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# What usage can do: The effect of language dominance on simultaneous bilinguals' morphosyntactic processing

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**Abstract:** Even when bilinguals learn both languages from birth and achieve high levels of proficiency, they rarely use their languages to the same degree. Recent findings suggest that individual differences in bilingual profile such as the usage of the bilingual's different languages could affect the way they retrieve and analyse linguistic information, with greater use of linguistic mechanisms from the dominant language. One of the linguistic areas where a wide variety of bilingual performance has been reported is morphosyntax. The present study tests whether language usage can account for a certain amount of the individual variability in morphosyntactic feature extraction. Basque-Spanish simultaneous bilinguals with a range of language dominance profiles were asked to judge the grammatical gender of Spanish nouns the ending of which could provide a reliable cue to gender (i. e., transparent) or not (i. e., opaque). Results showed that the more bilinguals used Basque (i. e., an agglutinative language) on a daily basis, the faster they were at detecting the presence of transparent morphemes relative to opaque nouns. These findings suggest that simultaneous bilinguals have different ways of retrieving grammatical gender depending on their language profile. Language usage can contribute to explaining the presence of individual differences in morphosyntactic feature retrieval.

**Keywords:** individual differences, simultaneous bilinguals, Interdependent Development Hypothesis, grammatical gender, PsychLingVar

## 1 Introduction

Learning a second language (L2), even if early in life, does not always ensure native performance and a wide variety of L2 final attainment can still be observed among early bilinguals (Birdsong 2014). Whether language usage (i. e., how often and how much a bilingual uses a language on a daily basis) might account for this variability and might have a permanent impact on the neural and behavioural specialization underlying high levels of proficiency is still unknown. To shed light on this issue, the present study will investigate whether language usage modulates morphosyntactic feature extraction in highly proficient simultaneous bilinguals (i. e., who acquired both languages from birth).

Adult highly proficient simultaneous bilinguals can differ widely in the way they use their languages in the social environment (i. e., in which domains, contexts and purposes, Grosjean 1989, 2008). Depending on their linguistic needs and preferences, the amount of input from each specific language they deal with on a daily basis can be very different and, as a consequence, they can show dominance for one language over the other (Birdsong 2014). Although this imbalance is quite common among highly proficient early bilinguals, the role and characteristics of language dominance are still not clear (Birdsong 2014). The Interdependent Development Hypothesis (Döpke 2000; Hulk and Müller 2000; Paradis and Genesee 1996; Yip and Matthews 2007) suggests that the weaker language would be more vulnerable to cross-linguistic influence from the dominant language, resulting in delays in the pace of development (Gawlitzek-Maiwald and Tracy 1996) and in qualitative changes of the ultimately – attained competence (Hulk and Müller 2000; Yip and Matthews 2007). In contrast to this theory, the Separate

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Development Hypothesis (Houwer 1990, 2005) holds that when the two languages are acquired very early in life each language develops separately.

Developmental studies focussing on spontaneous speech in young bilinguals have provided conflicting results, with some studies showing that, regardless of dominance, the two linguistic systems develop separately from each other with no substantial interaction (Houwer 1990, 2005) and others reporting cross-linguistic interaction with atypical linguistic routines in the weaker language (Mok 2011; Nicoladis 2006; Yip and Matthews 2007). Despite these contrasting findings, authors supporting the Separate Development Hypothesis have highlighted the fact that dominance effects are temporary and do not affect the nature of the ultimately-attained competence in the non-dominant language (Houwer 2005).

Given the very scarce empirical research carried out on the effects of language dominance in adult early bilinguals, it is still difficult to draw definitive conclusions. However, the few studies available on phonological perception in adult early bilinguals suggest that language dominance can actually have permanent consequences on how a language is processed. In fact, highly proficient early bilinguals have shown non-native perception of some phonological contrasts in the non-dominant language (Sebastián-Gallés et al. 2005). They found it difficult to perceive contrastive vowels in their non-dominant language, when they were not contrastive also in their dominant language (Sebastián-Gallés et al. 2005). Interestingly, these difficulties were not purely determined by age of acquisition (AoA) differences, since they were reported both with simultaneous and early sequential bilinguals (Sebastián-Gallés et al. 2005). Moreover, these dominance effects do not seem to be limited to the phonological domain, but extend also to lexical processing and word recognition (Sebastián-Gallés et al. 2005, 2006; Pallier et al. 2001). Overall, the available data imply that even when people learn both languages early in life and achieve high levels of proficiency, the way linguistic cues (such as phoneme discriminability) are detected and computed can still depend on the amount of language usage (MacWhinney 2001; McDonald 1987).

