

## RESEARCH

# Another look at the interpretation of overt and null pronominal subjects in bilingual language acquisition: Heritage Portuguese in contact with German and Spanish

Esther Rinke<sup>1</sup> and Cristina Flores<sup>2</sup><sup>1</sup> Goethe-Universität Frankfurt, Norbert-Wollheim-Platz 1, 60629 Frankfurt am Main, DE<sup>2</sup> Universidade do Minho, Campus de Gualtar, 4710-057 Braga, PT

Corresponding author: Esther Rinke (Esther.Rinke@em.uni-frankfurt.de)

This paper investigates the interpretation of overt and null subject pronouns in the heritage language (European Portuguese, EP) of Portuguese heritage bilinguals (children and teenagers) in Germany and Andorra with German (Ger) and Spanish/Catalan (Span/Cat) as environmental languages and compares it to the outcomes of age-matched monolingual Portuguese children and monolingual adults. The results of an offline sentence interpretation task show that all groups of speakers differentiate between overt and null subjects. They are also sensitive to the syntactic context (intrasentential vs. intersentential) and the directionality of the anaphoric relation (anaphoric vs. cataphoric), although to different degrees. We argue that the interpretation of differences between monolingual and bilingual speakers needs to take into account these different syntactic contexts of pronominal resolution in order to gain a better understanding of the role of language-internal factors and cross-linguistic influence (CLI). With respect to the latter, the comparison between the Ger-EP and the Span/Cat-EP groups reveals no differences between these populations and shows that for the speakers' knowledge of anaphora resolution in EP it is not decisive whether the contact language is a null subject language or not (confirming thus the results in Sorace et al. 2009).

**Keywords:** pronominal resolution; null subjects; overt pronouns; heritage speakers; European Portuguese; cross-linguistic influence

## 1 Introduction

This paper focusses on pronominal resolution in two different multilingual child populations, Portuguese heritage speakers (HSs) with either German or Spanish as their dominant contact languages, and compares them to each other and to an age-matched group of monolingual speakers of European Portuguese (EP). In particular, we investigate the interpretation preferences of null (pro) and overt pronominal subjects in EP in sentences like (1a–b).

(1) *European Portuguese* (Lobo & Silva 2016: 327)

- a. A mãe cumprimentou a avó quando pro entrou  
the mother greeted the grandmother when pro entered  
na cozinha.  
in-the kitchen

‘The mother greeted the grandmother when she entered the kitchen.’

- b. O avô fotografou o menino quando ele saiu  
 the grandfather took-a-picture the boy when he came-out  
 da garagem.  
 of-the garage  
 ‘The grandfather took a picture of the boy when he left the garage.’

It has been widely shown that, in such ambiguous contexts, monolingual native speakers of null subject languages preferentially interpret the null subject in the subordinate clause in terms of the subject referent of the main clause (*a mãe* ‘the mother’, ex. (1a), topic continuity) and the overt subject in the subordinate clause as being co-referential with the object of the main clause (*o menino* ‘the boy’, ex. (1b), topic shift (TS)) (Calabrese 1986, cf. for EP Barbosa, Duarte & Kato 2005). *Topic continuity* means that the topic of the main clause is carried over to the topic of the following clause, *topic shift* means that a new topic is established in the following clause. Hence, null subjects are assumed to be related to topic continuity (–TS) and overt pronominal subjects to topic shift (+TS) (Tsimplici et al. 2004). According to Carminati (2002), this preference can be captured in terms of the *Position of Antecedent Hypothesis* (PAH). The PAH predicts that, in ambiguous contexts, the null pronoun refers to an antecedent that is in the IP position, whereas the overt pronoun tends to select an antecedent lower in the phrase structure, typically a non-subject antecedent. The PAH has been attested for a number of null subject languages, although there exist cross-linguistic differences, e.g. with respect to the scope of overt subject pronouns (cf. Filiaci et al. 2014).

Studies on bilingual populations have shown that pronominal resolution is a vulnerable domain in L1 attriters, bilingual children, adult HSs and late L2 learners. As demonstrated by Tsimplici et al. (2004), for adult native speakers of Italian with near native English, and Kaltsa et al. (2015), for native speakers of Greek with Swedish as their L2, L1 attriters prefer the object as an antecedent of an overt pronoun less often than their monolingual counterparts. Adult HSs seem to reveal a similar behaviour. In contrast to monolingual speakers, they do not show clear preferences for associating the overt subject pronoun with the subject or with the object antecedent (Kaltsa et al. 2015, for Greek HSs living in Sweden) or they even show a preference for the subject antecedent (Keating et al. 2011, for Spanish-English early bilinguals). In many experimental studies heritage bilinguals and L1 attriters do not deviate from the monolingual controls in the null subject condition (e.g. Paradis & Navarro 2003, for a Spanish-English bilingual child), although some studies also show deviations concerning the use of null subjects (Montrul 2004, for Spanish HSs in the US; Sorace et al. 2009, for bilingual English-Italian and Spanish-Italian bilingual children).<sup>1</sup> Because HSs and L1 attriters do not show a deviant knowledge of null subjects, some authors suggest that these populations do not exhibit a representational deficit concerning the null subject property as such. This finding is also confirmed in Serratrice et al.’s (2004) study of a bilingual English-Italian child (1;10–4;6) that was very sensitive to the pragmatics of the distribution of overt and null subjects but showed some instances of pragmatically inappropriate uses of overt pronominal subjects in null subject contexts.

The particular performance of bilinguals, especially with respect to the use and interpretation of overt subjects, has been attributed to different factors. One explanation is cross-linguistic influence (CLI), namely that a non-null subject language (e.g. English)

<sup>1</sup> An oral production task by Montrul (2004) only partly confirms the overt vs. null subject asymmetry in the bilingual children and attriters: the adult HSs used more overt (and less null) subjects than the monolingual control group, but at the same time, they showed a pragmatically illicit use of null subjects when there was a change of referent.

can exert an influence on a null subject language (e.g. Italian) because the interpretation of overt subjects in a language like English is less restrictive/underspecified [+TS, -TS] in comparison to a language like Italian [+TS] (Tsimpli et al. 2004, with respect to L1 attriters; Serratrice et al. 2004, for a bilingual child). Belletti, Bennati & Sorace (2007) also assume that the tendency of near native L2 speakers of Italian to interpret an overt pronoun in terms of topic continuity in anaphoric contexts is a result of CLI from their L1 English and leads to a weakening of the discourse constraint limiting the use of an overt subject pronoun to signal reference to a different topic. Another factor that has been credited with an important role is related with qualitatively and quantitatively diverging input that HSs may receive in the course of bilingual language acquisition. According to several authors, this might lead to diverging outcomes (Paradis & Navarro 2003; Sorace et al. 2009; Keating et al. 2011; Kaltsa et al. 2015). Less or divergent input is particularly relevant if the phenomenon under consideration represents a complex acquisition task. That variation and complexity may play a role for the acquisition of the interpretation of overt pronouns is not unlikely, given that the interpretation of overt pronouns in null subject languages is less strict than the interpretation of null pronouns because overt pronouns can more easily be associated with topic continuity as well as with topic shift. This variability applies to different null subject languages to different extents: e.g. it seems that overt pronouns have a wider scope in Spanish than in Italian (cf. Keating et al. 2011; Filiaci et al. 2014). Nevertheless, most authors have argued that the PAH is still valid in Spanish, even though its strength may vary within different varieties. Bel & García-Alcaraz (in press), for instance, show that the PAH is more pronounced in the Spanish contact variety in Catalonia than in other (monolingual) Spanish varieties. Sorace et al. (2009) argue that inappropriate null subjects in [+TS] context are related to ambiguity, whereas inappropriate overt subjects in [-TS] contexts lead to redundancy. Although bilingual children may show protracted development with both, they tend to make proportionally more errors involving redundancy than ambiguity because they have more difficulties in coordinating different sources of information (cf. Sorace et al. 2009: 464; Sorace 2011, for an overview). According to Sorace (2011), the differences between monolingual and bilingual populations concerning the interpretation of overt pronouns in null subject languages may therefore also relate to bilingualism per se and to the allocation of general cognitive resources in bilingual processing, not being caused by the nature of the contact language. This possibility is also considered by Kaltsa et al. (2015). In the following section we will discuss several factors that have been proposed to determine the structural and interpretative properties of null and overt pronominal subjects before we present our research questions.

