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4. The Interface Hypothesis as a framework for studying L1 attrition

Gloria Chamorro¹ and Antonella Sorace²

¹University of Kent and ²University of Edinburgh

Abstract

This chapter focuses on first generation individual attrition from the point of view of the Interface Hypothesis (IH), which proposes that structures at the interface between syntax and other cognitive domains, such as pragmatics, are more likely to undergo attrition than structures that do not involve such an interface, and discusses recent research that provides evidence of the selectivity and reversibility of individual first language (L1) attrition. This research provides supporting evidence for the IH as it reveals that attrition affects structures at the syntax-pragmatics interface but not structures requiring the satisfaction of semantic conditions. This chapter also reviews research that supports Sorace's (2011, 2016) proposal that individual L1 attrition affects only the ability to process interface structures but not knowledge representations, as it reveals that attrition only affects online sensitivity with structures at the syntax-pragmatics interface rather than causing a permanent change in speakers' L1 knowledge representations.

4.1 Introduction

The Interface Hypothesis (IH) was originally proposed by Sorace and Filiaci (2006) to explain the non-convergence and optionality revealed in very advanced adult second language (L2) learners in the comprehension and production of certain structures. The original proposal suggested that those language structures that are sensitive to conditions involving an interface between syntax and other cognitive domains, such as pragmatics, are more difficult to be acquired completely than structures that do not involve such an interface. The IH has evolved over time from assuming a dichotomy between ‘narrow’ syntax and ‘interface’ structures to a more fine-grained differentiation among types of interface conditions (‘internal’ versus ‘external’, Sorace, 2004; Tsimpli & Sorace, 2006), opening the way for research on the multiple cognitive mechanisms involved in acquiring and processing structures sensitive to different interface conditions. Specifically, ‘external’ interface conditions, such as those operating at the syntax-pragmatics interface, involve the integration of ever-changing contextual and pragmatic information while processing language; ‘internal’ interface conditions, on the other hand, involve the integration of semantic or morphological information, which is not sensitive to external contextual changes and relies on well-rehearsed processing mechanisms.

The IH was later extended to early bilingual acquisition and individual first language (L1) attrition, suggesting that interface structures are less likely to be acquired completely for the former and more likely to undergo attrition for the latter. In relation to L1 attrition, the current hypothesis further proposes that individual L1 attrition affects only the ability to process interface structures but not knowledge

representations themselves (Sorace, 2011, 2016). It is important to emphasise that this prediction relates to first generation individual attrition in speakers who have acquired the L1 completely before the onset of attrition and not to second generation attrition in heritage speakers, for whom the acquisition of the L1 may be incomplete or divergent, depending on the quantity and quality of input received.

The IH has been supported by a large body of research exploring cross-linguistic influence effects for different interface structures in diverse bilingual groups. For example, many studies have been conducted on the acquisition of null versus overt pronouns in bilingual children (e.g., Argyri & Sorace, 2007; Paradis & Navarro, 2003; Serratrice, Sorace, Filiaci, & Baldo, 2012; Serratrice, Sorace, & Paoli, 2004; Sorace, Serratrice, Filiaci, & Baldo, 2009), advanced adult L2 learners (e.g., Belletti, Bennati, & Sorace, 2007; Lozano, 2009; Rothman, 2009) and L1 attriters (e.g., Chamorro, Sorace, & Sturt, 2016; Montrul, 2004; Tsimpli, Sorace, Heycock, & Filiaci, 2004). The present chapter will focus on first generation individual attrition from the point of view of the IH, and particularly on recent research that provides evidence of the selectivity and reversibility of individual L1 attrition.

4.2 The Interface Hypothesis in first generation L1 attrition

In line with findings in bilingual L1 acquisition and adult L2 acquisition, recent research on L1 attrition also supports the IH, revealing that the structures at the syntax-pragmatics interface are the most prone to undergo attrition, causing ‘emerging optionality’ in the attrited speakers. Sorace (2000) tested anaphora resolution in Italian near-native speakers of English under L1 attrition and found that

they overgeneralised overt pronouns in Italian to contexts in which native speakers of Italian would use a null pronoun due to the influence from English. Sorace further established a connection between L2 acquisition and L1 attrition given that both English near-native speakers of Italian and Italian L1 attriters overextended the use of overt pronouns in Italian as a result of the influence from English.

