

The Interpretation of Contrastive Stress in Spanish-Speaking Children

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1. Introduction

The aim of this paper is to investigate Spanish children's interpretation of pronouns across sentence boundaries. Referential dependencies established between pronouns and their antecedents are constrained by both syntactic, prosodic and discourse principles. In order to assign reference to a pronoun, a child needs to know these principles, but also needs the ability to apply them.

This paper presents recent experimental results showing that Spanish children have early knowledge of the relevant principles governing pronominal interpretation, including the interpretative effect of contrastive stress, but have a limited capacity to implement this knowledge. We will show that this view is supported by evidence from the acquisition of other languages and by evidence from agrammatic Broca aphasia.

2. Interpretation of pronouns

In this study we will focus on the interpretation of pronouns in coordinate structures such as (1).

- (1) a. First **John** hit Bill, and then *he* hit Mary.
b. First John hit **Bill**, and then Mary hit *him*.

In (1a) the subject pronoun of the second conjunct *he*, is interpreted as referring to the subject of the first conjunct (*John*). In (1b) the direct object pronoun *him* refers to the direct object of the first conjunct (*Bill*). This shows that the interpretation of pronouns in conjoint structures is constrained by parallelism: subject refers to subject, object to object.

Note that parallelism can be easily overridden by pragmatic factors. In (2) the object pronoun *him* is most naturally interpreted as referring to the subject of the first conjunct. Since normally hitting somebody is disapproved of, the one who hit is likely to be punished instead of the victim of this action.

- (2) **John** hit Bill and then Mary punished *him*.

The parallelism interpretation is also cancelled by contrastive stress, as is shown in (3) (Akmaijan and Jackendoff 1970).

- (3) a. First John hit **Bill**, and then **HE** hit Mary.
b. First **John** hit Bill, and then Mary hit **HIM**.

In (3a), the stressed subject pronoun *he* is most naturally interpreted as referring to the direct object of the first conjunct, while in (3b) the stressed object *him* most naturally refers to the subject of the first conjunct. Importantly, contrastive stress does not indicate what is the correct antecedent of the pronoun, it only signals that the correct antecedent is one not selected by parallelism. As can be seen in (4b), stressed *him* can refer to either *John* or *Peter*, but not to *Bill*, which is the antecedent selected by parallelism (4a).

- (4) a. John introduced **Bill** to Peter, and then Mary introduced **him** to Frank.
b. **John** introduced Bill to **Peter**, and then Mary introduced **HIM** to Frank.

This means that the interpretation of stressed pronouns involves a two-step procedure. First, pronominal reference is established under parallelism, and then contrastive stress cancels or switches this reference. If the first conjunct only contains two potential antecedents, this will lead automatically to the selection of the antecedent not selected by parallelism.

3. Children's interpretation of contrastive stress: previous research

Children's mastery of parallelism and the interpretative effects of contrastive stress have been investigated for English-speaking children by Maratsos (1973) and McDaniel and Maxfield (1992), using an Act-Out Task (5).

- (5) a. Ernie touched **Grover**, now you touch *him*.
b. **Ernie** touched Grover, now you touch **HIM**.

The results indicated that English children performed at chance level on sentences with stressed pronouns (5b), but above chance level on sentences with non-stressed pronouns (5a). This indicates that English children have considerably more problems with the interpretation of contrastive stress than with the application of parallelism.

In this study, we will investigate the mastery of parallelism and contrastive stress interpretation in children acquiring Spanish. Spanish differs from English in that stressed pronouns are morphologically and syntactically distinct from non-stressed pronouns. These morphosyntactic cues might give Spanish children a developmental advantage over children acquiring languages that do not display morphological and syntactic differences between stressed and non-stressed pronouns. Similar advantages of rich morphosyntax have been attested in the acquisition of tense and referential dependencies. For example, the rich subject-verb agreement on Spanish and Italian verbs has been argued to prevent children from showing a Root Infinitive stage (Guasti 1994). Similarly, the presence of a syntactic clitic system (probably an instance of overt object-verb agreement) has been argued to account for the absence of a Delay of Principle B Effect in Spanish children's interpretation of pronouns (Baauw 2002).