## 2 Pronominal resolution in null subject and non-null subject languages

Pronominal resolution is determined by a number of different factors, such as universal syntactic principles (*Binding theory*, Chomsky 1981), language specific options (null versus overt subjects, personal pronouns versus demonstratives, Bosch et al. 2003; Wilson et al. 2009), processing constraints (*PAH*, Carminati 2002), directionality of the anaphora (anaphoric versus cataphoric reference, Lust 1986; Reinhart 1986; Blackwell 2003; Tsimpli et al. 2004; Lobo & Silva 2016), sentence structure (intrasentential versus intersentential anaphora, Alonso Ovalle et al. 2002; Carminati 2002; Morgado 2013), and discourse-pragmatic aspects and plausibility considerations (Ariel 1990; Filiaci et al. 2014). In this section we will briefly discuss the different factors. It will turn out that they focus on different aspects of the same phenomenon and complement each other.

Binding theory predicts that a pronominal subject that c-commands an R-expression (cf. (2a)) cannot bind it because the latter has to be free (Principle C). If the pronoun occurs in the subordinate clause (and therefore does not c-command the noun phrase) as in (2b), binding is possible.

- (2) a. \*She<sub>i</sub> listens to music when Sarah<sub>i</sub> reads poetry.  
 b. When she<sub>i</sub> listens to music, Sarah<sub>i</sub> reads poetry.

However, as pointed out by Lujàn (1985; 1986), sentences like (2b) are not grammatical in null-subject languages like Spanish, when the pronominal subject is an overt (and stressed) pronoun (cf. example 3a).

- (3) *Spanish* (Larson & Lujàn 1989)  
 a. Cuando pro/\*el<sub>i</sub> trabaja, Juan<sub>i</sub> no bebe.  
 when pro/he works John not drinks  
 ‘When he works, John doesn’t drink.’  
 b. Juan<sub>i</sub> no bebe, cuando el<sub>i</sub> trabaja.  
 John not drinks when he works  
 ‘John doesn’t drink when he works.’

Larson & Lujàn (1989) observe that overt pronouns can behave in two ways: in contexts like (3a), the overt pronoun (*él* ‘he’) is not co-referential with the subject of the main clause (*Juan*). In contexts where the null subject is excluded (4), overt pronouns behave like neutral pronouns.

- (4) *Spanish* (Larson & Lujàn 1989)  
 Cuando \*pro/él y su mujer trabajan, Juan no bebe.  
 when pro/he and his wife work, John not drinks  
 ‘When he and his wife work, John doesn’t drink.’

In (4), the overt pronoun *él* (‘he’) is co-referential with the subject of the main clause (*Juan*). According to Larson & Lujàn (1989), the different interpretations of overt and null pronouns in (3a) and (4) are the result of their different structural positions. In (3a), *pro* occupies the canonical subject position and is licensed and identified by the INFL head from where it gets its feature content. Since the overt pronoun *él* already has feature content, it cannot form a chain with INFL in the same way as the null pronoun. The authors assume that *él* is embedded in a non-pronominal XP (QP) which does not undergo feature copying. In sentences like (4), no licensing by INFL is involved and, consequentially, *él* can occur as a neutral pronoun and be co-referential with the main clause subject.

The observations so far indicate that language specific options also play an important role. If a language disposes of null and overt subject pronouns, the *Avoid pronoun principle* (Chomsky 1981) predicts that a null variant is preferred over an overt pronoun whenever possible. Hence, an overt pronoun should only be employed in topic shift contexts but not in contexts of topic continuity. Accordingly, Tsimpli et al. (2004) assume that overt pronouns are marked by the interpretable feature [+TS] (topic shift), whereas null pronouns by the feature [-TS] (topic continuity). In non-null subject languages, a similar division of labour is found with respect to pronouns vs. demonstratives (ex. (5) (=German equivalent of ex. (1a)); cf. Bosch et al. 2003; Wilson et al. 2009).

(5) *German*

Die Mutter<sub>i</sub> begrüßte die Großmutter<sub>j</sub>, als sie<sub>i</sub>/diese<sub>j</sub> in die Küche kam.  
the mother greeted the grandmother when she/this one in the kitchen came  
'The mother greeted the grandmother when she entered the kitchen.'

This indicates that overt pronouns in null subject languages and demonstratives in non-null subject languages can be characterized as strong pronouns (Cardinaletti & Starke 1999), whereas null subject pronouns in null subject languages and overt pronouns in non-null subject languages behave like weak forms that must have an antecedent prominent in the discourse.<sup>2</sup> As already mentioned above, the difference between overt and null pronominal subjects has been formulated as the PAH (position of antecedent hypothesis, Carminati 2002), a processing principle which accounts for the fact that in ambiguous contexts, the null pronoun preferentially refers to an antecedent in SpecIP, whereas the overt pronoun tends to select a structurally lower antecedent.

(6) *Italian* (Carminati 2002: 78)

Marta<sub>i</sub> scriveva frequentemente a Piera<sub>j</sub>, quando pro<sub>i</sub>/lei<sub>i/j</sub> era negli Stati Uniti.  
Marta<sub>i</sub> wrote often to Piera<sub>j</sub> when pro<sub>i</sub>/she<sub>i/j</sub> was in-the US  
'Maria often wrote to Piera when she was in the US.'

Carminati (2002) shows that native speakers of Italian associate a null subject in cases like (6) with the subject antecedent to 80.72% but an overt subject pronoun only to 16.67%.

The strong preference for associating an overt subject with the non-subject constituent can be weakened when the pronoun occurs before the potential antecedents (7).

(7) *European Portuguese*

Enquanto pro/ela se prepara para sair, a Joana conversa com a  
while pro/she Refl. prepares for going out the Joana talks to the  
Paula.  
Paula  
'While she prepares for going out, Joana talks to Paula.'

As noted by many authors (Lust 1986; Reinhart 1986; Blackwell 2003), backward anaphora represent a marked form of anaphoric relation. Because "... backward anaphora requires holding the pronoun in memory and going back to it" (Reinhart 1986: 140). Therefore, for processing reasons, the pronoun is interpreted as soon as possible. This means that in cataphoric contexts like (7), the PAH is weakened and the reference of the overt subject pronoun may be resolved as soon as possible, i.e. in terms of the subject of the following main clause (*Joana* in (7)). Fedele & Kaiser (2014) show that the asymmetry between the anaphoric and the cataphoric condition, as expected, only concerns the overt subject pronouns but not the null subjects. In Belletti, Bennati & Sorace's (2007) study, in cataphoric contexts, near native L2 speakers of Italian preferentially interpret an overt pronominal subject as co-referential with the matrix subject whereas monolingual speakers prefer an extra-linguistic referent. They assume that both strategies relate to the conflict between the discourse principle guiding the interpretation of overt pronouns (signal reference to

<sup>2</sup> In fact, subject pronouns in non-null subject languages can often be ambiguous between weak and strong forms as argued by Cardinaletti & Starke (1999). This applies for instance to the German subject pronoun *sie* which can occur as a strong and a deficient form. In the sentence *Sie sind groß*. ('They are big. '), the pronoun can have a human and non-human interpretation, it is a weak pronoun. In the sentence *Sie und die daneben sind groß*. ('They and those besides are big. '), *sie* is a strong form and can only be interpreted as referring to a human referent. In fact, the possibility of referring to a human and non-human referent (the occurrence of the weak pronoun) is the unmarked case.

a different topic) and additional processing load (holding the pronoun in memory until a possible referent is encountered, thus favouring co-reference with the subject).

The comparison of sentence (7), where the overt pronoun refers either to the subject or to the object of the main clause with sentence (4a), where the pronoun cannot refer to the subject of the main clause, shows that besides the direction, the availability of different potential antecedents (ambiguous vs. non-ambiguous contexts) also seems to play a role for pronominal resolution possibilities.

Weakening of the PAH is not only observed in cataphoric intrasentential contexts but also in anaphoric intersentential contexts, as shown by the Spanish example in (8) (cf. Alonso Ovalle et al. 2002; Carminati 2002).

- (8) *Spanish* (Alonso Ovalle et al. 2002: 6)  
 Juan pegó a Pedro. pro/Él está enfadado.  
 Juan hit Prep. Pedro he is tired  
 ‘Juan hit Pedro. He is tired.’

