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Singular and Plural Pronominal Reference in Spanish

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Abstract In two self-paced, sentence-by-sentence reading experiments, we examined the difference in the processing of Spanish discourses containing overt and null pronouns. In both experiments, antecedents appeared in a single phrase (*John met Mary*) or in a conjoined phrase (*John and Mary met*). In Experiment 1, we compared reading times of sentences containing singular overt and null pronouns referring to the first or to the second mentioned antecedent. Overt pronouns caused a processing delay relative to null pronouns when they referred to the first antecedent in single but not in conjoined phrases. In Experiment 2, we compared reading times of sentences containing overt and null pronouns referring to singular or plural entities. Plural null pronouns were read faster than their singular counterparts in conjoined conditions. Plural overt pronouns were read more slowly than their null counterparts both in single and conjoined conditions. We explain our findings in a framework based on the notion of balance between processing cost and discourse function in line with the Informational Load Hypothesis.

Keywords Anaphora · Spanish · Null pronouns · Overt pronouns · Plural reference

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Introduction

Local discourse coherence is established, to a large extent, through repeated reference to a small number of entities (Grosz et al. 1983, 1995; Halliday and Hassan 1976; Kintsch and Dijk 1978). Subsequent reference to these entities is achieved by means of anaphora, that is, the process by which a linguistic expression gets its reference from another linguistic expression that was mentioned earlier in the text. For example, in a sentence such as *Superman was flying around when he saw a thief*, the pronoun *he* is the anaphor, and the proper noun *Superman* is its antecedent. The anaphor and its antecedent are said to be co-referential because they refer to the same entity in the world (in this case, the same superhero). Anaphoric processing is highly dependent on the discourse salience of the entity introduced by the antecedent (Givon 1987; van-Dijk and Kintsch 1983), which is determined, among other factors, by the syntactic context (Chambers and Smyth 1998; Crawley et al. 1990; Frederiksen 1981), the discourse pragmatics, (Almor 1999; Ariel 1990; Prince 1978), and the related memory processes (Almor 1999; Gernsbacher 1989; Sanford and Garrod 1981). In particular, antecedent salience has been shown to be affected by the antecedent's syntactic function (Gordon et al. 1993, 1999), its position in the sentence (Carreiras et al. 1995), and its representation in the discourse model (Eschenbach et al. 1989; Moxey et al. 2004, 2011). The felicitous use of an anaphoric expression in a particular context is, thus, the result of the interplay of many factors which together determine the ease with which the anaphor will be processed.

Almor's (1999) Informational Load Hypothesis associates the overall processing difficulty of an anaphoric expression with the balance between its processing cost and the discourse contribution that it makes in either identifying the antecedent or adding relevant information. In this view, an anaphor's processing cost is not exclusively determined by its type, but by the amount of memory interference related to the semantic information that the anaphor activates. Overall processing effort, as is gauged in tasks such as whole sentence self- paced reading, reflects the balance between this processing cost and the discourse function of the anaphor. Superfluous information that is activated by an overspecific anaphor that neither adds new information nor helps identify the antecedent is therefore expected to cause an overall processing delay.

One example of such processing delay is the slower reading of repeated names compared to pronouns in English in certain circumstances (Gordon et al. 1993). This Repeated Name Penalty (RNP) occurs only when the entity referred to by the antecedent is salient in the discourse (see examples 1 and 2 in Table 1). A similar effect, the Overt Pronoun Penalty (OPP), occurs in Spanish, a null subject language in which overt pronouns lead to slower reading times relative to null pronouns, when the antecedent is the subject, but not the object, of a previous sentence (Gelormini-Lezama and Almor 2011) (see examples 3 and 4 in Table 1). Thus, both the RNP and the OPP can be useful as tests of discourse salience. Indeed, the RNP has already been successfully used as a marker of antecedent salience (Gordon et al. 1999). For example, Gordon et al. (1993) showed that, in English, the RNP occurs not only when referring to an antecedent bearing the role of grammatical subject but also when reference is made to an entity introduced by a parenthetical construction as a surface-initial non subject. This suggests that discourse salience is affected both by the syntactic function of the antecedent and by its surface position.