Tsimpli et al. (2004) also reported attrition effects in a group of Greek and Italian near-native speakers of English in relation to subject pronouns. They tested the production and interpretation of null versus overt pronouns in Greek and Italian using a picture verification task to elicit the participants' preference for the subject or the object antecedent with each pronoun. During the experiment, participants were presented with three pictures and an ambiguous sentence like the ones in (1), and they were asked to choose the picture or pictures that correctly matched the meaning of the sentence.

- (1) a. Quando lei attraversa la strada, l'anziana signora saluta la ragazza.
'While she crosses the street, the old woman greets the girl.'
- b. Quando *pro* attraversa la strada, l'anziana signora saluta la ragazza.
'While (she) crosses the street, the old woman greets the girl.'
- c. L'anziana signora saluta la ragazza quando lei attraversa la strada
'The old woman greets the girl when she crosses the street.'
- d. L'anziana signora saluta la ragazza quando *pro* attraversa la strada
'The old woman greets the girl when (she) crosses the street.'

Consistent with Sorace's (2000) results, attrition effects were found for Italian attriters on the interpretation of the overt pronoun, for which they showed more

indeterminacy in their antecedent preferences than the control group of Italian monolinguals. In contrast, no attrition was revealed with the null pronoun, for which both groups of attriters preferred the subject as its antecedent, in line with both control groups of Greek and Italian monolinguals. Interestingly, the monolingual control group in this study did not perform categorically, showing a tendency towards more variable interpretation of the overt pronoun.

Tsimpli et al. (2004) also investigated the interpretation of preverbal versus post-verbal subjects in a group of native Greek L2 speakers of English. In this study, participants were also presented with three pictures and a pair of sentences like the ones in (2), in order to compare the speakers' interpretation of preverbal subjects, which are usually understood as 'old' information (i.e. topic), as in (2a), versus post-verbal subjects, which can be ambiguously understood as 'old' or 'new' information, as in (2b).

(2) a. I gitonisa mu ston trito orofo apektise dhidhima. Xtes vradhi
 my neighbour on the third floor had twins last night
ena moro ekleje.

one baby cry-PST.CONT

'My neighbour on the third floor had twins. One of the twins was crying last night.'

b. I gitonisa mu ston trito orofo apektise dhidhima. Xtes vradhi
 my neighbour on the third floor had twins last night
 ekleje **ena moro.**

cry-PST.CONT one baby

‘My neighbour on the third floor had twins. A baby (one of the twins or some other baby) was crying last night.’

The results from this experiment also revealed attrition effects, given that Greek attriters showed significantly more indeterminacy when interpreting preverbal subjects in comparison with the control group of Greek monolinguals. Based on the results obtained from these two structures, the authors concluded that attrition affects properties at the syntax-pragmatics interface but not syntactic features obeying conditions internal to the grammar.

Gürel (2004) also investigated the L1 attrition of null and overt pronouns in Turkish L2 learners of English and found language attrition to be selective. Turkish has two overt pronouns, *o* ‘s/he’ and *kendisi* ‘self’, and a null pronoun. Whereas all three pronouns can occur in subject position, as in (3), and in object position, as in (4), only the overt pronoun *kendisi* and the null pronoun, but not the overt pronoun *o*, can refer to the subject of the main clause when they occur in object position, as (4) illustrates.

- (3) *O/kendi-si/pro* Londra’ya git-ti
(S)he/self-3SG/*pro* London-DAT go-PST
‘(S)he went to London.’
- (4) Burak_i *o-nu*/i_j/kendi-si-ni_{i/j}/pro_{i/j}* beg’en-iyor
Burak (s)he-ACC/self-3SG-ACC/*pro* like-PGR
‘Burak_i likes him_{*i/j}/self_{i/j}/*pro*_{i/j}’