Alonso Ovalle et al. (2002) show with respect to Spanish that, in intersentential contexts, overt pronouns are interpreted equally in terms of topic continuity and topic shift (50.2% of subject preference). Although it might be the case that this tendency is stronger in Spanish than in Italian (Filiaci et al. 2014), Carminati (2002) observes the same effect in Italian. Whereas topic continuity with the overt intrasentential subject is judged by an average of 3.68 on a scale from 1 (very good) to 5 (very bad), topic continuity with the overt intersentential subject in (9b) is judged significantly better by an average of 2.89.

- (9) *Italian* (Carminati 2002: 133)  
 a. Siccome Alda sembra essere brava in matematica, pro/lei è stata  
 since Alda seems to be clever at mathematics pro/she has been  
 scelta come tesoriere.  
 chosen as treasurer  
 ‘Since it seems that A. is clever at math, she has been chosen as a treasurer.’  
 b. pro<sub>expl.</sub> sembra che Alda sia brava in matematica. Per questo  
 pro<sub>expl.</sub> seems that Alda is clever at mathematics for this (reason)  
 pro/lei è stata scelta come tesoriere.  
 pro/she has been chosen as treasurer  
 ‘It seems that A. is clever at math. For this (reason) she has been chosen as treasurer.’

In her experimental study on anaphoric resolution in EP, Morgado (2013) even finds that in intersentential contexts, the most prominent discourse referent – the subject of the main clause – is chosen as an antecedent by *both* the null and the overt subject. According to Morgado (2013), this preference can be explained on the basis of Ariel’s (1996) accessibility hierarchy. In general, null pronouns mark high accessibility and overt pronouns lower accessibility of a referent. Therefore, null pronouns in general tend to refer to the subject antecedent and overt pronouns to a referent that is less accessible, e.g. the object of a preceding main clause. However, in contexts with less cohesion, e.g. because of a sentence boundary, the subject referent becomes less accessible and is more likely to be resumed by a more informative anaphoric expression, e.g. an overt pronoun.

A last factor that has to be taken into consideration is plausibility, as exemplified by the Italian example in (10a.) and the Portuguese example in (10b.), taken from our test.

(10) *Italian* (Filiaci et al. 2014)

- a. Dopo che Giovanni<sub>i</sub> ha criticato Bruno<sub>j</sub> così ingiustamente, pro/lui<sub>i</sub> si  
after that Giovanni<sub>i</sub> has criticised Bruno<sub>j</sub> so unfairly pro/he<sub>i</sub> Refl.  
è scusato ripetutamente.  
has apologized repeatedly  
'After that John has criticised Bruno so unjustly, he apologized repeatedly.'

*European Portuguese*

- b. O João conversou com o pai porque ele quer comprar um carro novo.  
the João talked with the father because he wants to buy a car new  
'João talked to his father because he wants to buy a new car.'

As can be seen in (10a), the overt subject pronoun in the main clause (*lui*) is more easily associated with the subject of the preceding subordinate clause than with the object because of plausibility reasons. In (10b), a test item that was excluded during data analysis, the tendency for the overt pronoun *ele* to refer to the object of the main clause 'the father' (*o pai*) is weakened by the knowledge that, normally, it is the son who has to talk to his father to convince him to buy a car and not the other way round.

In fact, alongside with syntactic and processing factors, anaphora resolution is also constrained by plausibility and world knowledge: thus, the discursive context of the target sentence plays an important role and the syntactic and processing factors discussed above may be outweighed by pragmatic considerations in the contexts with overt pronouns. The weight that is given by the speaker to this world knowledge and to contextual information is subjected to individual variation and is, thus, a further factor that explains the variability of pronominal resolution.

### 3 The present study

#### 3.1 Aims and research questions

As already mentioned in section 1, a number of different factors have been proposed to explain the differences between monolingual and bilingual speakers concerning the interpretation of null and overt subject pronouns. We may subsume these factors under four different hypotheses: i) the *underspecification hypothesis*, which assumes unidirectional CLI from the non-null subject language to the null subject language, ii) the *differential input hypothesis*, based on the idea that input differences between monolinguals and bilinguals explain outcome differences, iii) *conflicting input/complexity hypothesis*, assuming that complexity and variability in the target system account for interpretation differences, and iv) the *processing/cognitive resources hypothesis*, which points to processing or cognitive resource limitations related to bilingualism as such.

Although the studies on the topic are numerous and all these factors might contribute to some extent to an explanation of the observed differences between monolingual and bilingual speakers, there are two aspects that, in our view, have not received enough attention. Both aspects relate to the role of the contact language as a source of CLI. The first aspect concerns the *conflicting input/complexity hypothesis*: in order to determine whether bilinguals deviate from monolinguals and in which ways, the variability of the phenomenon and its complexity have to be taken into consideration. The interpretation of overt and null subjects in null subject languages depends on a number of different factors, and varies with respect to different contexts such as ambiguous versus non-ambiguous contexts, anaphoric versus cataphoric relations, intersentential versus intrasentential anaphora, and also discursive and plausibility considerations. For instance, in order to determine whether overt pronouns can indeed inherently be characterized by the feature [+TS] in the monolingual grammar and [+TS, -TS] in the bilingual grammar, different structural

contexts have to be taken into consideration. However, not many of the studies on this topic include anaphoric as well as cataphoric relations or intersentential as well as intra-sentential anaphora in order to attain a more complete picture of anaphora resolution preferences. This point is relevant, because anaphora resolution is not a categorical but a variable phenomenon that depends on a number of different factors and it should also be taken into consideration how bilingual speakers deal with this variation and whether they are sensitive to the different factors in the same way as monolinguals are.

The second aspect concerns the differentiation between the *underspecification hypothesis* and the *processing/cognitive resource hypothesis*. In order to determine whether the differences between monolingual and bilingual speakers can be attributed to CLI or to a contact-independent bilingual effect, combinations of null-subject/non null-subject language and null-subject/null-subject language should be compared. However, there is to our knowledge only one such study that compares bilingual speakers with different language combinations. Sorace et al. (2009) tested Italian-English bilingual children of different age groups (6–7 and 8–10 yrs.) in Italy and Great Britain and compared them to age-matched Italian-Spanish children and monolingual Italian children and adults. With respect to the null subject language (Italian), the participants were provided a discursive context in which either the subject of the main clause or a different person was the *only* possible antecedent. They were told that the characters were learning Italian and they had to decide which of the two characters spoke better Italian. Example (11) shows one of the test items of Sorace et al. (2009) in the Topic continuity condition.

- (11) *Italian* (Sorace et al. 2009: 467); – topic shift condition (–TS)<sup>3</sup>  
 (Minnie and Daisy in the foreground; Mickey and Donald in the background)  
 Minnie: sono caduta!  
       ‘I’ve fallen!’  
 Donald: Minnie ha detto che è caduta.  
       ‘Minnie has said that (she) has fallen.’  
 Mickey: Minnie ha detto che lei è caduta.  
       ‘Minnie has said that she has fallen.’

Sorace’s et al.’s (2009) study shows that all groups of younger children (bilingual and monolingual) chose pragmatically inappropriate overt subject pronouns (*Mickey*) significantly more often than older children and adults. The group of the older Spanish-Italian bilinguals opted significantly more often for an overt pronoun in the [–TS] condition than the monolinguals but they were not significantly different from the English-Italian bilinguals. The authors interpret these findings as evidence that CLI cannot be the only factor contributing to differences between bilingual and monolingual speakers.

The present study aims at contributing more empirical evidence to the discussion concerning the different hypotheses that may account for outcome differences across speaker groups, in particular the role of CLI. Like Sorace et al. (2009), we will compare different groups of bilingual children (and teenagers) with European Portuguese as their heritage language and German or Spanish/Catalan as dominant environmental languages. However, given that the interpretation of overt and null subjects is not a categorical but a variable phenomenon, we will not address the question of appropriate/inappropriate use of overt and null subject pronouns but focus on the PAH in ambiguous constructions with two potential linguistic antecedents. As already mentioned, this study includes additional

<sup>3</sup> For reasons of space and because it is more relevant, we only provide the example of the [–TS] condition. There was also a [+TS] condition.

variables such as anaphoric vs. cataphoric relations and intersentential vs. intrasentential anaphora, which are of particular relevance with respect to the interpretation of overt subject pronouns. More concretely, we will focus on the following research questions:

- i) Is the PAH valid in the grammar of monolingual and bilingual speakers of EP?
- ii) Can we confirm that bilinguals and monolinguals are in general more alike in the null subject condition than in the overt pronoun condition?
- iii) Are bilingual (and monolingual) speakers sensitive to different factors that have an influence on the interpretation of overt pronominal subjects (cataphoric vs. anaphoric and intersentential vs. intrasentential)?
- iv) What is the role of cross-linguistic influence? Can we confirm that possible differential behaviour of HSs is independent of the language combination?

