The Challenge of a Bilingual Society in the Basque Country

EDITED BY
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Center for Basque Studies
University of Nevada, Reno

UPV/EHU

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The Basque Language in the Minds of Native and Nonnative Bilinguals

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An Overview of the Bilingual Mind

Bilinguals outnumber monolinguals: according to some recent estimates, between 60 and 75 percent of the world's population is bilingual. It has been argued that the capacity to learn more than one language is an adaptive trait in human evolution (Hirschfeld 2008), and given what we know of interactions between human groups, is not unlikely that people throughout history have more often than not known more than one language. Language research initially tended to restrict itself to the study of monolinguals, and there was not much interest in the study of bilingualism, because it was generally (though tacitly) assumed that the representation and processing of a given language was not affected by another one, whether acquired simultaneously or later in life. Recent findings have completely overturned this assumption, and suggest instead that research beyond monolingualism holds a great potential for generating knowledge about the psychological nature of the human language faculty and the way in which language is organized in our minds.

François Grosjean, a pioneer researcher on bilingualism, warns in his foundational paper (1989) that the bilingual is not two monolinguals in one person. Current work on the cognition of bilingualism shows the extent to which this statement is true because mental differences that relate to being bilingual or monolingual are being discovered. Some of these differences involve cognitive abilities that lie outside linguistic systems, such as the

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capacity to ignore irrelevant information when changing tasks, or a certain degree of resilience toward symptoms of neurodegeneration. Other differences between monolinguals and bilinguals involve the interplay of the two linguistic systems they use: we now know that bilinguals are simultaneously activate both languages, and must select or inhibit one at a time; we also know that the cost involved in having two lexicons instead of one are experimentally detectable. The developmental patterns of preverbal bilingual babies—who can very early on detect that more than one language is spoken in their environment—are also different from those of their monolingual counterparts. Ultimately, the main differences between monolingual and bilingual minds eventually emanate from the intensive cognitive training undergone by bilinguals in their lifetimes, given the frequency and speed at which they switch from one language to another.

From a more narrowly linguistic point of view, people with more than one language in their brains provide crucial evidence regarding the neurocognitive nature of the human language faculty. Thus, for instance, aspects of grammar are sensitive to *when* in life they are acquired, and also to *what* was known before, so that native speakers and nonnative speakers do not process certain aspects of the same grammar in the same way, even at high levels of language proficiency and given frequent use of the language. In contrast, vocabulary appears insensitive to when it is learned and what the words of a previously acquired language look like: given high proficiency in the language, nonnative speakers are native-like with respect to vocabulary processing (see Laka 2012a for a review).

Broadly speaking, neurocognitive studies of language and bilingualism reveal that the patterns of activation related to language processing are consistent across languages and native speakers; research shows that the processing of different languages occurs in much of the same brain tissue (Kim et al. 1997, Perani et al. 1998), and in recent work we have also found that the processing of Basque by native speakers generates electrophysiological signals that are equivalent to those generated by the processing of other languages (Erdozia et al. 2009; Díaz et al. 2011). When differences between languages are found, they obtain in bilinguals and they correlate with differences in proficiency levels attained in each language, and differences in age of acquisition for each language. This strongly suggests that age of acquisition and language proficiency are determinant factors in the neural underpinnings of language and bilingualism, so that early and proficient bilinguals do not "separate" languages in the brain, but as age of acquisition of the nonnative language increases and proficiency decreases, the nonnative language tends to be located in more extended and individually variable areas.

Given these findings, neurobilingualism has teneded to focus research on the impact of language proficiency and of the age at which a language is acquired. Less attention has been devoted to the impact of the degree of similarity of the grammars located in one brain and the differences among different types of grammatical phenomena. As our knowledge advances, language diversity emerges as a likely relevant factor to be kept into account, and as the volume and level of detail of the studies carried out increases, it also becomes increasingly clear that, although all these factors have often been studied separately, there are strong connections between them: proficiency in the language, age of acquisition, and grammatical similarity are likely to be intertwined rather than separate factors. These are the topics that our research focuses on, as we strive to contribute to the general knowledge on bilingualism by exploring in detail Basque-Spanish bilinguals in our community.

