allied cognitive sciences. Brian MacWhinney's research program has been central to the development of this effort. By embracing an emergentist perspective that enables domain-general cognition to act in the service of language rather than as an intruder and by recognizing the plasticity of language systems and the variation in language users, his work has enabled lines of inquiry that require that traditional accounts of language learning and language use be revised.

In this paper, we bring together two research programs on bilingualism that have been supported by this approach. One of us is trained as a cognitive psychologist and the other as a linguist. In research that we have conducted independently and collaboratively, we have come to see the importance of the competition that reflects the dynamics of a dual language user's two languages. But the course and consequence of cross-language competition varies across individual experience and across the opportunities and obstacles that emerge within environments for language learning and language use. In what follows, we briefly review the research on language processing in bilinguals that reveals the dynamics of competition and the resulting openness of the language system itself. That openness reflects the engagement of cognitive resources during language processing but also the ways that the bilingual speaker's two languages change with respect to one another. While the research that we review provides strong support for the principles of competition, it also suggests that the notion of cross-language transfer as it was initially conceptualized, requires modification. Not only does the native or first language, L1, transfer to the second or less dominant language, L2, but both languages come to influence each other from the start of learning and from the first moments of language processing in proficient speakers. As a result, there is a reorganization that affects both languages, their relationship, and the ways that domain-generation cognitive resources are engaged.

How do the bilingual's two languages come to have this bidirectional influence? One of the most profound observations about bilingualism is that both languages are continually active, even when only one language is required and regardless of modality and form similarity across the two languages (e.g., Dijkstra et al., 1998; Marian & Spivey, 2003; Morford et al., 2011; Thierry & Wu, 2007). The parallel activation of the two languages may seem counterintuitive because bilinguals are rarely aware of the language not in use and indeed make few errors of speaking the unintended language (e.g., Gollan et al., 2011). Despite this phenomenology, there is overwhelming evidence that when bilinguals read, listen, or speak one language alone, the other language is active.² The implication is that to become a dual

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² The evidence for nonselective access to both of the bilingual's languages has been reviewed extensively (e.g., Bultena & Dijkstra, in press; Dijkstra & Van Heuven, 2018; Kroll et al., 2014; Kroll et al., 2015; Kroll, 2017; Kroll et al., 2022; Kroll, 2024)

language speaker, there is a continual requirement to navigate the joint activation of the two languages, a process that also requires that individuals acquire the ability to regulate or control the use of each language (e.g., Declerck & Koch, 2023; Green, 1998). We return to this process in the review that follows to consider how this might happen and how the contexts in which bilingual speakers use each language may determine how easily each of the two languages can be used. The point that is critical in thinking about transfer processes is to recognize that this cross-language exchange is dynamic, occurring continuously as each language is used and when bilingual speakers switch between the two languages. The observation of ongoing bidirectional influence potentially changes the notion of transfer as a developmental process that emerges over time as learners acquire new information about the L2 and its relation to the L1, to one that imposes the need for adjustment or regulation in real time. A key feature of the Competition Model (Bates & MacWhinney, 1989; MacWhinney, 1987, 2022) is sensitivity to predictive cues that differentiate the grammatical features associated with each language. We later discuss how we might think about cues more generally because the evidence on the parallel activity of bilingual language processing suggests that not all cues are necessarily functional in providing a means to identify the language in use and to reduce the activation of the nontarget language. The research that we review on lexical and syntactic processing illustrates the consequences of this dynamic interchange across the bilingual's two languages. Crucially, the "in the moment" processes that appear to characterize bilingual language processing and that come to create continual modulation of the two languages, are not the only time-sensitive factors that influence language outcomes. While debates around the importance of age of acquisition persist (e.g., Caldwell & MacWhinney, 2023), there has also been interest in understanding how other features of early life language experience may continue to influence language learning and to shape language use across the lifespan. These features include, among others, the language in which individuals first acquire literacy skills (e.g., Bice & Kroll, 2021), whether they were language brokers as children (e.g., López, 2020), and whether they overheard of a language in childhood that they never learned to speak (e.g., Au et al., 2002). Although studies on the consequences of early life language experience that may endure are only beginning to emerge, the evidence suggests that adult language processing reflects a complex mix of immediate demands placed by language and by the environmental contexts in which language processes occur (e.g., Green & Abutalebi, 2013) and by language experience.

In what follows, we briefly overview what we have learned about lexical and syntactic processing in bilingual speakers and then consider some of the broader implications that we think owe a debt of inspiration from Brian MacWhinney's research program. Our effort will inevitably be far from comprehensive or complete but will hopefully point to directions of promise for future research.

The Dynamics of Lexical Processing in Bilinguals

In this section, we consider the evidence that reveals the competitive nature of bilingual lexical access and the mechanisms that have been proposed to resolve competition to enable proficient language use. We have reviewed this work in detail in other publications (e.g., Kroll, 2017; Kroll et al., 2022; Kroll, 2024; Kroll, in press) so we focus here on the primary discoveries and their relation to issues of competition and transfer. Initial models of bilingual lexical access assumed that there was transfer from the native or dominant L1 to the L2. Transfer was

operationalized in two different ways. The Revised Hierarchical Model (Kroll & Stewart, 1994) proposed that the asymmetry in the dominance of the bilingual's two languages for adult L2 learners was responsible for a pattern in which the less dominant L2 relied upon the more dominant L1. According to the model, the L1 is privileged with respect to its ability to access meaning relative to L2. That privilege then becomes a source of mediation for the weaker L2. Kroll and Stewart tested this claim by having bilinguals translate from their L1 to L2, in the forward direction of translation, or from their L2 to L1, in the backward direction of translation. They found that there was indeed an asymmetry, with translation in the forward direction taking significantly longer than translation in the backward direction. Critically, only forward translation was sensitive to the semantics of the information being translated, suggesting that translation in the backward direction, from L2 to L1, relied on direct access to the L1. Subsequent research has supported the hypothesis that the L1 translation may play an important role when adults learners acquire a second language although it appears to remain available, at least implicitly, when proficient speakers process words in the L2 (e.g., Guo et al., 2012; Ferré et al., 2006; Morford et al., 2011; Sunderman & Kroll, 2006; Talamas et al., 1999; Thierry & Wu, 2007).³

A second form of transfer can be seen in the continual cross-language interactions between the two languages. As noted earlier, the persistent activation of the language not in use has been documented in over hundreds of studies reported in the last 30 years. When bilinguals read or listen to words in one language only, the influence of the other language is evident. The initial demonstrations of transfer at the level of lexical form (e.g., Dijkstra et al., 1998; Marian & Spivey, 2003) exploited the presence of ambiguity across shared lexical features (e.g., orthography or phonology) in different languages. That ambiguity was shown to produce facilitation in word recognition tasks when form and meaning converge, in the case of cognates, translations that share the same or similar form (e.g., the word "hotel" in Dutch and English) or interference when words conflict, in the case of interlingual homographs or false friends (e.g., the word "room" that means cream in Dutch). Critically, the consequences of lexical-level ambiguity have been shown to persist even when those words appear in sentence context (e.g., Libben & Titone, 2009; Schwartz & Kroll, 2006), suggesting that these well-documented cross-language interactions are not the result of presenting words in an artificial laboratory task. They can also be seen for translation equivalents that share meaning but not lexical form (e.g., Morford et al., 2011; Thierry & Wu, 2007) and they are evident even when bilinguals are planning speech in one language alone (e.g., Costa et al., 2000; Kroll et al., 2006; Strijkers et al., 2010).