### **3.2 Participants**

A total of 72 informants participated in this study: two groups of bilingual HSs of EP in the age span of 9 to 16 years (living in Germany and Andorra with German and Spanish/Catalan as the respective environmental languages), and two groups of monolingual speakers of EP, an age-matched child group and an adult control group.

The HSs' language background was assessed by means of a biographic questionnaire, which included questions on the participants' place of birth, years living in the country of migration, age of onset of bilingualism, contexts of language use, frequency of contact with EP native speakers, language preferences and a self-assessment of language dominance. An additional section comprised questions about the parents' age, place of birth, current occupation, and level of education. In addition to outlining the sociolinguistic profile of the HSs, the information gathered in this detailed questionnaire allowed us to quantify an input index for each bilingual participant, which was, then, correlated with the individual test results. The input index is based on a 100-point scale, obtained by summarizing the values attributed to AOA of EP and the majority language, the number of family members speaking EP, the frequency of use of EP by the participant with each member, the preferred language, the language used in interaction with friends and the number of years attending a HL course (a detailed description of the quantification procedure is given in the appendix). Values close to 100 points indicate a high amount of contact with EP, while values more close to 0 indicate absence of daily contact with the HL.

The German-EP bilingual group comprises 16 participants (mean age = 12.9; SD = 2.6) who were born in Germany into Portuguese-speaking families or immigrated before the age of 5 years. All participants received input from Portuguese since birth, speaking both languages, Portuguese and also German, within the family. Two children have only one EP-speaking parent (the mother); in all other cases both parents are EP native speakers. Six children started to acquire German between the age of 3 and 5 years; the other are simultaneous bilinguals. They have contact with the Portuguese language mainly through communication at home and Portuguese neighbors, TV and music. All children spend their holidays in Portugal and are enrolled in a weekly HL course (where they were tested). In all other social contexts, German input is dominant. The input index in this group ranges from 36.5 to 95 points with a mean of 68.1 (SD = 17.8).<sup>4</sup>

<sup>4</sup> In the case of five children the parents did not answer to all questions, so that it was possible to describe the children's profile but not to calculate an input index. These participants were coded as missing values in the Correlation test.

The group of HSs living in Andorra comprises 20 participants (mean age = 13; SD = 2.7) who have an identical profile as the German-EP bilinguals with regards to the acquisition and use of Portuguese. Six participants were born in Portugal and immigrated before the age of five years to Andorra; all other children were born in the host country. All children have contact with EP since birth, except for one girl who had more contact with EP after age two. Eleven children were first exposed to EP and started to acquire Spanish after age three. The other acquired Spanish and EP simultaneously. One participant has only one EP speaking parent (the mother), all others have first generation parents, who are native speakers of EP. As in the case of the HSs living in Germany, Portuguese is mainly spoken within the family, with other Portuguese migrants and in the weekly HL course. Children also travel frequently to Portugal and are enrolled in cultural activities related with the Portuguese culture (through Portuguese associations). The input index for EP ranges from 33 to 90 points with a mean of 73.2 (SD = 14.7).

Data were collected in Andorra, where Catalan is the official language. However, we tested only Portuguese HSs enrolled in two Spanish schools, who are instructed only in Spanish and use this language preferentially with their peers. No participant had intensive contact with Catalan from birth. Furthermore, no child selects Catalan as being a language used in daily contacts nor as a language used with friends or family members. Thus, the speakers in this group are in fact trilingual, with Catalan (also a null subject language) as weaker language. For reasons of simplification, in the figures, this group is referred to as Spanish-EP bilingual group.

The monolingual child group comprises 18 children and teenagers in the same age span as the bilinguals (mean age = 12.1; SD = 2.6). They grew up in a monolingual context in Portugal and never lived abroad.

The adult control group includes 18 university students (mean age = 21.4; SD = 1.9) who were raised in a monolingual context.

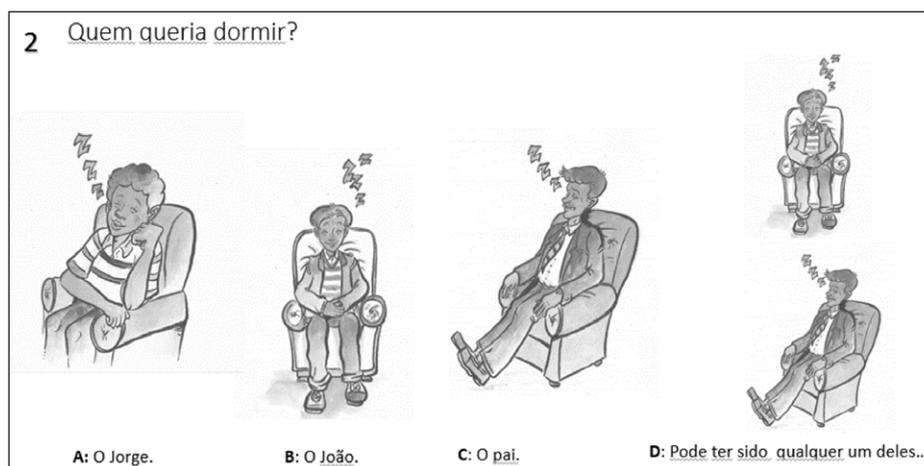
Table 1 summarizes the participants' age range, mean age per group and, in the case of the bilinguals, their input index (mean and range).

### 3.3 Experimental design: Materials and procedure

The test consisted of an offline sentence comprehension task with ambiguous sentences, i.e. the referent of the subject pronoun could either be the subject or the object of the other clause. The items were constructed such that both the subject and the object referent were in principle plausible candidates. Examples such as (10b) were excluded during data analysis, when we noticed during the test that one of the options was systematically disregarded because of plausibility reasons (cf. 4.2). The stimuli were presented orally and in written form with pictures. These showed different situations which involved a family whose members were introduced at the beginning of the test (see Figure 1).

**Table 1:** Participants.

	Monolingual adults <i>n</i> = 18	Monolingual children/teenagers <i>n</i> = 18	German-EP bilinguals <i>n</i> = 16	Spanish-EP bilinguals <i>n</i> = 20
age range	19–27	8–16	9–16	9–16
mean age (SD)	21.4 (1.9)	12.1 (2.6)	12.9 (2.6)	13 (2.7)
input index range (out of 100)	n.a.	n.a.	36.5–95	33–90
mean input index (SD)	n.a.	n.a.	68.1 (16.9)	73.2 (14.7)



**Figure 1:** Images from an elicitation item – response options.

Three variables were manipulated: i) the subject pronoun could be either null (12a) or overt (12b); ii) the relationship between the two clauses could be inter- (12d) or intrasentential (12c); iii) in the case of the intrasentential context, the reference could be anaphoric (12c) or cataphoric (12b). In intrasentential contexts, the overt or null subject pronoun was always in the subordinate clause, which was either a temporal adverbial clause introduced by *quando* ('when') or *enquanto* ('while') or a causal adverbial clause headed by *como* ('since') or *porque* ('because').

- (12) a. Mas como pro queria dormir, o pai afinal não telefonou  
 but since pro wanted to + sleep the father after all not called  
 ao João.  
 to + the João  
 'But since he wanted to sleep, the father didn't call João.'
- b. Quando ela chegou, a Susana abraçou a Luísa.  
 when she arrived the Susana hugged the Luísa  
 'When she arrived, Susan hugged Luísa.'
- c. Por isso, a mãe chamou a Sónia quando pro voltou do  
 therefore the mother called the Sónia when pro came back from-the  
 trabalho.  
 work  
 'Therefore the mother called Sónia when she arrived from work.'
- d. A Sónia telefonou à Susana. Como sempre ela está atrasada.  
 the Sónia called to + the Susana as always she is late  
 'Sónia called Susana. As usual she is late.'

Following Keating et al. (2011), each item was followed by a comprehension question that elicited participants' preference for the referent of the subject pronoun. For example, the sentence in (12a) was preceded by the context sentence in (13a) and followed by the question given in (13b).