Activation and Control of the Two Languages in the Bilingual Brain

The brain activates all the languages it knows when it has to use language. In particular, bilinguals activate both of their languages when they have to use one (Desmet and Duyck 2007). The simple hypothesis that bilinguals have two separate lexicons—one for each language, so that when they use one language only its lexicon is activated—has been proved wrong by many studies: both lexicons are active whenever the bilingual speaks, either in one or the other language. In a pioneering study, Walter Van Heuven, Ton Dijkstra, and Jonathan Grainger (1998) find that the lexical items from a bilingual's native language are active while the bilingual is engaged in recognizing words from a nonnative language. Further studies have shown that this activation of the lexical items occurs irrespectively of the language for different types of bilinguals and language-pairs. Further evidence that the native language is activated when using the nonnative one had been uncovered by a large number of studies (including Costa, Caramazza, and Sebastián-Gallés 2000; Colomé 2001; Duyck 2005; Duyck et al., 2004; and Schwartz et al. 2007), by means of many different phenomena. It has also been repeatedly shown that the nonnative language is active when the native one is used (see for instance Duyck 2005, and Van Hell and Dijkstra 2002, among others). Similar results have been obtained in studies in which participants, instead of reading, heard the words they had to recognize (for instance Marian, Blumenfeld, and Boukrina 2008; Marian, Spivey, and Hirsch 2003), and in studies in which participants had to actually say the words (Costa, Santesteban, and Caño 2005; Kroll, Bobb, and Wodniecka 2006; Costa, Albareda, and Santesteban 2008; and Santesteban and Costa 2006).

The most important evidence supporting the parallel activation assumption comes from the so called cognate facilitation effects reported in both comprehension and production modalities. Cognates are those words that are formally (orthographically and phonologically) similar across languages (for example, the words *botella* and *botila* meaning "bottle" are cognate words of Spanish and Basque, respectively). In studies of lexical access during comprehension and production, cognate words have been reported to be faster to learn and more resistant to forgetting (for example, De Groot and Keijzer 2000), less likely to fall into tip-of-the-tongue states (Gollan and Acenas 2004), faster to produce (Costa, Caramazza, and Sebastián-Gallés 2000), and more sensitive to cross-linguistic priming (Van Hell and De Groot 1998).

According to some researchers, the cognate effect arises because retrieving phonemes belonging to cognate words is facilitated by concurrently activating the corresponding translations (Costa, Caramazza, and Sebastian-Galles 2000; Costa, Santesteban, and Caño 2005). For instance, in production, the phonological content of a cognate word would be activated by its corresponding lexical representation and, given the phonological overlap, also by its translation. In contrast, the phonological representation of a non-cognate word would be actrivated only by the corresponding lexical representation. In other words, when a Spanish-Basque bilingual aims to produce a cognate word like *botila*, the parallel activation of its Spanish translation *botella* would facilitate retrieval of the phonemes shared by both words, because these phonemes will be activated by both the target word and its cognate. In contrast, when the word to be produced is a non-cognate like *labana* ("knife," in Basque), its Spanish translation *cuchillo* would also be activated, but would not be able to facilitate retrieving the phonemes of the target word *labana*. This is because the target word and its translation do not share any phoneme, so that retrieving the phonemes of the target word *labana* would not receive extra activation from its translation word *cuchillo* (Costa, Caramazza, and Sebastian-Galles 2000; Costa, Santesteban, and Caño 2005; Gollan and Acenas 2004).

This discovery naturally leads us to the question of how bilinguals manage to produce the words of the target language and prevent words from the non-target language from being uttered. If all the languages of the bilingual are active when language is processed, then there must be some further cognitive operation that controls what language is used at a given time.

