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Title

Activation and local inhibition in the bilingual child's processing of codeswitching

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Abstract

Codeswitching has been used as a tool to investigate how the properties of the two language systems interact in the bilingual mind with relatively few studies investigating bilingual children. We target two groups of L1 Spanish-L2 English children in Spain to address language activation and language inhibition in the processing of codeswitching between a determiner (DET) and a noun (N). We investigate how the mental representation of the formal features involved is responsible for the sensitivity to grammatical gender, which in turn affects how bilinguals' language activation and inhibition processes are at play and shape processing. We target both the directionality

of the switch (English DET-Spanish N versus Spanish DET-English N) and the type of implicit gender agreement mechanism —in the case of Spanish DET-English N switches— by using offline acceptability judgment data and eyetracking during reading data. Results suggest lower processing costs of English DET switches and higher ones of non-congruent Spanish DET switches. We interpret the preference for classifying the non-gendered Ns along the lines of the gendered Ns in the gendered language as evidence for the integrated representation hypothesis which states that both Ns depicting the same concept are connected in the mind of the bilingual.

Keywords: codeswitching, gender features, inhibition-activation, English-Spanish bilingual children, eyetracking during reading

I Introduction

Codeswitching has been used to investigate how the properties of two language systems interact in the mind of the bilingual (e.g., Arnaus et al., 2012; Burkholder, 2018; Fairchild and Van Hell, 2017; Fernández Fuertes et al., 2019; Jorschick et al., 2010; Liceras et al., 2016). Switch-points involving functional and lexical categories have attracted a great deal of attention, especially those between a determiner (DET) and a noun (N).

It has been shown that bilinguals exhibit some measure of activation of both languages and some interaction between them at all times, even more so in contexts in which both languages are used (e.g., Bialystok et al., 2012; Kroll et al., 2012). This joint activation of the two languages of the bilingual is what we aim to characterize in the case of Spanish-English sequential bilingual children when confronted with Spanish-English determiner phrase (DP) switches like those in (1) to (3).

(1) a. *El señor está arreglando* ***la***$_{\mathbf{F}}$ **window** with a hammer (Spanish DET-English N)

'The man is fixing the window with a hammer'

b. The man is fixing **the *ventana***$_{\mathbf{F}}$ *con un martillo* (English DET-Spanish N)

'The man is fixing the window with a hammer'

(2) a. *El señor está arreglando* ***la***$_{\mathrm{F}}$ **window**$_{\mathrm{F\ in\ SP}}$ with a hammer (gender congruent)

'The man is fixing the window with a hammer'

b. *El señor está arreglando* ***el***$_{\mathrm{M}}$ **window**$_{\mathrm{F\ in\ SP}}$ with a hammer (gender non-congruent)

'The man is fixing the window with a hammer'

(3) a. *El niño está leyendo* ***el***$_{\mathrm{M}}$ **book**$_{\mathrm{M\ in\ SP}}$ for the first time (gender congruent)

'The child is reading the book for the first time'

b. *El niño está leyendo* ***la***$_{F}$ **book**$_{M}$ in SP for the first time (gender non-congruent)

'The child is reading the book for the first time'

DET=determiner; N=noun; F=feminine; M=masculine; SP=Spanish

The focus is placed on the joint activation of the two languages (Spanish and English in this case). In particular, we explore the underlying representation of the L1 Spanish grammatical gender features with a view to analyzing whether they shape codeswitching preferences (and, if so, how). It is generally assumed that the two languages (i.e., the L1 and the L2) have an integrated representation in the lexicon and that they share the same conceptual system (i.e., Colomé and Miozzo, 2010; Costa et al., 2005; Dijkstra, 2005; Klassen, 2016; Kroll and Stewart, 1994; Vigliocco et al., 2002). This means that, as in the examples in (1) and (2) above, the two Ns "window" and "*ventana*" are connected in the mind of the bilingual. If this is so, and when it comes to switched DPs, the parallel activation of both Ns (i.e., "*ventana*" from the L1 Spanish and "window" from the L2 English) could potentially result in different ways of dealing with different switched DPs like those in (1)-(3). We aim to explain how joint activation will shape the directionality of the switch (examples in 1) and the gender agreement patterns (examples in 2 and 3).

Activation operates hand in hand with inhibition (e.g., Kroll et al., 2012; Meuter and Allport, 1999; Philipp et al., 2007; Philipp and Kotch, 2009) and this interplay characterizes bilinguals' language processing. In this particular case, language activation and local inhibition are at stake. Local inhibition is understood as inhibition of a specific competing distractor, such as the translation equivalent of the required concept (as in De Groot and Christoffels, 2006). When processing switched DPs, local inhibition would have a specific linguistic outcome: reduced speed. However, local inhibition would be less costly than activating the translation equivalent because, when

activated, the translation equivalent would trigger grammatical mechanisms that need to be enforced that would, in turn, slow processing. That is, processing an English DET switch (1b) would be less costly than a Spanish DET switch (1a), as, in the first case, inhibition results in the absence of having to enforce the grammatical mechanisms at stake (i.e., gender assignment and gender agreement).

When it comes to gender agreement, we investigate whether participants access the Spanish Ns when making judgments about codeswitched DPs or when processing codeswitched DPs in which no Spanish N is in fact present (Spanish DET-English N switches, examples 2 and 3 above). Being bilingual implies knowledge of two languages, which entails the simultaneous activation of both (Kroll et al., 2012). Taking this approach as a point of departure, we explore how L1 activation and, in particular, the activation or inhibition of Spanish grammatical gender features influences L2 bilingual children's codeswitching preferences. We aim to characterize how the co-activation of the two languages proceeds and whether the non-spelled-out Spanish N is not only activated but governs and triggers the type of gender agreement mechanism that will otherwise be enforced in a fully-in-Spanish DP, giving way to the gender congruent Spanish-English DP switch in (2-3a) versus the non-congruent switch in (2-3b).

Previous work on these topics has mainly focused on adult bilinguals with very few studies analyzing how the processing of these specific switches proceeds in the case of bilingual children. In this article, we attempt to fill in this gap by presenting an analysis of switched DPs in two groups of sequential bilingual children with Spanish as a first language (L1) and English as a second language (L2) (n=87). Our aim is to investigate how inhibition and activation work, as reflected in the mental representation of the formal features of the languages involved in the switch and, in turn, how this

interplay shapes these bilinguals' codeswitching preferences. This will shed light on how linguistic features are represented in the mind of the bilingual and how the bilingual mind executes linguistic operations in the case of sequential bilinguals.

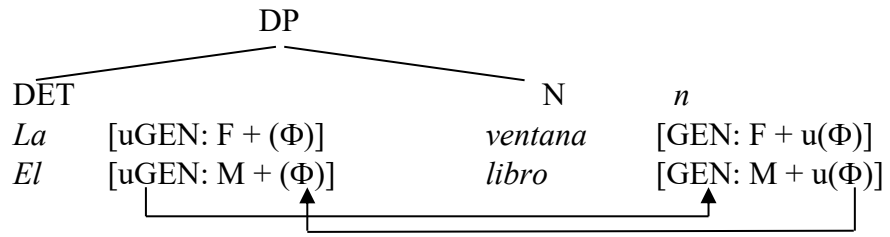
Furthermore, by comparing offline and online data, we address whether and how these bilinguals have similar intuitions about the same grammatical structures in different experimental conditions and whether and how these are modulated by their dominant and their non-dominant language (Spanish and English respectively). In fact, the combination of the two data sets will allow us to offer a more complete picture of both processing and real-time processing. The predictions for these two modes (judging and reading) are similar in that participants need to process each sentence (both for directionality and gender agreement) so that they can evaluate its acceptability —in the case of judgment— and process it —in the case of reading. Even if the linguistic modes differ (judgment of a structure versus reading of a structure), the linguistic representations and, in particular, the way gender is represented in the mind of bilinguals will shape (i) the speaker's preferences when judging and (ii) their processing costs when reading.