- (13) a. O pai, o João e seu amigo Jorge tinham combinado ir ao  
 the father the John and his friend George had agreed to go to-the  
 cinema esta noite.  
 cinema this night  
 'The father, John and George wanted to go to the cinema tonight.'

Mas como pro queria dormir, o pai afinal não telefonou  
 but since pro wanted to + sleep the father after all not called  
 ao João.  
 to + the João  
 ‘But since he wanted to sleep, the father didn’t call João.’

- b. Quem queria dormir?  
 who wanted to sleep  
 ‘Who wanted to sleep?’

For the answer, participants had four options, as shown in Figure 1.

One option referred to the subject of the main clause, the other to the object. A third option referred to another character mentioned in the short narrative preceding the test item and, finally, a fourth option was given to the participants (as in Fedele & Kaiser 2014). This fourth option should be selected when the participant did not have a clear preference for a referent, considering that both the subject and the object of the other clause, could be the referent of the target subject. The participants were instructed to select this option when they did not have a clear preference or were uncertain. This option was, thus, included in order to verify if the participants had indeed clear preferences for a certain interpretation, as it is claimed in the literature, or, if having the choice to select both referents, they would resort more to this option. The four options were given in random order throughout the test.

The experimental materials consisted of 30 experimental sentences, with six conditions and five sentences per condition (see Table 2).

The experimental items were preceded by a previous training item. Participants were tested in small groups either at school/university or at afternoon learning centers. The answers were registered in a sheet by indicating the respective (randomized) option (A to D). In the case of the bilingual groups, participants answered the background questionnaire after the test session.

#### 4 Results

For data coding we first analyzed the raw results per group and per condition based on the four options the participants could give as answer to each item. The interpretation of the target subject as co-referent of the subject of the other clause was coded as topic continuity, while the interpretation of the target subject as referring to the object of the other clause was considered an instance of topic shift. Also the option for a third character, previously mentioned in the discourse, is a case of topic shift. Since the selection of this third option was marginal (ranging from 1.1% to 8.6%), we will not quantify these responses separately but have merged them together with the option for the object-referent as instances of topic shift responses.

As mentioned above, the fourth option was selected when the participant did not show clear preferences and considered that subject or object could be equally the referent of the target subject. This fourth option would signal differences between the speaker groups

**Table 2:** Test conditions.

Condition I	Condition II	Condition III	Condition IV	Condition V	Condition VI
null	null	null	overt	overt	overt
intersent.	intrasent.	intrasent.	intersent.	intrasent.	intrasent.
anaphoric	anaphoric	cataphoric	anaphoric	anaphoric	cataphoric

regarding the degree of confidence of their preferences. Furthermore, participants who selected this option in more than half of their answers would be excluded from the study since their results would be inconclusive. This was not the case, however. All speakers tended to clearly prefer an object/other person or subject-referent option instead of resorting to the answer ‘either one’. Table 3 shows the percentage of ‘either one’-answers per group and per subject-type condition (pro/overt).

Given that the rate of this option is low in all groups (between 3.7 and 9.8% in null pronoun conditions, and between 6.5 and 13.2% in overt pronoun conditions), for data quantification we excluded these items and coded the remaining responses as binary choice between a “topic continuity” and a “topic shift” interpretation. Note that the topic shift reading includes the interpretation of the target subject either as referring to the object of the other clause or to a third person, which was also mentioned in the discursive context. Since the groups still show some differences in the rate of ‘either one’-responses, in the discussion we will come back to the results concerning this option.

For the statistical analysis we ran a generalized linear mixed model (GLMM) executed in SPSS 22. The (binary) dependent variable was the topic preference showed by the participants (continuity/shift). Fixed effects entered into the model were Group (mon adults; mon children; bil German-EP; bil Spanish-EP), Age (as continuous variable), Condition (pro inter, pro intra anaph, pro intra cataph, overt inter, overt intra anaph, overt intra cataph) and a Group\*Condition interaction. Subjects and items were entered as random effects. Additional sidak-corrected pairwise comparisons were included into the model. Since the input index was only applicable to the two bilingual groups, thus lowering the model’s strength, this variable was analyzed separately through a Spearman’s Correlation Test.

The model showed significant main effects of Condition ( $F(5,1773) = 17.440$ ,  $p < .001$ ) and of the Group\*Condition interaction ( $F(15,1773) = 3.523$ ,  $p < .001$ ). Group ( $F(3,1773) = 2.053$ ,  $p = .104$ ) and Age ( $F(1,1773) = .035$ ,  $p = .852$ ) have no predictive effect. For a detailed presentation of the results the null and overt conditions will be discussed separately.

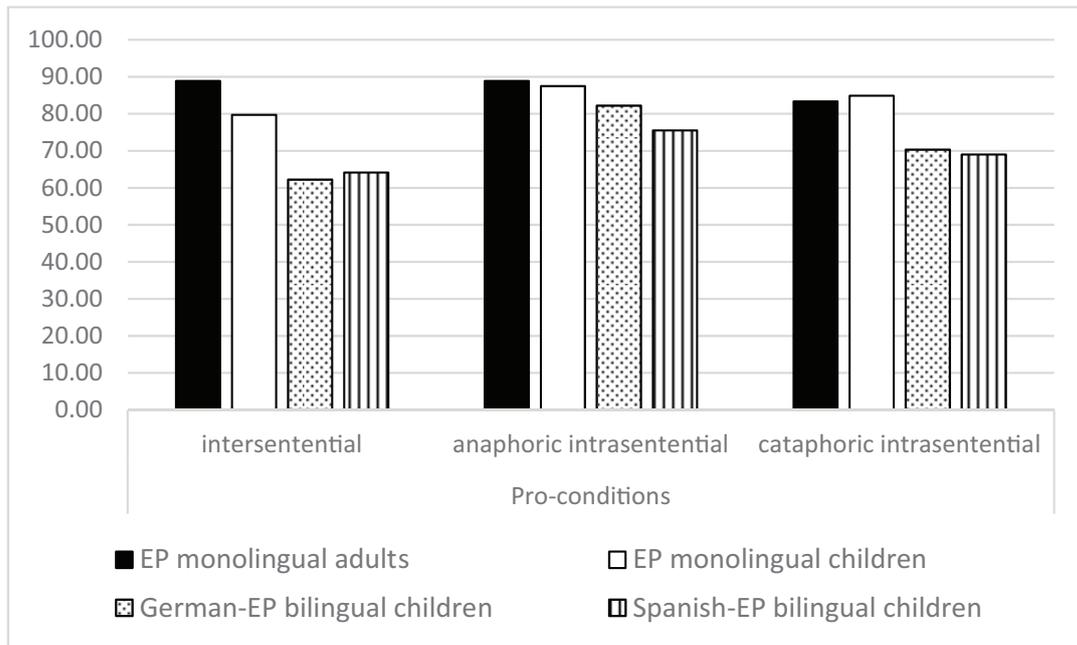
#### 4.1 Null pronoun conditions

We will start by presenting the results concerning the three null pronoun conditions (see Figure 2). For reasons of unification we will always present the rate of topic continuity responses, i.e. the percentage of items where the participant interpreted the target null subject as referring to the subject of the other (main, previous or following subordinate) clause.

As shown in Figure 2, globally all groups show a marked preference for the topic continuity interpretation, when the target subject is a null pronoun (over 60%). This is an expected result, considering the findings in the literature. There are, however, differences between the groups. In the monolingual adult control group, the preference for a topic continuity interpretation lies between 83.3%, for the cataphoric intrasentential condition, and 88.9% for the anaphoric intrasentential and the intersentential condition. These

**Table 3:** Rate of ‘either one’-responses.

	Monolingual adults	Monolingual children	German-EP bilingual children	Spanish-EP bilingual children
null	3.7	3.7	5.8	9.8
overt	6.5	9.7	9.8	13.2



**Figure 2:** Null pronoun conditions: rate of topic-continuity interpretation per group.

results are very similar in the monolingual child group with 79.7% in the intersentential, 87.5% in the anaphoric intrasentential and 84.9% in the cataphoric intrasentential conditions.

A look at the preferences shown by the bilingual groups in these conditions reveals much lower rates of topic continuity interpretations of the null subject. In the intersentential condition the bilingual groups select the topic continuity response only in 62.2% (German-EP) and 64.2% (Spanish-EP) of the cases. The bilingual groups also present similar results in the cataphoric intrasentential contexts with 70.3% in the German-EP and 69% in the Spanish-EP group. In the anaphoric intrasentential condition the results are closer to the monolinguals (82.2% for German-EP bilinguals and 75.5% for Spanish-EP bilinguals).