In Spanish, there is some evidence that antecedent salience might be affected more significantly by the antecedent's surface position than by its syntactic function. Carreiras et al. (1995) used a probe word recognition task to examine the salience of first and second mentioned antecedents, including antecedents embedded in conjoined noun phrases (e.g., *John and Mary*). They found that the first element was accessed faster than the second one,

Table 1 Examples of repeated name penalty (RNP) and overt pronoun penalty (OPP) in Spanish

	Salient antecedent	Non-salient antecedent
	1 (RNP)	2 (No RNP)
Repeated name	Juan se encontró con María	María se encontró con Juan
	Juan la vio triste	Juan la vio triste
	Juan met with María	*María met with Juan*
	Juan found her sad	*Juan found her sad*
	3 (OPP)	4 (No OPP)
Overt pronoun	Juan se encontró con María	María se encontró con Juan
	Él la vio triste	Él la vio triste
	Juan met with María	*María met with Juan*
	He found her sad	*He found her sad*

independent of syntactic function. The authors propose that the advantage of first mention is a general phenomenon that reflects an underlying universal mechanism. In contrast, Gordon et al. (1999) found no RNP in a self-paced reading task in English, when the antecedent of a repeated name was embedded in a conjoined phrase. In addition, they found no difference in reading times of sentences containing singular pronouns that referred to the first or to the second element of a conjoined noun phrase.

The contrast between the English and the Spanish data could be attributed to, at least, two different factors. First, it is possible that the data from probe word recognition tasks may not reflect the processes underlying reference processing. In this respect, it is worth remembering that, using a probe recognition task, Gernsbacher (1989) found a repeated name *advantage* when participants had to respond to probe words while engaged in sentence comprehension. Gordon et al. (1999, 2000) argued that this effect may have only reflected the relationship between the anaphoric expression and the probe word, but not the relationship between the anaphoric expression and its corresponding antecedent. A second reason for the discrepancy between the English and Spanish data may be that there exists some syntactic difference between these two languages that affects the salience of antecedents in single and conjoined noun phrases. Indeed most of the relevant research has been conducted in English and although most existing theories appeal to universal processing principles, they are, for the most part, supported only by English data.

In English, Garrod and Sanford (1982) had shown that using a singular pronoun to refer to one of the two elements of a conjoined noun phrase was more disruptive than using a plural pronoun. Albrecht and Clifton (1998) found slower reading times for sentences in which a singular pronoun referred to one of the two characters in a conjoined noun phrase than for sentences in which a singular pronoun referred to a character in a single noun phrase (e.g., *John*). The authors attributed these results to a mechanism which they dub *splitting*, whereby the processing delay caused by singular pronouns reflects the time to break up a conjoined noun phrase in order to gain access to its individual components as antecedents. It could also be that the plural object referred to by a conjoined noun phrase is the most salient antecedent and thus pronominalization should be expected for that plural reference object (Barker 1992; Eschenbach et al. 1989; Kamp and Reyle 1993; Moxey et al. 2004).

A possible interpretation of the research described thus far is that conjoined noun phrases generate a plural reference object in the discourse representation that, if salient, may over-

ride the advantage of first mention. Eschenbach et al. (1989) proposed that plural reference is deemed possible if a *complex reference object* has been formed in the discourse representation. In *John met Mary,* both *John* and *Mary* appear as atomic reference objects, whereas in *John and Mary met*, the conjoined noun phrase *John and Mary* favors the creation of a complex reference object (*John* + *Mary*), which makes subsequent plural pronominal reference felicitous.

The notion of a complex reference object raises questions about the factors and constraints that participate in the creation of such a representation. Eschenbach et al. (1989) argued that the conjunction *'and'* is one of those factors, because it introduces two entities as part of the same syntactic constituent. In this case, singular reference becomes disadvantaged due to a *conjunction cost* (Albrecht and Clifton 1998; Garrod and Sanford 1982; Koh and Clifton 2002; Moxey et al. 2004) such that, in the presence of a conjoined noun phrase antecedent, sentences with a singular pronoun are read more slowly than sentences with a plural pronoun. Sanford and Moxey (1995) argue that a complex reference object is constructed to the extent that both entities are involved in the same action and share common thematic roles. Koh and Clifton (2002) proposed the Equivalence Hypothesis and argued that a complex reference object is formed when the two participants are equivalent in some respect. Moxey et al. (2011) further argued that they are equivalent to the extent that they are likely to take part in the same activity or experience the same states with respect to the discourse model under construction. She claims that equivalence is a predictor of complex reference object formation. Since these equivalence factors reflect and influence the discourse representation and not the representation of grammatical roles, which have been shown to affect the processing of singular references, this view argues that the processing of plural reference is particularly sensitive to the discourse model rather than to surface or grammatical function factors.