Proposals as to how bilinguals control their languages in order to produce the one they want to use generally agree that bilingual lexical access must involve some kind of attention control mechanism (Costa 2005; Costa, Miozzo, and Caramazza 1999; Finkbeiner, Gollan, and Caramazza 2006; Green 1998; Kroll, Bobb, and Wodniekca 2006; La Heij 2005). Some researchers argue that, in order to avoid competition between the simultaneously activated lexical items of the target and non-target languages, language control in bilinguals entails the active inhibition of the linguistic representations of the non-target language; this is known as the inhibitory control model proposed by David Green (1998). However, others argue that bilingual speakers do not need to actively inhibit the linguistic representations of the non-target language. Instead, Albert Costa, Michele Miozzo, and Alfonso Caramazza (1999) suggest that the lexical nodes of the non-target language are activated but do not act as competitors during lexical access. In other words, according to the so-called language specific selection model, the bilinguals' language control mechanism allows them to ignore the activation of the non-target languages' lexical items by not considering them for selection.

The most important evidence in favor of the language specific selection model and the absence of cross-linguistic competition during bilingual lexical access comes from the picture-word interference paradigm. In this paradigm, participants are asked to name pictures while ignoring printed words. Here, it has been repeatedly demonstrated that speakers need more time to name a picture (such as a table) presented with a semantically related distractor word as *chair* than a semantically unrelated word such as *dog*. This "semantic interference effect" has been taken as evidence for the existence of lexical competition during lexical access in monolinguals. Hence, Costa, Miozzo, and Caramazza (1999) suggest that, if a semantically related word in the target language interferes in the lexical access process, the target's translation would be the strongest possible distractor. However, highly proficient Catalan-Spanish bilingual speakers were shown to be faster to name a picture of a table (*taula*, in Catalan) when the printed distractor word was its Spanish translation *mesa* than with an unrelated word like *perro* ("dog," in Spanish). Hence, Costa, Miozzo, and Caramazza (1999) interpret these "translation facilitation effects" as evidence of the absence of competition of the non-target language during bilingual lexical access.

The most revealing evidence for inhibitory mechanisms in bilinguals has been provided by Renata F. I. Meuter and Allan Allport (1999) in an experiment on language-switching, in which participants were asked to name a picture in one language or another, depending on the color of the picture. In their experiment, Meuter and Allport (1999) asked low proficient bilinguals to name digits in their L1 (French, Spanish, German, Italian, and Portuguese), and in their L2 (English) in switch and non-switch trials. This study shows that low-proficient bilinguals take longer to switch from their less dominant nonnative language to their native one than the other way around; an effect that has been termed the "asymmetrical switching cost." At first glance, this result may appear counterintuitive because it implies that it is "harder" to change from the language you do not know so well to the language you know better than it is to change from the language you know better to the language you do not know so well. However, this is the pattern of results predicted by the inhibitory control model. This is because, as Green (1998) suggests, the amount of inhibition applied to one language depends on the proficiency level with which that language is spoken: the more proficient one is in a language, the more inhibition has to be applied over it in order to favor the other language. Moreover, the more inhibition is applied to a given lexicon, the longer and the harder it will take to overcome it in a subsequent trial. Hence, when low proficient bilinguals have to speak in their weaker, nonnative language, the native language is activated and therefore it has to be very strongly inhibited. As a consequence of the strong inhibition applied to it, if later these low proficient bilinguals want to speak in the dominant native language, they need to undo the strong inhibition applied to words in their native language. In contrast to this, changing from the strong native language to the weaker nonnative language does not require undoing such a strong inhibition, because words in the weaker language need not be so strongly inhibited.