Sidak-corrected pairwise comparisons show that inter-group differences reach significance in the intersentential condition between the Spanish-EP bilingual group and the EP monolingual adults ( $t(1773) = 3.448, p = .003$ ), as well as the German-EP bilingual group and the EP monolingual adults ( $t(1773) = 3.499, p = .003$ ). The bilingual groups do not show any inter-group differences ( $t(1773) = 0.206, p = .837$ ). The same holds for the monolingual groups ( $t(1773) = 1.551, p = .227$ ). The differences between the bilingual groups and the monolingual child group is marginally significant (Spanish bil vs. mon child:  $t(1773) = -2.280, p = .069$ ; German bil vs. mon child:  $t(1773) = -2.373, p = .069$ ). In the other conditions inter-group differences are not statistically significant.

In order to gain some insights into individual variation, Table 4 indicates the mean rate of topic continuity responses, standard deviation (SD), minimal and maximal rates and the number (and percentage) of participants per group who selected the topic continuity option in more than 50% of the items.

The values in Table 4 show higher SDs in the bilingual groups compared to the monolinguals, which indicates higher intragroup variation. The range of minimal and maximal rate is also much expanded in both bilingual groups in the intersentential condition (from 0 to 100%). A look at the number of participants who gave more than 50% of topic continuity answers (i.e. above chance) also reinforces the observation that there is more variation within the bilingual groups since, compared to the monolingual child group,

**Table 4:** Descriptive statistics of null pronoun conditions.

	<b>Monolingual adults n = 18</b>	<b>Monolingual children n = 18</b>	<b>German-EP bilinguals n = 16</b>	<b>Spanish-EP bilinguals n = 20</b>
<b>null intersentential</b>				
mean (SD)	88.9 (12.3)	79.7 (18.2)	62.2 (24.7)	64.2 (23.8)
min-max	60-100%	40-100%	0-100%	0-100%
Participants with more than 50% rate	18/18 (100%)	17/18 (94.4%)	11/16 (68.8%)	14/20 (70%)
<b>null anaphoric intrasentential</b>				
mean (SD)	88.9 (12.2)	87.50 (15.7)	82.2 (218)	75.5 (23.7)
min-max	60-100%	40-100%	40-100%	40-100%
Participants with more than 50% rate	18/18 (100%)	17/18 (94.4%)	14/16 (87.5%)	15/20 (75%)
<b>null cataphoric intrasentential</b>				
mean (SD)	83.3 (19.9)	84.9 (20.3)	70.3 (18.5)	69 (19.2)
min-max	40-100%	33-100%	40-100%	25-100%
Participants with more than 50% rate	16/18 (88.9%)	17/18 (94.4%)	13/16 (81.3%)	16/20 (80%)

fewer children are very consistent in their interpretation of the null subject. However, in general, we can say that also in the bilingual groups the number of participants who consistently interpreted the null subject as topic continuity referent is still high (higher than 65%). A closer look at the data shows, that in neither group the lower rates are due to one single participant. This leads to the conclusion that there is slightly more variation in the bilingual groups but in general also their results are very consistent.

In order to assess whether there is a correlation between the HSs' topic preferences in the three null subject conditions and their input profile, we ran separate Spearman's Rank-Order Correlation Tests for each condition and each group.<sup>5</sup> Results (given in Table 5) reveal complete absence of correlation between the participants' input profile and their topic preference, i.e. the children with the highest input index are not necessarily those who show higher topic continuity preferences in null subject conditions. This means that the amount of contact these children have with their HL is not a confounding variable that influences the results in these conditions. In other words, the input that the participants received was sufficient to ensure the acquisition of the target domain; inter-individual differences are not due to this variable.

#### 4.2 Overt pronoun conditions

A first analysis of the obtained data revealed biased results for three sentences in the overt pronoun conditions, which were not evident in a previous pilot phase. In these sentences (one per condition, see example 10b and the discussion in section 2) there was a very marked tendency in every group to select the topic continuity interpretation. A closer look at these sentences revealed that world knowledge and common sense influenced the

<sup>5</sup> Age interacts with the amount of input that characterizes a child's acquisition process (older children have gathered more input than younger ones). For this reason, the input index, previously calculated for each bilingual participant on the basis of the questionnaires, was multiplied with the participant's age (e.g. a 15-year-old participant with an input index of 90 obtained an input score of 103.5, by calculating  $90 \times 1.15$ ).

subject interpretation significantly, so that we decided to exclude these sentences from quantification in all groups.

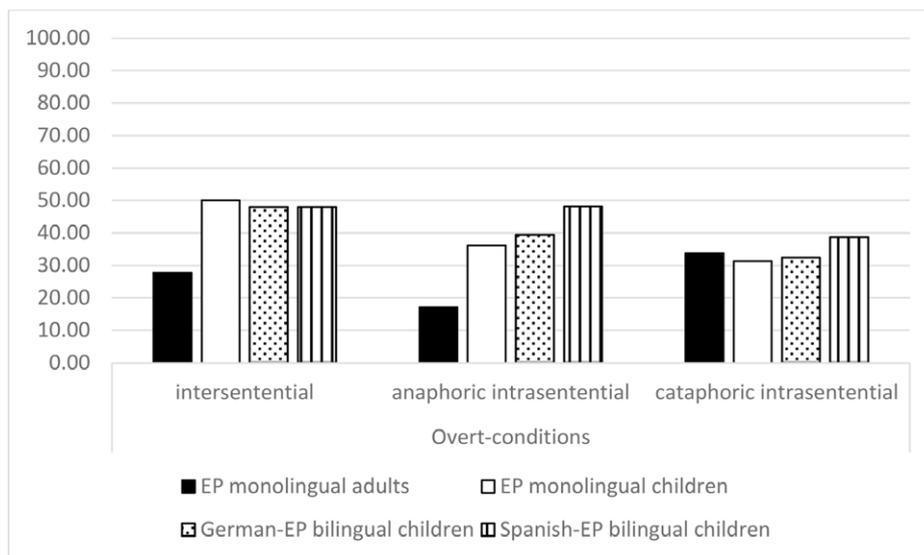
Figure 3 shows the results concerning the three overt pronoun conditions. Again, for reasons of unification we will always present the rate of topic continuity responses.

The first observation regarding the results of the overt subject conditions is related with the overall lower rates of topic continuity interpretations in all groups, when the target subject is overtly realized (under 50%). Also this result is expected, if we consider the findings described by other studies. There is indeed a PAH-effect in all three conditions in EP. This confirms previous results presented by Luegi (2012). In the monolingual control group, the rate of topic continuity interpretation varies between 17.1% in the anaphoric intrasentential condition and 33.8% in the cataphoric intrasentential conditions, with a similar rate in the intersentential condition (27.8%). In the EP monolingual child group, the rate of topic continuity responses is higher in all three conditions, compared to the adults' preferences. It varies between 50% for intersentential contexts and 31.3% for the cataphoric intrasentential condition, with 36.1% in the anaphoric intrasentential condition.

The results of the German-EP bilingual group are very similar to the results of the monolingual children, with 47.9% of "topic continuity" responses in the intersentential condition, 39.4% in the anaphoric intrasentential condition and 32.2% in the cataphoric intrasentential condition. The Spanish-EP bilinguals show similar rates of topic continuity as the other child groups in the intersentential condition (47.9%), but slightly higher rates in the intrasentential conditions (anaphoric intrasentential: 48.2%; cataphoric intrasentential: 38.7%).

**Table 5:** Spearman's correlations of input and topic preference in null pronoun conditions.

	German-EP bilinguals		Spanish-EP bilinguals	
	$r_s$	$p$	$r_s$	$p$
null intersentential	.055	.700	-.019	.865
null anaphoric intrasentential	-.139	.315	.087	.413
null cataphoric intrasentential	.079	.570	.072	.496



**Figure 3:** Overt pronoun conditions: rate of topic-continuity interpretation per group.

The comparison of all four groups reveals that the monolingual adults show the lowest rates of co-reference interpretation, however this group only differs from the child groups in the intersentential and intrasentential anaphoric conditions, but not in the cataphoric context. Sidak- corrected pairwise comparisons included in the model revealed that these differences are only statistically significant when contrasting the Spanish-EP bilingual children with the monolingual adults ( $t(1773) = -3.062, p = .013$ ). There are no significant differences between the child groups.