Therefore, plural anaphor resolution appears to be affected by factors other than syntactic structure and word order. In Spanish, Carreiras (1997) suggested that antecedents for plural pronouns are found by consulting a discourse model representation. Specifically, he found that plural reference is easier when the two participants are in the same location. However, one important limitation of his study is that he only considered Spanish overt pronouns, which, in the case of singular reference, have been shown by Gelormini-Lezama and Almor (2011) to be reliable indicators of *non salience* rather than *salience*. If pronominalization is going to be used in a null subject language as a measure of antecedent salience, then null pronouns, and ideally the overt/null manipulation should be used.

In the present study, we look at conjoined noun phrases in Spanish in the hope of further testing the universality of the processes underlying anaphoric processing. In particular, we make use of the Overt Pronoun Penalty (OPP) as a marker of antecedent salience. Gelormini-Lezama and Almor (2011) found that, in Spanish, sentences with overt singular pronouns were read more slowly than corresponding sentences with null singular pronouns, when the referent of the anaphoric expression was salient. Here we make use of the overt/null pronominal availability to extend our research on the OPP and use it as a diagnostic tool (1) to establish whether first mentioned antecedents are more salient than second mentioned antecedents independent of the syntactic structure (Experiment 1); (2) to test whether, in Spanish, the plural entity evoked by a conjoined noun phrase is more salient than both of its individual components (Experiments 1 and 2); (3) to establish the relative effect of grammatical function and discourse factors on the OPP and on the processing of plural pronominal reference (Experiment 2).

Experiment 1

The first experiment examined the processing of singular overt and null pronouns referring to antecedents in single (*Juan met María*) and conjoined (*Juan and María met*) noun phrases. The OPP was used to determine the relative salience of first and second mentioned antecedents. Overt pronouns cause a processing delay relative to null pronouns when the relevant antecedent is highly accessible. The advantage of first mention predicts a processing advantage for first mentioned over second mentioned antecedents, independent of the syntactic structure. Thus, this would lead to the expectation that sentences with overt pronouns referring to first mentioned antecedents ought to elicit the OPP both in single and conjoined conditions. However, if the advantage of first mention can be overridden by the conjunction cost, then the OPP should only be elicited for single conditions.

The specific hypotheses tested in this experiment were:

1. Sentences with overt singular pronouns referring to first mentioned antecedents will elicit the OPP in single conditions, replicating Gelormini-Lezama and Almor (2011).
2. The advantage of first mention will be elicited in single conditions: sentences with null pronouns will be read faster when they refer to the first relative to the second element.
3. If syntactic factors have a greater effect than the first mention advantage in Spanish as they do in English, then we expect that the OPP will be eliminated in conjoined conditions.
4. If syntactic factors have a greater effect than the first mention advantage in Spanish as they do in English, then we also expect that the advantage of first mention will be eliminated in conjoined conditions.

Method

Participants

Forty graduate and undergraduate students from the Instituto de Enseñanza Superior en Lenguas Vivas J. R. Fernández participated in a single session lasting approximately 20 min. They were all native speakers of Spanish and they were between 20 and 40 years of age.

Materials

A set of 40 passages like the one in Table 2 was constructed. Sentence (1) introduced two entities in a single (*Juan met María in the park*) or in a conjoined structure (*Juan and María met in the park*). Sentence (2), the critical sentence, made reference to either of the two entities in the previous sentence by means of a null or an overt pronoun: (a) *(Null) was happy* (masc.), (b) *He was happy* (masc.), (c) *(Null) was happy* (fem.), (d) *She was happy* (fem.). This resulted in eight different conditions as shown in Table 2. Overall, this was a $2 \times 2 \times 2$ design with factors Antecedent Structure (Single, Conjoined), Antecedent Position (First, Second) and Anaphor Form (Null, Overt). Each two-sentence passage was followed by a yes/no comprehension question in order to ensure that participants were processing the sentences as they read. The names of the two characters in the experimental items were of different genders so that the adjectival morphology could only have grammatical concord with one of the two proper nouns. A set of 40 filler items was constructed to reduce the predictability of the experimental items and mask the purpose of the experiment. These fillers were also two-sentence coherent passages including proper names but they contained

Table 2 Examples of all eight conditions in Experiment 1

Anaphor Form	Antecedent structure Single	Conjoined
	First mentioned	
Null	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Estaba contento	Estaba contento
	Juan met with María in the park	*Juan and María met in the park*
	NULL was happy (masc.)	*NULL was happy* (masc.)
Overt	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Él estaba contento	Él estaba contento
	Juan met with María in the park	*Juan and María met in the park*
	He was happy (masc.)	*He was happy* (masc.)
	Second mentioned	
Null	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Estaba contenta	Estaba contenta
	Juan met with María in the park	*Juan and María met in the park*
	NULL was happy (fem.)	*NULL was happy* (fem.)
Overt	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Ella estaba contenta	Ella estaba contenta
	Juan met with María in the park	*Juan and María met in the park*
	She was happy (fem.)	*She was happy* (fem.)

syntactic structures that were not relevant to the experimental manipulation in question. Filler items were also followed by a comprehension question.