If transfer at the lexical level were only a matter of applying experience with the native or more dominant L1 to the weaker or less dominant L2, then one might expect to see robust cross-language lexical interactions from L1 to L2 but not the reverse. Contrary to this prediction, we see effects of the L2 on the L1 even when adult learners are at the earliest stages of acquiring an L2 (e.g., Bice & Kroll, 2015) as well as for highly proficient speakers (e.g., Schwartz et al., 2007; Van Hell & Dijkstra, 2002). The entire language system appears to adapt to the presence of the L2 in a manner that creates multiple sources of cross-language transfer.

³ For additional discussion and debate on the role of the translation equivalent see Brysbaert and Duyck (2010) and Kroll et al. (2010).

The competitive dynamics of these interactions has been shown to create change even in the native or more dominant L1 (and see Chang, 2012, for evidence on the effects of L2 on L1 at the phonetic level). These changes have also been documented in studies that have adopted neuroscience methods (e.g., Midgley et al., 2011; Van Heuven et al., 2008; and see Schwieter & Festman, 2023 for a recent review of evidence on bilingualism and the brain).

The research on cross-language interactions at the lexical level reveals pervasive competition that characterizes bilingual language experience. But how is this competition resolved to enable fluent use of each language? We argue here that bilinguals acquire the regulatory skills to rapidly adjust the state of play across the two languages and across the contexts in which they find themselves using one language alone or both. A model of inhibitory control by Green (1998) and a seminal study by Meuter and Allport (1999) on language switching gave rise to a body of research that has continued to examine the mechanisms that bilinguals use to effectively resolve cross-language competition. Meuter and Allport examined the processing costs following the switch of language in a simple cued lexical production experiment. They found that proficient bilingual speakers were slower to produce words in each language following a switch from the other language. But there was an asymmetry. The switch costs were differential for the two languages, with larger switch costs in L1 following L2 than in L2 following L1. At first that may appear counterintuitive if we assume that L1 is the more dominant and active language. But by the logic of Green's inhibitory control model, the more dominant language is hypothesized to be inhibited to enable speech planning and production in the less dominant language. If the two languages are always active, then the regulation of the more dominant L1 may be required to enable the L2 to be spoken at all.

In the time since the initial work on inhibitory control appeared, there has been an extensive body of research that asks how bilinguals acquire the ability to regulate the two languages and how that process draws on domain-general cognitive resources. Bilingual speakers are not only slower to speak L1 following L2 in lexical switching tasks that require trial-to-trial adjustments, but they are also slower to speak L1 following L2 when they speak the L2 for an extended period and then speak L1 for an extended period of time (e.g., Casado et al., 2022; Van Assche et al., 2013). The same costs to L1 can be seen in brain activity (e.g., Guo et al., 2011; Misra et al., 2012). And in a phenomenon that may seem most counterintuitive of all, highly L1 dominant bilinguals reveal a "dominance reversal" when they perform lexical production tasks in a mixed context in which there is uncertainty about language of naming from one spoken utterance to the next (e.g., Declerck et al., 2020). An early conjecture was that these control mechanisms might be more important at early stages of acquiring L2 proficiency (e.g., Costa & Santesteban, 2004) but we now know that this is not a matter of acquiring control early in L2 learning; the most proficient bilinguals rely on these skills to adapt dynamically to the regulatory needs of specific communicative contexts.

How does language regulation differ from domain-general cognitive control? We and others have argued that the regulation of the two languages engages a network of cognitive control but not in a manner that necessarily maps identically to the ways that executive control tasks reflect that network (e.g., Guo & Ma, 2023; Kroll et al., 2022). In both cases, there may be resolution of competition and conflict, but there is not a one-to-one relationship. Moreover, the process of resolving cross-language competition may depend on the demands of the environmental context and individual differences in bilingual language experience. Green and

Abutalebi (2013) argued for the adaptive control hypothesis such that the recruitment of domain general cognitive resources depends on the way that the two languages are used in any given context. Some bilinguals code switch, a topic we consider in detail in the next section of this paper, and others do not. Some bilinguals live in an environment in which most people with whom they interact are similarly bilingual but others live in contexts in which they may encounter few others who speak one of their two languages. Some bilinguals are immersed in their L1 or native language context, but others are immersed in the L2, with potentially fewer opportunities to use the L1. Which of these features matters? We are at a moment in the research program of just beginning to identify the relative contribution of each of these scenarios.

An important insight in the recent studies of bilingual lexical processing, following the logic of adaptive control proposed by Green and Abutalebi (2013), is that all speakers are immersed. We typically assume that immersion means L2 immersion but given the variation in the contexts in which bilinguals use the two languages, a richer characterization is required to acknowledge the distinctive features across environments and the impact they have on bilingual experience (e.g., Beatty-Martínez & Titone, 2021). In an early study of the consequences of L2 immersion for lexical processing, Linck et al. (2009) found that there was inhibition of the L1 when learners were immersed in the L2 context. But immersion is more than simple suppression. Beatty-Martínez, Navarro-Torres, Dussias, Bajo, et al. (2020) compared three groups of highly proficient Spanish-English bilinguals who lived in different locations that created distinct interactional contexts for the use of the two languages. One group used the languages separately, another used the languages interchangeably, and a third group was immersed in an L2 English setting in which few others spoke the L1. Beatty-Martínez et al. asked how cognitive control, using the AX-Continuous Performance Task (e.g., Braver, 2012), might differentially be engaged during performance on a lexical picture naming across these three contexts. The striking result was for the Spanish-English bilinguals living in a predominantly L2 English environment. Those speakers appeared to use proactive control mechanisms to maintain their use of Spanish in an environment that afforded few opportunities to speak Spanish with others. A subsequent study by Zhang et al. (2021), using the AX-CPT and a language switching paradigm, compared Mandarin-English speakers in China and in the US. Like Beatty-Martínez et al., they found that immersion in the L2 was associated with higher proactive cognitive control processes and that proactive control was coupled with increased inhibition of the L1 in the switching task. The implication is that even similarly proficient L2 speakers vary in how they recruit cognitive control and how they regulate each of their two languages as a function of the opportunities to speak each language. Other studies have shown that diversity of the social networks in which bilinguals live and work have a profound influence on language performance and on the recruitment of cognitive control (e.g., Gullifer & Titone, 2020; Gullifer et al., 2018).