The present study investigates for the first time whether language usage in simultaneous bilinguals impacts grammatical judgements. Together with phonology, this is a particularly difficult linguistic domain to be mastered by bilinguals, in which variations in performance have been reported even when bilinguals learned both languages from birth (Montrul et al. 2008). Similarly to what has been observed in phonology, we hypothesized that differences in simultaneous bilinguals' daily language usage might have a permanent effect on the way they retrieve and compute morphosyntactic features. To test this hypothesis, we used Spanish grammatical gender as the testing arena.

## 1.1 Grammatical gender cues

In Spanish, the grammatical gender of a noun can entail consistent relations with its word form. Based on these gender-to-ending correspondences nouns can be classified as transparent (i. e., the ending represents a valuable cue to retrieve gender), opaque (i. e., the ending is uninformative of gender), or irregular (i. e., the ending represents a misleading cue for gender retrieval). Transparent endings have a different morphological status depending on the type of Spanish noun considered. In most of the nouns referring to human beings (and some animals) the transparent ending is an inflectional morpheme that can change depending on the sex of the referent (e. g. -o and -a in *amigo*, 'friend-M', *amiga*, 'friend-F', respectively). In contrast, in nouns referring to objects, inanimate entities and some animals, the transparent ending is just a pseudo-morpheme, which cannot be inflected (e. g., -a in *mesa*, 'table-F').

These sub-lexical units might be differently detected and computed depending on the bilingual's language background. For instance, previous behavioural studies seem to suggest that the transparent endings would be particularly useful to retrieve gender for bilinguals whose dominant language lacks a grammatical gender system (Bordag et al. 2006). Specifically, English-German bilinguals showed a behavioural advantage for German transparent nouns compared to opaque nouns during a gender decision task (with faster reaction times for transparent nouns compared to opaque ones, Bordag et al. 2006).

In addition, the relevance of morphemes and sub-lexical units might depend on the type of morpho-syntactic mechanisms that are widely used in the dominant language (MacWhinney 2001; McDonald 1987). For instance, morphemes might not be particularly salient to speakers whose dominant language is mainly inflectional, i. e. a language like Spanish in which a single inflectional affix simultaneously marks different features, such as the noun's gender and number (e. g. the bound morpheme *-as* in the Spanish adjective *rojas*<sub>fem.pl</sub>, red, which marks both gender and number information). The pervasive syncretism of inflectional languages contrasts with the predominant one-to-one correspondence between affixes and grammatical category/meaning that is found in agglutinating languages like Basque. In such languages, words can be easily divided into stem and affixes, with each affix typically representing a single grammatical category or lexical meaning, as in e. g. *etxe-a-n* (in the house), in which the stem (*etxe*, house) is followed by the determiner (*-a*, the) and case marking (*-n*) (see Hualde and Ortiz de Urbina 2003, for an overview). In this case, morphemes may constitute salient cues for speakers during language processing, as a direct mapping between word form and grammatical function/meaning is available. If this is indeed the case, one could expect simultaneous bilinguals with unbalanced dominance to transfer the mechanisms associated with their dominant language to the non-dominant one, even when the analysis focuses on properties available only in the weaker language. To explore this hypothesis, we tested simultaneous Basque-Spanish bilinguals (with different degrees of Basque dominance) in a task in which they were required to make a grammatical decision based on a feature that is available in Spanish but not in Basque, i. e. gender. If Basque word form-to-function correspondence mechanisms are frequently used on a daily basis, they are likely to be transferred to the non-dominant language (i. e., Spanish), resulting in a stronger reliance on Spanish form-to-function correspondences.

## 1.2 The present study

The present study focused on the role of language dominance during the morphosyntactic feature extraction of simultaneous Basque-Spanish bilinguals. Specifically, we tested whether language usage can affect the reliance on sub-lexical units (e. g., transparent morphemes) during Spanish grammatical gender decision. We hypothesized that the amount of Basque (or Spanish) used every day could influence the way gender information is retrieved based on formal gender cues.

A behavioural experiment was conducted with Spanish-Basque bilinguals who had learned both languages from birth. The task was to decide the grammatical gender of a set of Spanish words with transparent or opaque endings. The transparent endings could be morphemes or pseudo-morphemes.

According to the Interdependent Development Hypothesis (Döpke 2000; Hulk and Müller 2000; Paradis and Genesee 1996; Yip and Matthews 2007) simultaneous bilinguals should show effects of language dominance resulting in individual differences in grammatical gender decision (Gawlitzeck-Maiwald and Tracy 1996; Hulk and Müller 2000; Yip and Matthews 2007). In line with this theoretical perspective, the more bilinguals use Basque on a daily basis, the more likely it is that Basque morphosyntactic mechanisms are transferred to Spanish. This should result in a better detection of regular sub-lexical units (i. e., transparent endings, and especially of transparent morphemes) and a stronger reliance on this type of formal cues during gender retrieval, leading to faster reaction times (RTs) and greater accuracy for transparent than opaque nouns. In other words, the behavioural advantage of transparent nouns over opaque nouns should be greater as the amount of Basque usage increases (and the Spanish usage decreases).