This study involved three tasks (a written interpretation task, a truth-value judgment task, and a picture identification listening task) that tested the participants’

interpretation of sentences like (3) and (4). Gürel (2004) reported that the interpretation of the overt pronoun *o* in Turkish was influenced by English because attriters appeared to treat this Turkish overt pronoun as if it was the English overt pronoun (i.e. co-referential with the subject antecedent). In contrast, the interpretation of the null pronoun and the overt pronoun *kendisi* did not show attrition effects. Gürel interpreted these results under Paradis' (1993) Activation Threshold Hypothesis (ATH). The ATH establishes a correlation between the frequency of use of a language element and its availability (or activation) to the speaker. In particular, it proposes that when an item is not used, the threshold of activation would rise, and when it is used, the threshold of activation would be low. Therefore, a linguistic item that has not been frequently used would have a high activation threshold and it would be difficult to activate, which would lead to the attrition of the item. This suggests that different language elements, depending of their frequency of use, would have different thresholds of activation, so that some would be more likely than others to undergo attrition. More specifically, the ATH predicts that L1 attrition will occur when an element in the L1 with a high activation threshold (i.e. disused) has a corresponding 'competing' element in the L2 with a lower activation threshold (i.e. used more frequently). Gürel's results are predictable under the ATH because it is the Turkish overt pronoun *o*, which is in competition with the English overt pronoun, the one that shows attrition due to its disuse in Turkish and frequent use in English, but the overt pronoun *kendisi* or the null pronoun in Turkish, which do not have a competing item in the L2, do not show attrition effects. The ATH is also partly compatible with the most recent version of

the IH, in that it provides a processing explanation, which is, however, only focussed on L1-L2 cross-linguistic effects.

Otheguy, Zentella, and Livert (2007) investigated attrition effects in the use of Spanish pronouns by different Spanish-speaking communities in the United States. They analysed the use of pronouns using data from a corpus of 63,500 verbs extracted from interviews conducted with the six largest Spanish-speaking communities living in New York City, who had their origins in six different Latin American countries. In order to analyse the use of overt pronouns, speakers were divided in terms of their dialect regions, 'Caribbean' (newcomers from the Dominican Republic, Puerto Rico, and Cuba) versus 'Mainlanders' (newcomers from Ecuador, Colombia, and Mexico), and in terms of their generation, 'newcomers' (those who arrived in New York after the age of 17 and had lived there for a maximum of five years) versus 'born and/or raised in New York' (those who were born in New York or arrived before the age of 3). The results from this study revealed that overt pronouns were used more frequently by the Caribbean speakers than by the Mainlanders. More importantly, the 'born and/or raised in New York' group showed a significantly higher rate of overt pronouns than the newcomers, which revealed the influence from English in the use of overt pronouns in the Spanish of both Caribbean and Mainlanders speakers living in New York City. L1 attrition effects have been found in languages with different inventories of anaphoric forms. Wilson (2009) and Wilson, Keller, and Sorace (2009) used the visual world eye-tracking methodology to investigate the online processing of German anaphora with demonstratives and pronouns by English-speaking L2

learners of German and German-speaking L2 learners of English under L1 attrition. Participants were presented with a set of pictures while they heard a pair of sentences like the ones in (5) and were asked to answer a yes/no question that revealed their antecedent preferences for the pronouns. Similar to the distribution of null and overt pronominals in null-subject languages, personal pronouns in German (*er, sie, es*) refer to the subject antecedent whereas demonstrative pronouns (*der, die, das*) refer to the object antecedent.

- (5) a. Der Kellner erkennt den Detektiv als das Bier umgekippt
the-NOM waiter recognises the-ACC detective as the beer tipped-over
wird. Er ist offensichtlich sehr fleißig.
is he-PRON is clearly very hard-working
‘The waiter recognises the detective as the beer is tipped over. He is
clearly very hard working.’
- b. Der Kellner erkennt den Detektiv als das Bier umgekippt
the-NOM waiter recognises the-ACC detective as the beer tipped-over
wird. Der ist offensichtlich sehr fleißig.
is he-DEM is clearly very hard-working
‘The waiter recognises the detective as the beer is tipped over. He is
clearly very hard working.’
- c. Den Kellner erkennt der Detektiv als das Bier umgekippt
the-ACC waiter recognises the-NOM detective as the beer tipped-over
wird. Er ist offensichtlich sehr fleißig.
is he-PRON is clearly very hard-working

‘The waiter is recognised by the detective as the beer is tipped over. He is clearly very hard working.’

d. Den Kellner erkennt der Detektiv als das Bier umgekippt
the-ACC waiter recognises the-NOM detective as the beer tipped-over
wird. Der ist offensichtlich sehr fleißig.
is he-DEM is clearly very hard-working

‘The waiter is recognised by the detective as the beer is tipped over. He is clearly very hard working.’