Although they are considered non-habitual codeswitchers, sequential bilinguals' intuitions about codeswitching patterns and structures also provide valuable information as to how language properties interact in the bilingual mind. In fact, sequential bilinguals are the most common type of bilingual in todays' world population (Grosjean, 2010; Eberhard et al., 2021), so they constitute an important part of the bilingual community.

II Codeswitching and formal features

Under Minimalist premises, a double gender feature valuation process could be enforced in Spanish DPs. We take as a point of reference the "double feature valuation" proposal that Pesetsky and Torrego (2001, 2007) formulated under minimalist assumptions as follows: nominative Case is seen as a T feature on D and agreement as a D feature on T. What we assume for our study is that a parallel relation can be established between inherent lexical Gender (GEN) and Gender Agreement (Φ), so that Gender is seen as an N feature on D and Gender Agreement as a D feature on N (e.g., Carstens, 2010; Pesetsky and Torrego, 2001, 2007; Liceras et al., 2008). This proposal involves an unvalued gender feature in the Spanish DET which needs to be valued by the one in the Spanish N; and an unvalued gender agreement feature in the Spanish N valued against the one in the Spanish DET, as in (4a-b). This valuation process involving the two gender features (i.e., inherent gender, GEN, and gender agreement, Φ) is deeply rooted in the L1 Spanish mind, both the bilingual and the monolingual one (e.g., Fernández Fuertes et al., 2016).

(4)



	DET		N	n
a.	*La*	[uGEN: F + (Φ)]	*ventana*	[GEN: F + u(Φ)]
b.	*El*	[uGEN: M + (Φ)]	*libro*	[GEN: M + u(Φ)]
c.	The		*ventana*	[GEN: F + u(Φ)]
d.	The		*libro*	[GEN: M + u(Φ)]
e.	*La*	[uGEN: F + (Φ)]	window	*ventana*=[GEN: F + u(Φ)]
f.	*El*	[uGEN: M + (Φ)]	book	*libro*=[GEN: M + u(Φ)]

GEN=gender feature; Φ=gender agreement feature; u=unvalued; F=feminine; M=masculine

When it comes to Spanish-English DP switches and given that English Ns lack gender features and English DETs lack gender agreement features, the corresponding features in the Spanish DET and in the Spanish N are left unvalued (4c-d) (Liceras et al., 2008). However, in the case of Spanish DET-English N switches (4e-f), as in (2) and (3) above, the double gender feature valuation process can be imposed if we attribute the corresponding features of the Spanish translation equivalent to the English Ns. In this situation, feature valuation could take place, as in the case of a Spanish DP, thus rendering gender congruent structures (2a-3a) where gender and gender agreement features in the two DP components are valued; or gender non-congruent structures (2b-3b) where there is a feature mismatch. This process has been referred to as the analogical criterion (Otheguy and Lapidus, 2005).

In gendered languages like Spanish, many linguists have proposed that there is a masculine and a feminine feature (e.g., Carstens, 2010). There is also a default option (underspecified for gender) that has been termed masculine as default because, when that default strategy is used, it happens to take masculine morphology (e.g., Roca, 1989; Kramer 2020). In the case of Spanish DET-English N switches, the default strategy would be as in (5)[1].

(5) a. El señor está arreglando **el**$_{\text{underspec. M}}$ **window**$_{\text{F in SP}}$ with a hammer (default masculine)

'The man is fixing the window with a hammer'

b. El niño está leyendo **el**$_{\text{underspec. M}}$ **book**$_{\text{M in SP}}$ for the first time (default masculine)

'The child is reading the book for the first time'

F=feminine; M=masculine; SP=Spanish; underspec. M=underspecified masculine (default)

[1] Harris (1991) and Roca (2005a, b) propose that there is only one gender in Spanish (feminine) and that masculine Ns are not classified for gender.

In this case, the default form ensures gender valuation but under a default strategy. That is, the DP in question has gender features but these are not specified as being [+feminine] or [-feminine]. Therefore, the gendered N (either masculine or feminine) will be preceded by a masculine default DET.

As opposed to Spanish DET-English N switches, in the case of English DET-Spanish N switches (example 1b above) the gender features of the Spanish N are not involved in a feature valuation process, resulting in what can be conceptualized as a simplification of the grammatical operations that are triggered in Spanish DPs and possibly so in Spanish DET-English N DP switches.

III Codeswitching and bilingual processing

In order to address how bilinguals from different linguistic backgrounds process switched DPs, researchers have adopted multiple methodologies to elicit data from different bilingual populations. In this study we target different processing strategies as seen through behavioral experimental data and, therefore, we will focus on research that has used both offline and online experimental data elicited from English-Spanish bilingual adults and children.

Studies on English-Spanish DP switches using offline data have shown that bilingual adults generally exhibit a preference for English DET switches (example 1b versus 1a above) (Liceras et al., 2008, 2016). This has been explained in terms of lower processing costs attributed to these switches. That is, the lack of gender valuation in these switches lessens their processing cost when parsing these switched DPs and makes bilingual adults show a preference for English DET switches versus Spanish DET switches. This was the case regardless of language status (i.e., whether Spanish is the L1, the L2 or the HL) (e.g., Liceras et al., 2008).

In the case of the gender agreement preferences shown by adult bilinguals when confronted with Spanish DET switches, the different results are often connected to the language status —that is L1 or L2— of the languages involved in the switch for the participants under scrutiny. When analyzing L2 English-L1 Spanish bilingual adults, a preference for gender congruent switches (examples 2a and 3a above) is often analyzed as a reflex of the enforcement of the analogical criterion (e.g., Liceras et al., 2008; Valenzuela et al., 2012). That is, when the speakers' L1 is the gendered language (i.e., Spanish), it seems that the process of gender agreement is rooted in these speakers' mind so much so that they impose these gender mechanisms (i.e., gender assignment to the English N and gender agreement between the English N and the Spanish DET) in switched DPs.

Other studies refer to a preference for the so-called masculine as a default option, as in (5 above), and this has been found to occur in the case of bilingual adults from whom Spanish is their HL, L2 or L3 while English is their L1 (e.g., Delgado, 2018; Denbaum and De Prada, 2021; Liceras et al., 2008, 2016; Valenzuela et al., 2012).

In the case of the masculine as default preference, however, it is unclear what different studies count as default masculine. In this respect, the analysis could include all DP switches containing a Spanish masculine DET and this involves both DP switches in which a Spanish masculine DET combines with an English N whose translation equivalent in Spanish has feminine gender (i.e., the non-congruent [-AC] switched DPs), as well as DP switches in which a Spanish masculine DET with an English N whose translation equivalent in Spanish has masculine gender (i.e., the congruent [+AC] switched DPs). This constitutes a more conservative approach in which, if masculine is a default form, the default DET could combine with both

masculine and feminine Ns (e.g., Denbaum and De Prada, 2021). Alternatively, when considering default strategies, only the DP switches in which a Spanish masculine DET combines with an English N whose translation equivalent in Spanish has feminine gender (i.e., only the non-congruent switched DPs) could be included (e.g., Balam et al., 2021). In this case a more restrictive approach is followed whereby only those DPs in which a clear default form is seen —as opposed to a congruent switched DP— are considered as fully default forms. This different view on what constitutes default masculine structures makes comparisons across studies quite difficult when it comes to determine the degree of preference for the default strategy over the analogical criterion.

Studies concerned with offline experimental data from bilingual children are rather scarce. Gómez Carrero et al. (2018) show that bilingual children in Gibraltar (L1 English-HL Spanish) rate English DET switches higher, thus following the same pattern as adult bilinguals. The same preference for this directionality of the switch is found for L1 Spanish-HL English and L1 Spanish-L2 English bilingual children in Spain and L1 English-HL Spanish bilingual children in Gibraltar (Gómez Carrero et al., 2019; Liceras et al., 2016). As for gender agreement, a preference for using the Spanish masculine DET as a DET underspecified for gender has been reported in the case of 8 L1 Spanish-HL English children in Spain in an acceptability judgment task, while the analogical criterion is favored by these same children in a production task (Gómez Carrero and Fernández Fuertes, 2017). In the case of 17 L1 Spanish-HL English and 18 L1 Spanish-L2 English bilingual children in Spain, Liceras et al. (2016) also found a preference for the analogical criterion. Studies on L1 English-L2 Spanish child data have yet to be carried out.