On the other hand, the Separate Development Hypothesis (Houwer 1990, 2005) does not predict any impact of language dominance on grammatical performances of simultaneous bilinguals, since each language should develop independently and without cross-linguistic interaction (Houwer 1990, 2005). In this case, the increased amount of Basque usage should not affect the behavioural responses recorded during the grammatical gender decision task.

## 2 Method

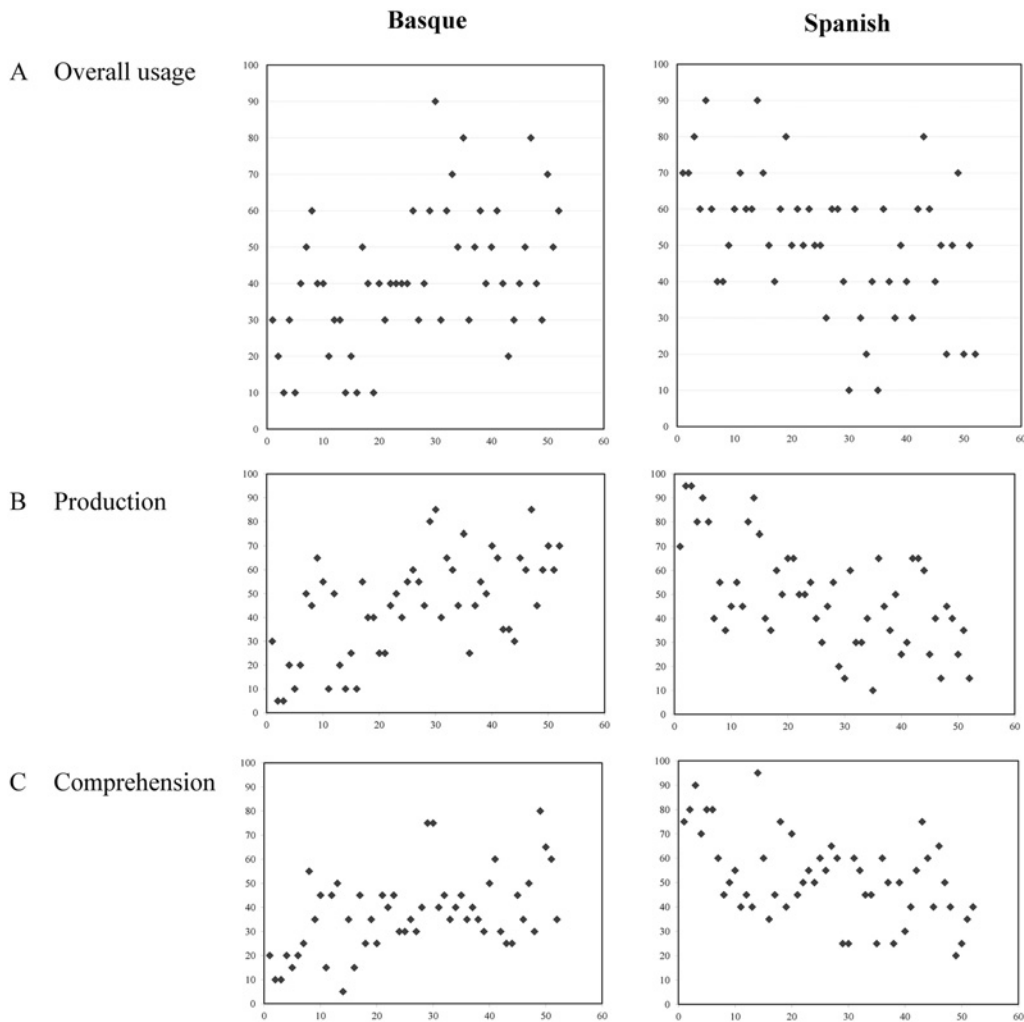
### 2.1 Participants

Fifty-two Basque-Spanish simultaneous bilinguals took part in the experiment (38 women, mean age: 23.7; SD: 5.5) and they were paid for their participation (8 €). Age ranged from 18 to 39 years with a mean of 23.7 years (SD: 5.5). All participants were born and lived in the Basque Country. They had been exposed both to Spanish and Basque since birth and they started to learn both languages early in life (Basque AoA: 0.6 SD: 1.1; Spanish AoA: 0.8; SD: 1.1). All participants showed high levels of proficiency in both Spanish and Basque (on a picture naming test they were all above 95% of accuracy; at a structured interview<sup>1</sup> with a native speaker they were all above four on a scale of one to five). All participants had some notions of English from school but their level of proficiency was not as high as for Basque and Spanish (on a picture naming test they could name about 71% of all images; at a structured interview<sup>1</sup> with a native speaker their average score was three on a scale of one to five). Three self-reported measures of usage were separately estimated for Basque and Spanish. First, participants were asked to rate on a scale of 1 to 100 the overall amount of Basque used on a daily basis (the same was done for Spanish). Also, they had to rate on a scale of 1 to 100 their amount of Basque and Spanish production (i. e., amount of spoken and written language) and comprehension (i. e., amount of heard and read language). Participants showed a wide variability in the overall usage of Basque and Spanish (Spanish mean usage: 50.9, SD: 19, range: 10–90; Basque mean usage: 41.3, SD: 19, range: 10–90; see Figure 1), as well as in more specific measures related to production and comprehension (see Figure 1). Production and comprehension measures were highly correlated with the overall usage of Basque (production:  $r = 0.83$ ,  $p < 0.001$ ; comprehension:  $r = 0.62$ ,  $p < 0.001$ ) and Spanish (production:  $r = 0.96$ ,  $p < 0.001$ ; comprehension:  $r = 0.89$ ,  $p < 0.001$ ) and for this reason they were not further analysed. Basque and Spanish were the two languages mainly used by all participants and, thus, the usage measures of the two languages were strongly negatively correlated (overall usage:  $r = -0.78$ ,  $p < 0.001$ ; production:  $r = -0.91$ ,  $p < 0.001$ ; comprehension:  $r = -0.75$ ,  $p < 0.001$ ). All participants were right-handed and reported normal or corrected-to normal vision. None of the participants had a history of neurological disorder.