4. Spanish children: the experiment

In this experiment the following constructions were tested:

- (6) Primero la mujer_i besó a la niña_k, y luego...
“First the woman_i kissed the girl_k, and then...”
- | | |
|---|------------------------------|
| a. <i>pro</i> _i besó al niño.
“she _i kissed the boy.” | Subject Non-stressed (SuNst) |
| b. ELLA _k besó al niño
“SHE _k kissed the boy.” | Subject Stressed (SuSt) |
| c. la _k besó el niño
“the boy kissed her _k .” | Object Non-stressed (ObNst) |
| d. el niño la besó a ELLA _i .
“the boy kissed HER _i .” | Object Stressed (ObSt) |

The examples in (6) show that the interpretation of stressed and non-stressed pronouns does not differ from English: in the non-stressed conditions SuNst and ObNst (6a,c) parallelism applies, in the stressed conditions SuSt and ObSt (6b,d) parallelism is cancelled and reference is shifted. The realisation of stressed and non-stressed pronouns is different from English. Spanish realizes stressed subject and object pronouns as full pronouns (6b,d). Since Spanish is a null-subject language, non-stressed subject pronouns are realized as *pro* (6a). Non-stressed object pronouns are realized as clitics (6c). Unlike full pronouns, clitics surface in a (preverbal) non-argument position.^{1, 2}

32 normally developing Spanish-speaking children from a primary school in Oviedo, Spain, were tested. The children ranged from 5;3 to 6;2, with a mean age of 5;8. In addition eight adult controls were tested. The controls were psychology students from the University of Oviedo, with no knowledge of linguistics.

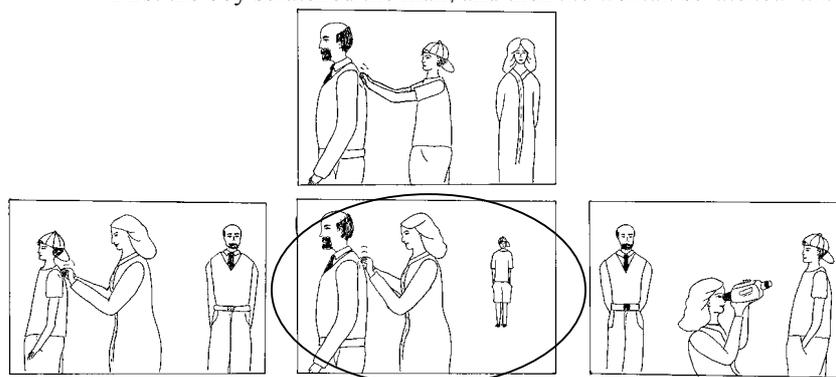
The experimental method we used was a Picture Selection Task. The linguistic input of the experiment consisted of sentences such as (6). These were presented with four pictures. One picture depicted the action of the first conjunct. Of the other three pictures only one correctly depicted the action represented by the second conjunct. The child's task was to indicate out of the three pictures the one that correctly represented the second conjunct. In (7) we give an example of an Object Non-stressed trial, testing children's mastery of parallelism. In this trial, the correct picture is the middle picture, indicated by the circle. Children who have difficulties with the application of parallelism in constructions containing non-stressed object

¹ According to some authors object clitics are the manifestation of object-verb agreement (Franco 1993; Medikoetxea 1993, among others). If this is correct, the direct object of (6c) is a *pro*, generated in the canonical post-verbal object position. Spanish could then be argued to have two types of pronouns: full pronouns, which can bear stress, and *pro*, which cannot bear stress.

² Note that Spanish also differs from English in that assignment of information focus has syntactic effects. Focussed elements, such as the subject *el niño* 'the boy' in (6c), are realized in a postverbal position (Zubizarreta 1998).

pronouns, may often select the left most picture. The right most picture is a non-related filler, meant to check whether the child is paying attention.

- (7) ObNst: Primero el niño rascó al hombre, y luego *lo* rascó la mujer.
 ‘First the boy scratched the man, and then *the woman scratched him.*’



Each of the four conditions consisted of eight trials. The test items were intermingled with 30 filler items.³ The total number of trials was 62, presented to the child in two sessions of 10-15 minutes each, spaced apart one day. Before the child started the experiment, some practice items were administered.

5. Results

As shown in Table 1, adults perform highly targetlike on all four conditions. Children's performance was close to 50% targetlike on most conditions, with the exception of SuNst.⁴

	SuNst	ObNst	SuSt	ObSt
Children	72	50	43	44
Adults	98	82	91	86

Table 1: percent targetlike responses children and adults

A MANOVA shows a significant main effect for condition ($F=13.613$, $p=0.000$) and for group (children vs. adults, $F(1,38)=108.256$, $p=0.000$), and a significant interaction effect ($F(1,38)=3.069$, $p=0.040$). An ANOVA shows that there was an effect of condition in children ($F=18.814$, $p=0.000$). Post-hoc t-tests show that SuNst differs from all other conditions (SuNst vs. ObNst, $t=6.216$, $p=0.000$; SuNst vs.