Design

Each experimental passage was presented to each participant in only one condition, but every passage occurred in all eight conditions across participants. The order of trials was randomized. There was a short practice session consisting of 5 filler passages to familiarize participants with the reading task. This session also included yes/no questions for the participants to know that they were expected to understand the sentences as they read them.

Procedure

Participants read the instructions on the screen and began the practice session to become familiar with the self-paced reading task. At the start of each trial the sentence *Presione la barra espaciadora* ("press the space bar") was presented on the screen. Once the participants had pressed the space bar, they were presented with an entire sentence on the screen. Participants were instructed to press the space bar as soon as they were ready to advance to the next sentence. After both experimental and filler passages, participants were presented with a comprehension question. Participants were required to press the space bar to answer "yes" and to press the "shift" key to answer "no". Half of the questions had "yes" answers and half of them had "no" answers. The experiment was run on a Windows-based personal computer running the E-prime software. The time lapse from the presentation of Sentence 2 to the participant's pressing of the space bar was recorded and was the dependent measure.

Table 3 Mean reading times (in ms) and standard error (in parentheses) for sentence 2 in Experiment 1

Anaphor form	Antecedent structure Single	Conjoined
	First mentioned	
Null	1384 (45)	1505 (50)
Overt	1616 (66)	1518 (68)
	Second mentioned	
Null	1548 (71)	1533 (61)
Overt	1523 (73)	1622 (70)

Results

Table 3 shows the mean reading time of the critical second sentence for all eight conditions. A $2 \times 2 \times 2$ repeated measures analysis of variance (ANOVA) with factors, Antecedent Structure (Single, Conjoined), Antecedent Position (First, Second) and Anaphor Form (Null, Overt) was conducted with both participants ($F1$) and items ($F2$) as a random factor.

These analyses revealed a main effect of Anaphor Form, such that, overall, sentences with null pronouns were read faster than corresponding sentences with overt pronouns, $F1(1, 38) = 5.40, MSE = 86314, p < 0.05, F2(1, 39) = 4.75, MSE = 81276, p < 0.05$. There were no main effects of Antecedent Structure, $F's < 1$, or Antecedent Position, $F1(1, 38) = 1.73, MSE = 113988, n.s., F2(1, 39) = 2.46, MSE = 92009, n.s.$ There were also no two-way interaction effects (all $Fs < 1$, except for the interaction between Antecedent Position and Anaphor Form, $Fs < 1.75$). However, there was a significant three way interaction, $F1(1, 38) = 7.63, MSE = 70827, p < 0.01, F2(1, 39) = 4.30, MSE = 127855, p < 0.05$. Visual inspection of the means shown in Table 3 suggested that this interaction was driven by an OPP in the single first mention conditions but not in the conjoined first mention or any of the second mentioned conditions. The results from four planned contrasts aiming to test our specific predictions support this interpretation:

1. In the single conditions, sentences with null pronouns referring to first mentioned antecedents were read significantly faster than corresponding sentences with overt pronouns, $F1(1, 38) = 18.12, MSE = 58302, p < 0.001, F2(1, 39) = 12.14, MSE = 80373, p < 0.01$.
2. In the single conditions, sentences with null pronouns were read faster when they referred to the first relative to the second element, $F1(1, 38) = 7.14, MSE = 73194, p < 0.05, F2(1, 39) = 6.68, MSE = 87251, p < 0.05$.
3. In the conjoined conditions, no significant differences were found between reading times of sentences with null or overt pronouns referring to the first mentioned element, $F's < 1$.
4. In the conjoined conditions, no significant difference was found between reading times of sentences with null pronouns referring to the first or to the second element, $F's < 1$.

Discussion

The results from this experiment support our specific predictions: (1) the OPP was elicited in the single conditions; (2) the advantage of first mention was elicited in the single conditions; (3) the OPP was eliminated in the conjoined conditions; (4) the advantage of first mention

was eliminated in the conjoined conditions. Results (1) and (3) show that the OPP is elicited when reference is made to the first mentioned antecedent if this is the head of the subject (single conditions) but not when it is the first component of a complex subject (conjoined conditions). Results (2) and (4) show that sentences with null pronouns are read faster if they refer to first rather than to second mentioned antecedents, but, crucially, this advantage only occurs when that first element is a single subject.