Offline data so far suggest an economy strategy that results in a preference for those DP switches in which no gender valuation has to occur (i.e., English DET-Spanish

N DP switches). When the possibility of gender valuation is presented in Spanish DET switches, the strategy followed seems to depend on whether or not Spanish is the dominant language. When this is the case, there seems to be a need to enforce gender mechanisms (i.e., the analogical criterion), which sometimes is stronger in the case of L1 Spanish-L2 English bilinguals than in the case of 2L1 bilinguals. When Spanish is not the dominant language, as in the case of the L1 English-L2 Spanish bilinguals, these mechanisms do not seem to be enforced and the masculine as default option prevails. Therefore, results from previous work seem to suggest a certain gradience in the sensitivity to the analogical criterion depending on the status Spanish has for the bilingual participants in question. That is, it is linked to language dominance.

The processing of the directionality of the switch and gender agreement in English-Spanish switched DPs has also been explored using online data from adult bilinguals with different linguistic profiles, including both habitual codeswitchers and non-habitual codeswitchers. When it comes to directionality, L1 English-HL Spanish bilingual adults seem to have slower processing and lower accuracy rates with Spanish DET switches (Fairchild and Van Hell, 2017). In Litcofsky and Van Hell (2017), for instance, processing costs related to the directionality of the switch were contingent on the dominant language so that English DET switches were harder to process for Spanish-dominant bilinguals (i.e., when switching into the dominant language), while Spanish DET switches were more so for English-dominant bilinguals. They attribute this finding to the type of task as it elicits top-down endogenous control processes (i.e., "top-down activation or maintenance of top-down activation driven by expectancies regarding incoming information", 113). In fact, they found the opposite pattern in an ERP study where the switch into the weaker language was more costly, as expected.

When it comes to gender agreement, conflicting results appear with Spanish DET switches so that while in some cases default strategies are favored by bilinguals (e.g., Beatty-Martínez and Dussias, 2017), preferences for the analogical criterion have also been attested as shown by shorter processing times and shorter fixations in the case of eyetracking data and an N400 effect in the case of EEG data (Beatty-Martínez and Dussias, 2017; Fairchild and Van Hell, 2017; Fernández Fuertes et al., 2019).

To the best of our knowledge, online data from bilingual children are still to be reported. In fact, to date, no studies have dealt with codeswitching patterns exhibited by bilingual children including real-time processing on the issues under consideration here. In the present paper, we investigate this by examining sentence processing in L2 English bilingual children. The present research on child bilinguals builds on previous studies with adults and focuses on task effects (i.e., behavioral acceptability judgment data, processing eyetracking during reading data).

IV Research questions

Given that Spanish-English bilingual communities have been shown to exhibit an overwhelming tendency to produce DP switches (e.g., Fernández Fuertes and Liceras, 2018; Herring et al., 2010; Liceras et al., 2008; Valdés Kroff, 2016; Valenzuela et al., 2012), we formally explore the directionality of the switch and the type of implicit gender agreement mechanism in the case of Spanish DET switches. Our aim is to shed light on the interplay between activation and local inhibition of the formal features that intervene in English-Spanish DP switches in the processing of two groups of bilingual children being born and brought up in Spain who are learning English as their L2. This will be measured via offline processing (acceptability judgment data) and online processing (eyetracking during reading data). The data analysis will offer a

window into how the two languages of the bilingual are co-activated and how local inhibition works in shaping these speakers' codeswitching preferences.

Based on the above, two research questions guide this investigation:

1. In the case of directionality, do the feature valuation requirements of a Spanish DET-English N switched DP affect processing? Does having to value features (either following the analogical criterion or using default forms) make these bilinguals' task harder, as a result of the activation of the translation equivalent? If this is so, the bilingual children should favor English DET switches which will receive higher judgment rates and lower processing costs, as a result of local inhibition.
2. In the case of gender agreement in Spanish DET-English N switches, does the need to select and retrieve the Spanish translation equivalent N affect processing? Or rather, does the grammatical violation (as seen in a feature mismatch) contribute to further slowing the processing speed? Given that Spanish is an L1 for the bilingual children and given that the gender features are deeply rooted in the mind of native speakers of Spanish, it could be the case that enforcing gender agreement mechanisms is, in the end, less costly than not complying with them.

The scale in (6) captures the interaction between processing costs and feature valuation, from less costly to more costly in terms of processing, when it comes to Spanish DET-English N DP switches.

(6)	Local inhibition	<	activation by default	<	activation proper
	el/la window		*el window*		*la window*

Our interpretation of this scale is as follows. Local inhibition involves the blockage or suppression of the Spanish translation equivalent of the English N. That is, the Spanish translation equivalent of "window" (i.e., "*ventana*") is inhibited and, given that no grammatical gender appears in English Ns, both masculine Spanish DET (i.e., "*el*") or feminine Spanish DET (i.e., "*la*") can, therefore, appear in a switched DP with the English N "window". This is less costly than the other options in the scale because no feature valuation needs to be enforced as English Ns bear no gender features. Language activation involves the bilingual classifying the Ns of the non-gendered language, assigning them the features of the translation equivalents in the gendered language. That is, in this particular case, the translation equivalent is activated, and this triggers the necessary feature valuation that characterizes Spanish Ns. We refer to this as activation proper as it deals with the gender feature and gender agreement feature valuations that take place in a Spanish DP. Activation by default suggests a relaxation of the gender agreement requirements and, therefore, lies in between local inhibition (where no agreement takes place) and activation proper (where double gender feature valuation fully takes place).

The scale in (6) could be interpreted, therefore, as a hierarchy of processing difficulty that bilinguals navigate and where issues such as the status of the languages involved in the switch (Spanish as the L1 and English as the L2 of the bilingual or as the HL of the bilingual) and the nature of the experimental task (offline judgment or reading) can factor in.

V Child processing of English-Spanish DP switches

1. Participants

The participants (n=87) that took part in the experiments belong to two different groups of L1 Spanish-L2 English sequential bilingual children. Although each group performed only one of the experimental tasks, they are very homogeneous groups in terms of their sociolinguistic background, as well as their proficiency level in L2 English (A1-A2). There is, however, an age difference between them in terms of when they were tested, as is shown below. This is so because, in order for children to complete an eyetracking during reading task they needed to be able to have sufficient reading abilities in the two languages (given that the task involved English-Spanish codeswitching). This is why the children who took the eyetracking task were older than those who took the judgment task.

These L1 Spanish children started learning English at school in Spain at the age of 5, as per Spanish educational laws. Other than English as an L2, two or three more subjects are also taught in English, depending on the school year level. As per the language background questionnaire filled out by the children's parents, children have never been exposed to English in a naturalistic context, that is, they have not spent long periods abroad in an English-speaking country nor have they been in contact with native speakers of the language outside the school context. As for the amount of exposure to L2 English in the school context, children received on average between 10 and 15 hours per week (35 weeks in a normal academic year).

A group of 56 L1 Spanish-L2 English bilingual children (mean age=7.80, *SD*=2.50, age range=5-12) took part in the acceptability judgment task. As for the eyetracking during reading task, a group of 31 L1 Spanish-L2 English bilingual children (mean age=11.19, *SD*=1.57, age range =10-15) participated. Their proficiency level of

English was assessed by the Cambridge Young Learners Placement Test in which they obtained between a Movers and a Flyers level, which corresponds to an upper A1 and an A2 as per the Common European Framework of Reference for Languages (CEFRF). This ensured that their reading abilities in English were in tune with the requirements of the two experiments because (i) the proficiency test targets both reading and oral comprehension and (ii) the two CEFRF proficiency levels involve reading capacities that have been matched with the tasks in terms of simple sentences and frequent vocabulary (see below for a description of the experiments).