Albert Costa and Mikel Santesteban (2004) further test the language switching performance of low- and high-proficient bilingual speakers, and suggest that bilingual speakers might make use of both language selection mechanisms. More specifically, these authors replicated the asymmetrical language switching cost patterns in a group of low proficient Spanish-Catalan bilinguals (who had more difficulty in switching from L2 to L1 than vice versa). Additionally, as would be predicted by the inhibitory control model, high proficient Spanish-Catalan bilinguals showed a symmetrical language switching cost pattern while switching between their two strong languages. However, in contrast to the predictions of the inhibitory control model, these high proficient bilinguals *also* showed a symmetrical language switching pattern while switching between their strong L1-Spanish or L2-Catalan and their weak L3-English (Costa and Santesteban 2004; Costa, Santesteban, and Ivanova 2006). Based on these results, these authors suggest that, although low proficient bilingual speakers rely on inhibitory processes to select words in the intended language, a shift from inhibitory to language specific selection mechanisms occurs in the case of high proficient bilinguals. Additionally, Costa, Santesteban, and Ivanova (2006) show that a symmetrical language switching was obtained in a group of high-proficient Spanish-English translators that acquired their L2 at a late age (after ten years old), and by a group of high-proficient Spanish-Basque bilinguals who acquired Basque at an early age, suggesting that neither L2 age of acquisition (AoA) or linguistic distance (how different the two languages of the bilingual are) play a role in the shift from inhibitory to language specific selection mechanisms.

Thus, while the switching performance of low-proficient bilinguals leads to an asymmetrical pattern, depending on language dominance, in proficient bilinguals it yields a symmetric pattern. This does not only apply to the dominant languages, but also to non-dominant, languages that one might learn later in life.

Why Study Basque-Spanish Bilingual Syntactic Processing?

In recent decades, a rapidly growing body of studies using experimental methods and neuroimaging techniques has explored syntactic processing, and as a result, findings from linguistics and the neurosciences are progressively converging and finding common ground (Moro 2008; Pullvermüller 2002). However, the vast majority of language processing and neuroimaging studies focus on rather similar languages (English, Spanish, Italian, French, German, or Dutch, for instance). In other words, with the exception of a few recently emerging studies on Japanese, Chinese, and Korean, the languages most intensively studied share many central design properties.

In linguistic theory, a significant expansion of the language pool investigated and systematic cross-linguistic inquiry were crucial to uncovering the interplay between universal and variable aspects of the language faculty (Greenberg 1963; Chomsky 1981). Research on language representation and processing in the brain must similarly also engage in cross-linguistic studies so that we can differentiate language-particular effects from universal invariant properties of language processing by the brain, and thus properly understand the interplay between the two. In order to achieve this goal, it is necessary to conduct studies and gather evidence from a wide array of languages pertaining to different typological groups, and it is particularly important to study bilinguals whose languages have opposite parametric specifications; in other words, bilinguals who speak typologically very different grammars, like Basque-Spanish bilinguals.

One main goal of our research strategy is to contribute to uncovering the impact of variable versus universal design properties of language in its representation and processing by the brain. In particular, we seek to understand whether (and how) different typological/parametric properties of language impact on the neural representation of a speaker's knowledge of language; in other words, how opposite grammatical properties are represented and put to use in the bilingual mind. To address this central research question, we selectively target instances in which grammatical specifications are opposed in value for the two languages of the bilingual population we study (Spanish/Basque), and compare them to instances in which the specifications of the two grammars converge.

Here, we will review a series of experiments we have designed and conducted targeting three central domains of linguistic variation across languages: word order (the head-parameter: head-final/head-initial languages), the argument marking system (ergativity versus accusativity), and verb agreement types (subject agreement versus object agreement). These three domains have either hardly been studied from a neurocognitive perspective, or in some cases have never been considered at all before. Thus, we are in a position to inquire into phenomena that have not been previously addressed, working at the frontiers of our knowledge.

