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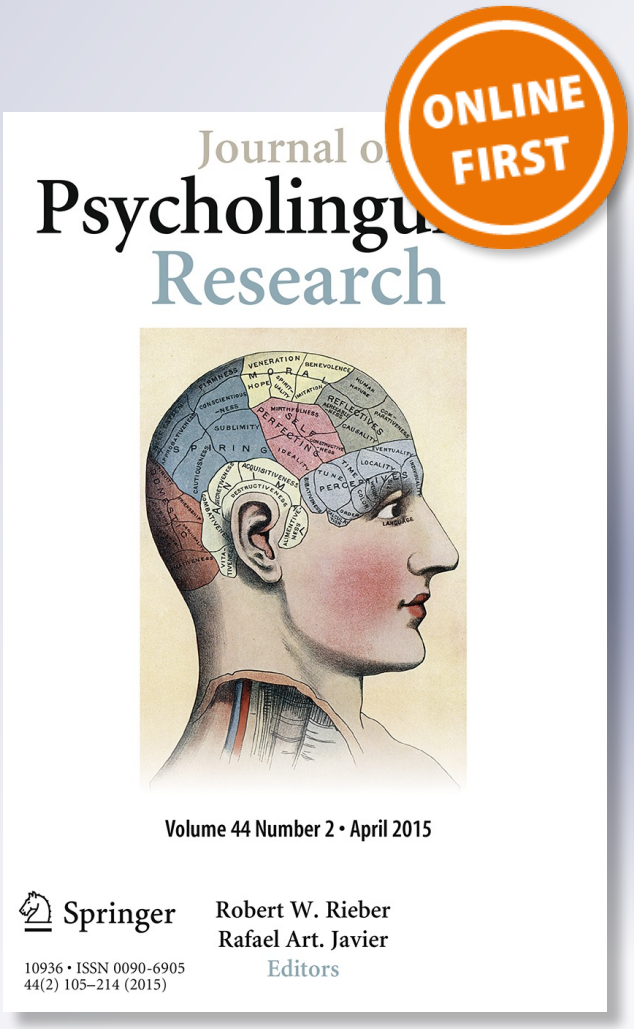
Journal of Psycholinguistic Research

ISSN 0090-6905

J Psycholinguist Res
DOI 10.1007/s10936-015-9372-4



Springer

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Selectivity in L1 Attrition: Differential Object Marking in Spanish Near-Native Speakers of English

Gloria Chamorro[1] · **Patrick Sturt**[2] · **Antonella Sorace**[3]

Abstract Previous research has shown L1 attrition to be restricted to structures at the interfaces between syntax and pragmatics, but not to occur with syntactic properties that do not involve such interfaces ('Interface Hypothesis', Sorace and Filiaci in Anaphora resolution in near-native speakers of Italian. Second Lang Res 22: 339–368, 2006). The present study tested possible L1 attrition effects on a syntax-semantics interface structure [Differential Object Marking (DOM) using the Spanish personal preposition] as well as the effects of recent L1 re-exposure on the potential attrition of these structures, using offline and eye-tracking measures. Participants included a group of native Spanish speakers experiencing attrition ('attriters'), a second group of attriters exposed exclusively to Spanish before they were tested, and a control group of Spanish monolinguals. The eye-tracking results showed very early sensitivity to DOM violations, which was of an equal magnitude across all groups. The off-line results also showed an equal sensitivity across groups. These results reveal that structures involving 'internal' interfaces like the DOM do not undergo attrition either at the processing or representational level.

Keywords L1 attrition · L1 re-exposure · Eye-tracking · Differential Object Marking · Spanish

Introduction

Much previous research on second language (L2) acquisition has focused on the influence of the L1 on the L2 (Argyri and Sorace 2007; Belletti et al. 2007; Hertel 2003; Hopp 2009; Lozano 2006, 2009; Montrul 2004a; Paradis and Navarro 2003; Rothman 2009; Serratrice

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Published online: 03 May 2015

et al. 2004, 2012; Sorace et al. 2009), but to a much lesser extent on the influence that the L2 might have in the native language (L1) of non-native speakers. This phenomenon is known as 'L1 attrition', and it refers to the changes in a speaker's L1 as the result of the acquisition of an L2. This study explores the kind of structures that undergo L1 attrition and whether attrition effects are due to processing difficulties or to a change in the attriters' L1 knowledge representations.

First language attrition, and to a greater extent bilingual first language acquisition and adult second language acquisition, have been widely explored in relation to many factors, such as the stages in which they take place, the contexts in which they occur and the factors affecting them. More recent research has focused on the Interface Hypothesis (Sorace and Filiaci 2006), which postulates that structures that involve an interface between syntax and pragmatics present more instability in both L2 acquisition and L1 attrition 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' vs. 'external', Sorace 2004; Tsimpli and Sorace 2006) and different explanatory accounts in terms of linguistic versus processing factors affecting bilingual development.

The prediction made by the Interface Hypothesis on interface structures has been supported by many studies exploring cross-linguistic influence effects for different interface structures in different bilingual groups (i.e. bilingual children, near-native speakers and L1 attriters). Previous research addressed aspects such as the effects of semantic or discourse factors in the acquisition of word order (Belletti et al. 2007; Hertel 2003; Hopp 2009; Lozano 2006; Montrul 2004a; Wilson 2009), or the influence of pragmatics in the acquisition of null versus overt pronominal subjects and objects (Argyri and Sorace 2007; Belletti et al. 2007; Lozano 2009; Montrul 2004b; Paradis and Navarro 2003; Rothman 2009; Serratrice et al. 2004, 2012; Sorace et al. 2009; Tsimpli et al. 2004). Structures that are sensitive to pragmatic or contextual conditions have been an especially privileged ground for research.

However, not many studies have tested the Interface Hypothesis (Sorace and Filiaci 2006) in relation to its prediction that structures that do not involve an interface between syntax and external cognitive domains should undergo less, or no L1 attrition. Therefore, the present paper will address the question of whether L1 attrition affects structures involving internal interfaces by investigating the interpretation and processing of a syntax-semantics interface structure, the Spanish personal preposition *a*. This structure differs from previously studied interface structures 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. Moreover, in the case that any attrition effects are revealed with this structure, the present study also explores whether they affect knowledge representations or processing by implementing offline and eye-tracking measures, and whether recent re-exposure to the L1 decreases these potential attrition effects. Therefore, this study directly investigates whether structures sensitive to semantic conditions undergo L1 attrition and, if that is the case, whether attrition effects are related to inconsistent or inefficient processing of these structures in real time or to a change in the attriters' L1 knowledge representations (i.e. in their L1 grammatical competence).

L1 Attrition

As mentioned above, 'L1 attrition' refers to the change of certain aspects of a speaker's L1 as the result of the acquisition of an L2 at an adult age, after the L1 acquisition process has

been completed. More specifically, L1 attrition normally occurs in the L2 environment as the consequence of the speaker's immigration and consequent exposure to a great amount of L2 input together with a drastic decrease in L1 input.