Both groups of L2 English children were born and brought up in Spain, and they were tested in an institutional setting in [removed for review] where codeswitching is not a common practice. However, even if they are not habitual codeswitchers, these children frequently alternate between their L1 and their L2 in the classroom, where the two languages are used. Furthermore, it has been widely acknowledged that bilinguals have intuitions about switched structures, regardless of whether they are habitual codeswitchers or not (see Fernández Fuertes et al., 2019; Fernández Fuertes and Liceras, 2018).

As the participants from both groups were minors, their parents gave their informed consent and completed a language background questionnaire. Ethics approval from the [removed for review] was obtained before data collection [protocol approval refs. [removed for review]].

2. *Offline processing: judgment experiment*

a. *Acceptability judgment task.*

The task consisted of 38 sentences where 8 were practice sentences, 6 were fillers and distractors, and 24 were experimental sentences. Regarding the experimental

sentences, half of them contained an English DET-Spanish N switch, as in (7a), while the other half included a Spanish DET-English N switch, as in (7b).

(7) a. They are playing in the *lluvia*

'They are playing in the rain'

b. *La niña ha roto la* chair

'The girl has broken the chair'

Likewise, the Spanish DET-English N switches were organized in four conditions according to the gender of the Spanish translation of the English N (masculine or feminine) and the gender agreement relationship between the DET and the N (i.e., following the analogical criterion, [+AC], or not, [-AC]). The conditions are shown in (8).

(8) a. *El pájaro está en* <u>*el*</u>$_{M}$ <u>plane</u>$_{SP\ M}$ masculine [+AC] switch

'The bird is on the plane'

b. *El niño está abriendo* <u>*la*</u>$_{F}$ <u>door</u>$_{SP\ F}$ feminine [+AC] switch

'The child is opening the door'

c. *El niño está jugando con* <u>*la*</u>$_{F}$ <u>clock</u>$_{SP\ M}$ masculine [-AC] switch

'The child is playing with the clock'

d. *El señor está mirando por* <u>*el*</u>$_{M}$ <u>window</u>$_{SP\ F}$ feminine [-AC] switch

'The man is looking through the window'

M=masculine; F=feminine; SP=Spanish

In order to ensure that animacy, which is linked to biological gender, did not interfere with grammatical gender, which is our topic of research, all the target Ns

included in the experimental tasks were [-animate] and [+concrete]. Cognates and words used in both languages were excluded, as were the English Ns starting with a vowel or an /l/ to avoid confounding effects with the Spanish DET (i.e., el_M, la_F). No experimental N was repeated along the task. Gender canonicity was not controlled for, and so there are both canonical Ns (i.e., Ns ending in -o for masculine and -a for feminine) and non-canonical Ns.

Frequency of the Ns in both languages was also controlled for. No significant differences were found between masculine and feminine Spanish Ns ($t(10)=2.123$, $p=.06$) nor between the masculine and the feminine translation equivalents of the English Ns ($t(10)=-0.129$, $p=.89$).

The fillers were monolingual sentences with an N-N compound, while the distractors were sentences with a switch between the subject and the verbal phrase.

Participants were presented with a dialogue including a question and an answer with a picture as visual cue (9).

(9)

After 15 seconds, participants were asked to rate the answer on a scale from 1 (sounds bad) to 4 (sounds excellent) represented with emoticon faces. Each item was presented in oral mode.

Linear mixed effects models were run in R environment, version 4.1.1 (R Core Team, 2021). They were fit using the lme4 package (Bates et al., 2015) and *p* values were estimated using the lmerTest package (Kuznetsova et al., 2017). Three models were fit in the case of the judgment data: (i) a model including directionality (English DET switches versus Spanish DET switches) as a fixed factor; (ii) a model including the analogical criterion ([+AC] versus [-AC]) as a fixed factor; and (iii) a model including condition ([+AC] versus masculine default) as a fixed factor. All of them were controlled for participants as a random factor.

b. Acceptability judgment results

The outputs of the models are presented in Table 1 and explained in the subsequent paragraphs.

<insert Table 1 about here>

Table 1. Acceptability judgment task results per comparison: (i) directionality of the switch; (ii) [+AC] vs. [-AC]; (iii) [+AC] vs. masculine as default.

	Fixed effects	***b***	***SE***	***t***	***p***
Directionality	Intercept	3.05	0.06	46.57	**<.001**
	Directionality (Spanish DET switches)	-0.17	0.04	-3.88	**<.001**
[+AC] vs. [AC]	Intercept	3.00	0.08	37.55	**<.001**
	AC ([-AC])	-0.24	0.06	-4.05	**<.001**
[+AC] vs. Masc. Default	Intercept	2.84	0.08	34.19	**<.001**
	Condition (Masc. Default)	0.00	0.05	0.14	0.88

Note. Significant at p<.05.

Regarding the directionality of the switch, English DET switches (including those with a Spanish masculine N and those with a Spanish feminine N) were compared to all Spanish DET switches (including those with an English N whose translation equivalent in Spanish was masculine and those corresponding to a feminine equivalent

N). The output presented in Table 1 indicates a significant preference for English DET-Spanish N switches (b=-0.17; SE=0.04; t=-3.88; p<.001) (Figure 1).

<Insert Figure 1 about here>

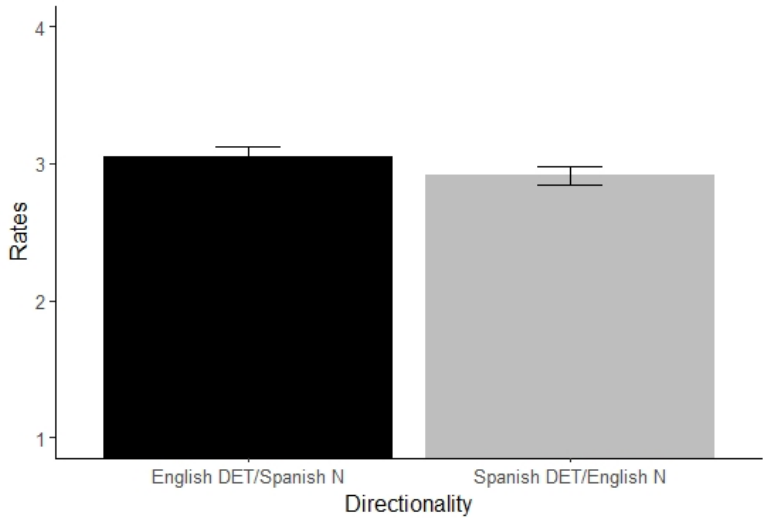


Figure 1. Directionality of the switch in the acceptability judgment task: English DET switches vs. Spanish DET switches. Rates go from 1=very bad to 4=excellent.

In the case of the gender agreement mechanisms preferred by these bilingual children when judging Spanish DET-English N switches, we have considered two comparisons: (i) [+AC] switches versus [-AC] switches (e.g., el_{M} plane$_{M}$ / la_{F} house$_{F}$ vs. la_{F} plane$_{M}$ / el_{M} house$_{F}$) and (ii) [+AC] switches versus masculine default structures (e.g., el_{M} plane$_{M}$ / la_{F} house$_{F}$ vs. el_{M} plane$_{M}$ / el_{M} house$_{F}$). In the first case, and when analyzing gender agreement and the analogical criterion (i.e., [+AC] versus [-AC]), both masculine and feminine switches were used. Given the two gender options in Spanish, this decision is motivated by the need to offer a complete representation of the two gender options present in the gendered language (i.e., Spanish). In the second case, and when analyzing default masculine, we followed a conservative more inclusive analysis by confronting [+AC] switches to all masculine Spanish DET switches (both the ones with a feminine Spanish translation equivalent of the English N and the ones with a

masculine equivalent). A masculine default DET is able to value both masculine and feminine gender agreement, and this has motivated the inclusion of all masculine Spanish DET switches to address default strategies.

Results in Table 1 and Figure 2 reveal a significant preference for the structures where the gender of the DET agrees with the gender of the Spanish translation equivalent of the English N ([+AC]), as in (8a) and (8b), when compared to the switches where there is no such feature match ([-AC]) (b=-0.24; SE=0.06; t=-4.05; p<.001).