### 2.2 Materials

Eighty-eight Spanish nouns were selected (16 feminine nouns, range: 3–9 letters, see Appendix 1 for the complete list of words). Half of the nouns were transparent (44, e. g. *gusano*, ‘worm-M’) and half were opaque (44, e. g., *cisne*, ‘swan-M’). The transparent endings were strongly associated with a specific gender class (i. e., “-o” for masculine and “-a” for feminine). The opaque endings were uninformative of grammatical gender (e. g., “-e”, “-n”, “-r”, “-d”, “-z”; final groups of letters strongly related to a specific gender class were excluded according to Bull 1965; Clegg 2010). Overall, the cue availability (i. e., how often a specific ending is available in the lexicon, MacWhinney et al. 1984) and the cue reliability (i. e., how often a specific ending is associated with a given gender class, MacWhinney et al. 1984) of opaque endings were lower than those of transparent endings (Harris 1991).

<sup>1</sup> Participants had to answer questions about three main topics: introduce yourself (i. e., who, where are they from, what did they study, why), hobbies (i. e., sports, music, art, dance, etc.), spatial localization (i. e., how did you get here?). Based on their responses a score from one to five was assigned: one for a total lack of knowledge (i. e., the participant knows some words, but he/she is unable to create a sentence); two for a basic level (i. e., the participant can produce simple sentences but with a lot of difficulties and mistakes); three for a mid-level (i. e., the participant is able to have simple conversations but with some mistakes; he/she shows difficulties and low fluency with long sentences); four for an advanced level (i. e., the participant is able to have conversations on a wide range of topics; he/she can produce long sentences with high fluency but there are still some mistakes); five for a very high proficiency level (i. e., the participant can talk easily about everything without errors).



**Figure 1:** **A:** Overall amount of Basque (on the left side) and Spanish (on the right side) used on a daily basis by the 52 participants. **B:** Amount of Basque (on the left side) and Spanish (on the right side) production reported by the 52 participants. **C:** Amount of Basque (on the left side) and Spanish (on the right side) comprehension reported by the 52 participants. Ratings were provided on a scale of 1 to 100 (represented on the y-axis).

In order to check whether formal cues to gender could show different effects depending on their morphological status, half of the transparent endings (i. e., 22) were morphemes (e. g., *alumno*, ‘student-M’) and the other half were pseudo-morphemes (e. g., *gusano*, ‘worm-M’). Note that nouns with a transparent morpheme had a grammatical gender that corresponded to the sex of the referent (i. e., biological gender), while transparent nouns with a pseudo-morpheme did not show this correspondence (i. e., their grammatical gender was arbitrary). In order to have a homogeneous control condition, we maintained the same distinction in opaque nouns. Thus, in half of the opaque nouns (i. e., 22) the grammatical gender corresponded to the biological sex of the referent (e. g., *duende*, ‘elf-M’) and in the other half it did not (e. g., *cisne*, ‘swan-M’, see Table 1). In the rest of the manuscript nouns with biological gender are labelled “morphemic nouns”, while nouns with arbitrary gender are labelled “non-morphemic nouns”.