Previous research on L1 attrition supports the Interface Hypothesis, revealing that the structures at the syntax-pragmatics interface are the most vulnerable to attrition, causing emerging optionality[1] in the attrited speakers. A few studies have reported attrition effects in the L1 with the interpretation of anaphoric forms (e.g., Gürel 2004 for Turkish near-native speakers of English; Tsimpli et al. 2004 for Greek and Italian near-native speakers of English; Wilson et al. 2009 on German). However, as mentioned previously, the Interface Hypothesis has not been tested in relation to its prediction that structures interfacing with conditions more internal to the grammar are less sensitive to L1 attrition. To the best of our knowledge, the present study is the first to test for any possible attrition effects with the Spanish personal preposition, which is a structure that is relatively independent of context.

It is important to note that the phenomenon of attrition discussed so far is related to cases of adult L2 learners who acquired the L2 after acquiring their L1 completely, usually by migrating to the country where the L2 is spoken at an adult age (i.e. non-pathological L1 attrition by 'first generation attriters'). Therefore, these 'first generation attriters' are different from 'heritage speakers' in the sense that whereas the former have completed the process of L1 acquisition before the onset of attrition, the process of L1 acquisition of the latter is interrupted before they attain native competence, so their acquisition of the L1 is incomplete. Much research on L1 attrition focuses on these 'incomplete' heritage speakers, who are usually second-generation speakers in communities that have migrated to the L2 setting, separating from the L1 community and experiencing a decrease in the use of the L1 (Håkansson 1995; Johnson and Newport 1989; Silva-Corvalán 1991).

Processing in L1 Attrition

As it has been shown by L2 acquisition research, L1 attriters reveal emerging optionality with structures at the syntax-pragmatics interface, and in particular with subject pronouns. However, the precise nature of these difficulties is still unknown: a current hypothesis is that these difficulties could be attributed to speakers' reduced efficiency when integrating information in context in real time and updating the mental discourse model when needed, possibly as a trade-off effect of the need to exercise inhibitory control to avoid interference from the unwanted language (Costa et al. 2000; Green 1998; Sorace and Serratrice 2009; Sorace 2011). If the effects of attrition do not involve the knowledge of the language itself, but rather the cognitive strategies to access and implement this knowledge in real time, one may predict that attrition effects will not be manifested with structures that require the integration of linguistic, rather than contextual, information, because this type of integration involves proceduralized routines of access to grammatical elements. One may also predict that for the structures that do reveal attrition effects, these effects are not irreversible but may be sensitive to the amount and frequency of exposure to the native language (Chamorro 2014; Chamorro et al. 2015).

Therefore, the present study investigates the Spanish personal preposition, which is a structure requiring the satisfaction of the semantic factors animacy and specificity, rather than pragmatic or contextual conditions. As it will be discussed in the next section, the integration of semantic dimensions such as animacy and specificity relies on proceduralized

[1] The term 'optionality' refers to the coexistence in the speakers' grammar of two or more variants of a construction that share the same meaning and lexical resources (i.e. the alternation between target and non-target items).

mechanisms to a greater extent than the integration of contextual information in pronominal use and is therefore cognitively less demanding.

The Spanish Personal Preposition *a*

The personal preposition, also called Differential Object Marking (henceforth, DOM), is a phenomenon present in some languages, such as Spanish, Romanian, Turkish, Persian or Hindi, but not in English, by which some direct objects must be introduced by a dative preposition, *a* "to" in the case of Spanish. The presence or absence of this preposition is not random, but it 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 (1a) below exemplifies. An animate and specific direct object that is not marked with the dative preposition would result in ungrammaticality, as (1b) shows.

(1) a. María vio **al**[2] ni*ño esta mañana.*
María saw to+the kid this morning
b. *María vio el ni*ño esta mañana.*
María saw the kid this morning
"María saw the kid this morning."

Not all direct objects are marked with the dative preposition, but the presence or absence of the dative preposition would be determined by animacy and specificity. Therefore, cases such as animate but generic direct objects, as (2a), or inanimate direct objects, independently of the specificity, as (3a), would not be preceded by personal *a*. As before, animate but generic direct objects or inanimate direct objects that are marked with the dative preposition would be ungrammatical, as (2b) and (3b) show respectively.

(2) a. María vio un ni*ño esta mañana.*
María saw a kid this morning
b. *María vio **a** un ni*ño esta mañana.*
María saw to a kid this morning
"María saw a kid this morning."

(3) a. María vio una película/la película*esta mañana.*
María watched a movie/the movie this morning
b. *María vio **a** una película/la película*esta mañana.*
María watched to a movie/the movie this morning
"María watched a movie/the movie this morning."

The factors that influence the presence or absence of the dative preposition have nonetheless posed some controversy in the literature. Apart from animacy and specificity, Torrego (1998) points out that there are other factors that influence the DOM, such as the aspect of the verb or the affectedness on the object. Moreover, Aissen (2003) proposes a scale of animacy and specificity by which the higher in prominence a direct object is in the scales of animacy and specificity, the more likely it is to be marked with the dative preposition. On the other hand, whereas for von Heusinger and Kaiser (2003) specificity is a motivating factor for a direct object to be marked with the personal preposition, Leonetti (2004) considers specificity as a marginal factor for the DOM. However, this complex picture about the personal

[2] Note that *al* is the contraction of the preposition *a* and the masculine singular definite article *el*. This contraction does not occur with any other definite or indefinite article.

preposition *a* will not be relevant for the present study, since the items used in the experiments will be just limited to the presence or absence of the personal preposition in relation to the animacy of the direct object, which is a common motivating factor in the literature. In the experimental items used in the present study, whether the personal preposition should be used or not is completely clear, without any need to consult 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.

Acquisition of the Spanish Personal Preposition

Since the personal preposition *a* is not as common as other structures across languages, there are not many studies that have addressed the acquisition of this aspect and, to the best of our knowledge, there are no studies on the effects of L1 attrition on first generation attriters with this structure.

The only study that, to our knowledge, has been carried out on the L1 acquisition of the DOM in Spanish to date is Rodríguez-Mondoñedo (2008). He investigated the production of personal *a* using spontaneous production data from six Spanish-speaking children under the age of 3 from the CHILDES database. Rodríguez-Mondoñedo reported an accuracy rate of 98.38 %: from a total of 991 sentences containing V-O, the children only made 17 errors, 8 uses of the preposition with inanimate and generic direct objects and 9 omissions of the preposition with animate and specific direct objects. These results clearly demonstrate that children acquire this structure at a very young age and are able to produce it very accurately.

A few studies have also explored the DOM phenomenon in Spanish L2 acquisition. Guijarro-Fuentes and Marinis (2007) investigated the acquisition of the Spanish personal *a* by English-speaking adult learners of Spanish from three different proficiency levels (low intermediate, high intermediate and advanced), together with a control group of Spanish monolinguals from Spain. Participants were asked to perform an acceptability judgment task with sentences that correctly or incorrectly contained or lacked the preposition with both animate and specific direct objects and inanimate and generic direct objects. Participants were instructed to read the sentences and rate their acceptability in a scale from 1 to 4. Results showed that while the high intermediate and low intermediate groups performed at a chance level, the advanced group performed significantly better than the high intermediate and low intermediate groups, and the Spanish control group performed very accurately.