In this brief review of research on bilingual lexical processing we have attempted to show that there is a high level of competition across the bilingual's two languages that is bidirectional, with each language coming to influence the other and with the modulation of that processes open to the influence of the environments in which bilinguals find themselves. While transfer from the native or dominant language is certainly present during initial L2 learning, it does not diminish as individuals become proficient speakers of the L2. To the contrary, it gives

rise to a language system in which there is adaptation to the presence of the two languages via a mechanism of regulation, drawing on domain-general cognitive resources and shaping both languages as a result. Some bilinguals may habituate to a situation that is relatively consistent over time whereas others may find themselves in a continually changing context that requires regulatory adjustment. In the next section, we consider how these cross-language interactions are manifest at the level of syntactic processing and how language regulation may be crucial in understanding the ability of bilingual speakers to code switch with one another.

Cross-Linguistic Interactions during Syntactic Processing in Bilinguals

In this next section, we review recent contributions to the study of bilingual sentence processing that will serve to illustrate how exposure to an L2, even for a brief period, can influence syntactic processing in the native language. The influence of the native language system on the acquisition and processing of a second language has long been noted (Bates & MacWhinney, 1982; Corder, 1981; Gass & Selinker, 1994), but the reverse has not been recognized until relatively recently. Although more research has examined bilingual language interactions for words than for sentence, the available evidence converges on the finding that the bilingual's two languages are open to one another at every level of representation. These results challenge the interpretation of a critical period for syntactic learning and demonstrate that the native language adapts flexibly to the linguistic environments and the cultural contexts in which bilinguals use their two languages (Liu et al., 2021; Pot et al., 2019). The evidence now shows that variations in language dominance and language use prompt system alterations—some subtle, some significant, even when individuals have acquired high proficiency in the second language (e.g., Gollan et al., 2011; Ivanova & Costa, 2008; Kasparian & Steinhauer, 2017; Runnqvist et al., 2013). Importantly, we view the evidence on the weakening of the native language constraints (Kroll & Finger, 2023) not as indicative of signs of first language loss, but rather as evidence of the inherent flexibility of the linguistic system (Kroll et al., 2015).

Monolingual speakers also demonstrate linguistic adaptability, adjusting to and incorporating unfamiliar structures from different language varieties into their own language (e.g., Fraundorf & Jaeger, 2016), and exhibiting reduced sensitivity when exposed to ungrammatical structures for a brief period (Hopp, 2016). To take just one example, Wells et al. (2009) systematically manipulated input-driven experience in a self-paced reading task involving subject and object relative clauses. The constructions were selected based on the well-established finding that object relative clauses are typically more challenging to process than subject relative clauses. Participants were divided in two training groups. The 'non-exposed' group participated in three training sessions over the course of several weeks, during which they were exposed to various syntactic structures, none which included subject and object relatives. The 'exposed group' also completed three training sessions, but crucially they saw an equal number of subject and object relative clauses. At testing time, the exposed group took significantly less time to read object relative clauses compared to the non-exposed group, indicating a reduction in processing difficulty brought about by exposure to the less frequent structure.

Studies have also shown that monolingual language users are able to adapt rapidly to novel distributional patterns in the input within a single experimental session. Hopp (2016) tested whether grammatical gender assignment that deviated from native speaker expectations would

lead to erroneous gender-based prediction. German native-speaking participants saw four pictured objects on a computer screen. In the critical condition, three of the four objects were identical in color but were differentiated by their grammatical gender (i.e., feminine, masculine, and neuter). One of the objects served as the target and remaining two as competitors. The fourth object served as a distracter. Adult native German participants were assigned to one of two experimental groups. In one group, participants heard target sentences that followed German grammatical gender agreement rules. The second group was additionally exposed to a small number of filler trials in the final quartile of the experiment that contained gender agreement violations, effectively creating a context in which the distributional properties of the input were not helpful to generate predictions. The findings showed that the presence of this relatively small number of erroneous tokens in the experimental session attenuated participants' sensitivity to grammatical gender as a cue to predictive processing. In other words, the native listeners in the Hopp study showed evidence of strategic shifting by adapting their expectations away from the a priori more frequent morphosyntactic agreement patterns in German towards the more recent statistics and used these local statistics to guide their decisions about language comprehension in real time (see Fine et al., 2013 for related discussions). There is also evidence that when L1 has been reconfigured (as would be the case in individuals who use their two languages in their daily lives or individuals regarded as L1 attriters) even brief re-immersion in the first language can realign processing strategies towards monolingual-like preferences (Chamorro et al., 2016; Dussias et al., submitted).

The results with monolingual speakers suggest that their linguistic experiences affect processing, underscoring the key role of input and experience. While speakers of the same linguistic variety often converge on the information employed during sentence processing, there nonetheless exists great heterogeneity and variation in the way monolingual speakers approach sentence processing in their native language (Farmer et al., 2012). In what follows, we exemplify experience-based interactions while bilinguals process sentences in their two languages by reviewing two illustrative cases of native language reconfiguration, which we argue are natural extensions of a dynamic linguistic system.

In one of the earlier studies demonstrating the influence of the second language on the native language, Dussias and Sagarra (2007) examined whether extensive immersion in English would impact how Spanish-English bilinguals resolved syntactically ambiguous sentences in Spanish (their first language). English and Spanish differ in the interpretation of syntactically ambiguous relative clauses preceded by a complex noun phrase, exemplified in "Alguien disparó al hijo de la actriz que estaba en el balcón" ('Someone shot the son of the actress who was on the balcony'). When asked "¿Quién estaba en el balcón?" ('Who was on the balcony?'), Spanish speakers typically respond "el hijo" ('the son'), while English speakers respond "la actriz" ('the actress'). Dussias and Sagarra found that bilinguals immersed in an English-speaking environment favored the interpretation associated with English when reading in Spanish. This differed from a non-immersed, proficiency-matched bilingual group, who favored the expected Spanish-associated interpretation.