The frequency of use (extracted from *EsPal*, Duchon et al. 2013) and the length of the nouns were matched across the four conditions (frequency:  $F(3,84) = 0.06$ ,  $p = 0.98$ ; length:  $F(3,84) = 0.14$ ,  $p = 0.94$ ; see Table 2).

Fifty-six filler nouns were added in order to increase the variability of the materials and prevent participants from using superficial strategies (e. g., attending just to the noun ending). Filler included irregular nouns, whose endings were misleading cues to gender (e. g., *mano*, ‘hand-F’, *problema*, ‘problem-M’), and nouns with



**Table 1:** Examples of experimental stimuli. Transparent endings can be morphemes (first row) or non-morphemes (second row).

	Transparent	Opaque
Morphemic nouns	<i>Alumno</i> Student-M	<i>Duende</i> Elf-M
Non-morphemic nouns	<i>Gusano</i> Worm-M	<i>Cisne</i> Swan-M

**Table 2:** Mean frequency and length for each experimental condition.

		Frequency (log)	N° letters
Morphemic	Transparent	1.4 (0.7)	6 (2)
	Opaque	1.4 (0.8)	6 (2)
Non-morphemic	Transparent	1.4 (0.7)	6 (2)
	Opaque	1.4 (0.7)	6 (2)

Note: Standard deviations are reported in parentheses.

stereotypical gender (i. e., nouns that are typically associated with male or female representations, e. g., *profesor/profesora*, ‘teacher-M/teacher-F’ is more often used to refer to women).

Overall, the participants had to decide the grammatical gender of 144 nouns (72 were masculine and 72 were feminine).

### 2.3 Procedure

Each participant was tested in a quiet and dimly illuminated room. They sat 120 cm away from the computer monitor. Stimuli were displayed in yellow letters against a black background in order to minimise the contrast between colours and to facilitate the reading task. Participants were asked to decide the grammatical gender of each noun displayed on the screen by pressing one of two response keys (labelled with M for “masculine” and F for “feminine”). The experimental stimuli were randomly presented and the button position was counterbalanced across participants.

Each trial began with a fixation cross that remained on the screen for 800 ms, followed by a blank screen for 300 ms. Then the target noun was presented on the screen until participants’ response (or for a maximum of 3 sec). There was a 300-ms blank screen between trials. RTs were calculated from the onset of the target noun to participants’ keypress. The experiment lasted approximately 15 minutes.

An offline questionnaire was presented to the participants at the end of the behavioural experiment. The list of 88 experimental items was provided. For each noun they were asked to report whether they knew the word and whether they knew its grammatical gender. When a participant did not know either the meaning or the gender, accuracy rate and RTs for that noun were excluded from the analyses (2.6%).

## 3 Statistical analyses and results

Accuracy rates and RTs from accurate trials were obtained for each participant and each experimental condition (i. e., transparent – morphemic, transparent – non-morphemic gender, opaque – morphemic, opaque – non-morphemic). RTs that were 2.5 standard deviations (SDs) above or below the RT mean of each

participant were excluded from further analyses (3.1% of all data). Overall, participants knew the gender of most of the words and could achieve high accuracy rates (mean: 96.6; SD: 4.2) providing relatively fast responses (mean: 748 ms; SD: 133 ms). To make sure that participants were sensitive to our experimental manipulations (as in Bates et al. 1995; Vigliocco and Frank 1999), a two-way repeated measures ANOVA was calculated including Formal Cue (transparent, opaque) and Morphological Status (morpheme, non-morpheme) as within-subjects factors. The results showed that participants were faster and more accurate at judging the grammatical gender of transparent nouns compared to opaque nouns (accuracy:  $F(1,103) = 29.2$ ,  $p < 0.001$ ; RTs:  $F(1,50) = 37.96$ ,  $p < 0.001$ ). They were also faster and more accurate with morphemic nouns than with non-morphemic nouns (accuracy:  $F(1,103) = 29.2$ ,  $p < 0.001$ ; RTs:  $F(1,50) = 54.53$ ,  $p < 0.001$ ).<sup>2</sup>

Although this analysis confirmed the importance of transparency and semantic gender of nouns during explicit gender decision (in line with previous studies on monolinguals Bates et al. 1995; Caffarra et al. 2014; Vigliocco and Frank 1999), it did not allow us to check for the presence of individual differences in gender cue detection. In order to specifically test whether participants' linguistic habits (i. e., amount of Spanish/Basque used on a daily basis) affected the way they rely on sub-lexical units during gender retrieval, we ran Pearson correlation analyses between the self-reported measures of language usage and the behavioral advantage shown for gender cues. This behavioral advantage was quantified by calculating the accuracy and RT difference between transparent and opaque endings both for morphemic and non-morphemic nouns. Thus, for each participant we obtained four measures of personal reliance on formal gender cues. These measures were correlated with the self-reported scores of overall language usage for Basque and Spanish. The comparison of the magnitude of the correlations was carried out using "cocor" software package for the R programming language (Diedenhofen and Musch 2015).