In a later study, Guijarro-Fuentes and Marinis (2009) investigated the acquisition of the personal preposition *a* by Catalan-Spanish and English-Spanish bilinguals, in comparison with a group of Spanish monolinguals. The Catalan-Spanish bilinguals acquired both languages when they were children in a naturalistic setting, and the English-Spanish bilinguals learned Spanish in the classroom in the UK. Participants had to perform a completion task, in which they were presented with sentences where the preposition had to be used or sentences where no preposition was required, and they were asked to either fill the gap with one word or leave it empty. It is important to note that in Catalan, like in English, direct objects do not have to be preceded by a preposition. Results showed that the monolingual group performed very accurately and significantly different from the bilingual groups. Moreover, although the Catalan-Spanish bilinguals performed better than the English-Spanish bilingual group, this difference was not significant.

To our knowledge, there is no research on the personal preposition that addresses attrition in first generation attriters, but there are a few studies that have investigated attrition effects of this structure on heritage speakers. Montrul and Bowles (2008, 2009, 2010) tested the knowledge of the DOM on Spanish heritage speakers living in the US, using an elicited

written production task and a written grammaticality judgment task. For the production task, participants were presented with three words (two nouns and a verb in infinitive), and they were asked to write a sentence using the three words given and any other grammatical element that they needed in order to complete the sentence, which contained either an animate object or an inanimate object. For the grammaticality judgment task, participants were presented with sentences that contained grammatical and ungrammatical uses of the DOM with both animate objects and inanimate objects. The results from Montrul and Bowles' (2008, 2009, 2010) studies showed an overacceptance and overproduction of ungrammatical sentences in which no dative preposition preceded animate direct objects, even those speakers with advanced proficiency in Spanish. Montrul and Bowles (2009) tried to account for these findings proposing that they could be the result of the lack of perceptual salience of the structure in question. In many occasions, the final vowel of the verb and the preposition are reduced to one sound if the verb ends in [a], as in (4), or they are diphthongized, as in (5), which makes the preposition difficult to be recognized. Moreover, as they point out, the omission of the personal preposition does not usually interfere with communication.

(4) Llama a María.
"(He/she) calls María. / Call María."
(5) Llamó a María.
"(He/she) called María."

Moreover, Montrul and Bowles (2010) further tested these heritage speakers after being exposed to language instruction on the DOM, which consisted of explicit grammatical instruction on the uses of the preposition and three practice exercises, after which participants received feedback on their performance. The results showed that heritage speakers' intuitions and production of the personal preposition were significantly better after they were explicitly instructed on how to use the structure.

The research presented in this section suggests that the acquisition of the Spanish personal preposition *a* can be challenging for L2 learners (Guijarro-Fuentes and Marinis 2007, 2009) and heritage speakers (Montrul and Bowles 2008, 2010, 2009), but not for L1 acquisition (Rodríguez-Mondoñedo 2008; see also Betancort et al. 2009; Casado et al. 2005; Nieuwland et al. 2013 for on-line studies that examined the processing of the DOM in adult native speakers of Spanish). Therefore, since the attrited speakers in the present study acquired the DOM completely before they arrived in the L2 setting and before the onset of attrition, and since it is a syntax-semantics interface structure, they are expected to show no attrition with it and, consequently, to make no or very few errors.

Research Questions and Scope of the Study

The present study will address the following research questions:

(i) Following the Interface Hypothesis (Sorace and Filiaci 2006), will attriters show any indeterminacy with a syntax-semantics interface structure, such as the DOM?
(ii) If they do, does attrition affect online sensitivity when processing this structure in real time or is it due to changes in attriters' L1 knowledge representations?
(iii) If attrition does affect syntax-semantics interface structures, will it decrease or disappear with frequency and recency of (re)exposure to the L1?

To explore these questions, we investigated the interpretation and processing of a syntax-semantics interface structure, the DOM, by Spanish attrited speakers, who carried out two

tasks: an offline naturalness judgement task and an online eye-tracking while reading task. The terms offline and online are used to distinguish between what each of the tasks tested: while the online task is taken to reflect participants' processing of the DOM, the offline task is taken to reflect participants' competence of this structure.

Method

Participants

Three groups of participants were tested: 'monolinguals', 'attriters' and 'exposed'. They were all from Spain and had no knowledge of any other language from birth (Spanish speakers from regions in which another L1 was spoken, such as Catalan, Basque or Galician were excluded from the experiment).

The control group of 'monolinguals' (MON) were 24 Spanish native speakers (14 females, 10 males) who had recently arrived in Edinburgh (the mean number of weeks spent in the UK was 7.958, SD = 7.117), and had no (or very little) knowledge of English (considering that English is currently a mandatory subject in Spanish education, we assume that most of the participants will have had some previous contact with the language). Participants were asked to rate their use of the L1 and the L2 on a 5-point scale (1 = never; 2 = rarely; 3 = sometimes; 4 = often; 5 = always) in three different settings (at home, in their social circle and at their job or professional/educational setting) and the monolingual group used the L1 significantly more often than the L2 ($p < .001$). For the L1, the mean use across all three settings was 4.312, $SD = .639$; for the L2, the mean use was 2.708, $SD = .908$.

The group of 'attriters' (ATT) consisted of 24 Spanish native speakers (16 females, 6 males) who had been residing in the UK for a minimum of five years and were near-native speakers of English (the mean number of years spent in the UK was 7, $SD = 2.844$). This group, unlike the monolinguals, used the L2 significantly more often than the L1 ($p < .001$). For the L1, the mean use was 3.417, $SD = .843$; for the L2, the mean use was 4.333, $SD = .434$.

Finally, another group of attriters was tested after being recently exposed exclusively to their L1 to explore whether attrition can decrease or disappear after a prolonged exposure to L1 input. This 'exposed' group (EXP) was formed by 24 Spanish native speakers (12 females, 12 males) who, as the attriters, had been living in the UK for a minimum of five years and were near-native speakers of English (the mean number of years spent in the UK was 5.833, $SD = 1.736$). Also, like the attriters, the exposed group used the L2 significantly more often than the L1 ($p < .001$). For the L1, the mean use was 2.583, $SD = .880$; for the L2, the mean use was 4.417, $SD = .565$. However, this group had been exposed exclusively to Spanish for a minimum of a week in a Spanish-speaking environment (i.e. Spain) during their Christmas holidays right before they were tested (the mean number of days that they were exposed to the L1 was 13.083, $SD = 4.745$).