Additional evidence of changes to the L1 has been observed in bilinguals who regularly codeswitch between their two languages. In numerous bilingual communities, speakers frequently alternate between languages, sometimes within a single utterance. Far from being random and haphazard, codeswitching is systematic and requires highly skilled bilingual

ability, not only because bilinguals must be proficient in both languages to identify potential switch sites, but because they must be practiced at combining the languages to adapt strategies from each (Beatty-Martínez, Navarro-Torres, Dussias, 2020; Torres Cacoullos & Travis, 2015). Using Spanish and English as an illustrative example, a large body of corpus studies has shown an asymmetric use of Spanish determiners in mixed noun phrases. When determiners and nouns mix within a single noun phrase, Spanish-English bilinguals' preference is not only for combinations of Spanish determiners followed by English nouns (“el fork”/the_{MASC} fork) rather than, for example, English determiners followed Spanish nouns (“the tenerdor_{MASC}”/the fork) but, in particular, for Spanish determiners with *masculine* grammatical gender followed by English nouns regardless of the grammatical gender of the noun’s Spanish translation equivalent. Both “el fork” (‘fork’ = ‘tenedor_{MASC}’) and “el table” (‘table’ = ‘mesa_{FEM}’) are found in Spanish-English bilingual corpus. Mixed noun phrases involving Spanish feminine determiners followed by English nouns are infrequent and restricted to contexts in which the noun’s gender would be feminine if it were translated into Spanish. Hence, “la blender” (‘blender’ = ‘licuadora_{FEM}’) has been documented but “la shoe” (‘shoe’ = ‘zapato_{MASC}’) has not (see Jake et al. 2002; Otheguy & Lapidus, 2003; Trawick & Bero 2022; Valdés Kroff, 2016;).

Correspondingly, psycholinguistic studies have asked whether the asymmetry described above, which is amply attested in Spanish-English codeswitched naturalistic productions (e.g., Parafita Couto & Gullberg, 2017) modulates bilingual language comprehension such that feminine determiners would signal the upcoming presence of a feminine gender noun either in Spanish or in the English translation equivalent of the corresponding Spanish word, but masculine determiners would not. This was the central question of a lab-based study by Valdés Kroff et al. (2017). Specifically, the authors examined whether experience with determiner-noun asymmetric codeswitching patterns affected comprehension in such a way that masculine gender determiners would no longer exclusively signal the presence of masculine gender nouns either when bilinguals were in a codeswitching mode or in a Spanish mode.

To address this question, Spanish-English codeswitching bilinguals were shown visual scenes with two picturable objects while they listened to auditory instructions to click on one of the two objects. When the instructions were delivered in a code-switching mode, the bilinguals predictively processed English targets soon after hearing a feminine article, but when they heard a masculine article, they delayed processing until they heard the target noun onset. Strikingly, these were also the findings when the bilinguals heard Spanish-only instructions. These results suggest that the bilingual comprehension system adapted to the speakers' codeswitching experience, modulating sensitivity to grammatical gender as an anticipatory cue even when they were processing Spanish-only noun phrases. Despite potential limitations on cross-language interactions, these influences reflect a dynamic native language system responsive to bilingual language contact and usage patterns. This and other findings advocate for a research approach that thoroughly characterizes bilingual experience to better understand the influence of bilingualism on language and cognition (Kroll & Finger, 2023).

Although the results discussed above indicate that the bilinguals' two languages do not functionally behave like either native language of monolinguals (Grosjean, 1989), there may be limitations on the types of cross-language interactions in bilinguals. Ahn et al. (in press) compared the sentence processing and production of a group of Korean-immersed speakers in

Korea (with little English exposure) with Korean-immersed speakers in the US. The critical conditions included Korean sentences in two possible word orders: one that did not overlap with English (SOV – the canonical word order in Korean) and one that overlapped with English (SVO – a less preferred word order in Korean but the canonical word order in English). The key question was whether there would be an effect of English immersion on Korean manifested as a preference for the English SVO word order while processing Korean sentences. The results showed changes in the US Korean-immersed speakers but not as an L2 straightforward influence on L1 sentence processing and production, suggesting that perhaps the greater typological difference between Korean and English might modulate the influence of L2 on L1.

The studies examined in this section illustrate the influence of the second language on the first, collectively underscoring the permeability of the L1 linguistic systems, sometimes involving processing costs that initially slow down the native language or that make bilingual speakers less sensitive to features of the native language. These and many other studies (Fine & Jaeger, 2016; Kleinschmidt & Jaeger, 2015) demonstrate how linguistic experience modulates native language processing. These modulations may be short-term and adaptive in nature and may be driven by changes in an individual's expectations or predictions about upcoming input, which in turn affect how participants react to deviations from norms in the moment (Hopp, 2016). Modulations may also be the result of long-term, community-based norms (Valdés Kroff et al., 2017) that reflect at least some shift in the underlying representations, such that the new or unfamiliar structures become entrenched in the individual's linguistic system. Whatever the case, variability in language processing should be considered the norm, rather than the exception. The evidence presented here advocates for an approach that connects L2 language processing with language experience and basic cognitive principles that is more compatible with our current knowledge of the architectural underpinnings of the systems responsible for language acquisition and language processing, and that provides a more fruitful approach in future studies of bilingual syntactic processing.

In summary, in this section, we have examined recent advancements concerning the permeability of the native language system, primarily emphasizing sentence comprehension. Our goal has been to elucidate the perspective that changes to the native language signify the openness of the networks underpinning language knowledge and usage and are an inherent feature of the linguistic system's architecture. While the adaptability of the native system is observable in both monolingual and bilingual individuals, bilingual speakers serve as a "natural experiment." Changes to the native language, prompted by the exposure and contextual usage of a second language, occur organically when individuals engage with and utilize multiple languages. Moreover, recent methodological advances have furnished unique insights into the emerging inquiries briefly reviewed in this section. Stepping away from the specific experiments discussed, our review's overarching theme underscores the remarkable openness between the bilingual's two languages, characterized by persistent cross-language interactions spanning from word to sentence processing, and modifications to the native language that offer a framework to test assertions regarding the plasticity of cognitive and neural representations.

Conclusion


We have reviewed research on bilingual language processing that has transformed our understanding of how the bilingual's two languages come to live together in the same mind

and brain. The continual activation of the two languages creates a situation that is highly competitive. In the spirit of Brian MacWhinney's research program, there is competition everywhere we look. There is competition in selecting which language is in use and there is competition across the alternative linguistic structures that may be associated uniquely with one of the two languages or shared by both. This work shows that it is not only that the L1 is used as a source of transfer but that the native and/or more dominant language is remarkably open to transformations that enable the dynamic and plastic changes that occur over the course of bilinguals' lives (and see Pliatsikas, 2020, for a model of how brain plasticity changes over the lifespan). The adaptive nature of these changes and the regulatory skill that is acquired to navigate the variation across speakers and environments enable bilingual speakers to speak proficiently in each language and to code switch with one another with far fewer, if any, costs than might be anticipated.