Table 6 presents the descriptive results, including mean and standard deviation per group, the minimal and maximal values and the number of participants who selected the co-reference option in less than 50%, since in this case this would be the expected option for EP.

The descriptive results reveal that overall in the overt pronoun conditions participants show more variation than in the null subject conditions, since the standard deviation values are a little higher and slightly less participants were within the expected values of up to 50% co-reference interpretation. Although there are some differences in the degree of variation compared to the null pronoun conditions, we cannot say that there are very expressive intergroup differences. In all groups the majority of participants indeed opted for a topic shift interpretation when the subject was overt.

Also for the results in the overt pronoun conditions we ran Spearman’s Rho correlations between the individual topic preferences and the input index (see Table 7). Again no correlation between the input index and the topic preference was found.

Finally, Figure 4 contrasts the rate of topic continuity preferences in null vs. overt pronoun conditions per group.

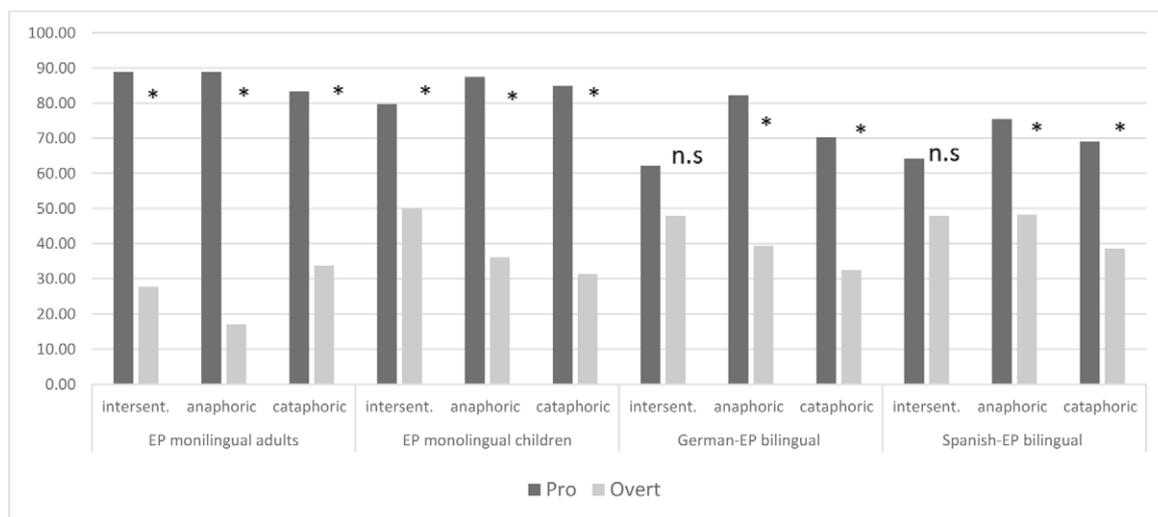
In order to evaluate whether there is a statistically significant PAH-effect in the three syntactic contexts in EP (intersentential and anaphoric/cataphoric intrasentential contexts), several T-Tests for paired samples were applied, which compared the intra-group performance per syntactic context when null versus overt subject conditions were confronted.

**Table 6:** Descriptive statistics of overt pronoun conditions.

	<b>Monolingual adults n = 18</b>	<b>Monolingual children n = 18</b>	<b>German-EP bilinguals n = 16</b>	<b>Spanish-EP bilinguals n = 20</b>
<b>overt intersentential</b>				
mean (SD)	27.8 (24.1)	50.0 (32.1)	47.9 (29.1)	47.9 (33.1)
min-max	0-75%	0-100%	0-100%	0-100%
Participants with up to 50% rate	15/18 (83.3%)	11/18 (61.1%)	10/16 (62.5%)	14/20 (70%)
<b>overt anaphoric intrasentential</b>				
mean (SD)	17.1 (17.5)	36.1 (27.4)	39.4 (29.5)	48.2 (24.6)
min-max	0-50%	0-100%	0-75%	0-75%
Participants with up to 50% rate	18/18 (100%)	17/18 (94.4%)	10/16 (62.5%)	11/20 (55%)
<b>overt cataphoric intrasentential</b>				
mean (SD)	33.8 (28.4)	31.3 (27.5)	32.2 (26.7)	38.7 (25.1)
min-max	0-100%	0-100%	0-75%	0-100%
Participants with up to 50% rate	16/18 (88.9%)	15/18 (83.3%)	13/16 (81.3%)	16/20 (80%)

**Table 7:** Spearman’s correlations of input and topic preference in overt pronoun conditions.

	German-EP bilinguals		Spanish-EP bilinguals	
	$r_s$	$p$	$r_s$	$p$
overt intersentential	-.047	.779	-.096	.438
overt anaphoric intrasentential	.308	.06	.030	.801
overt cataphoric intrasentential	-.046	.776	-.108	.383



**Figure 4:** Topic preference in null pronoun and overt pronoun conditions per group.

In the monolingual adult control group there are, as expected, very significant differences between the rate of topic continuity responses in null pronoun and overt pronoun conditions in all three contexts (intersentential:  $t(17) = 11.07, p < .001$ ; anaphoric intrasentential:  $t(17) = 12.84, p < .001$ ; cataphoric intrasentential:  $t(17) = 6.03, p < .001$ ). Also in the EP monolingual child group there are significant differences between the rate of topic continuity responses in the overt pronoun conditions compared to the null pronoun conditions, as revealed by several T-Tests for paired samples (intersentential:  $t(17) = 4.22, p = .001$ ; anaphoric intrasentential:  $t(17) = 7.67, p < .001$ ; cataphoric:  $t(17) = 7.22, p < .001$ ).

As for the bilingual children, only in intersentential contexts there are no statistical significant differences between null and overt pronoun conditions (German-EP bilinguals:  $t(15) = 1.95, p = .071$ ; Spanish-EP bilinguals:  $t(19) = 1.75, p < .096$ ). This indicates a low PAH-effect in this context. In the intrasentential contexts the difference between null and overt pronoun conditions is significant in both groups (German-EP bilinguals – anaphoric intrasentential:  $t(15) = 4.73, p < .001$ ; cataphoric intrasentential:  $t(15) = 3.94, p = 0.001$ ; Spanish-EP bilinguals – anaphoric intrasentential:  $t(19) = 3.72, p = .001$ ; cataphoric intrasentential:  $t(19) = 4.32, p < .001$ ). This means that the heritage speakers are sensitive to PAH effects in intrasentential contexts.

## 5 Discussion and conclusion

As a first conclusion of the study at hand the results allow us to answer our first research question: Is the PAH valid in the grammar of monolingual and bilingual speakers of EP? Overall, the data confirm that all groups of monolingual and bilingual speakers demonstrate

a different behaviour in the null subject condition as compared to the overt subject condition. In the intrasentential contexts this difference is significant in all groups. In the intersentential condition, the difference between the null and the overt subjects is less expressed, especially in the bilingual groups. This has been already shown in other studies. Morgado (2013), for instance, shows that, in intersentential contexts, adult monolingual speakers of EP interpret an overt pronoun significantly more often as co-referential with a preceding subject than in intrasentential structures. As already discussed in section 2, this is due to the intervening sentence boundary, which makes the subject referent less accessible. For this reason, the subject of an independent, previous sentence is more likely to be resumed by an overt pronoun. It is therefore expected that in EP intersentential contexts the most prominent discourse referent (the subject of the previous main clause) is resumed by null and overt subjects to more similar extents than in embedded contexts. This means that intersentential contexts, in general, show more variability regarding anaphora resolution than other contexts. Going back to our results, this variability is mirrored in the lower PAH-effect observed in intersentential contexts in the bilingual groups. This means that bilingual children are more sensitive to variability in the input.

Despite this less clear difference in the bilingual groups in this particular context, overall monolingual and bilingual speakers *know* that null pronouns are preferentially interpreted in terms of topic continuity and that overt subjects are related to topic shift. This is an important result because it shows that the PAH is part of the adult monolingual EP grammar (such as in other Romance grammars, see Carminati 2002 for Italian, and Alonso-Ovalle et al. 2002, for Spanish), that monolingual children are aware of it at the age of 9 (as already shown by Lobo & Silva 2016) and that bilingual children, independent of their language combination, also have acquired this knowledge at roughly the same age.