As mentioned before, both groups of attriters, ATT and EXP, had at least 5 years of residence in the UK and used English significantly more often than Spanish. Therefore, following previous studies on L1 attrition, this long-term exposure to the L2 combined with limited exposure to the L1 is sufficient for syntactic attrition to occur (e.g. Tsimpli et al. 2004). Moreover, their English near-nativeness was also assessed with the questionnaire and during the recruiting process and the experimental session.

Stimuli

Thirty-two items like the ones illustrated in (6) were used. Each item consisted of a simple sentence which contained a subject, a verb and a specific direct object, either animate or inanimate. The animate direct object could be correctly introduced by a personal preposition *a*, as in (6a), or ungrammatically lacking the preposition, as in (6b). On the other hand, the inanimate direct object could be correctly lacking the preposition, as in (6c), or ungrammatically introduced by it, as in (6d).

(6) a. Condition 1: ***Animate/el**
Juan defendió el conductor que fue despedido.
"Juan defended the driver that was fired."
b. Condition 2: **Animate/al**
Juan defendió al conductor que fue despedido.
"Juan defended to the driver that was fired."
c. Condition 3: **Inanimate/el**
Juan defendió el argumento de forma efusiva
"Juan defended the argument in an effusive way."
d. Condition 4: ***Inanimate/al**
Juan defendió al argumento de forma efusiva.
"Juan defended to the argument in an effusive way."

As mentioned in "The Spanish personal preposition **a**" Section, it is important to note that in these experimental items, whether the personal preposition should be used or not is completely clear, without any need to consult 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.

Each item contained four conditions, two with an animate direct object and the other two with an inanimate direct object. Thus, two different nouns, one animate and one inanimate, had to be included in the direct object position for each item. For this reason, both nouns were matched to have the same number of characters and very similar frequency, which was checked using a Spanish corpus, Corpus del Español (http://www.corpusdelespanol.org/), so that word length and frequency did not influence participants' processing in the online experiment.

Moreover, the subjects from the 32 items were distributed in a way so that 16 of them were proper names (8 male, 8 female) and the other 16 were subject pronouns (4 female singular, 4 female plural, 4 male singular, 4 male plural). The 32 items were divided into four lists and, using a Latin square, each list contained one of the four conditions of each of the 32 items, and all conditions appeared the same number of times in each of the lists. In addition to the experimental items, 32 fillers were also randomly included in each list.

All experimental items had the same number of words. In order to be able to do that, only masculine nouns were included in the direct object position, because the contraction of the preposition and the article that takes place with the masculine singular definite article *el* (*al*) is not possible with the feminine singular definite article (*a la*).

Procedure

To explore whether the source of any attrition effects lies at the processing or at the representational level, participants carried out two tasks: an offline naturalness judgement task and an online eye-tracking-while-reading task. The experimental session was designed to be

carried out as a single task, in which participants had to read the sentences that were shown in a computer screen, which was used as the online eye-tracking data, and then rate each sentence in terms of its naturalness, which was used as the offline judgment data.

The experiment was run using an Eyelink 1000 tower-mounted eye-tracking system. Sentences appeared in a computer monitor, and participants were instructed to read each sentence and then press a button on a game pad once they had comprehended it. When they pressed the button, the question *¿Cómo de natural te suena esta frase?* "How natural does this sentence sound to you?" followed and they were asked to rate the previous sentence on a 5-point scale in terms of their perceived naturalness (with 1 being 'not natural at all' and 5 being 'totally natural'). Their responses were recorded.

Data Analysis

With regard to the online data, using EyeDoctor.0.5.7 (http://www.psych.umass.edu/eyelab/software/), vertical drift in the position of fixations was corrected, and blinks and fixations that fell very outside of the boundaries deleted. Extremely short fixations, <80 ms, and extremely long fixations, more than 1200 ms were also removed.

Moreover, items were divided into five regions, as (7) below illustrates. The critical region (region 3) contained the article, *el* or *al*, and the noun, animate or inanimate.

(7) Juan/ defendió/ el conductor/ que fue/ despedido./
Juan defended the driver that was fired

We report three different eye-movement measures: first-pass time, go-past time and total time. 'First-pass time' (*fp*) includes the summed duration of all the fixations made in a particular region from the first time the eye enters the region until it leaves the region. 'Go-past time' (*gp*) includes the sum of all the fixations made from the first time the region is entered until and it is passed to the right, including fixations made in previous regions. 'Total time' *(tt*) includes the sum of all the fixations made in a particular region during the whole trial. The analysis did not include trials in which the relevant measure returned a zero value (for first-pass and go-past, these trials correspond to cases where the region was skipped in initial reading; for total time, these trials correspond to cases where the region received no fixations at all).

For the analysis both offline and online tasks, two factors were manipulated, each containing two levels: *Animacy* (animate or inanimate) and *Article* (*el* or *al*), which were combined to create a 2×2 factorial design. For the offline data, a repeated-measures ANOVA with these two factors was run for each of the three groups. For the online data, a repeated-measures ANOVA for each measure and region was run for each of the three groups.

Finally, for the comparison between the groups, the factor *Language Group* (monolinguals, attriters or exposed) was included. This factor was between-participant, and within item. A repeated-measures ANOVA (mixed design, in the case of the participant analysis) with the three factors for each measure and region was run for monolinguals versus attriters, monolinguals versus exposed and attriters versus exposed. We report analyses of the participant means collapsed over items (F1), as well as the item means collapsed over participant (F2).

Hypothesis and Predictions

Two main hypotheses will be tested in the present study, from which some predictions can be put forward:

(i) H_1: L1 attriters will not reveal any attrition effects with the DOM in either their offline representation or when processing the structure in real time.
(ii) H_2: any attrition effects revealed with the DOM will decrease or disappear with recent exposure to the L1.

Therefore, no differences are expected between monolinguals, attriters and exposed with the DOM in the offline task, and all three groups are expected to perform at ceiling. Since conditions 1 and 4 are the ungrammatical ones and conditions 2 and 3 the grammatical ones, all groups are expected to rate condition 1 (*animate/el) lower than condition 2 (animate/al), and condition 4 (*inanimate/al) lower than condition 3 (inanimate/el). As a result, all groups are predicted to show a significant interaction effect of *Animacy*Article* in their ratings (reflecting a preference for the article *el* with inanimate objects and a preference for the article *al* with animate objects). No significant three-way interaction of *Animacy*Article*Language Group* is expected to be seen when comparing MON versus EXP, MON versus ATT or ATT versus EXP, since the offline task should reveal no differences among the three groups in their knowledge representations.

Similar results are expected for the online task since it is testing the processing of a syntax-semantics interface structure. Therefore, all groups are expected to perform well and to show no significant differences between them, showing longer RTs for condition 1 (*animate/el) than for condition 2 (animate/al), and longer RTs for condition 4 (*inanimate/al) than for condition 3 (inanimate/el). As a result, all three groups are expected to show an *Animacy*Article* interaction in reading times (RTs), at or soon after the critical region is first encountered (see example 7 above for the regions). No significant three-way interaction of *Animacy*Article*Language Group* is expected when comparing MON vs. EXP, MON vs. ATT or ATT vs. EXP, but these effects are expected to be particularly significant for MON and EXP, since the latter group has been recently exposed to their L1, so it is expected to perform like monolinguals.