The results we have reviewed also have several other important consequences. We have already described the significance for how we conceptualize the native or dominant language. Not only is the L1 changed by virtue of its role in bilingual language dynamics, but it renders that language different in some critical respects relative to monolingual speakers of the same language and relative to other bilingual speakers who may use the two languages in distinct contexts. We have learned that not only bilinguals but also monolinguals vary in how pressures on speakers across alternative contexts and as a reflection of their language experiences may come to influence language processing (e.g., Bice & Kroll, 2019; Pakulak & Neville, 2010). While there may be some enduring consequences associated with early acquisition of the L1 (e.g., Kousaie et al., 2017), the evidence on bilingualism suggests that there is less stability associated with the L1 than traditional accounts have assumed and that liberating the narrative from its fixation on the native speaker may enable richer and more complete accounts of the language variation that results (e.g., Caldwell-Harris & MacWhinney, 2023; Rothman et al., 2022). This is an exciting enterprise and one that has been inspired by Brian MacWhinney and his collaborators.

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Ethics Declarations

Competing Interests

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References

- Ahn, D., Ferreira, V.S., & Gollan, T.H. (in press). Structural representation in the native language after extended second-language immersion: Evidence from acceptability judgment and memory-recall. *Bilingualism: Language and Cognition*. <https://doi.org/10.1017/S1366728923000950>
- Au, T. K., Knightly, L. M., Jun, S.-A., & Oh, J. S. (2002). Overhearing a language during childhood. *Psychological Science*, *13*, 238-243. <https://doi.org/10.1111/1467-9280.00444>
- Bates, E., & MacWhinney, B. (1982). Functionalist approaches to grammar. In E. Wanner and L. R., Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 173-218). Cambridge University Press.
- Bates, E. & MacWhinney, B. (1989). Functionalism and the Competition Model. In B. MacWhinney & E. Bates (Eds.), *The cross-linguistic study of sentence processing* (pp. 3-73). Cambridge University Press.
- Bates, E., McNew, S., MacWhinney, B., Devescovi, A., & Smith, S. (1982). Functional constraints on sentence processing: A cross-linguistic study. *Cognition*, *11*, 245-299. [https://doi.org/10.1016/0010-0277\(82\)90017-8](https://doi.org/10.1016/0010-0277(82)90017-8)
- Beatty-Martínez, A.L., Navarro-Torres, C. A., & Dussias, P.E. (2020). Codeswitching: A bilingual toolkit for opportunistic speech planning. *Frontiers in Psychology*, *11*, 1699. <https://doi.org/10.3389/fpsyg.2020.01699>
- Beatty-Martínez, A. L., Navarro-Torres, C. A., Dussias, P.E., Bajo, M. T., Guzzardo-Tamargo, R., & Kroll, J. F. (2020). Interactional context mediates the consequences of bilingualism for language and cognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *46*, 1022-1047. <https://doi.org/10.1037/xlm0000770>
- Beatty-Martínez, A. L., & Titone, D. A. (2021). The quest for signals in noise: Leveraging experiential variation to identify bilingual phenotypes. *Languages*, *6*, 168. <https://doi.org/10.3390/languages6040168>
- Bice, K., & Kroll, J. F. (2015). Native language change during early stages of second language learning. *NeuroReport*, *26*, 966-971. <https://doi.org/10.1097/WNR.0000000000000453>
- Bice, K., & Kroll, J. F. (2019). English only? Monolinguals in linguistically diverse contexts have an edge in language learning. *Brain & Language*, *196*, 104644. <https://doi.org/10.1016/j.bandl.2019.104644>
- Bice, K., & Kroll, J. F. (2021). Grammatical processing in two languages: How individual differences in language experience and cognitive abilities shape comprehension in heritage bilinguals. *Journal of Neurolinguistics*, *58*, 100963. <https://doi.org/10.1016/j.jneuroling.2020.100963>
- Braver, T. S. (2012). The variable nature of cognitive control: a dual mechanisms framework. *Trends in Cognitive Sciences*, *16*, 106-113. <https://doi.org/10.1016/j.tics.2011.12.010>
- Brysbaert, M., & Duyck, W. (2010). Is it time to leave behind the Revised Hierarchical Model of bilingual language processing after fifteen years of service? *Bilingualism: Language and Cognition*, *13*, 359-371. <https://doi.org/10.1017/S1366728909990344>
- Bultena, S. & Dijkstra, T. (2023). Lexical access in visual word recognition in second language processing. In A. de Bruin & D. Trenkic, (Eds.), *The Encyclopedia of applied linguistics*. Wiley Publishers. <https://doi.org/10.1002/9781405198431.wbeal0685>
- Caldwell-Harris, C. L., & MacWhinney, B. (2023). Age effects in second language acquisition: Expanding the emergentist account. *Brain & Language*, *241*, 105269. <https://doi.org/10.1016/j.bandl.2023.105269>
- Carreiras, M., & Clifton, C., Jr. (1999). Another word on parsing relative clauses: Eye tracking evidence from Spanish and English. *Memory & Cognition*, *27*, 826-833. <https://doi.org/10.3758/BF03198535>
- Casado, A., Szewczyk, J., Wolna, A., & Wodniecka, Z. (2022). The relative balance between languages predicts the degree of engagement of global language control. *Cognition*, *226*, 105169. <https://doi.org/10.1016/j.cognition.2022.105169>
- Castro, S., Wodniecka, Z., & Timmer, K. (2022). Am I truly monolingual? Exploring foreign language experiences in monolinguals. *PloS One*, *17*, e0265563. <https://doi.org/10.1371/journal.pone.0265563>
- Chamorro, G., Sorace, A., & Sturt, P. (2016). What is the source of L1 attrition? The effect of recent L1 re-exposure on Spanish speakers under L1 attrition. *Bilingualism: Language and Cognition*, *19*, 520-532. <https://doi.org/10.1017/S1366728915000152>
- Chang, C. B. (2012). Rapid and multifaceted effects of second-language learning on first-language speech production. *Journal of Phonetics*, *40*, 249-268. <https://doi.org/10.1016/j.wocn.2011.10.007>
- Corder, S. P. (1981). *Error analysis and Interlanguage*. Oxford University Press.
- Costa, A., Caramazza, A., & Sebastian-Galles, N. (2000). The cognate facilitation effect: implications for models of lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *26*, 1283. <https://doi.org/10.1037/0278-7393.26.5.1283>