<Insert Figure 2 about here>

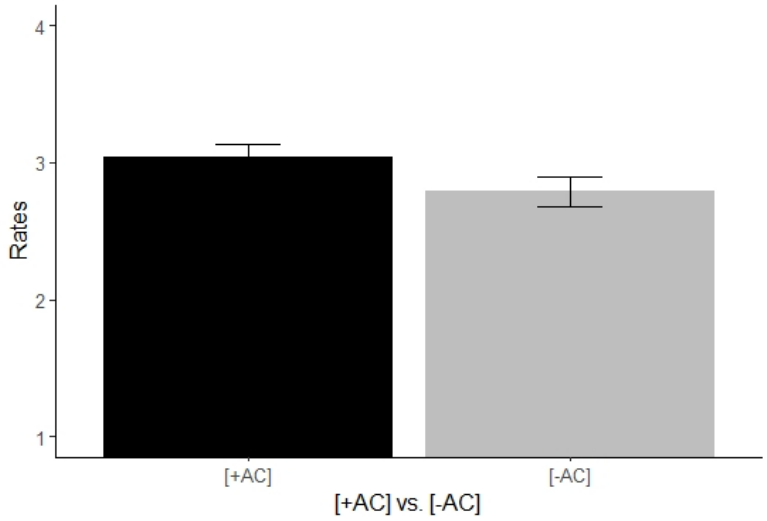


Figure 2. Gender agreement preferences in the acceptability judgment task: the [+AC] vs. [-AC] comparison. Rates go from 1=very bad to 4=excellent. [+AC]=+analogical criterion, gender congruent; [-AC]=-analogical criterion, gender non-congruent.

In the case of the comparison between [+AC] and masculine as default switches, no significant differences have been found (p=.88). Both [+AC] and masculine default switches are judged similarly[2].

[2] An anonymous reviewer suggests to only consider feminine noun [+AC] switches to deal with the potential difference between [+AC] and [-AC] switches. We have performed post-hoc tests (Bonferroni) comparing across the four structures (i.e., [+AC] masculine and feminine; and [-AC] masculine and feminine). Results show that the only significant difference appears in Spanish DET feminine switches between [+AC] and [-AC] switches (p<.0001). That is, even when masculine switches are discarded in order to address gender agreement, the results show the same pattern: [+AC] is significantly preferred

3. Online processing: eyetracking during reading experiment

a. Eyetracking during reading task

Stimuli consisted of 156 sentences of which 48 were experimental items, 54 were distractors and 54 were fillers. The experimental sentences (n=288) were organized into 48 experimental items each one comprising 6 conditions; this resulted in 6 lists so that each participant only saw 1 condition per experimental item. That is, all participants saw 48 experimental sentences but not the same 48. An example of an experimental item is provided in Table 2.

<Insert Table 2 about here>

Table 2. Example of an experimental item from the eyetracking during reading task: book$_{M}$ - window$_{F}$.

Condition	*AC*	*Target DP*	*Pre-target*	*Target*	*Post-target*
MM	[+AC]	*el* book	*El niño está leyendo*	*el* book	for the first time
MF	[-AC]	*el* window	*El señor está arreglando*	*el* window	with a hammer
FF	[+AC]	*la* window	*El señor está arreglando*	*la* window	with a hammer
FM	[-AC]	*la* book	*El niño está leyendo*	*la* book	for the first time
DM	--	the *libro*	The boy is reading	the libro	*por primera vez*
DF	--	the *ventana*	The man is fixing	the ventana	*con un martillo*

Notes: F=feminine; M=masculine; [+AC]=+analogical criterion, gender congruent; [-AC]=-analogical criterion, gender non-congruent.

As shown in Table 2, each experimental item contained four target Ns, two of them were in Spanish (*libro* "book" and *ventana* "window") and two were in English (*book* and *window*). The latter were preceded by a Spanish DET, resulting in two gender congruent DPs ([+AC]) (e.g., *el*$_{SP\ M}$ book$_{SP\ M\ [libro]}$, *la*$_{SP\ F}$ window$_{SP\ F\ [ventana]}$) and two DPs where there was no gender congruency between the Spanish DET and the translation equivalent of the English N ([-AC]) (e.g., *la*$_{SP\ F}$ book$_{SP\ M\ [libro]}$, *el*$_{SP\ M}$ window$_{SP\ F\ [ventana]}$).

over [-AC] and no significant differences appear in the case of the [+AC] versus default masculine, and this is so regardless of whether we include only feminine nouns (*el*$_{M}$ *window*$_{F}$) or the more conservative approach using both masculine and feminine translation equivalent nouns (*el*$_{M}$ *book*$_{M}$ and *el*$_{M}$ *window*$_{F}$).

For each experimental sentence, there were 4 pre-target words, 2 target words and 2 to 4 post-target words. The target DP was always located in direct object position. The target Ns were [-animate], [+concrete] and they involved no body parts, no cognates and no Ns beginning with a vowel in either language or with an /l/ in English. The Spanish target Ns were selected using the EsPal database (Duchon et al., 2013) and the SUBTLEX-ESP database (Cuetos et al., 2011), and the English target Ns were selected using the SUBTLEXus database (Brysbaert and New, 2009). Frequency of the Ns in both languages was also controlled for. No significant differences were found between masculine and feminine Spanish Ns ($t(94)=0.959$, $p=.345$) nor between masculine and feminine Spanish translation equivalents ($t(94)=-1.144$, $p=.256$).

Fifty-four fillers and 54 distractors were also part of the eyetracking during reading task. Fillers were Spanish and English monolingual sentences with an N-N compound which could appear in initial, mid or final position. Distractors were bilingual sentences involving a switch between a DP subject and a verb. Both fillers and distractors were similar in length to the experimental sentences and none of them included target Ns. Half of the fillers (n=27) and half of the distractors (n=27) were followed by a yes-no question to keep the participants' attention to the task.

Before the experimental session, participants performed a practice session including 9 sentences similar to the ones found in the experimental task. Yet, these sentences included codeswitching at a grammatical point different from target region. Half of the practice sentences were also followed by a yes-no question to make sure that participants understood the task.

Participants were tested individually in a quiet room at an institutional setting in [removed for review], using an EyeLink Portable Duo which sampled eye-movements at 1000 Hz. Degrees of visual angle were at 0.67 (horizontally) and 0.44 (vertically) at

600 mm of viewing distance. Button presses from the answers to the yes-no comprehension questions were recorded using a gamepad response device. Before participants started the task, a 3-point calibration was performed. When the average error was below 0.5º, participants did the practice session. Once we had ensured that they had understood the task instructions, stimuli were presented divided into four blocks.

As the purpose of this study is to understand the relationship between the DET and the N in terms of gender, two late eyetracking measures have been used in the analyses of the fixations: total fixation duration and regression path duration. The total fixation duration measure consists in the sum of all fixations in a region, including both forward and regressive movements; and the regression path duration is the sum of all fixations in a target region from first entering the region until moving to the right of the region, including the fixations made during any regression to earlier parts of the sentence before moving past the right boundary of the region (Clifton et al., 2007). Both measures have been used to analyze the fixations in the N target region[3], as in (10).

(10)	a. *El niño está*	*leyendo el*	[**book**]	for the first time
	b. The man is	fixing the	***[ventana]***	*con un martillo*

All stimuli, data, and analysis scripts for the current study are available via the Open Science Framework at https://osf.io/v2xeq/?view_only=5eb30710ec1b405e8235fadfd0bea5fa.

The log-transformed data were analyzed with linear mixed effects models in R version 4.1.1 (R Core Team, 2021) with the lme4 package (Bates et al., 2015) and the

[3] Although both the DET and the N regions were considered target regions in the creation of the experiment, only the fixations in the N region were considered for the analyses of the present study.

lmerTest package (Kuznetsova et al., 2017). Separate analyses were done for each eyetracking measure, and, for each measure, three different models were fit: (i) two models including directionality (English DET switches versus Spanish DET switches) as a fixed factor; (ii) two models including the analogical criterion ([+AC] versus [-AC]) as a fixed factor; and (iii) two models including condition ([+AC] versus masculine default) as a fixed factor. All of them controlled for participant as a random factor.

b. Eyetracking during reading results

The outputs of the models are presented in Table 3 and discussed in the subsequent paragraphs.