³ Most filler items belonged to an experiment on pronominal anaphora (testing the presence of the so-called Delay of Principle B Effect). Six fillers did not test any linguistic competence, but only served to check the subjects understanding of, and attention to the task.

⁴ Note that children's errors overwhelmingly involve reference to the wrong antecedent of the pronoun. Reference to the non-related filler picture was rare: it accounts for hardly 5% of the errors in the ObNst, SuSt and ObSt conditions, and did not happen at all in the SuNst condition.

SuSt, $t=6.518$, $p=0.000$; SuNst vs. ObSt, $t=7.472$, $p=0.000$). The other three conditions did not differ significantly from each other ($p > 0.05$).

Table 2 shows that children perform less targetlike on stressed (SuSt + ObSt) than on the non-stressed (SuNst + ObNst) conditions.

	Non-stressed	Stressed
Children	61	44
Adults	91	88

Table 2: Percent targetlike performance on Stressed and Non-stressed conditions

A t-test shows children's performance on Stressed to differ significantly from their performance on Non-stressed ($t=6.623$, $p=0.000$). This difference was not significant in adults ($t=0.403$, $p=0.699$).

6. Lack of knowledge vs. lack of processing resources

The results show that Spanish children, like the English children in the McDaniel and Maxfield's study, perform better on parallelism than on contrastive stress. Similar results were found for Dutch children (Zuckerman, Avrutin and Vasić 2002). However, their performance on parallelism was still far from adultlike. Particularly, their performance on the Object Non-stressed condition was 50% targetlike, and did not differ significantly from the two stressed conditions.

If we compare the present results with results from Zuckerman, Avrutin and Vasić' (2002) study on Dutch children, we observe that the Spanish children perform a little better than the Dutch children, especially on SuNst. However, the Spanish children also performed better than the Italian children studied by De Lange (2003), although Italian is similar to Spanish in that it shows a full pronoun vs. clitic/null-subject distinction. This indicates that the presence of a full pronoun vs. clitic/null-subject distinction in Spanish (or Italian) does not give children a developmental advantage with regard to the application of parallelism and the correct interpretation of contrastive stress.

The experimental results give rise to three questions: (i) why do children show problems with parallelism, (ii) why do they show more problems with contrastive stress than with parallelism, and (iii) why do children perform better on non-stressed subject pronouns (SuNst) than on non-stressed object pronouns (ObNst)?

Children's poor performance on parallelism and contrastive stress could be argued to be the result of incomplete acquisition of the relevant discourse principles. However, the experimental results do not justify this conclusion. Children perform above chance level on SuNst. It could be argued that this does not prove knowledge of parallelism, since children might apply an alternative strategy, always selecting the subject of the first conjunct as the antecedent. However, if this were the case, it is unexpected that children still perform 50% targetlike on ObNst, instead of 0%. This means that something prevents children from always selecting the first conjunct's subject as the antecedent of the non-stressed object pronoun. We propose that this "something" is parallelism. A similar argument applies to children's knowledge of the interpretative effects of contrastive stress. If children were unaware of these effects, the results on the stressed condition SuSt would be the

mirror image of the results on the unstressed condition SuNst. However, the results show that children perform 43% targetlike on SuSt, instead of 28%, which would be expected if performance on SuSt were the mirror image of their performance on SuNst.

We therefore propose an alternative account of children's poor performance on parallelism, and their even worse performance on contrastive stress. Essentially, we propose that five-year-old Spanish children know parallelism and the reference shifting effect of contrastive stress, but are often unable to correctly implement this knowledge, due to a lack of processing resources (see Grodzinsky and Reinhart 1993, for a similar account of coreference errors in children).

Children's poor performance on parallelism can be explained in the following way. Parallelism makes use of syntactic concepts such as *subject* and *object*. This means that in order to apply parallelism, the syntactic structure of the first conjunct has to be stored in working memory. Suppose now that syntactic configurations deteriorate more rapidly in children than in adults, due to children's more limited processing resources. In that case application of parallelism will fail, and children may resort to another strategy to determine the reference of the pronoun. As we will see in Section 8, this other strategy contributes to children's relatively good performance on SuNst.

The interpretation of contrastive stress is even more problematic for children. Recall that contrastive stress signals a reference shift of a pronoun to the antecedent not selected by parallelism. This requires the parallelism construal to be present at some level. As we have argued, the rapid deterioration of syntactic structures prevents children from applying parallelism. As a result, contrastive stress cannot be interpreted. But even if children manage to maintain the parallelism construal (and children sometimes will), this still does not guarantee a perfect ability to interpret contrastive stress. After the parallelism construal is formed, the child has to look for an antecedent that does not match the antecedent selected by parallelism. We assume that this second step exceeds many children's processing capacity even more so than applying parallelism does, to the effect that they will resort to alternative strategies to identify the antecedent of the stressed pronoun. In section 8, we will discuss which strategies children apply to interpret contrastively stressed pronouns.