Although we expect ATT to perform like MON and EXP, if they show any attrition effects with this syntax-semantics interface structure, this is expected to happen during the online task, and it may occur if the appearance of *Animacy*Article* interaction is delayed in the eye-movement record relative to the MON group (e.g. occurring in a later region), or if it is completely absent in the eye-movement data. In either case, this could lead to a three-way interaction of *Animacy*Article*Language Group* in the MON versus ATT comparison at the critical region in measures of early processing.

Results

The results from both offline and online experiments revealed very clear findings. The offline results showed an equal sensitivity to Differential Object Marking violations across all groups. Similarly, the eye-tracking results also showed very early sensitivity to differential object marking violations, which was of an equal magnitude across all groups.

Offline Experiment

This experiment consisted of an offline judgement task in which participants were given sentences like those in (16) above to read and then rate on a 5-point scale depending on their perceived naturalness, in order to investigate whether participants showed any attrition effects in their offline interpretation of the DOM.

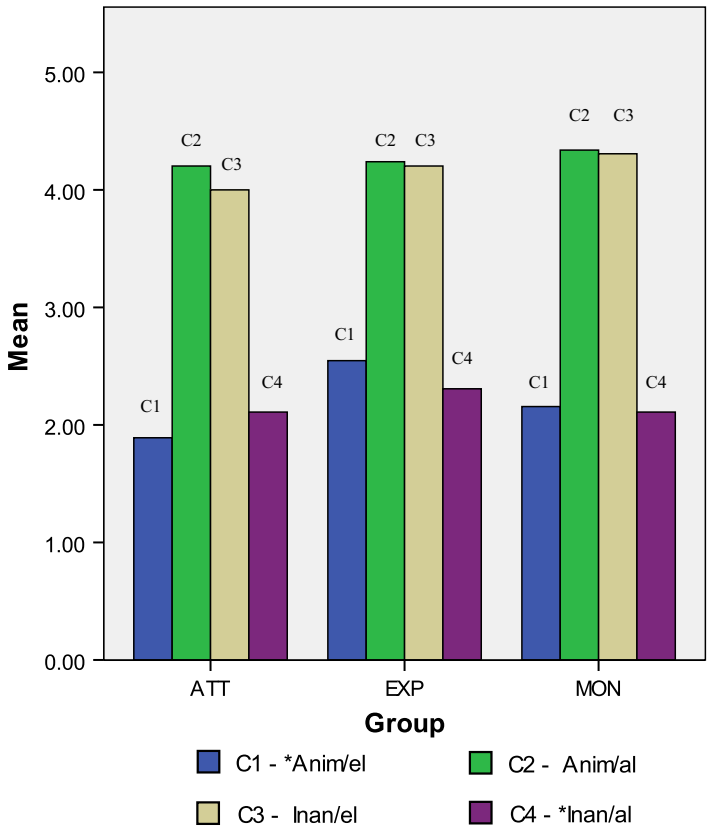

Fig. 1 Score means for the Spanish personal preposition by the three groups

The results from the offline task follow our predictions, revealing that participants from the three groups rated condition 1 (*animate/el) much lower than condition 2 (animate/al), and condition 4 (*inanimate/al) much lower than condition 3 (inanimate/el), as Figure 1 illustrates.

A repeated-measures ANOVA with the factors *Animacy* and *Article* was run for each of the three groups. The results revealed no significant main effect of *Animacy* by any of the groups: MON ($F_1(1, 23) = .160$, $p = .693$; $F_2(1, 31) = .108$, $p = .745$), ATT ($F_1(1, 23) = .008$, $p = .928$; $F_2(1, 31) = .004$, $p = .950$) and EXP ($F_1(1, 23) = 3.924$, $p = .060$; $F_2(1, 31) = .987$, $p = .328$). On the other hand, a main effect of *Article* was only revealed by ATT, and only by subjects ($F_1(1, 23) = 7.020$, $p = .014$; $F_2(1, 31) = 3.062$, $p = .090$), with the *al* article rated higher than the *el* article, but not for MON ($F_1(1, 23) = .011$, $p = .917$; $F_2(1, 31) = .004$, $p = .951$) or EXP ($F_1(1, 23) = .665$, $p = .423$; $F_2(1, 31) = .594$, $p = .447$).

More importantly, a highly significant interaction effect of *Animacy* by *Article* was revealed for all groups' ratings of the DOM: MON ($F_1(1, 23) = 189.812$, $p < .001$; $F_2(1, 31) = 292.753$, $p < .001$), ATT ($F_1(1, 23) = 215.091$, $p < .001$; $F_2(1, 31) = 354.942$, $p < .001$) and EXP ($F_1(1, 23) = 187.453$, $p < .001$; $F_2(1, 31) = 217.135$, $p < .001$). This indicates that the three groups of participants reacted to the mismatching conditions when interpreting the personal preposition offline.

To explore the nature of these interaction effects, paired samples t-tests were conducted with all groups to compare their interpretation of animate and inanimate objects. As Table 1 shows, for the animate object, all three groups rated significantly lower scores for the *el*

Table 1 Score means and (SD) for the personal preposition by all groups

	MON	EXP	ATT
C1-*anim/el	2.16 (.77)	2.55 (.74)	1.89 (.74)
C2-anim/al	4.34 (.47)	4.24 (.46)	4.20 (.45)
C3-inan/el	4.31 (.49)	4.20 (.45)	4.00 (.60)
C4-*inan/al	2.11 (.83)	2.31 (.61)	2.11 (.85)

article than for the *al* article: MON ($t_1(23) = -13.130$, $p < .001$; $t_2(31) = -11.689$, $p < .001$), ATT ($t_1(23) = -15.808$, $p < .001$; $t(23) = -17.390$, $p < .001$) and EXP ($t_1(23) = -8.485$, $p < .001$; $t_2(31) = -10.015$, $p < .001$). For the inanimate object, they showed significantly higher scores for the *el* article than for the *al* article: MON ($t_1(23) = 11.956$, $p < .001$; $t_2(31) = 12.657$, $p < .001$), ATT ($t_1(23) = 10.513$, $p < .001$; $t_2(23) = 9.928$, $p < .001$) and EXP ($t_1(23) = 11.856$, $p < .001$; $t_2(31) = 10.016$, $p < .001$).

Finally, group comparisons were conducted running a repeated-measures ANOVA with the factors *Animacy, Article* and *Language Group* for monolinguals versus attriters, monolinguals versus exposed, and attriters versus exposed. The only three-way interaction effect of *Animacy*Article*Language Group* revealed was for MON vs. EXP by items ($F_1(1, 46) = 3.692$, $p = .061$; $F_2(1, 31) = 19.130$, $p < .001$) and ATT vs. EXP by items ($F_1(1, 46) = 2.504$, $p = .120$; $F_2(1, 31) = 10.581$, $p = .003$), but not for MON vs. ATT ($F_1(1, 46) = .171$, $p = .681$; $F_2(1, 31) = .868$, $p = .359$). These results indicate some differences between monolinguals and exposed and between attriters and exposed in terms of their offline interpretation of the DOM.