<insert Table 3 about here>

Table 2. Eyetracking during reading results per measure (i.e., total fixation duration measure and regression path duration measure) and per comparison (i.e., directionality of the switch, [+AC] versus [-AC], and [+AC] versus masculine as default).

		Fixed effects	***b***	***SE***	***t***	***p***
Total fixation duration	Directionality	Intercept	5.99	0.05	107.27	**<.001**
		Directionality (Spanish DET switches)	0.08	0.03	2.66	**0.007**
Regression path duration		Intercept	5.88	0.04	122.22	**<.001**
		Directionality (Spanish DET switches)	0.12	0.03	3.86	**<.001**
Total fixation duration	[+AC] vs. [AC]	Intercept	6.02	0.05	113.76	**<.001**
		AC ([-AC])	0.10	0.03	2.84	**0.004**
Regression path duration		Intercept	5.98	0.04	128.82	**<.001**
		AC ([-AC])	0.03	0.03	1.02	0.30
Total fixation duration	[+AC] vs. Masc. Default	Intercept	6.35	0.05	106.48	**<.001**
		Condition (Masc. Default)	0.01	0.01	1.42	0.16
Regression path duration		Intercept	6.41	0.06	105.09	**<.001**
		Condition (Masc. Default)	-0.01	0.02	-0.68	0.49

Note. Significant at p<.05.

With regards to the directionality of the switch, participants show longer fixations in the English Ns preceded by a Spanish DET than they do in the Spanish Ns preceded by an English DET (e.g., *la/el*$_{SP}$ house$_{EN}$ vs. the$_{EN}$ *casa*$_{SP}$). As in Table 3, this comparison is significant in the case of the total fixation duration measure (Spanish DET-English N switches: *M*=509 ms; *SD*=281; English DET-Spanish N switches: *M*=472 ms; *SD*=275) (*b* =0.08; *SE* =0.04; *t*=2.66; *p*=.007) (Figure 3) and in the case of the regression path duration measure (Spanish DET-English N switches: *M*=469 ms; *SD*=251; English DET-Spanish N switches: *M*=411 ms; *SD*=229) (*b*=0.12; *SE*=0.03; *t*=3.86; *p*<.001) (Figure 4).

<Insert Figure 3 about here>

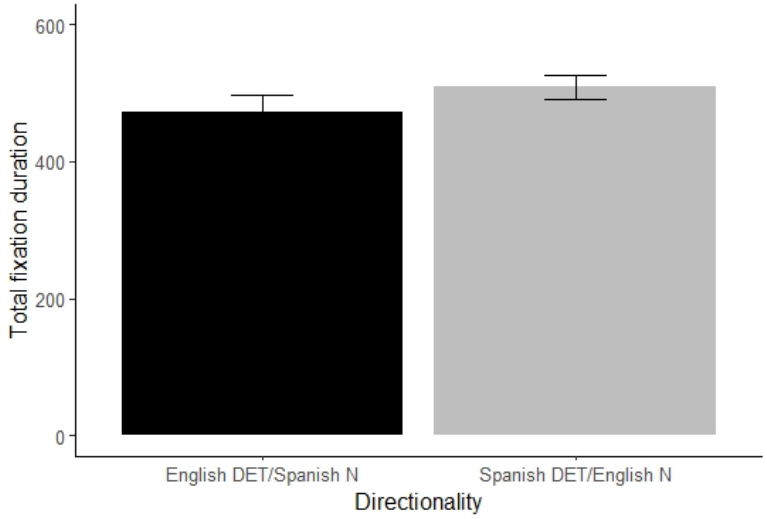


Figure 3. Directionality of the switch in the eyetracking during reading task. Mean results from the total fixation duration measure in the N region (in milliseconds).

<Insert Figure 4 about here>

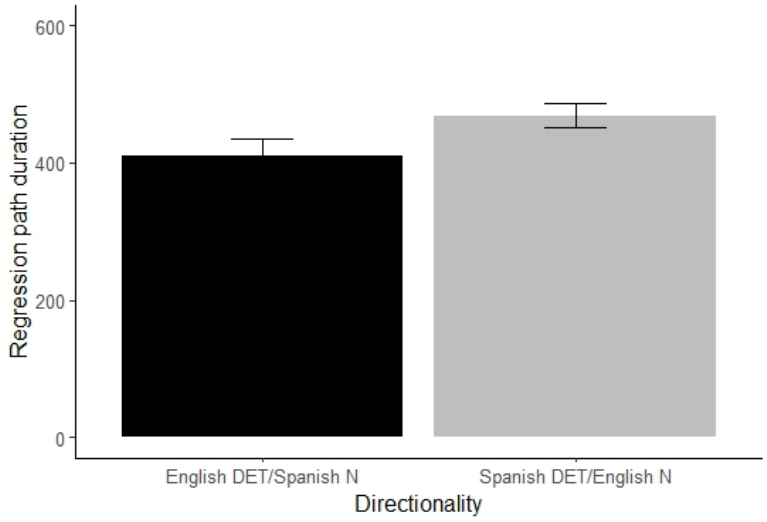


Figure 4. Directionality of the switch in the eyetracking during reading task. Mean results from the regression path duration measure in the N region (in milliseconds).

When comparing [+AC] switches (e.g., *el*$_{M}$ book$_{SP\ M}$ or *la*$_{F}$ window$_{SP\ F}$) versus the [-AC] switches (e.g., *la*$_{F}$ book$_{SP\ M}$ or *el*$_{M}$ window$_{SP\ F}$), the results presented in Table 3 indicate a significant difference between [+AC] switches and [-AC] as per the total fixation duration measure (b=0.10; SE=0.03; t=2.84; p=.004), with [-AC] switches being fixated upon longer (M=532 ms; SD=290) than [+AC] switches (M=486 ms; SD=269) (Figure 5). When analyzing the data from the regression path duration measure in the N target region, [-AC] switches are also fixated upon longer than [+AC] switches, yet not significantly so (p=.30).

<Insert Figure 5 about here>

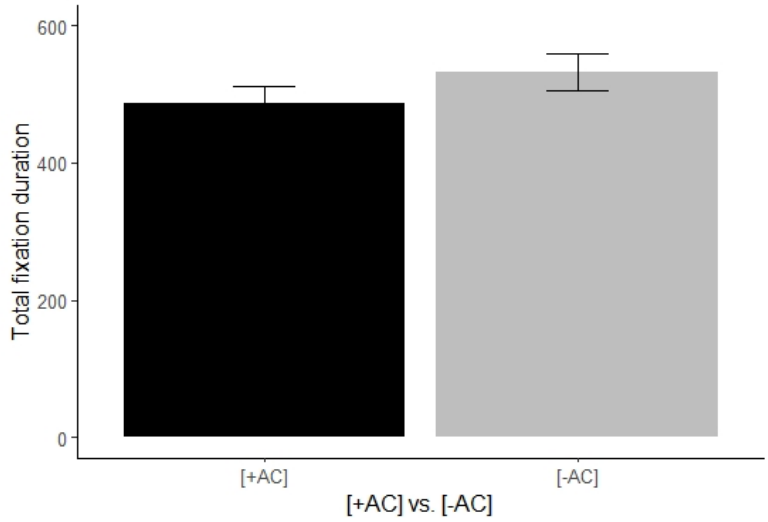


Figure 5. Gender agreement mechanisms in the eyetracking during reading task. Mean results from the total fixation duration measure in the N region when comparing [+AC] switches versus [-AC] switches (in milliseconds). [+AC]=+analogical criterion, gender congruent; [-AC]=-analogical criterion, gender non-congruent.