There are 6,912 languages in the world today (according to Ethnologue's last count, at www.ethnologue.com), showing both great diversity and significant similarities. In the second half of the twentieth century, with the birth of generative grammar and the cognitive sciences, significant advances were made regarding the invariant universal design aspects of human language. But language variability is still not sufficiently well understood from a theoretical (explicative) perspective, despite the wealth of valuable descriptions of linguistic types provided by modern linguistic typology (Newmeyer 2005). Noam Chomsky's (1981) principles and parameters model (henceforth P&P) constitutes a promising attempt to provide a principled account for the interplay and nature of the variant and invariant aspects of grammar (Baker 2001, 2003). Though there are still deep gaps in our understanding, and despite the fact that the model has been challenged and is far from verified, P&P still provides the only verifiable model for language variation (Yang 2003; Moro 2008). This makes parametric theory a particularly suitable model for experimental research; and the model can thus serve as empirical test for neurocognitive models of language (see Friederici 2002; Bornkessel and Schlesewsky 2006, among others). For instance, the declarative/procedural (DP) model (Ullman 2001, 2004), claims that the computational component (grammar) belongs to the procedural system. Since the DP model argues that procedural cognitive processes have limited neuronal plasticity, it predicts that syntactic parameters in particular should show age-related effects.

Ever since Eric Lenneberg (1967) suggested that there is a critical period for language acquisition, the impact of age of early linguistic experience on adult neural representation and processing has been a much debated issue, particularly regarding bilingualism. Whether adult knowledge of a non-native language is represented and processed as the native language has been intensely debated for almost two decades (White 2003), and we hope that our research will be able to contribute significantly to understanding this issue, both given the type of bilingualism we can study in the Basque Country, and also given the type of experimental techniques we employ. As we will see, these can give us very fine-grained measures that are not otherwise detectable regarding neural processing of language.

In our research, one aspect we explore is precisely the representation and processing of the syntactic component in adult Basque-Spanish bilinguals. In recent years we have undertaken a systematic study of adult Spanish/Basque bilinguals, exploiting the fact that Spanish and Basque have opposite values for several parameters (see Bosque and Demonte 1999 for a thorough description of Spanish grammar; and Hualde and Ortiz de Urbina 2003, and de Rijk 2008 for a description of Basque). We investigate whether the specific grammatical phenomena targeted in our experimental work give rise to differences in the neural representation and processing of bilinguals of various types. Since nothing is known about how Basque grammar is processed in the brain, we first determine how the phenomena under study are processed by natives of Basque (and also Spanish, as regards cases in which there are no previous studies on the particular topic we address), and once we obtain those results from native speakers, we explore how nonnative speakers who learned Basque at different ages represent and process these same phenomena. In order to proceed systematically, we start by studying nonnatives with high proficiency levels and early ages of acquisition of Basque. Basque-Spanish and Spanish-Basque bilinguals are particularly suited to contributing to our understanding of bilingual language processing, because bilingualism is pervasive in all realms of Basque society and because the two languages have the same or opposite values for different syntactic properties.

Table 8.1. Parametric settings of Basque and Spanish. "Plus" values represent a positive value of that choice in the linguistic parameter and "minus" values a negative value

	Verb agreement	Argument alignment	Word Order			
	Yes	*No*	*Nominative*	*Ergative*	*Initial*	*Final*
Spanish	+	–	+	–	+	–
Basque	+	–	–	+	–	+

The Impact of Age and Proficiency in the Bilingual Brain

Studies on bilingual language processing currently provide a somewhat confusing picture: while some studies report that if a second language is not acquired early, it is not processed native-like, others report that age does not have an effect on bilingualism, so that proficient bilinguals are like natives regarding language processing.