As a result of the three-way interactions revealed for MON vs. EXP and ATT vs. EXP, some tests were run to explore the nature of these effects. For the animate object, significantly lower scores were revealed for the *el* article than for the *al* article by monolinguals and exposed ($t_1(47) = -14.534$, $p < .001$; $F_2(1, 31) = 9.773$, $p = .004$) and by attriters and exposed ($t_1(47) = -15.352$, $p < .001$; $F_2(1, 31) = 16.927$, $p < .001$). For the inanimate object, significantly higher scores were shown for the *el* article than for the *al* article by monolinguals and exposed ($t_1(47) = 16.707$, $p < .001$; $F_2(1, 31) = 7.325$, $p = .011$) and by attriters and exposed ($t_1(47) = 15.904$, $p < .001$; $F_2(1, 31) = .002$, $p = .969$).

Online Experiment

The online experiment consisted of an eye-tracking-while-reading task, in order to explore whether participants showed online sensitivity when processing the DOM in real time.

For each of the three groups, a repeated-measures ANOVA with the factors *Animacy* and *Article* was run for each measure (first-pass, go-past and total time) and region (although only the critical, post-critical and final regions will be reported). Tables 2, 3 and 4 show the RT means revealed by each group for *fp*, *gp* and *tt* in the critical, post-critical and final regions, respectively.

No main effects of *Article* were revealed by any of the groups in any of the regions for *fp*, *gp* or *tt*. On the other hand, some main effects of *Animacy* were revealed. For MON, significant main effects were shown for *gp* in the post-critical region ($F_1(1, 23) = 10.288$, $p = .004$; $F_2(1, 31) = 4.145$, $p = .050$), with the animate object showing longer RTs than the inanimate, and for tt in the final region by subjects ($F_1(1, 23) = 4.837$, $p = .038$; $F_2(1, 31) = 2.736$, $p = .108$), with the animate object showing shorter RTs than

Table 2 First-pass, go-past and total time RT means and (SD) in the critical region (*el conductor*) by the three groups

	MON	EXP	ATT
first-pass			
C1 -*anim/el	476 (202.16)	436 (179.11)	475 (172.88)
C2 -anim/al	398 (113.40)	398 (128.71)	438 (133.26)
C3 -inan/el	398 (115.40)	411 (152.52)	368 (106.11)
C4 -*inan/al	450 (178.62)	504 (178.04)	441 (176.55)
go-past			
C1 -*anim/el	680 (295.72)	667 (322.38)	704 (263.38)
C2 -anim/al	504 (181.23)	508 (169.61)	596 (246.86)
C3 -inan/el	493 (140.94)	577 (260.26)	500 (148.61)
C4 -*inan/al	598 (205.87)	659 (220.09)	620 (312.77)
total time			
C1 -*anim/el	1208 (374.32)	1489 (618.72)	1473 (642.39)
C2 -anim/al	985 (345.08)	1134 (488.77)	1364 (504.17)
C3 -inan/el	952 (344.63)	1075 (479.57)	1288 (404.61)
C4 -*inan/al	1207 (425.25)	1506 (650.25)	1426 (564.67)

Table 3 First-pass, go-past and total time RT means and (SD) in the post-critical region (*que fue*) by the three groups

	MON	EXP	ATT
first-pass			
C1-*anim/el	390 (150.17)	378 (118.15)	381 (120.11)
C2-anim/al	404 (115.12)	416 (145.64)	390 (117.16)
C3-inan/el	391 (115.57)	388 (102.77)	399 (100.90)
C4-*inan/al	369 (81.74)	378 (131.35)	377 (105.11)
go-past			
C1-*anim/el	891 (356.97)	995 (395.09)	957 (440.63)
C2-anim/al	695 (308.09)	946 (608.16)	881 (533.45)
C3-inan/el	596 (286.31)	659 (315.10)	842 (346.76)
C4-*inan/al	732 (225.22)	851 (352.12)	926 (605.85)
total time			
C1-*anim/el	916 (363.44)	985 (376.78)	1174 (699.84)
C2-anim/al	1005 (380.13)	1136 (612.47)	1122 (383.14)
C3-inan/el	953 (359.56)	981 (348.78)	1123 (341.93)
C4-*inan/al	898 (272.60)	949 (342.39)	958 (349.81)

the inanimate. For EXP, significant main effects were shown for *fp* in the critical region by subject ($F_1(1, 23) = 5.253$, $p = .031$; $F_2(1, 31) = 3.035$, $p = .091$), with the animate object showing shorter RTs than the inanimate, and for *gp* in the post-critical region ($F_1(1, 23) = 5.878$, $p = .024$; $F_2(1, 31) = 4.712$, $p = .038$), with the animate object showing longer RTs than the inanimate. For ATT, significant main effects were shown in the

Table 4 First-pass, go-past and total time RT means and (SD) in the final region (*despedido*) by the three groups

	MON	EXP	ATT
first-pass			
C1-*anim/el	329 (108.08)	360 (134.34)	302 (109.65)
C2-anim/al	344 (93.47)	399 (150.83)	371 (162.83)
C3-inan/el	354 (121.32)	375 (202.78)	352 (126.00)
C4-*inan/al	348 (108.31)	393 (235.76)	303 (82.34)
go-past			
C1-*anim/el	1882 (767.10)	2680 (1531.21)	2599 (1766.57)
C2-anim/al	2137 (951.57)	2773 (1549.32)	3116 (1538.51)
C3-inan/el	2240 (1038.33)	2651 (1127.30)	3005 (1488.89)
C4-*inan/al	2060 (925.64)	2456 (1326.93)	2354 (1156.91)
total time			
C1-*anim/el	527 (180.19)	664 (283.45)	603 (336.14)
C2-anim/al	679 (325.75)	893 (436.63)	794 (382.46)
C3-inan/el	729 (366.34)	868 (464.42)	819 (364.38)
C4-*inan/al	670 (279.70)	729 (401.44)	605 (305.35)

critical region for *fp* ($F_1(1, 23) = 5.831,\ p = .024;\ F_2(1, 31) = 6.796,\ p = .014$) and *gp* ($F_1(1, 23) = 17.160,\ p < .001;\ F_2(1, 31) = 6.810,\ p = .014$), with the animate object showing longer RTs than the inanimate.