- Costa, A., & Santesteban, M. (2004). Lexical access in bilingual speech production: Evidence from language switching in highly proficient bilinguals and L2 learners. *Journal of Memory and Language*, *50*, 491-511. <https://doi.org/10.1016/j.jml.2004.02.002>
- Declerck, M., Kleinman, D., & Gollan, T. H. (2020). Which bilinguals reverse language dominance and why? *Cognition*, *204*, 104384. <https://doi.org/10.1016/j.cognition.2020.104384>
- Declerck, M., & Koch, I. (2023). The concept of inhibition in bilingual control. *Psychological Review*, *130*, 953-976. <https://doi.org/10.1037/rev0000367>
- Dijkstra, T., & Van Heuven, W. J. (2018). Visual word recognition in multilinguals. In S.A. Rueschemeyer & M.G. Gaskell (Eds.), *The Oxford handbook of Psycholinguistics* (pp. 118-143). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780198786825.013.6>
- Dijkstra, T., Van Jaarsveld, H., & Ten Brinke, S. (1998). Interlingual homograph recognition: Effects of task demands and language intermixing. *Bilingualism: Language and Cognition*, *1*, 51-66. <https://doi.org/10.1017/S1366728998000121>
- Dijkstra, T., Wahl, A., Buytenhuijs, F., Van Halem, N., Al-Jibouri, Z., De Korte, M., & Rekké, S. (2019). Multilink: a computational model for bilingual word recognition and word translation. *Bilingualism: Language and Cognition*, *22*, 657-679. <https://doi.org/10.1017/S1366728918000287>
- Dussias, P. E., & Sagarra, N. (2007). The effect of exposure on syntactic parsing in Spanish-English bilinguals. *Bilingualism: Language and Cognition*, *10*, 101-116. <https://doi.org/10.1017/S1366728906002847>
- Dussias, P. E., Valdés Kroff, J. R., Halberstadt, L., & LaCasse, D. (submitted). *The dynamics of predictive processing when the reliability of cues changes*.
- Dussias, P. E., Valdés Kroff, J. R., Guzzardo Tamargo, R. E., & Gerfen, C. (2013). When gender and looking go hand in hand: Grammatical gender processing in L2 Spanish. *Studies in Second Language Acquisition*, *35*, 353-387. <https://doi.org/10.1017/S0272263112000915>
- Farmer, T. A., Christiansen, M. H., & Monaghan, P. (2012). Phonological typicality influences on-line sentence comprehension. *Proceedings of the National Academy of Sciences, USA*, *103*, 12203-12208. <https://doi.org/10.1073/pnas.0602173103>
- Ferré, P., Sánchez-Casas, R., & Guasch, M. (2006). Can a horse be a donkey? Semantic and form interference effects in translation recognition in early and late proficient and nonproficient Spanish-Catalan bilinguals. *Language Learning*, *56*, 571-608. <https://doi.org/10.1111/j.1467-9922.2006.00389.x>
- Fine, A. B., & Jaeger, T. F. (2016). The role of verb repetition in cumulative structural priming in comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *42*, 1362-1376. <https://doi.org/10.1037/xlm0000236>
- Fine, A.B., Jaeger, T. F., Farmer, T. A., & Qian, T. (2013). Rapid expectation adaptation during syntactic comprehension. *PLoS One*, *8*, e77661. <https://doi.org/10.1371/journal.pone.0077661>
- Fraundorf, S., & Jaeger, T. F. (2016). Readers generalize adaptation to newly encountered dialectal structures to other unfamiliar structures. *Journal of Memory and Language*, *91*, 28-58. <https://doi.org/10.1016/j.jml.2016.05.006>
- Gass, S. M., & Selinker, L. (1992). *Language Transfer in Language Learning*. John Benjamins. <https://doi.org/10.1075/lald.5>
- Gollan, T. H., Sandoval, T., & Salmon, D. P. (2011). Cross-language intrusion errors in aging bilinguals reveal the link between executive control and language selection. *Psychological Science*, *22*, 1155-1164. <https://doi.org/10.1177/0956797611417002>
- Green, D. W. (1998). Mental control of the bilingual lexico-semantic system. *Bilingualism: Language and Cognition*, *1*, 67-81. <https://doi.org/10.1017/S1366728998000133>
- Green, D. W., & Abutalebi, J. (2013). Language control in bilinguals: The adaptive control hypothesis. *Journal of Cognitive Psychology*, *25*, 515-530. <https://doi.org/10.1080/20445911.2013.796377>
- Grosjean, F. (1989). Neurolinguists, beware! The bilingual is not two monolinguals in one person. *Brain and Language*, *36*, 3-15. [https://doi.org/10.1016/0093-934X\(89\)90048-5](https://doi.org/10.1016/0093-934X(89)90048-5)
- Gullifer, J. W., Chai, X. J., Whitford, V., Pivneva, I., Baum, S., Klein, D., & Titone, D. (2018). Bilingual experience and resting-state brain connectivity: Impacts of L2 age of acquisition and social diversity of language use on control networks. *Neuropsychologia*, *117*, 123-134. <https://doi.org/10.1016/j.neuropsychologia.2018.04.037>
- Gullifer, J. W., & Titone, D. (2020). Characterizing the social diversity of bilingualism using language entropy. *Bilingualism: Language and Cognition*, *23*, 283-294. <https://doi.org/10.1017/S1366728919000026>
- Guo, T., Liu, H., Misra, M., & Kroll, J. F. (2011). Local and global inhibition in bilingual word production: fMRI evidence from Chinese-English bilinguals. *NeuroImage*, *56*, 2300-2309. <https://doi.org/10.1016/j.neuroimage.2011.03.049>