These results are strikingly similar to those previously reported by Gordon et al. (1999) in English, who found a RNP for first mentioned antecedents in single but not in conjoined phrases, and no first mention advantage for antecedents in conjoined phrases. Therefore, our results challenge the advantage of first mention in Spanish and suggest, instead, that the discrepancies between the results in English and Spanish were only driven by the different methodologies employed. If first mentioned antecedents were always more accessible in Spanish, then the overt pronoun should have elicited an OPP whenever it coreferred with the first mentioned entity. Thus, given the item *Juan met with María /Juan and María met*, a follow- up sentence containing an overt pronoun referring to *Juan* (e.g., *he was happy*) ought to have generated a processing delay. However, our results showed a different pattern: the OPP was only elicited when the first mentioned antecedent was the single subject of a previous sentence. When the first mentioned antecedent was one of the two components of a conjoined noun phrase, the OPP was eliminated. Thus, rather than sequential word order, it is the hierarchical syntactic structure that appears to determine the salience of the possible antecedents. Because first mentioned elements and grammatical subjects usually coincide, it is often difficult to tease these two factors apart. In this experiment, it was clear that subjecthood played a greater role: first, there was no main effect of the factor Antecedent Position and second, the OPP was not elicited for first mentioned antecedents in the conjoined conditions.

We interpret these results in the framework of the Informational Load Hypothesis (Almor 1999) that takes into account the discourse function of the referential expression. In Spanish, the OPP is elicited in single structures because the overt pronoun offers no additional advantage over its null counterpart: the adjectival morphology, which contains overtly realized gender features, is sufficiently rich for the identification of the antecedent of the anaphoric expression. However, the overt pronoun becomes more functional when it picks a non-salient referent. The absence of an OPP in the conjoined conditions may thus be an indication that the referent of the first mentioned antecedent may have lost its discourse salience to the plural entity. This interpretation was tested in Experiment 2.

Experiment 2

Experiment 1 showed that the OPP was elicited in single but not in conjoined conditions and we hypothesized that this may have been due to the fact that the most accessible antecedent was not the first mentioned element, but the conjoined noun phrase. Thus, the present experiment contrasted singular and plural pronominal reference in order to establish whether the conjoined noun phrase is indeed more accessible than both of its individual components. If the plural entity is the most salient referent in the conjoined conditions, then this should be reflected in reduced reading times of plural null pronouns with respect to singular null pronouns, and in the absence of an OPP for singular reference in those conditions.

We also wanted to test whether the OPP occurs for plural reference, that is, if sentences with plural overt pronouns elicit a processing delay relative to sentences with plural null pronouns when the referent is salient. Specifically, we wanted to examine whether surface

and grammatical function information could be overridden by discourse level factors that could favor the creation of a complex reference object, as suggested by Carreiras (1997) and Moxey et al. (2011). If it is indeed the case that the formation of a complex reference object does not critically depend on surface and grammatical function information, then overt plural reference will elicit an OPP both in single and conjoined conditions. It should be noted that both in single and conjoined conditions, the two characters are "equivalent" (Koh and Clifton 2002) in the sense that they have the same ontological status (Eschenbach et al. 1989), and they participate in the same activity (Moxey et al. 2011) and thus, a complex reference object is expected to be formed in the discourse representation.

Thus, the specific hypotheses tested in this experiment were:

1. Singular overt pronouns referring to single antecedents will elicit the OPP in single but not in conjoined conditions, replicating Experiment 1.
2. If a complex reference object is created in the conjoined conditions, and is the most salient referent, then, in these conditions, sentences with plural null pronouns will be read faster than sentences with singular null pronouns.
3. If the OPP for plural reference is affected only by the syntactic function of the antecedent, then sentences with plural overt pronouns will be read more slowly than sentences with plural null pronouns only in the conjoined conditions, where the antecedent is the grammatical subject. If, however, the plural OPP is also affected by discourse representation factors, then a similar OPP will occur in the single conditions as well, despite the fact that the antecedent does not appear in the grammatical subject position and is not even a syntactic constituent.

Method

Participants

Forty graduate and undergraduate students from the same population as Experiment 1 participated in a single session lasting approximately 20 min. They were all native speakers of Spanish and they were between 20 and 40 years of age.