Moreover, the repeated-measures ANOVA tests revealed significant *Animacy* by *Article* interaction effects for all three groups of participants. MON revealed interaction effects in the critical region for *fp* ($F_1(1, 23) = 11.360,\ p = .003;\ F_2(1, 31) = 18.106,\ p < .001$), *gp* ($F_1(1, 23) = 19.560,\ p < .001;\ F_2(1, 31) = 37.870,\ p < .001$) and *tt* ($F_1(1, 23) = 21.995,\ p < .001;\ F_2(1, 31) = 15.946,\ p < .001$), in the post-critical region for *gp* ($F_1(1, 23) = 6.679,\ p = .017;\ F_2(1, 31) = 5.291,\ p = .028$) and in the final region for *tt* ($F_1(1, 23) = 4.759,\ p = .040;\ F_2(1, 31) = 12.204,\ p < .001$). EXP revealed significant interaction effects in the critical region for *fp* ($F_1(1, 23) = 11.531,\ p = .002;\ F_2(1, 31) = 4.996,\ p = .033$), *gp* ($F_1(1, 23) = 6.270,\ p = .020;\ F_2(1, 31) = 6.128,\ p = .019$) and *tt* ($F_1(1, 23) = 21.641,\ p < .001;\ F_2(1, 31) = 47.465,\ p < .001$), and in the final region for *tt* ($F_1(1, 23) = 8.408,\ p = .008;\ F_2(1, 31) = 14.083,\ p < .001$). Finally, ATT revealed significant interaction effects in the critical region for *fp* ($F_1(1, 23) = 5.164,\ p = .033;\ F_2(1, 31) = 12.390,\ p < .001$) and *gp* ($F_1(1, 23) = 8.844,\ p = .007;\ F_2(1, 31) = 18.138,\ p < .001$), and in the final region for *fp* ($F_1(1, 23) = 11.197,\ p = .003;\ F_2(1, 31) = 5.192,\ p = .030$), *gp* ($F_1(1, 23) = 6.091,\ p = .021;\ F_2(1, 31) = 6.538,\ p = .016$) and *tt* ($F_1(1, 23) = 13.213,\ p = .001;\ F_2(1, 31) = 9.407,\ p = .004$). This indicates that during the online processing on the Spanish personal preposition, all groups of participants were sensitive to the mismatching conditions, including the attrited group, and this effect was significant in all groups in the earliest measure of fixation times (first pass in the critical region).

To explore the nature of these interaction effects, paired samples t-tests were conducted again with all groups to compare their processing of animate and inanimate objects. As Tables 2, 4 and 4 above show, with the animate object, all groups overall revealed significantly longer

RTs for the *el* article than for the *al* article in the critical and post-critical regions, but not in final region: MON in the critical region for *fp* ($t_1(23) = 2.763$, $p = .011$; $t_2(31) = 2.036$, $p = .050$), *gp* ($t_1(23) = 2.992$, $p = .007$; $t(31) = 3.643$, $p = .001$) and *tt* ($t_1(23) = 3.609$, $p < .001$; $t_2(31) = 2.938$, $p = .006$), and in the post-critical region for *gp* ($t_1(23) = 2.725$, $p = .012$; $t_2(31) = 1.617$, $p = .116$); EXP in the critical region for *fp* ($t_1(23) = 1.957$, $p = .063$; $t_2(31) = 1.221$, $p = .231$), *gp* ($t_1(23) = 2.427$, $p = .023$; $t_2(31) = 2.534$, $p = .017$) and *tt* ($t_1(23) = 3.892$, $p < .001$; $t_2(31) = 3.953$, $p < .001$); and ATT in the critical region for *fp* ($t_1(23) = 1.213$, $p = .237$; $t_2(31) = 2.293$, $p = .029$) and *gp* ($t_1(23) = 2.417$, $p = .024$; $t_2(31) = 4.059$, $p < .001$). With the inanimate object, all groups overall showed significantly shorter RTs for the *el* article than for the *al* article in the critical and post-critical regions, but not in final region: MON in the critical region for *fp* ($t_1(23) = -2.084$, $p = .049$; $t_2(31) = -1.703$, $p = .099$), *gp* ($t_1(23) = -3.474$, $p = .002$; $t_2(31) = -3.010$, $p = .005$) and *tt* ($t_1(23) = -3.429$, $p = .002$; $t_2(31) = -3.110$, $p = .004$), and in the post-critical region for *gp* ($t_1(23) = -1.826$, $p = .081$; $t_2(31) = -1.406$, $p = .170$); EXP in the critical region for *fp* ($t_1(23) = -2.957$, $p = .007$; $t_2(31) = -2.200$, $p = .035$), *gp* ($t_1(23) = -1.480$, $p = .152$; $t_2(31) = -1.469$, $p = .152$) and *tt* ($t_1(23) = -3.836$, $p < .001$; $t_2(31) = -3.963$, $p < .001$); and ATT in the critical region for *fp* ($t_1(23) = -2.204$, $p = .038$; $t_2(31) = -2.952$, $p = .006$) and *gp* ($t_1(23) = -1.948$, $p = .064$; $t_2(31) = -1.958$, $p = .059$).

In the final region, although the t-tests overall revealed significant effects for both the animate and inanimate objects, the means of all three groups consistently showed shorter RTs for the *el* article than for the *al* article with the animate object, contrary to our predictions: MON for *tt* ($t_1(23) = -2.601$, $p = .016$; $t_2(31) = -3.460$, $p = .002$); EXP for *tt* ($t_1(23) = -3.030$, $p = .006$; $t(31) = -2.864$, $p = .007$); and ATT for *fp* ($t_1(23) = -2.562$, $p = .017$; $t_2(31) = -1.783$, $p = .084$), *gp* ($t_1(23) = -1.597$, $p = .124$; $t_2(31) = -1.690$, $p = .101$) and *tt* ($t_1(23) = -2.827$, $p = .010$; $t_2(31) = -2.125$, $p = .042$). Similarly, contrary to our predictions, all groups consistently revealed longer RTs for the *el* article than for the *al* article with the inanimate object: MON for *tt* ($t_1(23) = .953$, $p = .350$; $t_2(31) = 1.378$, $p = .178$); EXP for *tt* ($t_1(23) = 1.625$, $p = .118$; $t_2(31) = 1.633$, $p = .113$); and ATT for *fp* ($t_1(23) = 1.993$, $p = .058$; $t_2(31) = 1.977$, $p = .057$), *gp* ($t_1(23) = 2.929$, $p = .008$; $t_2(31) = 2.421$, $p = .022$) and *tt* ($t_1(23) = 3.523$, $p = .002$; $t_2(31) = 2.626$, $p = .013$). This unexpected effect can be easily explained if we take into consideration the kind of structure that participants are dealing with, which makes really clear ungrammatical sentences for the animate/el and the inanimate/al conditions. Therefore, by the time participants enter the final region of one of these ungrammatical conditions, it is already very clear they need to make a judgment of low acceptability, as they are dealing with an ungrammatical sentence. The ease of making this judgment results in very few fixations in the final region, which causes this opposite effect.