When comparing [+AC] switches versus masculine default switched DPs, the same conservative more inclusive approach to the default masculine used in the acceptability judgment task data analysis has been followed for the eyetracking data. In this comparison no significant differences were found when using the total fixation duration measure (p=.16), though a tendency for longer fixations towards masculine as default switches appears, as is shown in Figure 6[4].

<insert Figure 6 about here>

[4] Post-hoc tests with Bonferroni corrections comparing across the four structures (i.e., [+AC] masculine and feminine; and [-AC] masculine and feminine) show that the only significant difference appears in Spanish DET feminine switches between [+AC] and [-AC] switches (p=.0016). That is, even when masculine switches are discarded in order to address gender agreement, the results show the same pattern: [+AC] is significantly preferred over [-AC] and not significant differences appear in the case of the [+AC] versus default masculine, and this is so regardless of whether we include only feminine nouns (el_M $window_F$) or the more conservative approach using both masculine and feminine translation equivalent nouns (el_M $book_M$ and el_M $window_F$).

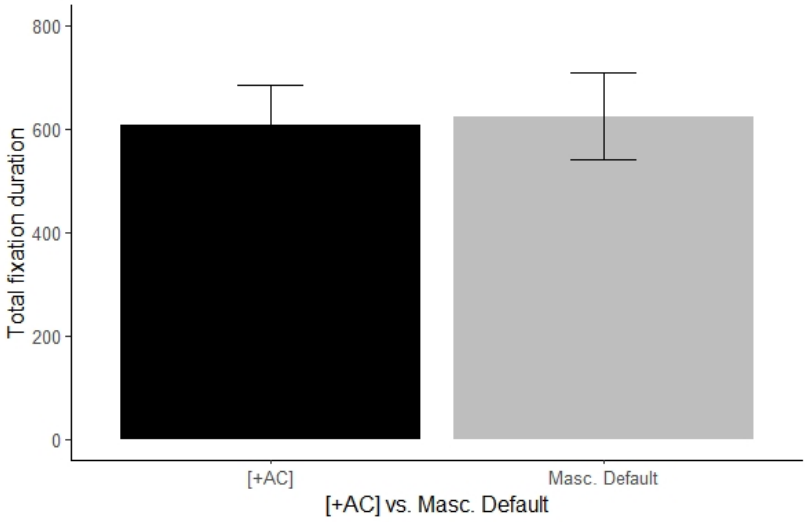


Figure 6. Gender agreement mechanisms in the eyetracking during reading task. Mean results from the total fixation duration measure in the N region when comparing [+AC] switches versus masculine default switches (in milliseconds). [+AC]=+analogical criterion, gender congruent; Masc. Default=masculine default.

Yet, when using the regression path duration measure, [+AC] and masculine as default switches are similarly processed ([+AC]: *M*=640 ms*; SD*=204*;* masculine as default: *M*=637 ms*; SD*=235) (*p*=.49).

VI Discussion and conclusions

Our point of departure was the well-known premise that codeswitching is not a random mixing of languages but instead follows predictable patterns and is governed by linguistic and psycholinguistic structural constraints, that language coactivation shapes the language of bilinguals and that bilinguals' two languages interact at the lexical and sentence levels (e.g., Bialystok et al., 2012; De Groot, 2013; Lemhöfer et al., 2008; Morales et al., 2011; Salamoura and Williams, 2007; Van Hell and Tanner, 2012).

Taking these premises as our framework, we have compared different switched DPs in order to determine how the feature valuation construct shapes codeswitching patterns and how these relate to language inhibition and language activation as two defining processes characterizing bilingual acquisition. We set out to explore intra-

sentential codeswitching and, in particular, English-Spanish codeswitching happening between DET and N. We investigated the presence of switch costs as this is a topic of wide interest in the literature on bilingual acquisition in general and on codeswitching in particular (i.e., Gollan and Ferreira, 2009; Gullifer et al*.,* 2013; Litcofsky and Van Hell, 2017).

Whereas previous work on these topics has focused predominantly on data from adult bilinguals, we have approached the research questions by considering child bilinguals and by comparing judgment data and eyetracking data from children in order to offer a broader picture of how processing proceeds. The combination of these two sets of data offers new insights into bilingual processing abilities since, as Godfroid (2020) states, "research also benefits from the triangulation of online eyetracking data with offline measures, such as grammaticality judgment tests or vocabulary tests, as participants' performance may vary dramatically in these contexts" (p. 116) (see also Boxell and Felser, 2017). Therefore, we have analyzed judgments and eyetracking data in order to gain insight into the cognitive mechanisms that shape bilingual children's preferences and processing when facing switched DPs.

Results from the bilingual children suggest that Spanish DET switches take significantly longer to process than English DET switches, which points to a lower processing cost of English DET switches. This is seen both in real-time processing (i.e., eyetracking data) and in offline processing (i.e., acceptability judgment data). We would like to suggest that, when processing Spanish DET switches, fixations in the N region and regressions to previous regions are more crucial for our purposes (than those happening after the N) because they could entail Spanish N retrieval or gender agreement mechanisms. So, in the case of directionality, we take these results as an indication that (i) in the judgment task, English DET switches are favored (over Spanish

DET switches) as they do not trigger gender agreement; and (ii) in the eyetracking task, English Ns are longer fixated (than Spanish Ns) because grammatical gender agreement mechanisms triggered by the Spanish DET come into play, and this slows processing. These findings suggest that, when facing English-Spanish switched DPs, the bilingual children seem to prefer the sequences that do not require enforcing gender valuation, in other words, they choose the structure which is more economical in terms of processing. Therefore, in the case of directionality (research question 1), a potential explanation underlying these results could be that the feature valuation requirements of a Spanish DET-English N switched DP do interact with processing. Having to value features (either following the analogical criterion or using default forms as in the case of Spanish DET switches, 4e-4f) makes these bilinguals' task harder and thus leads them to favor English DET switches where no such operations take place (4c-4d).

Processing costs are higher in the case of non-congruent Spanish DET switches (i.e., [-AC], 2b and 3b) as both in the case of judgment data and in the case of eyetracking data the results point to the same direction: the bilingual children show a preference for congruent switches, and these switches are associated with faster rates when processing in real time (i.e., [+AC], 2a and 3a). This preference is consistent across tasks and reaches statistical significance for the judgment data and the total fixation duration reading measure, but not so for the regression path duration measure This difference across reading measures could be explained as follows. There seems to be a regression to the N region in case of non-congruent switches, even if not statistically significant, that is accentuated when the total fixation measure is used, where statistically significance is achieved. In spite of differences in the statistical significance, the two reading measures go in the same direction: higher processing costs for [-AC] Spanish switches versus [+AC] Spanish switches.

Furthermore, it should be noted that the L2 English children process congruent switches rather similarly to those switches with a default masculine Spanish DET. Therefore, in the case of gender agreement (research question 2), what seems to slow processing is not the need to select and retrieve the Spanish translation equivalent N, but rather the grammatical violation (as seen in a feature mismatch). This could be taken as evidence for the following argument: for the bilingual children for whom the Spanish L1 gender features are so deeply rooted in their minds, enforcing gender agreement mechanisms seems to be, in the end, less costly than not complying with them (4e-4f). Barber and Carreiras (2005) argue that "reanalysis or repair processes after grammatical disagreement detection could involve more steps in the case of gender disagreement, as grammatical gender is a feature of the lexical representation" (p.137). This is what is at stake in [+/-AC] switches and this is true of both judgment and reading. That is, even if the linguistic modes differ (judgment of a structure versus reading of a structure), the linguistic representations and, in particular, the way gender is represented in the mind of bilinguals seems to shape (i) the speaker's preferences when judging and (ii) their processing costs when reading.