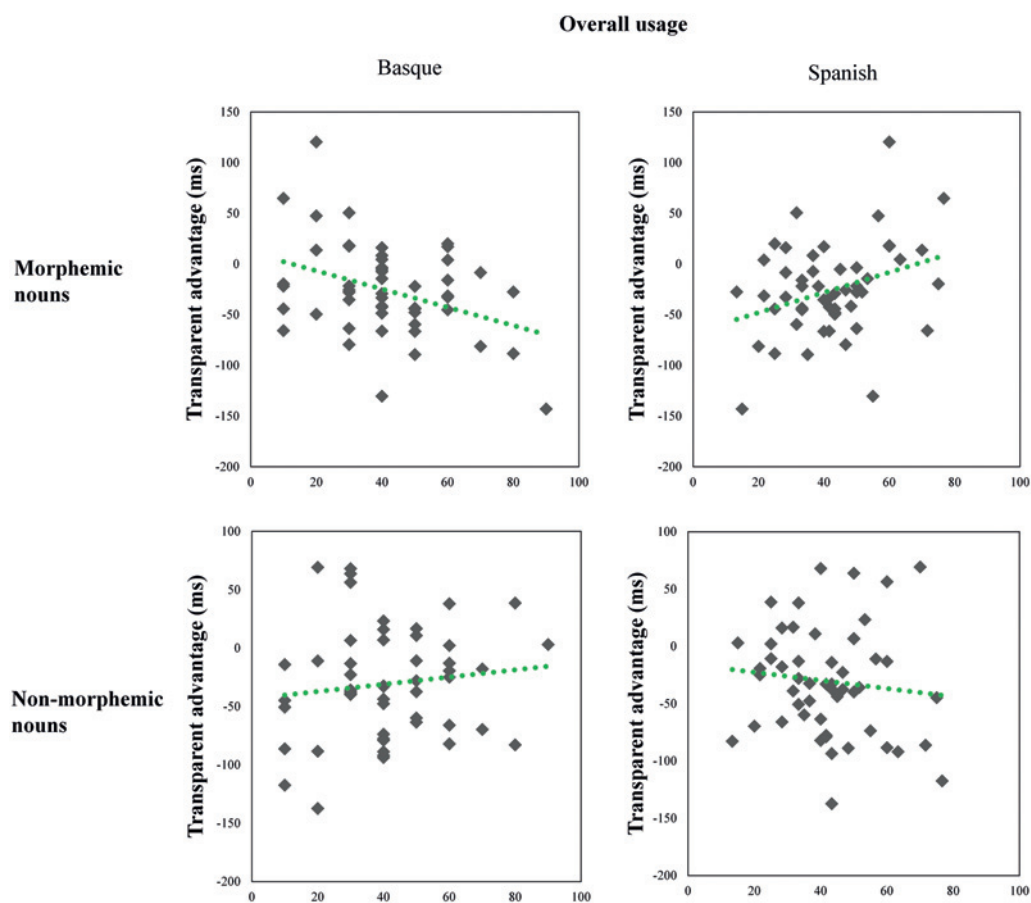
The results showed significant correlations with RTs, but not with accuracy measures (all  $|rs| < 0.2$ ; all  $ps > 0.10$ ), probably because of the low variability in accuracy rates across participants. Significant correlation values were observed between the overall amount of Spanish (or Basque) used on a daily basis and the RT advantage for transparent morphemes over opaque nouns (Basque:  $r = -0.37$ ,  $p < 0.01$ ; Spanish:  $r = 0.32$ ,  $p < 0.05$ ; see Figure 2). The more people used Basque (and the less they used Spanish), the faster they retrieved the grammatical gender of transparent nouns relative to opaque nouns. This was evident when transparent endings were morphemes (e. g., *alumno*, 'student-M'). The correlations between language usage and RTs of non-morphemic nouns did not reach significance (Basque:  $r = 0.12$ ,  $p = 0.39$ ; Spanish:  $r = -0.11$ ,  $p = 0.44$ ; see Figure 2). RT correlations of morphemic nouns significantly differed from correlations of non-morphemic items (Basque:  $z = 12.10$ ,  $p < 0.001$ ; Spanish:  $z = 12.99$ ,  $p < 0.001$ ; see Figure 2).

## 4 Discussion

The present behavioral study was aimed at testing the role of language dominance in morphosyntactic feature extraction in simultaneous bilinguals. We selected Basque-Spanish simultaneous bilinguals who were highly proficient in both languages but who used different degrees of Basque (and Spanish) on a daily basis. They were asked to decide the grammatical gender of Spanish nouns the endings of which could provide a reliable formal gender cue (i. e., transparent nouns) or not (i. e., opaque nouns). In addition, transparent endings could be inflectional morphemes or pseudo-morphemes.