- Guo, T., & Ma, F. (2023). Cognitive control in second language neurocognition. In *The Routledge handbook of second language acquisition and neurolinguistics* (pp. 424-435). Routledge. <https://doi.org/10.4324/9781003190912>
- Guo, T., Misra, M., Tam, J. W., & Kroll, J. F. (2012). On the time course of accessing meaning in a second language: An electrophysiological investigation of translation recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 38, 1165-1186. <https://doi.org/10.1037/a0028076>
- Herring J., Deuchar M., Parafita Couto M. C., & Moro Quintanilla M. (2010). When I went to Canada, I saw the madre: Evaluating two theories' predictions about codeswitching between determiners and nouns using Spanish-English and Welsh-English bilingual corpora. *International Journal of Bilingual Education and Bilingualism*, 13, 553-573. <https://doi.org/10.1080/13670050.2010.488286>
- Hopp, H. (2016). Learning (not) to predict: grammatical gender processing in second language acquisition. *Second Language Research*, 32, 277-307. <https://doi.org/10.1177/026765831562496>
- Ivanova, I., & Costa, A. (2007). Does bilingualism hamper lexical access in speech production? *Acta Psychologica*, 127, 277-288. <https://doi.org/10.1016/j.actpsy.2007.06.003>
- Jake, J. L., Myers-Scotton, C., & Gross, S. (2002). Making a minimalist approach to codeswitching work: Adding the matrix language. *Bilingualism: Language and Cognition*, 5, 69-91. <https://doi.org/10.1017/S1366728902000147>
- Kasparian, K., & Steinhauer, K. (2017). When the second language takes the lead: Neurocognitive processing changes in the first language of adult attriters. *Frontiers in Psychology*, 8, 389. <https://doi.org/10.3389/fpsyg.2017.00389>
- Kleinschmidt, D. F., & Jaeger, T. F. (2015). Robust speech perception: Recognize the familiar, generalize to the similar, and adapt to the novel. *Psychological Review*, 122, 148-203. <https://doi.org/10.1037/a0038695>
- Kousaie, S., Chai, X. J., Sander, K. M., & Klein, D. (2017). Simultaneous learning of two languages from birth positively impacts intrinsic functional connectivity and cognitive control. *Brain and Cognition*, 117, 49-56. <https://doi.org/10.1016/j.bandc.2017.06.003>
- Kroll, J. F. (2017). The bilingual lexicon: A window into language dynamics and cognition. In Libben, M., Goral, M., & Libben, G. (Eds.). *Bilingualism: A Framework for Understanding the Mental Lexicon* (pp. 27-48). John Benjamins Publishers. <https://doi.org/10.1075/bpa.6.02kro>
- Kroll, J. F. (2024). The bilingual mental lexicon. In T. Ionin, S. Montrul, & R. Slabakova (Eds). *The Routledge handbook of second language acquisition, morphosyntax and semantics*. Routledge. <https://doi.org/10.4324/9781003412373>
- Kroll, J. F. (in press). Language in the minds and the brains of bilingual speakers reflects the diversity of the social world. In M.Gelfand, C.Y. Chiu, & Y.Y. Hong (Eds.), *Advances in culture and psychology*. Oxford University Press.
- Kroll, J. F., Bice, K., Botezatu, M. R., & Zirnstein, M. (2022). On the dynamics of lexical access in two or more languages. In Gleitman, L., Papafragou, A., & Trueswell, J. (Eds). *Handbook of the mental lexicon* (pp. 583-597). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780198845003.013.26>
- Kroll, J. F., Bobb, S. C., & Hoshino, N. (2014). Two languages in mind: Bilingualism as a tool to investigate language, cognition, and the brain. *Current Directions in Psychological Science*, 23, 159-163. <https://doi.org/10.1177/0963721414528511>
- Kroll, J. F., Bobb, S., & Wodniecka, Z. (2006). Language selectivity is the exception, not the rule: Arguments against a fixed locus of language selection in bilingual speech. *Bilingualism: Language and Cognition*, 9, 119-135. <https://doi.org/10.1017/S1366728906002483>
- Kroll, J. F., Dussias, P. E., Bice, K., & Perrotti, L. (2015). Bilingualism, mind, and brain. *Annual Review of Linguistics*, 1, 377-394. <https://doi.org/10.1146/annurev-linguist-030514-124937>
- Kroll, J. F., & Finger, I. (2023). Learning a new language in time: What does variation in bilingual experience tell us? Commentary on Caldwell-Harris and MacWhinney (2023): Age effects in second language acquisition: Expanding the emergentist account. *Brain & Language*, 246, 105340. <https://doi.org/10.1016/j.bandl.2023.105340>
- Kroll, J. F., & Stewart, E. (1994). Category interference in translation and picture naming: Evidence for asymmetric connection between bilingual memory representations. *Journal of Memory and Language*, 33, 149-174. <https://doi.org/10.1006/jmla.1994.1008>
- Kroll, J. F., Van Hell, J. G., Tokowicz, N., & Green, D. W. (2010). The Revised Hierarchical Model: A critical review and assessment. *Bilingualism: Language and Cognition*, 13, 373-381. <https://doi.org/10.1017/S136672891000009X>
- Lew-Williams, C., & Fernald, A. (2007). Young children learning Spanish make rapid use of grammatical gender in spoken word recognition. *Psychological Science*, 18, 193-198. <https://doi.org/10.1111/j.1467-9280.2007.01871.x>