One possible explanation for the slower processing times in the Spanish DET-English N condition is that the English N is harder to retrieve than the Spanish N, given the status of Spanish as L1 for these children. However, this explanation does not seem plausible since, if this were case, harder processing of English Ns would be so regardless of whether they correspond to gender congruent (i.e., [+AC]; e.g., "*el* book" and "*la* house") or non-congruent switches (i.e., [-AC]; e.g., "*la* book" and "*el* house"). In fact, this is not what the data show because congruent switches are processed faster. What we believe should be taken into consideration is that N retrieval (affecting the lexical category, N) and gender mechanisms (involving both the lexical and the

functional category, N and DET) need to be separated in the analysis. When it comes to retrieval alone, these L1 Spanish bilinguals should have no problems in retrieving Spanish translation equivalents that are masculine (i.e., "book"="*libro*") or Spanish translation equivalents that are feminine (i.e., "house"="*casa*"). But the issue here is not retrieval in isolation, but how this retrieval interacts with the gender feature mechanisms that may be triggered by the retrieved Spanish N. That is, what is at stake is not only the Spanish translation equivalent of the English N but, most importantly, the type of gender agreement mechanisms that may occur between this N and the Spanish DET, which has the inherent gender agreement feature ("*la/el* house"; "*el/la* book"). In fact, the most economical directionality of the switch (i.e., English DET switches) seems to be favored, and so bilingual children could cancel the classification of English Ns according to the inherent gender features carried by the Spanish translation equivalent. Furthermore, when presented with the other types of directionality (i.e., Spanish DET switches), and because the child is given the possibility to not only retrieve the Spanish translation equivalent of the English N but also to perform the necessary gender feature valuations, processing seems to clearly slow down. Moreover, processing seems to be influenced in this case by whether or not feature valuation takes place and, if it does, by whether it results in feature matching: if feature matching occurs (i.e., gender congruent switches), these bilingual children have a tendency to process switches faster. This is seen in offline processing as well as in online processing when features are accessed in real time. Language activation, in this particular case, can be argued to lead to faster processing.

Processing costs are usually asymmetric depending on the directionality of the switch, suggesting differences in the language activation control mechanisms and the use of different processes of integration of lexical and syntactic information in each

switch direction (Litcofksy and Van Hell, 2017). Specifically, higher switching costs are usually found when switching from a dominant L1 to a less dominant L2. We would like to suggest, given the differences between [+AC] and [-AC] switches (both being switches into the weaker language, i.e., English), that it is not only a matter of dominance (i.e., switching from the L1 into the L2 or from the L2 into the L1), but a matter of language activation features and how these shape speakers' behavior when confronted with switched DPs. That is, in the case of these children and for DP switches, Spanish DET-English N switches (i.e., switching into the weaker language for these child participants) seem to be more effortful because they set in motion the gender agreement mechanisms that, all in all, slow processing. Furthermore, we have found a difference in processing in terms of whether these switches into the weaker language (i.e., Spanish DET-English N switches) correspond to [+AC] or to [-AC] switches. This could be related to the scale in (6): when gender agreement mechanisms are activated, processing is facilitated (i.e., faster) in the case of [+AC] when compared to [-AC] switches. This suggests that processing costs may actually be related to these convergence mechanisms rather than to the fact that we are dealing with a switch into the weaker language.

Processing costs as discussed above refer to how the underlying representation of the L1 gender features affects the use of gender in the case of switches between a gendered language (i.e., Spanish) and an ungendered language (i.e., English). The general assumption is that the L1 and the L2 have an integrated representation in the lexicon (i.e., Dijkstra, 2005; Klassen, 2016; Kroll and Stewart, 1994). That is, the two Ns are connected in the mind of the bilingual. Given that the L1 and the L2 share the same conceptual system (i.e., Costa et al., 2005; Vigliocco et al., 2002), the parallel activation of the L1 (i.e., Spanish) and the L2 (i.e., English) Ns would give way to

different reactions in terms of directionality and gender agreement preferences. That is, what we would like to argue is that speakers react differently to Spanish determiner switches that are [+AC] (over Spanish determiner switches that are [-AC]), as they comply with Spanish gender agreement mechanisms; and, in eyetracking, English Ns that follow a [-AC] pattern are longer fixated (than [+AC] Ns) because they involve a grammatical gender agreement violation, and this slows processing. These gender agreement preferences for [+AC] versus [-AC] switches would not be expected if the L1 and the L2 had independent conceptual representations.

Therefore, these results shed light on how language activation and inhibition take place, both phenomena being linked to the status that the two languages have for the bilingual participants in this study and, in particular, to the different status grammatical gender has in the two languages under investigation, as captured in the scale in (6). What we would like to suggest is the following: English DET switches (1b) are processed faster as no gender agreement mechanism needs to be enforced because English DETs bear no gender features; when a Spanish DET appears (1a), and given the strength of grammatical gender features in Spanish (the L1 of the children), gender agreement mechanisms are enforced, which results in longer processing times; furthermore, when gender agreement operations result in non-congruent switches (2b and 3b), this is seen as a violation for these L1 Spanish bilinguals, which also results in even longer processing times when compared to congruent switches. This is in line with previous studies considering adult data, both in offline acceptability judgment data (Liceras et al., 2008, 2016; Valenzuela et al., 2012) as well as in online data (Fernández Fuertes et al., 2019; Litcofsky and Van Hell, 2017).

In the spirit of past studies (e.g., Fairchild and Van Hell, 2017; Fernández Fuertes et al., 2019; Liceras et al., 2008; Litcofsky and Van Hell, 2017), we have

examined how bilingual children deal with gender formal features, rooted in their linguistic experience, to facilitate the processing of English-Spanish switched DPs. Specifically, we have examined the extent to which their relying on gender and gender agreement features (4a to 4f) shapes their codeswitching preferences illustrating how language inhibition and language activation works. The rationale for our study has been as follows: if bilingual children exhibit certain preferences depending on the directionality of the switch and on the gender agreement mechanisms enforced, these patterns may provide reliable cues as to how the two languages are represented in their mind and how their coactivation proceeds.

By comparing judgment data and eyetracking during reading data elicited from L1 Spanish L2 English bilingual children, we have been able to address how the representation of features in the mind of the bilingual guides linguistic experience in the specific case of a language contact phenomenon such as codeswitching. When speakers are confronted with offline judgment tasks and online reading tasks, these speakers' linguistic representations (one per language in the case of codeswitching) are activated. It is this activation that is targeted in this study. In both offline judgment and online reading, the directionality of the switch and gender agreement need to be dealt with and resolved by the speaker. That is, in both modes (judgment and reading), participants have to process the linguistic properties under investigation (directionality and gender agreement). Therefore, both modes provide information as to the process participants go through when they have to (i) process directionality and gender agreement in order to provide a judgment for a particular structure (e.g., Casasanto et al., 2010; Hofmeister et al., 2013; Schütze, 2019); and (ii) process both issues while reading. That is, even if the linguistic modes differ (judgment of a structure versus reading of a structure), the linguistic representations and, in particular, the way gender is represented in the mind of

bilinguals will shape (i) the speakers' preferences when judging and (ii) their processing costs when reading.

Using data from children has also contributed to extend research on processing by non-adult bilinguals with a focus on how the relationship between activation and inhibition proceeds when formal features are placed at the forefront of the analysis. Data from bilingual children with a different linguistic profile could help complete the picture as to the sensitivity to gender features in switched DPs (e.g., Lipski, 2016). It follows from our study that bilingual children whose L1 is not Spanish but English, or whose level of command in L2 English is lower would show a behavior consistent with a different interplay between the status of the formal features at stake and their activation and inhibition costs. For instance, if Spanish is an L2 they might exert even less effort as they would not activate their weaker language in terms of translation equivalents and feature valuation processes. Another venue that is left open to be explored is the comparison of child groups for whom English has a different status (i.e., as a heritage language, HL, or as an L2) as this could have an impact on the sensitivity to Spanish features when it comes to processing the English N in terms of imposing gender features to an otherwise genderless English N. Even if Spanish is an L1 for both HL English and L2 English children, the different status English has for them may lead the HL English children to a relaxion of the analogical criterion when compared to the L2 English children. That is, HL English children might be more prone to inhibit Spanish gender features, something that L2 English children, as seen in the present study, do not seem to be able to do. For the L2 English children, the strength of Spanish gender features clearly shapes their codeswitching preferences.

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