Regarding the first group of results, we should refer to the pioneering work of Christine M. Weber-Fox and Helen J. Neville (1996): this uses the event-related potentials' technique to test various groups of Chinese-speakers who had acquired English at different ages. Regarding syntax, participants who were exposed to English after the age of eleven showed a different processing pattern (different electrophysiological activity of the brain) from that found in native speakers. However, vocabulary-related phenomena elicited the same brain signature in all participants, whether natives or nonnatives who had arrived in the United States at different ages. The study concludes that syntax shows maturational effects related to the age of language learning, whereas vocabulary-related tasks do not. A significant impact of early exposure to the language is also reported by Anja Hahne and Angela D. Friederici (2001) for native Japanese who learned German at a mean age of twenty-seven. Their brain signatures did not look like the native speakers' when they were processing German grammar, but they did when they were engaged in vocabulary-related tasks. Subsequently, many studies have reported similar findings (such as Hahne 2001; Chen et al. 2007). All these studies conclude that certain aspects of syntax are sensitive to early experience.

Regarding the second group of results, there is also a wide sample of studies that find that very proficient nonnative speakers show the same electrophysiological brain signatures as native speakers, independently of the age at which they learned their second language. For example, Angela D. Friederici, Karsten Steinhauer, and Erdmut Pfeifer (2002) show that native German-speakers of a mean age of twenty-four, who were taught an artificial language named Brocanto, displayed the same brain signatures elicited by their native language when they processed the newly learned one. Rossi and colleagues (2006) investigated Italian-speakers who had learned German at around eighteen years of age and had either high or low proficiency in German. High-proficient speakers responded similarly to natives, but low proficient speakers did not. Sonja A. Kotz, Phillip J. Holcomb, and Lee Osterhout (2008) similarly report that Spanish natives who are high-proficient speakers of English (learned at about five years of age) process English sentences like natives. These results strongly suggest that high proficiency leads to equivalent neurophysiological activity in syntactic processing despite a delay in exposure to the nonnative language.

How can these apparently contradictory results be reconciled? Our hypothesis is that high proficiency allows for native-like processing only when there are no new parametric values involved in the acquisition of the nonnative language. A detailed and linguistically informed review of reported age-induced differences reveals that they always involve a grammatical feature in the nonnative language that is not present in the native one (for a detailed discussion of the literature in this respect see Zawiszewski et al. 2011). We hypothesize that when the native language lacks a specific syntactic trait, nonnatives do not become native-like even if they achieve high proficiency. Thus, if we review the studies that have investigated the impact of age and proficiency in language processing in light of the P&P model, we observe that early exposure effects are found only when the first and second language had opposite parametric values, and we also discover that proficiency results in native-like processing when the two languages share the same value for that specific parameter.

How do Spanish-Basque Bilinguals Process Two Very Different Grammars?

There are fewer studies on syntactic processing in non-monolinguals in comparison to studies on lexical processing, but in recent years this area of research has experienced enormous growth. While evidence on nonnative syntactic processing is still sparse, "even so existing data clearly indicate that syntax is a phenomenon that deserves full consideration" (Kotz 2009, 68).

If the studies that have examined the role of age versus proficiency in language processing are reviewed focusing on the syntactic phenomena they explore, differences in processing attributed to AoA tend to be found when the native grammar of the participant diverges significantly regarding the phenomenon tested in the nonnative grammar, and high proficiency tends to yield native-like processing when the syntactic phenomenon tested in L2 has an equivalent correlate in the L1 of the participants.

If we consider Weber-Fox and Neville (1996), Mueller et al. (2005), Shiro Ojima, Hiroki Nakata, and Ryusuke Kakigi (2005), Chen et al. (2007), we observe that age effects were obtained whenever very proficient nonnatives were processing a syntactic phenomenon that had no equivalent correlate in their native language: in the case of Weber-Fox and Neville (1996), they were obtained when testing native Chinese-speakers processing subjacency effects in English Wh-questions; Chinese lacks overt Wh-movement (it is a Wh in-situ grammar), while English is an overt Wh-movement language, so that the syntactic phenomenon tested involved a parametric property absent in the native language of the participants (see Cheng 1997); in Mueller et al. (2005), the phenomenon tested was classifier morphology, which German lacks completely. In Ojima, Nakata, and Kakigi (2005) and Chen et al. (2007), the phenomenon tested was verb agreement, in natives of grammars that lack verb-agreement relations.