- Libben, M. R., & Titone, D. A. (2009). Bilingual lexical access in context: Evidence from eye movements during reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *35*, 381-390. <https://doi.org/10.1037/a0014875>
- Linck, J. A., Kroll, J. F., & Sunderman, G. (2009). Losing access to the native language while immersed in a second language: evidence for the role of inhibition in second-language learning. *Psychological Science*, *20*, 1507-1515. <https://doi.org/10.1111/j.1467-9280.2009.02480.x>
- Liu, C., Li, L., Jiao L., & Wang, R. (2021). Bilingual language control flexibly adapts to cultural context. *Frontiers in Psychology*, *12*:744289. <https://doi.org/10.3389/fpsyg.2021.744289>
- López, B. G. (2020). Incorporating language brokering experiences into bilingualism research: An examination of informal translation practices. *Language and Linguistics Compass*, *14*, e12361. <https://doi.org/10.1111/lnc3.12361>
- MacWhinney, B. (1987). The Competition Model. In B. MacWhinney (Ed.), *Mechanisms of language acquisition* (pp. 249-308). Lawrence Erlbaum. <https://psyling.talkbank.org/years/1987/CM-summary.pdf>
- MacWhinney, B. (2022). The competition model: Past and future. In J. Gervain, G. Csibra, & K. Kovács (Eds.), *A life in cognition: Studies in cognitive science in honor of Csaba Pléh* (pp. 3-16). Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-030-66175-5_1
- Marian, V., & Spivey, M. (2003). Competing activation in bilingual language processing: Within- and between-language competition. *Bilingualism: Language and Cognition*, *6*, 97-115. <https://doi.org/10.1017/S1366728903001068>
- Meuter, R.F.I., & Allport, A. (1999). Bilingual language switching in naming: Asymmetrical costs of language selection. *Journal of Memory and Language*, *40*, 25-40. <https://doi.org/10.1006/jmla.1998.2602>
- Midgley, K. J., Holcomb, P. J., & Grainger, J. (2011). Effects of cognate status on word comprehension in second language learners: An ERP Investigation. *Journal of Cognitive Neuroscience*, *23*(7), 1634-1647. <https://doi.org/10.1016/j.jml.2012.05.001>
- Misra, M., Guo, T., Bobb, S. C., & Kroll, J. F. (2012). When bilinguals choose a single word to speak: Electrophysiological evidence for inhibition of the native language. *Journal of Memory and Language*, *67*, 224-237.
- Morford, J. P., Wilkinson, E., Villwock, A., Piñar, P. & Kroll, J. F. (2011). When deaf signers read English: Do written words activate their sign translations? *Cognition*, *118*, 286-292. <https://doi.org/10.1016/j.cognition.2010.11.006>
- Otheguy, R., & Lapidus, N. (2003). An adaptive approach to noun gender in New York contact Spanish. In Núñez-Cedeño, R., López, L., & Cameron, R. (Eds.) *A Romance perspective on language knowledge and use: Selected papers from the 31st Linguistic Symposium on Romance Languages (LSRL)* (pp. 209-229). ohn Benjamins Publishing. <https://doi.org/10.1075/cilt.238.17oth>
- Pakulak, E., & Neville, H. J. (2010). Proficiency differences in syntactic processing of monolingual native speakers indexed by event-related potentials. *Journal of Cognitive Neuroscience*, *22*, 2728-2744. <https://doi.org/10.1162/jocn.2009.21393>
- Parafita Couto, M.C., & Gullberg, M. (2017). Code-switching within the noun phrase: Evidence from three corpora. *International Journal of Bilingualism*, *23*, 695-714. <https://doi.org/10.1177/1367006917729543>
- Pliatsikas, C. (2020). Understanding structural plasticity in the bilingual brain: The dynamic restructuring model. *Bilingualism: Language and Cognition*, *23*, 459-471. <https://doi.org/10.1017/S1366728919000130>
- Pot A, Porkert J, & Keijzer, M. (2019). The bidirectional in bilingual: Cognitive, social and linguistic effects of and on third-age language learning. *Behavioral Sciences*, *9*, 98. <https://doi.org/10.3390/bs9090098>
- Rothman, J., Bayram, F., DeLuca, V., Di Pisa, G., Dunabeitia, J. A., Gharibi, K., ... & Wulff, S. (2022). Monolingual comparative normativity in bilingualism research is out of “control”: Arguments and alternatives. *Applied Psycholinguistics*, 1-14. <https://doi.org/10.1017/S0142716422000315>
- Runnqvist, E., Gollan, T. H., Costa, A., & Ferreira, V.S. (2013). A disadvantage in bilingual sentence production modulated by syntactic frequency and similarity across languages. *Cognition*, *129*, 256-263. <https://doi.org/10.1016/j.cognition.2013.07.008>
- Schwartz, A. I., & Kroll, J. F. (2006). Bilingual lexical activation in sentence context. *Journal of Memory and Language*, *55*(2), 197-212. <https://doi.org/10.1016/j.jml.2006.03.004>
- Schwartz, A. I., Kroll, J. F., & Diaz, M. (2007). Reading words in Spanish and English: Mapping orthography to phonology in two languages. *Language and Cognitive Processes*, *22*, 106-129. <https://doi.org/10.1080/01690960500463920>
- Schwietzer, J. W., & Festman, J. (2023). *The cognitive neuroscience of bilingualism*. Cambridge University Press. <https://doi.org/10.1017/9781108178501>
- Strijkers, K., Costa, A., & Thierry, G. (2010). Tracking lexical access in speech production: Electrophysiological correlated of word frequency and cognate effects. *Cerebral Cortex*, *20*, 912-928. <https://doi.org/10.1093/cercor/bhp153>

- Sunderman, G., & Kroll, J. F. (2006). First language activation during second language lexical processing: An investigation of lexical form, meaning, and grammatical class. *Studies in Second Language Acquisition*, 28, 387-422. <https://doi.org/10.1017/S0272263106060177>
- Talamas, A., Kroll, J. F., & Dufour, R. (1999). From form to meaning: Stages in the acquisition of second-language vocabulary. *Bilingualism: Language and Cognition*, 2, 45-58. <https://doi.org/10.1017/S1366728999000140>
- Thierry, G., & Wu, Y. J. (2007). Brain potentials reveal unconscious translation during foreign language comprehension. *Proceedings of National Academy of Sciences*, 104, 12530-12535. <https://doi.org/10.1073/pnas.0609927104>
- Torres Cacoullos, R., & Travis, C. E. (2015). Gauging convergence on the ground: Code-switching in the community. *International Journal of Bilingualism*, 19, 365-386. <https://doi.org/10.1177/1367006913516046>
- Trawick, S., & Bero, T. (2022). Gender assignment: Monolingual constraints contribute to a bilingual outcome. *International Journal of Bilingualism*, 26, 181-197. <https://doi.org/10.1177/13670069211053466>
- Valdés Kroff, J. R. (2016). Mixed NPs in Spanish-English bilingual speech: Using a corpus-based approach to inform models of sentence processing. In R. E. Guzzardo Tamargo, C. M. Mazak, & M. C. Parafita Couto (Eds.), *Spanish-English codeswitching in the Caribbean and the US* (pp. 281-300). John Benjamins Publishing Company. <https://doi.org/10.1075/ihll.11.12val>
- Valdés Kroff, J. R., Dussias, P. E., Gerfen, C., Perrotti, L., & Bajo, M.T. (2017). Experience with code-switching modulates the use of grammatical gender during sentence processing. *Linguistic Approaches to Bilingualism*, 7, 163-198. <https://doi.org/10.1075/lab.15010.val>
- Van Assche, E., Duyck, W., & Gollan, T. H. (2013). Whole-language and item-specific control in bilingual language production. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 39, 1781-1792. <https://doi.org/10.1037/a0032859>
- Van Hell, J. G., & Dijkstra, T. (2002). Foreign language knowledge can influence native language performance in exclusively native contexts. *Psychonomic Bulletin & Review*, 9, 780-789. <https://doi.org/10.3758/BF03196335>
- Van Heuven, W.J.B., Schriefers, H., Dijkstra, T., & Hagoort, P. (2008). Language conflict in the bilingual brain. *Cerebral Cortex*, 18, 2706-2716. <https://doi.org/10.1093/cercor/bhn030>
- Wells, J. B., Christiansen, M. H., Race, D. S., Acheson, D. J., & MacDonald, M. C. (2009). Experience and sentence processing: Statistical learning and relative clause comprehension. *Cognitive Psychology*, 58, 250-271. <https://doi.org/10.1016/j.cogpsych.2008.08.002>
- Zhang, H., Diaz, M. T., Guo, T., & Kroll, J. F. (2021). Language immersion and language training: Two paths to enhanced language regulation and cognitive control. *Brain & Language*, 223, 105043. <https://doi.org/10.1016/j.bandl.2021.105043>