The results from these studies revealed that while L2 learners performed similarly to German native speakers with pronouns, they showed indeterminacy with demonstratives, revealing no clear preference for the object as their antecedent. Similarly, attriters showed more attrition effects with demonstratives than with pronouns in comparison to the control group of monolinguals, also revealing no clear preference for a specific antecedent. The results also showed that the degree of attrition effects depended on the attriters’ length of residence in the UK.

The literature reviewed in this section supports the claims of the IH that structures at the syntax-pragmatics interface are likely to undergo attrition. There are also studies, mostly on L2 acquisition, exploring interface structures that have revealed mixed results with regards to the IH, with some findings being consistent and some being inconsistent with the IH (e.g., Judy & Rothman, 2014; Rothman & Iverson, 2008; Slabakova & Montrul, 2003; see Leal Méndez, Rothman, & Slabakova, 2015 on heritage speakers). Crucially, many of these studies typically use offline measures involving metalinguistic tasks, which are not the most suitable to test the predictions

of the IH concerning the processing of structures at the syntax-pragmatics interface, rather than the mental representational of these structures (see Section 4.3 below).

While a detailed review of these studies is beyond the scope of this chapter, they are a reminder that more research is needed—on a wider range of structures and based on multiple experimental methods—to precisely identify the boundaries on the applicability of the IH.

4.3 Selectivity of individual L1 attrition

The previous section presented research on L1 attrition that supports the predictions of the IH, as they reveal attrition effects with structures at the syntax-pragmatics interface. This selectivity of L1 attrition as well as Sorace's (2011, 2016) proposal that individual L1 attrition affects only the ability to process interface structures but not knowledge representations was tested in two recent studies: Chamorro, Sorace, and Sturt (2016), which investigated a structure involving an external interface, the syntax-pragmatics interface (i.e. subject pronouns), and Chamorro, Sturt, and Sorace (2016), which investigated a structure involving an internal interface, the syntax-semantics interface (i.e. the personal preposition).

Chamorro, Sorace, and Sturt (2016) investigated whether pronominal subjects, a structure at the syntax-pragmatics interface, would undergo attrition in L1 Spanish under prolonged exposure to the L2 English and, if so, whether these effects occur at the processing or representational level. Therefore, the interpretation and processing of overt versus null subject pronouns in Spanish was investigated using an offline naturalness judgment task and an online eye-tracking-while-reading task, where

participants were presented with anaphora in which the antecedent preferences were predicted using Carminati's (2002) Position of Antecedent Strategy (PAS).

Carminati proposed the PAS for Italian intra-sentential anaphora and it postulates that null pronouns are generally assigned to the subject antecedent, as in (6a), whereas overt pronouns are generally assigned to the object antecedent, as in (6b).

The PAS was shown by Alonso-Ovalle, Fernández-Solera, Frazier, and Clifton (2002) to also apply to Iberian Spanish.

(6) a. Quando Mario_i ha telefonato a Giovanni_j, *pro*_i aveva appena finito di mangiare.

‘When Mario has telephoned Giovanni, (he) had just finished eating.’

b. Quando Mario_i ha telefonato a Giovanni_j, lui_j aveva appena finito di mangiare.

‘When Mario has telephoned Giovanni, he had just finished eating.’

Based on Carminati's PAS, participants in Chamorro, Sorace, and Sturt (2016) were presented with intra-sentential semantically-neutral forward anaphora like the ones in (7), where the grammatical number of the antecedents was manipulated such that the pronoun could only refer to either the subject or the object antecedent. This led to sentences where the pronoun agreed in number with the pragmatically infelicitous antecedent as predicted by the PAS, as in (7a) and (7d), and sentences where the pronoun agreed in number with the pragmatically felicitous antecedent, as in (7b) and (7c).