In light of this, the results from ERP studies suggest that it is diverging grammatical phenomena that might be sensitive to age of exposure, rather than superficial morphosyntactic differences. Both age and proficiency have been hypothesized and scrutinized as relevant factors conditioning L2 processing, but perhaps less attention has been paid so far to the issue of what syntactic phenomena are tested, and why. In linguistics, one view of cross-linguistic variation holds that specific grammars result from combinations of a set of linguistic parameters. Thus, syntactic variation would result from differences in the values of this combination of parameters (see Chomsky 1981 and Baker 2001, 2003 for overviews), and the acquisition of syntax would consist in determining the values of these syntactic parameters for the input language.

We thus investigated to what extent the linguistic distance between L1 and L2 can influence nonnative language processing, and in order to do so, we tested Basque native speakers and very proficient L2 Basque speakers whose native language is Spanish. We focused particularly on three conditions that involve syntactic parameters: (i) sentence word order (the head parameter), (ii) case morphology, and (iii) verb agreement. (i) Basque and Spanish diverge with respect to the value assigned to the head parameter. Whereas Spanish is head-initial, so that heads of phrases precede their complements, Basque is head-final: heads of phrases follow their complements, as in Turkish or Japanese:

(1)

Basque	Spanish
a. [$_{PP}$ [$_{DP}$ [$_{NP}$ liburu] a] rekin] book-the-with	b. [$_{PP}$ con [$_{DP}$ el [$_{NP}$ libro]] with the book
c. [$_{VP}$ [$_{DP}$ [$_{NP}$ liburu] a] irakurri] book-the read	d. [$_{VP}$ leer [$_{DP}$ el [$_{NP}$ libro]] read the book

(ii) These two languages also diverge with respect to argument alignment: Spanish is a nominative-accusative language, like English, while Basque is an ergative-absolutive language. Thus, in Basque, intransitive subjects (2a) look like transitive objects (2b) while transitive subjects have a different case-marker and agreement morphology (2b). In Spanish, subjects have the same form and agreement regardless of whether they are transitive or intransitive, and objects are different (2c,d):

(2) a. gizon-a etorri da
man-the arrived is
"the man has arrived"

b. emakume-a-k gizon-a ikusi du
woman-the-erg man-the seen it-has-her
"the woman has seen the man"

c. el hombre ha venido
the man has arrived
"the man has arrived"

d. la mujer ha visto al hombre
the woman has seen acc-the man
"the woman has seen the man"

In fact, the very characterization of notions like "subject" and "object" is built upon nominative-accusative grammars, as the description of ergativity above in terms of "subject/object" makes apparent. There is no morphologically consistent class of "subjects" in ergative languages, at least not one that matches that class in nominative languages.

The head parameter and the nominative/ergative alignment are two fundamental syntactic parameters in which Spanish and Basque diverge. However, Spanish and Basque converge in having (iii) verb agreement. Both languages have subject agreement, and Basque also has object agreement, as shown in (2b and 3).

(3) zu-k ni ikusi na-u-zu
you-erg me seen me-root-you
"you have seen me"

To our knowledge, the impact of argument-alignment on L2 processing has not been systematically investigated so far. Previous ERP studies on case morphology, all of them carried out on nominative-accusative languages, showed that case violations elicit a centro-parietal positivity (P600) in 500-800 ms time window, usually preceded either by a left anterior negativity (LAN) or by an N400 component in 300-500 ms time window. Basque provides us with the opportunity to test whether these effects hold also in ergative case-systems; some previous results reported by Díaz et al. (2011) suggest that the electrophysiological signatures elicited by ergative case violations do not differ from those found in nominative languages, eliciting a comparable P600 component. (See Laka 2012b and Laka and Erdozia 2012 for a review of results on native processing of Basque word order and ergativity.)