Results revealed that even when simultaneous bilinguals showed high levels of proficiency in both languages, individual differences could be still observed in the way they retrieve Spanish grammatical gender. These individual variations were related to the amount of Spanish/Basque used on a daily basis.

<sup>2</sup> To make sure that the response button order did not influence the pattern of the results, we ran an additional analysis including Button Order as a between-subject factor. There was no main effect of Button Order (accuracy:  $F(1,50) = 0.02$ ,  $p = 0.90$ ; RT:  $F(1,50) < 0.08$ ,  $p = 0.78$ ) and no significant interactions with other experimental variables (all  $F_s < 2$ , all  $ps > 0.17$ ).



**Figure 2:** Correlations between the overall amount of Basque (on the left side) and Spanish (on the right side) used and the facilitation effect for transparent nouns. The facilitation effect was calculated computing the RT difference between nouns with transparent and opaque endings. Results concerning the morphemic nouns are shown in the first row and results for the non-morphemic nouns are in the second row. Values on the y-axis are negative when RTs of participants' correct responses were faster with transparent nouns than with opaque nouns.

Specifically, the more bilinguals were dominant in Basque (and the less they were dominant in Spanish), the faster they could retrieve the gender of nouns whose ending was a transparent morpheme, relative to opaque nouns.

We think that this difference in gender retrieval could be the result of cross-linguistic interaction between Basque and Spanish (Döpke 2000; Hulk and Müller 2000; Yip and Matthews 2007). The more people use Basque on a daily basis, the more they are used to relying on consistent one-to-one correspondences between an affix and a grammatical function (Hualde and Urbina 2003). This Basque morphosyntactic knowledge would be transferred to Spanish (Döpke 2000; Hulk and Müller 2000; Yip and Matthews 2007), resulting in an over-reliance of any available morpheme that allows successful retrieval of the grammatical gender feature (MacWhinney 2001; McDonald 1987). The cross-linguistic transfer of morphosyntactic preferences widely employed in the dominant language (i. e., Basque) can explain why simultaneous bilinguals showed different degrees of reliance on Spanish transparent morphemes during explicit gender decision. Interestingly, the RTs of non-morphemic nouns do not show correlations with bilinguals' language usage on a daily basis suggesting that Basque morphosyntactic preferences are not easily generalized to Spanish nouns whose ending is a pseudo-morpheme.

The present results are consistent with the Interdependent Development Hypothesis, showing that language dominance can have a permanent impact on the way early bilinguals retrieve and compute



linguistic information (Döpke 2000; Hulk and Müller 2000; Yip and Matthews 2007). Even if the two languages are acquired very early in life, the two linguistic systems can still interact with each other (Hulk and Müller 2000; Yip and Matthews 2007). The final linguistic attainment will depend on the dynamic balance between the two languages. The weaker language will be less resistant to cross-linguistic influence from the dominant one (Döpke 2000; Hulk and Müller 2000; Yip and Matthews 2007). The present study further suggests that the effects of language dominance are not limited to phonological and lexical domains (Sebastián-Galles et al. 2005, 2006; Pallier et al. 2001), but can also involve simultaneous bilinguals' morphological processing.

An alternative interpretation of the present pattern of results could be more focused on the processing difficulties during gender retrieval of opaque nouns. Our findings may be considered to suggest that bilinguals have increased difficulties in retrieving the gender of opaque nouns, as their amount of Spanish usage decreases. However, if this were the case, there should have been significant correlations between language usage and RTs not only with morphemic nouns, but also with non-morphemic ones. In contrast, the correlation with non-morphemic nouns suggests that the morphological status of noun endings (i. e., the availability of transparent morphemes) at least partially accounts for the present pattern of results.

It should also be noted that previous studies on second language gender processing are in line with our interpretation showing bilinguals' overuse of gender formal cues compared to monolinguals (Bordag et al. 2006). Previous studies have shown that when Spanish monolinguals perform explicit tasks on gender they can take advantage of formal gender cues (Caffarra et al. 2014; Hernandez et al. 2004). Our studies further suggest that in the case of simultaneous bilinguals, the behavioural advantage of transparent nouns over opaque nouns is not fixed, but can change depending on linguistic habits.