(7) a. La madre saludó a las chicas cuando ella cruzaba una calle
the mother greeted-SG to the girls when she crossed-SG a street

con mucho tráfico.

with much traffic

‘The mother greeted the girls when she crossed a street with a lot of traffic.’

b. Las madres saludaron a la chica cuando ella cruzaba una calle
the mothers greeted-PL to the girl when she crossed-SG a street
con mucho tráfico.

with much traffic

‘The mothers greeted the girl when she crossed a street with a lot of traffic.’

c. La madre saludó a las chicas cuando *pro* cruzaba una calle
the mother greeted-SG to the girls when *pro* crossed-SG a street
con mucho tráfico.

with much traffic

‘The mother greeted the girls when she crossed a street with a lot of traffic.’

d. Las madres saludaron a la chica cuando *pro* cruzaba una calle
the mothers greeted-PL to the girl when *pro* crossed-SG a street
con mucho tráfico.

with much traffic

‘The mothers greeted the girl when she crossed a street with a lot of traffic.’

On the other hand, Chamorro, Sturt, and Sorace (2016) tested whether L1 attrition also affects structures involving internal interfaces or only those structures that involve external interfaces such as subject pronouns. In order to do so, they investigated the interpretation and processing of a syntax-semantics interface structure, the Spanish personal preposition *a* or Differential Object Marking (DOM),

to explore whether structures sensitive to semantic conditions also undergo L1 attrition. This structure differs from pronominal subjects in that its use does not depend on context, but is conditioned by semantic factors such as the animacy and/or specificity of the direct object. In line with Chamorro, Sorace, and Sturt (2016), this study also investigated whether any attrition effects revealed with this structure would be related to inconsistent or inefficient processing in real time or to a change in the attriters' L1 knowledge representations (i.e. in their L1 grammatical competence) by implementing the same offline and eye-tracking measures as the pronoun study.

The DOM, which occurs in Spanish but not in English, establishes that some direct objects must be introduced by a dative preposition, *a* 'to' in the case of Spanish. The presence or absence of this preposition depends on the type of direct object.

Generally speaking, in Spanish, a direct object must be marked with the dative preposition if it is animate and specific, as (8) below shows, but inanimate direct objects, independently of the specificity, must not be preceded by the preposition, as in (9).

(8) a. María vio al¹ niño esta mañana.

María see-PST to-the kid this morning

'María saw the kid this morning.'

b. *María vio el niño esta mañana.

¹ Note that *al* is the contraction of the preposition *a* and the masculine singular definite article *el*.

María see-PST the kid this morning

‘María saw the kid this morning.’

(9) a. María vio una película/la película esta mañana.

María watch-PST a movie/ the movie this morning

‘María watched a movie/the movie this morning.’

b. *María vio a una película/la película esta mañana.

María watch-PST to a movie/ the movie this morning

‘María watched a movie/the movie this morning.’

Based on this, participants in Chamorro, Sturt, and Sorace (2016) were presented with sentences like the ones in (10). Each item consisted of a simple sentence which contained a specific direct object, either animate or inanimate, which led to sentences where the animate object was correctly introduced by the preposition, as in (10b), or ungrammatically lacked the preposition, as in (10a), and sentences where the inanimate object correctly lacked the preposition, as in (10c), or was ungrammatically introduced by it, as in (10d).

(10) a. *Juan defendió el conductor que fue despedido.

Juan defend-PST the driver that was fired

‘Juan defended the driver that was fired.’

b. Juan defendió al conductor que fue despedido.

Juan defend-PST to-the driver that was fired.

‘Juan defended the driver that was fired.’

c. Juan defendió el argumento de forma efusiva

Juan defend-PST the argument in way effusive

‘Juan defended the argument in an effusive way.’

d. *Juan defendió al argumento de forma efusiva.

Juan defend-PST to-the argument in way effusive

‘Juan defended to the argument in an effusive way.’

Unlike the experimental items in Chamorro, Sorace, and Sturt (2016), in these experimental items, whether the personal preposition should be used or not is completely clear and does not require participants to consult the discourse context: if there is an animate direct object, then the preposition must be used, and if the direct object is inanimate, the preposition must not be used, regardless of any context. The same group of Spanish native speakers under L1 attrition was tested in both studies to investigate two questions: (1) whether the IH would correctly predict attrition effects with the structure involving an external interface (i.e. pronominal subjects) but not with the structure involving an internal interface (i.e. the DOM); and (2) whether any attrition effects revealed occurred at the processing level (i.e. in the online eye-tracking-while-reading task) but not at the representational level (i.e. in the offline naturalness judgment task). The group of attriters tested in both studies consisted of twenty-four Spanish native speakers from Spain who had been residing in the UK for a minimum of five years and were near-native speakers of English. This group was compared to a control group of monolinguals, which consisted of twenty-four Spanish native speakers from Spain who had recently arrived in Edinburgh and had very little knowledge of English.