Materials

A set of 40 passages like the one in Table 4 was constructed. Sentence (1) introduced two entities in a single (*Juan met María in the park*) or in a conjoined structure (*Juan and María met in the park*). Sentence (2), the critical sentence, made reference to either the first or the conjoined entity in the previous sentence by means of a null or an overt pronoun: (a) *(Null) was happy* (masc. sing.), (b) *He was happy* (masc. sing.), (c) *(Null) were happy* (plural), (d) *They were happy* (plural). This resulted in eight different conditions as shown in Table 4. Each two-sentence passage was followed by a yes/no comprehension question in order to ensure that participants were processing the sentences as they read. The names of the two characters were of different genders so that there was no ambiguity in the matching of the adjective with the entity to which it referred. A set of 40 filler items was constructed. These fillers were also two-sentence coherent passages including proper names but they contained syntactic structures that were not relevant to the experimental manipulation in question. Filler items were also followed by a comprehension question.

Table 4 Examples of all eight conditions in Experiment 2

Anaphor Form	Antecedent structure Single	Conjoined
	Singular anaphors	
Null	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Estaba contento	Estaba contento
	Juan met with María in the park	*Juan and María met in the park*
	NULL was happy (masc.)	*NULL was happy* (masc.)
Overt	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Él estaba contento	Él estaba contento
	Juan met with María in the park	*Juan and María met in the park*
	He was happy (masc.)	*He was happy* (masc.)
	Plural anaphors	
Null	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Estaban contentos	Estaban contentos
	Juan met with María in the park	*Juan and María met in the park*
	NULL were happy (plural)	*NULL were happy* (plural)
Overt	Juan se encontró con María en el parque	Juan y María se encontraron en el parque
	Ellos estaban contentos	Ellos estaban contentos
	Juan met with María in the park	*Juan and María met in the park*
	They were happy (plural)	*They were happy* (plural)

Design

The design of this experiment was identical to Experiment 1.

Procedure

The procedure of this experiment was identical to Experiment 1.

Results

Table 5 shows the mean reading time of the critical second sentence for all eight conditions. A $2 \times 2 \times 2$ repeated measures analysis of variance (ANOVA) with factors Anaphor Form (Null, Overt), Antecedent Structure (Single, Conjoined) and Anaphor Number (Singular, Plural) was conducted with both participants ($F1$) and items ($F2$) as a random factor.

These analyses revealed a main effect of Anaphor Form, such that, overall, sentences with null pronouns were read faster than corresponding sentences with overt pronouns, $F1(1, 39) = 15.20, MSE = 87003, p < 0.001, F2(1, 39) = 17.172, MSE = 80956, p < 0.001$. There were no main effects of Antecedent Structure, $F1(1, 39) = 1.38, MSE = 71644, n.s., F2(1, 39) = 1.26, MSE = 61370, n.s$, or Anaphor Number, $F's < 1$.

However, all the two way interactions were significant: (a) Antecedent Structure and Anaphor Number, $F1(1, 39) = 8.30, MSE = 54668, p < 0.01, F2(1, 39) =$

Table 5 Mean reading times (in ms) and standard error (in parentheses) for sentence 2 in Experiment 2

Anaphor form	Antecedent structure Single	Conjoined
	Singular anaphors	
Null	1287 (48)	1442 (55)
Overt	1446 (57)	1371 (65)
	Plural anaphors	
Null	1337 (52)	1262 (55)
Overt	1585 (76)	1439 (59)

4.66, $MSE = 85694$, $p < 0.05$, such that, following a conjoined antecedent, sentences with plural pronouns were read 111 ms faster and sentences with singular pronouns 40 ms slower than following a single antecedent; (b) Antecedent Structure and Anaphor Form, $F1(1, 39) = 9.42$, $MSE = 48195$, $p < 0.01$, $F2(1, 39) = 7.07$, $MSE = 56969$, $p < 0.05$, such that, following a conjoined antecedent, sentences with overt pronouns were read 111 ms faster and sentences with null pronouns 40 ms slower than following a single antecedent; (c) Anaphor Number and Anaphor Form, $F1(1, 39) = 8.62$, $MSE = 66254$, $p < 0.01$, $F2(1, 39) = 5.02$, $MSE = 115664$, $p < 0.05$, such that sentences with singular pronouns were read 44 ms faster when the pronoun was null than when it was overt, but sentences with plural pronouns were read 213 ms faster when the pronoun was null than when it was overt. The three-way interaction was not significant, $F1(1, 39) = 2.61$, $MSE = 48069$, $n.s.$, $F2(1, 39) = 2.07$, $MSE = 90134$, $n.s.$

Planned pairwise contrasts aiming to test our specific predictions showed that:

1. Sentences with singular null pronouns referring to single antecedents were read 159 ms faster than corresponding sentences with overt pronouns, $F1(1, 39) = 14.99$, $MSE = 33729$, $p < 0.0001$, $F2(1, 39) = 8.01$, $MSE = 68813$, $p < 0.01$. In contrast, the 71 ms slower reading times of sentences with singular null relative to sentences with singular overt pronouns in the conjoined conditions was not significant, $F's < 1.3$.
2. In the conjoined conditions, sentences with plural null pronouns were read 180 ms faster than sentences with singular null pronouns, $F1(1, 39) = 13.37$, $MSE = 48598$, $p < 0.001$, $F2(1, 39) = 6.46$, $MSE = 98550$, $p < 0.05$.
3. Sentences with plural null pronouns were read 248 ms faster than sentences with plural overt pronouns in the single conditions, $F1(1, 39) = 18.49$, $MSE = 66976$, $p < 0.001$, $F2(1, 39) = 9.52$, $MSE = 120588$, $p < 0.005$, and 177 ms faster in the conjoined conditions, $F1(1, 39) = 8.99$, $MSE = 70007$, $p < 0.005$, $F2(1, 39) = 10.41$, $MSE = 72534$, $p < 0.005$.

As shown by the last planned comparison, the OPP for plural references is different than the OPP for singular references in that it occurred even when the antecedent was not the subject of the previous sentence (single conditions). Although this means that, in our experiment, the plural null pronoun was always processed faster than the plural overt pronoun, we wanted to see how the reading times of sentences with null pronouns was affected by our experimental manipulation. We therefore conducted three post-hoc contrasts, adjusted by a Bonferroni correction to examine the processing of the null pronoun in the different conditions. These contrasts showed that: (a) sentences with singular null pronouns were read significantly faster in the single than in the conjoined conditions, $F1(1, 39) = 9.71$, $MSE = 49535$, $p < 0.01$, $F2(1, 39) = 8.60$, $MSE = 58673$, $p < 0.02$; (b) sentences with plural

null pronouns were not read at different speeds in the single and in the conjoined conditions, $F1(1, 39) = 2.85, MSE = 39201, n.s.$, $F2(1, 39) = 2.31, MSE = 54160, n.s.$; (c) the difference in reading times of sentences with singular null pronouns and plural null pronouns in the single conditions was not significant, $F1(1, 39) = 1.10, MSE = 44578\, n.s.$, $F2(1, 39) = 0.81, MSE = 87332, n.s.$

Discussion

Further support for the OPP for singular reference was provided by the fact that sentences containing singular overt pronouns referring to first mentioned antecedents in single phrases elicited a processing delay relative to sentences containing singular null pronouns. This OPP, however, was not observed when the overt pronoun referred to the first mentioned element in a conjoined noun phrase, replicating the results of Experiment 1.

More importantly, these results show that, independent of the syntactic structure of the antecedent, sentences with plural overt pronouns elicited an OPP. Singular pronouns, however, only elicited an OPP in the single conditions. This further supports our explanation for the results from Experiment 1, in which sentences with overt singular pronouns referring to the first mentioned antecedent in the conjoined conditions did not elicit a processing delay. We had hypothesized that the absence of an OPP in such contexts may have been due to the fact that the plural entity, and not the first mentioned element, was the most salient referent. This was shown by longer reading times for singular null pronouns in the conjoined than in the single conditions.

Experiment 1 showed that the singular OPP is eliminated when the overt pronoun refers to an antecedent in object position or to the first element of a conjoined noun phrase. Experiment 2 shows that, in contrast, the plural OPP is observed for both single and conjoined conditions, which suggests that in both conditions the plural entity was highly accessible. It thus appears that the antecedent's grammatical function affects antecedent salience more significantly for subsequent singular reference than for subsequent plural reference. The formation of a complex reference object does not seem to depend exclusively on the grammatical function of the antecedent. Instead, our results are consistent with Moxey et al.'s (2004, 2011) hypothesis that it is the fact that both participants take part in the same activity that is more important for the formation of a complex reference object. Whether or not this explanation is correct, our results show that the plural OPP in Spanish is sensitive to a different set of factors than the singular OPP.

General Discussion

The goal of this research was to examine the processing of discourses with overt and null pronouns in Spanish. Three findings are particularly noteworthy: (1) for salient referents, overt pronouns elicit a processing penalty relative to null pronouns; (2) the advantage of first mention is eliminated when the first mentioned element is part of a conjoined noun phrase; (3) for plural reference, overt pronouns elicit a processing penalty relative to null pronouns both when the antecedent is grammatically salient and when it is made salient by discourse factors.