In addition, the present results suggest that learning a language from birth does not always guarantee the same level of ultimately-attained performance. Age of acquisition is only one of the potential factors that can impact bilinguals' syntactic processes (see Caffarra et al. 2015 for a discussion on this issue). The amount of language actually used on a daily basis seems to be an important variable to be considered in order to capture individual variations of linguistic processes (Bedore et al. 2012). This might be particularly true in the case of early or simultaneous bilinguals where age of acquisition and global measures of proficiency do not seem to be as predictive as other more specific aspects of linguistic habits (Silva-Corvalán and Treffers-Daller 2016). With this type of bilinguals, the amount of language used on a daily basis seems to be a more reliable measure to differentiate early bilinguals' morphosyntactic feature analysis. The correlation values reported in the present study suggest that self-reported measures of language usage can be predictive of bilinguals' performance variations. However, further studies are still needed in order to determine the best ways to quantify language dominance without exclusively relying on self-reported estimates (for alternative measures of language dominance see Gollan et al. 2012).

In conclusion, the present behavioural study highlights the presence of individual differences during morphosyntactic feature extraction in simultaneous bilinguals. It also shows that language dominance (i. e., amount of language used on a daily basis) can account for a certain amount of this individual variability.

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## Appendix 1: List of all the experimental items

Transparent Morphemic	Translation	Transparent Non-morphemic	Translation	Opaque Morphemic	Translation	Opaque Non-morphemic	Translation
<i>tía</i>	Aunt-F	<i>concha</i>	Shell-F	<i>madre</i>	Mother-F	<i>noche</i>	Night-F
<i>hechicera</i>	Sorceress-F	<i>piraña</i>	Piranha-F	<i>meretriz</i>	Prostitute-F	<i>serpiente</i>	Snake-F
<i>tataranieta</i>	Great-granddaughter-F	<i>bandeja</i>	Tray-F	<i>esfinge</i>	Sphinx-F	<i>nariz</i>	Nose-F
<i>hija</i>	Daughter-F	<i>tierra</i>	Ground-F	<i>mujer</i>	Woman-F	<i>gente</i>	People-F
<i>amigo</i>	Friend-M	<i>pájaro</i>	Bird-M	<i>hombre</i>	Man-M	<i>plan</i>	Plan-M
<i>tío</i>	Uncle-M	<i>lado</i>	Side-M	<i>rey</i>	King-M	<i>pez</i>	Fish-M
<i>hijo</i>	Son-M	<i>siglo</i>	Century-M	<i>padre</i>	Father-M	<i>país</i>	Country-M
<i>hermano</i>	Brother-M	<i>imperio</i>	Empire-M	<i>príncipe</i>	Prince-M	<i>tiburón</i>	Shark-M
<i>perro</i>	Dog-M	<i>barrio</i>	Neighborhood-M	<i>conde</i>	Count(male)-M	<i>valle</i>	Valley-M
<i>cuñado</i>	Brother in law-M	<i>hígado</i>	Liver-M	<i>jinete</i>	Horse rider(male)-M	<i>cohete</i>	Rocket-M
<i>niño</i>	Little boy-M	<i>cielo</i>	Sky-M	<i>león</i>	Lion-M	<i>cine</i>	Cinema-M
<i>suegro</i>	Father in law-M	<i>sótano</i>	Basement-M	<i>jabalí</i>	Wild pig(male)-M	<i>buitre</i>	Vulture-M
<i>alumno</i>	Student(male)-M	<i>sueldo</i>	Salary-M	<i>concejal</i>	Councilor-M	<i>satélite</i>	Satellite-M
<i>burro</i>	Donkey-M	<i>gozo</i>	Joy-M	<i>buey</i>	Ox-M	<i>cisne</i>	Swan-M
<i>zorro</i>	Fox(male)-M	<i>bando</i>	Proclamation-M	<i>abad</i>	Abbot-M	<i>coral</i>	Coral-M
<i>abuelo</i>	Grandfather-M	<i>crédito</i>	Credit-M	<i>sacerdote</i>	Priest-M	<i>uniforme</i>	Uniform-M
<i>mono</i>	Monkey(male)-M	<i>oficio</i>	Job-M	<i>patrón</i>	Boss-M	<i>bronce</i>	Bronze-M
<i>primo</i>	Cousin(male)-M	<i>techo</i>	Ceiling-M	<i>tigre</i>	Tiger-M	<i>reloj</i>	Watch-M
<i>búfalo</i>	Buffalo(male)-M	<i>gusano</i>	Worm-M	<i>duende</i>	Elf-M	<i>guante</i>	Glove-M
<i>conejo</i>	Rabbit(male)-M	<i>cuello</i>	Neck-M	<i>capitán</i>	Captain-M	<i>delfín</i>	Dolphin-M
<i>biznieta</i>	Great-grandson-M	<i>lavabo</i>	Sink-M	<i>gañán</i>	Brute(male)-M	<i>mejillón</i>	Mussel-M
<i>gato</i>	Cat(male)-M	<i>brazo</i>	Arm-M	<i>sultán</i>	Sultan-M	<i>tanque</i>	Tank-M