Chamorro, Sorace, and Sturt’s (2016) results on pronominal subjects reveal that attrition occurs with this structure at the syntax-pragmatics interface and that attrition

affects online sensitivity rather than offline judgments. The offline judgment data shows no significant differences between the group of attriters and the group of monolinguals, with both groups showing equal sensitivity to the pronoun mismatch (i.e. anaphora containing an overt pronoun when a null pronoun is appropriate or anaphora containing a null pronoun where an overt pronoun is appropriate) when rating anaphora offline. Results from the eye-tracking experiment revealed that, in online reading, the group of monolinguals was reliably more sensitive than the attriters to the pronoun mismatch, as the monolinguals showed a significant mismatch sensitivity with pronominal subjects (i.e. significant *Pronoun* by *Antecedent* interaction effects in their reading times in the critical region, where the pronoun occurs, as well as in the post-critical region), whereas attriters did not reveal online sensitivity to the pronoun mismatch (i.e. no significant interaction effects were shown in any of the regions) and performed significantly different from monolinguals.

In contrast, Chamorro, Sturt, and Sorace's (2016) results on the DOM revealed no attrition effects with this structure at the syntax-semantics interface. The offline results showed an equal sensitivity to DOM violations for both groups, with all participants correctly differentiating the grammatical sentences in which the animate object was preceded by *al* and those in which the inanimate object was preceded by *el* from the ungrammatical sentences in which the animate object was preceded by *el* and those in which the inanimate object was preceded by *al*. Similarly, the eye-tracking results showed very early sensitivity to DOM violations (i.e. both groups showed significant interaction effects of *Animacy* by *Article* in first-pass reading time

in the critical region, which is the earliest possible point), and this sensitivity was of an equal magnitude across both groups, with no significant differences revealed between the groups. This suggests that both groups were sensitive to the mismatching conditions when processing the DOM in real time (i.e. when the animate object was incorrectly preceded by *el* or when the inanimate object was incorrectly preceded by *al*).

Considering the findings from both studies, Chamorro, Sorace, and Sturt (2016) and Chamorro, Sturt, and Sorace (2016) provide further support for the IH and the selectivity of individual L1 attrition, as it was shown that attrition affects structures at syntax-pragmatics interface, such as pronominal subjects, but that structures requiring the satisfaction of semantic conditions, such as the DOM, do not undergo attrition, either at the processing or the representational level. Crucially, these studies provide supporting evidence for Sorace's (2011, 2016) proposal, as it was revealed that attrition affects online sensitivity with structures at the syntax-pragmatics interface but not knowledge representations.

4.4 Is indeterminacy in L1 attrition caused by transfer or by bilingualism itself?

In line with the findings discussed in Sections 4.2 and 4.3 for L1 attrition, research on L2 acquisition also reveal that advanced adult L2 learners show optionality in the production and/or interpretation of anaphoric forms (e.g., Belletti, Bennati, & Sorace, 2007; Lozano, 2009; Rothman, 2009; Sorace & Filiaci, 2006). Another aspect that these L2 studies have in common, as well as the ones on L1 attrition reviewed above, is that they all investigate speakers who have English as the other language.

Therefore, one could argue that the optionality revealed with interface structures by these L2 learners and L1 attriters may be due to interference from the language that does not have a choice of anaphoric forms (i.e. English) on the language that has such a choice, as some of these studies have concluded. However, anaphoric forms have also been found to cause optionality in bilingual speakers of two typologically similar languages, not only in speakers of two null-subject languages (Bini, 1993; de Prada Pérez, 2009, 2015; Lozano, 2006; Margaza & Bel, 2006; Mendes & Iribarren, 2007; Sorace et al., 2009), but also in speakers of two Germanic languages (Ellert, 2013; Juvonen, 1996), bimodal bilinguals (Bel, Ortells, & Morgan, 2014), and unimodal bilinguals (Chen Pichler & Koulidobrova, 2016).