Finally, group comparisons were conducted running a repeated-measures ANOVA with the factors *Animacy*, *Article* and *Language Group* for monolinguals versus attriters, monolinguals versus exposed, and attriters versus exposed for all measures and regions. The ANOVA tests only revealed three-way interaction of *Animacy*Article*Language Group* for MON versus ATT in the final region for *fp* by subjects ($F_1(1, 46) = 5.097$, $p = .029$; $F_2(1, 31) = 2.513$, $p = .123$) and for ATT vs. EXP in the critical region for *tt* ($F_1(1, 46) = 4.496$, $p = .039$; $F_2(1, 31) = 10.597$, $p = .003$). The patterns of these three-way interaction effects were explored and they are due to the fact that, in the final region, ATT showed *Animacy*Article* interaction in first-pass, while MON did not, and in

the critical region, EXP showed *Animacy*Article* interaction in total time, while ATT did not.

Discussion and Conclusions

The present study aimed to explore three main research questions. First, following the Interface Hypothesis (Sorace and Filiaci 2006), whether structures interfacing with semantic conditions like the DOM are unaffected by L1 attrition. Second, in the case that any attrition was found with this structure, whether it affected online sensitivity during real time processing or whether it is due to changes in attriters' L1 knowledge representations. Finally, in the case that any attrition was revealed, whether its effects decrease or disappear with frequency and recency of (re)exposure to the L1.

Since we explored L1 attrition in the interpretation and processing of a structure that does not depend on context, following the Interface Hypothesis, no attrition effects and, therefore, no major differences between the groups were predicted for the offline or the online tasks with the DOM. As expected, the results from the offline ratings revealed equal mismatch sensitivity to the Spanish personal preposition for all three groups of participants, with participants from the three groups correctly scoring the grammatical sentences in which the animate direct object was preceded by *al* (condition 2) and those in which the inanimate direct object was preceded by *el* (condition 3) as being 'natural', and the ungrammatical sentences in which the animate direct object was preceded by *el* (condition 1) and those in which the inanimate direct object was preceded by *al* (condition 4) as being 'not natural'. Moreover, even though some three-way interaction effects of *Animacy* by*Article* by*Language Group* were revealed by items between monolinguals and exposed and between attriters and exposed, the fact that all three groups performed as expected and their offline ratings showed the expected mismatch sensitivity with the DOM reveals that this structure has not undergone attrition in the L1, which supports the Interface Hypothesis.

On the other hand, the results from the eye-tracking while reading task also revealed that all groups showed significant interaction effects of *Animacy* by *Article,* at the earliest possible point (i.e. first-pass reading time in the critical region). This suggests that all groups are sensitive to the mismatching conditions when processing the DOM in real time (i.e. when the animate direct object was preceded by *el* or when the inanimate direct object was preceded by *al*). Moreover, the results revealed that the groups did not show major differences between them. The only significant three-way interaction effects were seen between monolinguals and attriters in the final region for first pass by subjects and between attriters and exposed in the critical region for total time. However, these unexpected effects are due to the fact that, in the final region, ATT showed *Animacy*Article* interaction in first-pass, while MON did not, and in the critical region, EXP showed *Animacy*Article* interaction in total time, while ATT did not. Therefore, we can still conclude that all groups of participants showed online sensitivity to the DOM mismatch and performed similarly with this structure, which indicates that attriters' processing of this structure is not affected by L1 attrition either.

Some unexpected results were obtained in the final region for all three groups, in which the opposite effect to the expected was obtained (i.e. the animate/el condition showed shorter RTs than the animate/al condition, and the inanimate/el condition longer RTs than the inanimate/al condition). However, this effect, which is the opposite to the one predicted, can be easily explained if we take into consideration the kind of structure that participants are dealing with, which involves clearly ungrammatical sentences for the animate/el and the

inanimate/al conditions. Therefore, by the time participants enter the final region of one of these ungrammatical conditions, it is already very clear that they need to make a judgment of low acceptability, as they are dealing with an ungrammatical sentence. The ease of making this judgment is likely to have resulted in very few fixations in the final region, resulting in this opposite effect.

It could be argued that the null effects revealed in the present paper could be due to lack of power of the experimental design. However, this is unlikely, because a recent paper from the same series of experiments as the present study reveals not only that the technique used in these studies is sensitive enough to detect differences between groups, but also the contrast of this syntax-semantics interface structure with a syntax-pragmatics interface structure, Spanish pronominal subjects. Chamorro et al. (2015) addressed the same research questions as the present study, carrying out the same offline and eye-tracking experiments with the same groups of participants, but testing a syntax-pragmatics interface structure, subject pronouns, instead of the syntax-semantics interface structure tested here. Similarly to the present study, the offline data showed no significant differences between the groups, with all three groups revealing equal sensitivity to the subject 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). However, the results from the eye-tracking experiment revealed that monolinguals and exposed are reliably more sensitive than attriters to the pronoun mismatch, with monolinguals and exposed showing a significant mismatch sensitivity with pronominal subjects and no significant differences between these two groups, and attriters not revealing online sensitivity to the pronoun mismatch and performing significantly different from monolinguals. These results reveal that Spanish attrited speakers undergo L1 attrition with a syntax-pragmatics structure like pronominal subjects and that attrition effects decrease as a result of L1 exposure. Chamorro et al. (2015) concluded that these findings suggest that attrition affects online sensitivity with this type of structure rather than causing a permanent change in speakers' L1 knowledge representations.

Therefore, considering all the findings obtained from this study, from both the offline and the online experiments, we can conclude that structures requiring the satisfaction of semantic conditions, such as the DOM, do not undergo attrition, either at the processing or representational level. This supports the Interface Hypothesis, although there could also be other explanations why this structure does not reveal attrition effects. Firstly, as it was revealed by Rodríguez-Mondoñedo (2008), children acquire the DOM at a very young age and are able to produce it very accurately before the age of 3 (98.38 % of accuracy), which could make this structure particularly stable and difficult to undergo attrition. In contrast, the use and interpretation of pronominal subjects is typically acquired late by monolingual children speaking a pro-drop language (Shin and Cairns 2012; Sorace and Serratrice 2009). This would also explain why heritage speakers do not show a native command of the DOM (Montrul and Bowles 2008, 2009, 2010), probably due to the fact that it was never completely acquired before they were exposed to English and their Spanish input was reduced. Secondly, the DOM is a highly frequent structure, since it must be used to introduce an animate and specific direct object, which would mean that the reduced Spanish input to which attriters may be exposed would still contain instances of this structure, which could prevent the DOM from being affected by attrition.

Finally, the hypothesis that any attrition effects found with this structure would decrease or disappear with attriters' re-exposure to their L1 could not be tested, due to the fact that no attrition effects were revealed by the attrited group with the DOM in the first place, so no differences were revealed between this group and the exposed group. However, as mentioned above, Chamorro et al.'s (2015) results did reveal that Spanish attrited speakers undergo

L1 attrition with a syntax-pragmatics interface structure like pronominal subjects and that attrition effects decrease as a result of L1 exposure. Future research is needed to further explore how different types of structures are differentially affected by L1 attrition.

Acknowledgments This study was partly supported by the College of Humanities and Social Sciences at the University of Edinburgh. Special thanks to all the participants who took part in the study.

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