Regarding verb-agreement, nonnatives performed the behavioral task with similar accuracy levels and displayed an equivalent biphasic N400-P600 pattern as a response to the ungrammatical stimuli, like natives had in previous experiments (Zawiszewski and Friederici 2009; Díaz et al. 2011). Regarding ergative case morphology, specific to Basque adn absent in Spanish, behavioral and ERP measures revealed significant differences between native and nonnative speakers. In the grammaticality judgment task performed along with the ERP session, nonnatives made significantly more errors than natives, despite their overall high language proficiency and early AoA. As for the ERP results, ungrammaticality elicited a broad negativity in both groups, but only the native group showed a P600 effect between 600-800 ms at the critical word position. Zawiszewski et al. (2011) offer two possible interpretations of these results: (i) the lack of P600 in the nonnatives could reflect transfer from their native grammar (Spanish) so that participants interpreted the absolutive case as an equivalent of Spanish nominative case, and as a consequence did not process the sentence as containing a grammatical violation; (ii) nonnative speakers could have neglected case information and relied on other extragrammatical factors such as animacy to infer the thematic role of the ungrammatical noun phrase.

Regarding the third syntactic property, the head-directionality parameter that governs the order of words in phrases, Spanish and Basque differ fundamentally in the same way as English and Japanese: Spanish and English are head-initial languages, while Japanese and Basque are head-final languages. We found a different brain signature (by means of ERP signal) for native and nonnative speakers who had an early AoA (three years) and high levels of language proficiency. Previously, Erdocia et al. (2009) demonstrated that processing canonical SOV (subject-object-verb) word order is faster and easier than processing the non-canonical OSV (object-subject-verb) word order for native speakers, and regarding brain electrophysiology, OSV sentences showed increasing negativities at both subject and object positions and a P600 effect at verb position. These results demonstrate that OSV sentences are costlier to process than canonical SOV for native speakers of Basque (Laka 2012b; Laka and Erdozia 2012). Early and proficient Spanish-Basque bilinguals also employ more processing effort to process OSV sentences as compared to SOV ones. Spanish-Basque bilinguals performed indistinguishably from natives in the behavioral experiment, but ERP signatures departed from those observed in natives, suggesting on the one hand that behavioral measures are not accurate enough to detect this type of subtle differences in neural language processing that ERPs can detect; and on the other, that natives and nonnatives employ different neural resources to process sentence word order in Basque.

Concluding Remarks

All told, our findings indicate that divergent parameters have a significant impact in nonnative syntactic processing even at high proficiency and low AoA. Natives and nonnatives behave alike in tasks that involve equivalent linguistic phenomena for Basque and Spanish such as verb agreement condition and semantic condition, but differ in tasks that involve diverging syntactic parameters such as the head parameter and argument alignment (nominative/ergative). The results indicate that, in particular, not all linguistic differences have the same impact in nonnative language processing, and they suggest that divergent parameters have a deeper impact in nonnative syntactic processing than other seemingly variable but superficially different aspects of language variability.

Our data lend support to the hypothesis that linguistic distance is one fundamental source behind native/nonnative contrasts in the neural syntactic computation of proficient bilinguals. We obtained indications that linguistic properties that systematically diverge between the native and the nonnative language of the bilingual yield a distinct processing signature different to that of natives, even in the case of early and very proficient bilinguals. Whether this distinct signature is due to an effect of transferring the parametric setting from the native language onto the nonnative one (transfer), or whether it is due to difficulty in setting two opposite values for one linguistic parameter in the bilingual, and the extent to which these two possibilities are mutually exclusive or necessarily concurrent, cannot be determined given the available evidence, and future work is required to further unravel the ultimate nature of the language-distance effect.

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