These results suggest that the optionality revealed in L1 attrition and L2 acquisition with interface structures cannot be due only to interference effects from English, but may be also related to the cognitive effort of handling any two languages in real time (Sorace, 2011; 2016). In addition, the convergences between L1 attrition and L2 acquisition suggest that both languages of late bilingual speakers may be affected by cognitive changes due to accommodating an L2 and that having two plausible anaphoric options may lead to processing difficulties when speakers compute pronoun-antecedent mappings, both in production and comprehension. It has been proposed that these difficulties could be attributed to bilingual speakers' reduced efficiency when integrating information from different domains in real time and updating the mental discourse model when needed, as a side effect of the need to exercise inhibitory control to avoid interference from the language not in use (see Costa, Hernández, Costa-Faidella, & Sebastián-Gallés, 2009; Green, 1998; Green &

Abutalebi, 2013 on the role of inhibitory control; Sorace, 2016 on possible consequences for integration).

Therefore, if the effects of attrition do not involve language change at the representational level, but rather affects the cognitive strategies to access and use this knowledge in real time, one may predict that these effects are not irreversible but may be sensitive to the frequency and recency of exposure to the L1. The question of the reversibility of individual attrition was investigated by Chamorro, Sorace, and Sturt (2016), which will be discussed in the following section.

4.5 Reversibility of individual L1 attrition

Another important issue in individual L1 attrition is the question of whether attrition effects are permanent or can be reversed. Chamorro, Sorace, and Sturt (2016) also explored this question by investigating whether attrition effects with pronominal subjects can decrease or disappear with recent re-exposure to the attriters' L1.

In order to investigate this, Chamorro, Sorace, and Sturt (2016) tested a second group of Spanish L1 attriters using the same experimental items and the same offline and online tasks as the ones described in Section 4.3. In line with the other group of attriters, this second group of attriters also consisted of twenty-four Spanish near-native speakers of English who had been living in the UK for a minimum of five years, but they had been exposed exclusively to Spanish in Spain for a minimum of a week right before they were tested. This 'exposed' group was compared to the other group of attriters and the control group of monolinguals to explore whether attrition

effects with structures at the syntax-pragmatics interface can decrease or disappear after recent exposure to L1 input.

The results obtained from this exposed group revealed that attrition effects are not permanent but decrease as a result of L1 re-exposure. The offline judgment data revealed that this group was not significantly different from the attriters or the monolinguals, with all groups showing equal sensitivity to the pronoun mismatch when rating anaphora offline (i.e. all three groups revealed significant *Pronoun* by *Antecedent* interaction effects in their ratings and no significant differences were revealed when these groups were compared). Results from the eye-tracking experiment revealed that, in online reading, the monolingual and exposed groups are reliably more sensitive than the attriters to the pronoun mismatch, as they show significant *Pronoun* by *Antecedent* interaction effects in their reading times with these sentences in the critical region (i.e. the region where the pronoun occurs) as well as in the post-critical region, while the attriters do not show any significant interaction effects in any of the regions. These results can be explained following Paradis' (1993) ATH, which predicts that attrition diminishes with frequency and recency of exposure to the L1. In line with this hypothesis, the results obtained for the exposed group did not reveal attrition effects with pronominal subjects, since this group, unlike the attriters, showed a reliable sensitivity to the pronoun mismatch when processing this interface structure in real time. Moreover, when they were compared to the monolinguals, no significant differences between the two groups were revealed, which suggests that attrition effects diminish after recent exposure to the L1.

Taking together all the results from Chamorro, Sorace, and Sturt (2016) and Chamorro, Sturt, and Sorace (2016), these findings reveal that individual L1 attrition is selective and occurs with structures that involve an external interface (i.e. the syntax-pragmatics interface) but not with structures that involve an internal interface (i.e. the syntax-semantics interface). They also reveal that attrition effects on these structures are more likely to be revealed in tasks tapping real-time processing rather than offline metalinguistic tasks such as acceptability judgments. Crucially, Chamorro, Sorace, and Sturt (2016) provide evidence for the question raised in this section, as it was revealed that individual L1 attrition affects online sensitivity with structures at the syntax-pragmatics interface rather than causing a permanent change in speakers' L1 knowledge representations. This reveals that bilinguals are sensitive to input changes and provides further support for Sorace's (2011, 2016) proposal that first generation individual attrition affects only the ability to process interface structures but not knowledge representations themselves.

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