Despite this (crucial) commonality, we observe some differences between monolingual and bilingual speaker groups. A first observation is that, in comparison to the monolinguals, the bilingual speakers show more insecurity in their responses. This is shown by the overall higher percentage of indecisive or ‘either one’ responses in both bilingual groups. This is a current outcome of research on HSS, who commonly are less secure in experimental tasks focussed on their HL due to lower language awareness and lack of contact with the target language in instructional settings (Valdés 2001). However, the different groups show similar tendencies: all groups have a higher proportion of ‘either one’ responses in the overt pronoun condition, indicating that there is more variability in this condition in the monolingual grammars, too. From a theoretical perspective, this indicates that null pronouns are consistently interpreted as weak pronouns in the sense of Cardinaletti & Starke (1999) whereas overt pronouns in null subject languages are not necessarily *always* interpreted as strong pronouns.

Furthermore, the results do not indicate that the bilingual groups differ *per se* more strongly from the monolinguals in the overt pronoun conditions than in the null subject conditions. This answers our second research question negatively: Can we confirm that bilinguals and monolinguals are in general more alike in the null subject condition than in the overt pronoun condition? As already discussed, in the null subject condition, the bilinguals show a different behaviour from the monolingual children and adults with respect to the intersentential and the cataphoric intrasentential conditions, albeit this difference is only statistically significant in the intersentential context. In the overt pronoun condition monolingual and bilingual children behave alike and differ in all conditions from the monolingual adults. These observations lead to the conclusion that the (monolingual and bilingual) acquisition of the interpretation of overt pronouns is a complex acquisition task and is mastered in general relatively late in comparison to

the interpretation of null subjects. This has also been proposed by Lobo & Silva (2016). Their study on the acquisition of the interpretation of null and overt subjects by monolingual EP children shows that 8–9 years old monolingual children differ significantly from the adult control group in all conditions. The interpretation of null subjects is mastered more completely and hence acquired earlier than the interpretation of overt pronouns. This is supported by our study since monolingual children differ in the interpretation of overt subjects from the monolingual adults but not in the interpretation of null subjects. Lobo & Silva (2016) also come to the conclusion that cataphoric contexts are acquired after anaphoric contexts. One reason may be that, in cataphoric intrasentential and intersentential contexts, PAH-effects are weakened also in the adult grammar, as we have discussed in section 2 (cf. also Fedele & Kaiser 2014, Lobo & Silva 2016). This is also shown by our adult monolingual data. Hence, our third research question is confirmed: are bilingual (and monolingual) speakers sensitive to different factors that have an influence on the interpretation of overt pronominal subjects (cataphoric vs. anaphoric and intersentential vs. intrasentential)? Indeed, the variability (and complexity) of the target system in some subdomains (cataphoric, intersentential, overt pronoun conditions) is a predictor for late acquisition both by monolingual and by bilingual children and adolescents. The absence of an age effect in the child groups reinforces the conclusion that the relevant knowledge is developed at an advanced age i.e. later during adolescence.

The comparison of the monolingual children with the bilingual groups reveals that the monolingual children/teenagers seem to be one step ahead with respect to null subjects, where they perform more like adults than the bilinguals, but they still show the same non-adult-like behaviour in the overt pronoun conditions. Here, all groups of children/teenagers do not really differentiate between the different syntactic conditions. A study investigating adult Portuguese HSs in Germany, conducted by Pirkmayr (2015) on the basis of a similar sentence interpretation task as the present one, demonstrates that adult bilinguals no longer show differences in the null subject conditions compared to an adult monolingual control group. However, in the overt subject conditions, the differences between the monolingual and bilingual adults persist. Thus, the absence of an age effect in the present study may be due to the fact that the bilingual speakers reach adult-like performance in the null subject conditions at a more advanced age (during adolescence). This could be confirmed only by a cross-sectional study with more participants per age span. The absence of an age effect in the overt subject conditions could signal fossilization that is not overcome in later ages.

Our last research question and main point of this study concerns the role of the contact language, which is the language of the dominant environment of the bilinguals, German or Spanish (together with Catalan): can we confirm that the differential behaviour of bilinguals is independent of the language combination? If CLI would play a relevant role in the development of pronominal resolution strategies in the heritage language, we would expect differences between the two groups of bilinguals due to the presence of structurally different dominant languages, a non-null subject language (German) and null subject languages with similar PAH-effects (Spanish/Catalan). Recall that in the Spanish variety spoken in contact with Catalan, as well as in Catalan, the PAH is realized in a similar way as in Italian and Portuguese (Bel & García-Alcaraz in press). Many authors argue that differences in anaphora resolution in null subject languages by bilingual speakers are caused by the presence of a dominant non-null subject language (normally English, e.g. Keating et al. 2011). This would mean, in our case, that the EP HSs living in Germany would deviate more from monolingual EP children than the HSs living in Andorra. This is, however, not the case. The interesting finding of the present study is that the bilingual groups show a very similar performance in all contexts. Their results do not differ statistically.

Furthermore, CLI would lead to differences between the monolingual and the bilingual children in the overt pronoun conditions. Since also this expectation is not met, cross-linguistic influence cannot be at play (cf. Rothman 2009, for a similar conclusion with respect to L2 learners).

Our findings are of relevance with respect to different hypotheses that have been proposed in the literature to explain differences between monolingual and bilingual speakers. The *underspecification hypothesis* (unidirectional CLI from the non-null subject language to the null subject language in terms of feature transfer) is unlikely because the children that speak two null subject languages (Spanish and Portuguese, and to a certain extent even a third null subject language, Catalan) perform in the same way as bilingual children with a non-null subject language and a null subject language (German-Portuguese). The behaviour of the monolingual adults in the intersentential and cataphoric conditions shows that, depending on the syntactic context, overt pronominal subjects in EP (and other null subject languages) can also be interpreted as marking topic continuity to some extent. This speaks against the assumption that they carry the feature [+TS] and suggests that overt subject pronouns in null subject languages are more variable than demonstratives in non-null subject languages and that they can either be weak or strong pronominals, depending on a number of factors, among them the syntactic structure of the sentence.

Monolingual children acquire the interpretation of overt pronominal subjects late and perform in the same way as the bilingual speakers. Therefore, the *differential input hypothesis* and the *processing/cognitive resource hypothesis* are also not supported by the results of our study. The behaviour of the monolingual children and teenagers and the variability in the adult system speaks in favour of the *conflicting input/complexity hypothesis*. The interpretation of overt subject pronouns is a complex and variable phenomenon that is acquired late in monolingual children and may be delayed in bilingual populations, independently of their dominant environmental language. The same holds for null subject contexts which show more variability in adult grammars. This is precisely the case of intersentential anaphora resolution.

In general, the results of this study support the assumption that heritage speakers are native speakers of their heritage language and acquire their grammar in roughly the same way as their monolingual counterparts (cf. Rinke & Flores 2014; Flores, Rinke & Rato 2017).

## Abbreviations

AOA = age of onset of acquisition, CLI = cross-linguistic influence, EP = European Portuguese, Ger = German, HL = heritage language, HS = heritage speaker, INFL = inflection, L1 = first language, L2 = second language, PAH = position of antecedent hypothesis, pro = null subject, QP = quantifier phrase, Span = Spanish, TS = topic shift, XP = maximal projection

## Additional File

The additional file for this article can be found as follows:

- **Appendix A.** Input index: quantification procedure. DOI: <https://doi.org/10.5334/gjgl.535.s1>

## Acknowledgements

We would like to thank the editorial board and the reviewers for helpful suggestions. We also thank the parents and the pupils of the Colegio Español María Moliner in Andorra and the Portuguese-speaking Catholic Mission in Mainz/Germany for making data collection possible. We are also grateful to Sílvia Novo dos Santos for her support in establishing the contacts in Andorra.

## Competing Interests

The authors have no competing interests to declare.

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**How to cite this article:** Rinke, Esther and Cristina Flores. 2018. Another look at the interpretation of overt and null pronominal subjects in bilingual language acquisition: Heritage Portuguese in contact with German and Spanish. *Glossa: a journal of general linguistics* 3(1): 68.1–24, DOI: <https://doi.org/10.5334/gjgl.535>

**Submitted:** 29 September 2017    **Accepted:** 23 February 2018    **Published:** 05 June 2018

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