We interpret results (1) and (2) as evidence against the advantage of first mention. This hypothesis would have predicted a different pattern of results, such as a main effect of Antecedent Position in Experiment 1, and a systematic advantage of singular null pronouns

referring to the first mentioned entity both in the single and in the conjoined conditions, in both experiments. Instead, we found no main effect of Antecedent Position and an advantage of singular null pronouns only when the antecedent was the grammatical subject. Overall, it seems as if the advantage of first mention could be reduced to the well-known fact that anaphors are read faster if they refer to subjects rather than to objects. When the second element is not the grammatical object but the second entity in a conjoined noun phrase, this comparative disadvantage is eliminated. The present results therefore show that previous reports of first mention advantage in Spanish likely reflect methodological limitations rather than differences in reference processing between Spanish and English.

We interpret result (3) as supporting the idea that readers find the antecedents of plural reference by consulting a discourse model representation. The fact that this has been shown both in English and Spanish suggests that this may not be a language specific feature. In line with previous research (Carreiras 1997; Moxey et al. 2004, 2011), Experiment 2 shows that plural anaphoric processing is facilitated when a complex reference object has been formed in the discourse representation. The formation of this plural entity is certainly facilitated by the presence of a conjoined noun phrase, but a conjoined noun phrase is not a necessary condition for its formation. What seems to be crucial is that a complex reference object is in the discourse representation. This can be achieved through a syntactic device, such as a conjoined noun phrase, or by discourse factors, such as the involvement of two characters in the same activity. Because plural reference generated an OPP both in single and conjoined conditions, it seems that the equivalence factor that determined the formation of a complex reference object was not the single or conjoined nature of the antecedent but the participation of the two characters in the same activity. This suggests that discourse factors may be relatively more important than surface factors and grammatical function in the anaphoric processing of plural pronouns.

In Experiment 1, the OPP can be easily interpreted as reflecting the imbalance between the cost associated with an anaphoric expression that contains more semantic features than are necessary, and its poor contribution to discourse coherence, as predicted by the Informational Load Hypothesis (Gelormini-Lezama and Almor 2011). This OPP is generated when the antecedent is the subject, but not the object of the previous sentence. When the antecedent is in object position, a new balance is established: the extra semantic features of the overt pronoun serve the discourse function of helping reactivate a non salient referent in working memory and thus, the OPP does not occur. In the same experiment, the OPP was also eliminated when the overt pronoun referred to either first or second mentioned antecedents in a conjoined noun phrase. This shows that the salience attributed to grammatical subjects does not extend into their individual components.

In Experiment 2, we interpreted the plural OPP in the single and in the conjoined conditions as suggesting that discourse factors may play a more significant role in the resolution of plural anaphora than they do in the case of singular anaphora. In addition, it is worthwhile noting that, in the case of plural reference, the information provided by the verbal morphology, which contains overt plural number features, was enough for the identification of the plural antecedent. Therefore, the number features of plural overt pronouns were redundant, and, as predicted by the Informational Load Hypothesis, could have generated a processing delay. This is different than the case of singular reference, in which the verbal morphology was not enough to identify which of the two characters was the referent of the singular anaphoric expression. In sum, both the formation of a complex reference object and the excess of number information in the plural conditions may have been responsible for the elicitation of a plural OPP both in the single and in the conjoined conditions. Disentangling the contribution of these two factors is a goal of our ongoing research.

Finally, the contrast between overt and null pronouns in Spanish appears to be similar to the contrast between repeated names and pronouns in English. However, an important difference between the OPP and the RNP is that the former compares two reduced expressions, two kinds of pronouns, and the latter is a contrast between a reduced and a full expression. In Spanish both overt pronouns and repeated names elicit a processing delay when they refer to syntactically salient antecedents (Gelormini-Lezama and Almor 2011). In essence, in Spanish anaphoric processing, the general category "pronouns" does not contrast with "full expressions". Rather, overt pronouns and repeated names are both penalized in similar contexts. This fact should discourage us from attempting to provide a taxonomic account of anaphor processing on the basis of anaphoric expression types across or within languages. The processing of anaphoric expressions in Spanish can be better understood in a framework such as the Informational Load Hypothesis, in which the processing cost is not attached to the type of anaphor in itself or to the purportedly reduced or full nature of the expression.

To conclude, together with previous research, our study shows that surface factors, grammatical function, and discourse representation play a role in the anaphoric resolution of pronouns. Similarly to what was shown by Gordon et al. (1999) in English, this study provides evidence that, for singular reference in Spanish, the syntactic function of the antecedent is more relevant than its position in the sentence. Our results also suggest that for plural reference, discourse factors such as the formation of a complex reference object and/or the balance between information load and function may be more important than syntactic factors. This study also confirms the differential contribution that null and overt pronouns make to discourse coherence and it shows that the contrast between these two forms is a useful tool to determine the salience of antecedents of anaphoric expressions in null subject languages.

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