Interestingly, this account is supported by evidence from a population that is claimed to have a limited processing capacity, but that is no longer in a process of language acquisition, namely agrammatic Broca aphasics.

7. Preliminary experimental evidence from Spanish agrammatism

Up till this moment only one agrammatic Broca aphasic has been tested. The patient is a 50-year-old man, from the north of Navarra. He suffered a CVA ("stroke") in the left hemisphere of the brain 10 months before the testing took place. He was diagnosed as a Broca aphasic by the Barcelona Test (Peña Casanova 1991), and this diagnosis was confirmed by his speech therapist, based on her clinical observation. The patient was recruited from the Ubarmin clinic in Elcano, near Pamplona, Navarra.

Like the children, he was presented a Picture Selection Task. This task contained all the items of the child experiment. In order to increase the number of

data points, five extra items per test condition were added, so that each test condition consisted of 13 trials. These were intermingled with 48 filler items.⁵ The total number of items was 100, presented to the patient in two sessions of 20-25 minutes each, with a brief pause between the two sessions. Before the actual test started, some practice items were administered.

In addition eight non-brain damaged controls were tested. The controls were Psychology students from the University of Oviedo, with no linguistic knowledge.

As Table 3 shows, the pattern exhibited by this patient was highly similar to the pattern found in children.

	SuNst	ObNst	SuSt	ObSt
Agrammatic	84	62	0	46
Controls	97	88	89	86

Table 3: percent targetlike responses agrammatic aphasic speaker and controls

Although the patient performed better on SuNst than on ObNst, like the children, this difference does not reach statistical significance (Fisher exact, $p = 0.3783$). Unlike the children this patient performed extremely non-targetlike on SuSt: he always interpreted the stressed subject pronoun as referring to the subject of the first conjunct, instead of the object.⁶

As shown in Table 4, this patient performed much better on Non-stressed than on Stressed, just like the children.

	Non-stressed	Stressed
Agrammatic	73	23
Controls	92	88

Table 4: Percent targetlike performance on Stressed and Non-stressed conditions

This difference was statistically significant (Fisher exact, $p = 0.0007$).

8. Parallelism, contrastive stress and Topic Prominence

The results indicate that agrammatics, like children, perform less than targetlike on parallelism and worse on contrastive stress. Similar results have been obtained for Dutch and Russian agrammatics, using virtually the same materials (Ruigendijk, Vasić and Avrutin 2002; Zuckerman, Vasić, Ruigendijk and Avrutin 2002; Avrutin, personal communication). These results support a processing account of children's non-adultlike performance.

There is still one issue that needs to be addressed. If we consider again the child results, we observe better performance on non-stressed subject pronouns (SuNst)

⁵ Like in the child experiment, most filler items belonged to an experiment on pronominal anaphora. Nine fillers did not test any linguistic competence, but only served to check the subjects understanding of, and attention to the task.

⁶ Like the children, the patient's incorrect responses involve reference to the wrong antecedent. He pointed at the non-related filler picture only once, in the ObNst condition.

than on non-stressed object pronouns (ObNst). This means that children often identified non-stressed object pronouns with the subject of the first conjunct, instead of the object. A similar tendency, although weaker, was shown by our agrammatic patient, and by the Dutch patients studied by Ruigendijk et al. (2002). Additionally, the patient showed another interesting tendency: he performed better on stressed object pronouns (ObSt) than on stressed subjects pronouns (SuSt). In fact, the patient always identified the stressed subject pronoun with the subject of the first conjunct, instead of the object. These results reveal an important tendency in children and the agrammatic: non-targetlike reference is predominantly subject-directed rather than object-directed.⁷ A comparison of children's targetlike performance on the conditions designed to elicit object reference (SuSt+ObNst) with their targetlike performance on conditions eliciting subject-directed responses (SuNst+ObSt) makes this clear. While children perform 47% correct on SuSt+ObNst, their performance on SuNst+ObSt was 58% of the time correct. A t-test shows this difference to be significant ($t=2.997$, $p = 0.005$). The same applies to the agrammatic's performance. His performance was only 31% targetlike on SuSt+ObNst, but was 65% targetlike on SuNst+ObSt. This difference too was significant (Fisher exact, $p = 0.0254$).

The tendency to prefer subject reference is also reflected in Figure 1, in which non-targetlike responses are split up between incorrect subject reference (incorrect responses on ObNst and SuSt) and incorrect object reference (incorrect responses on ObSt and SuNst).

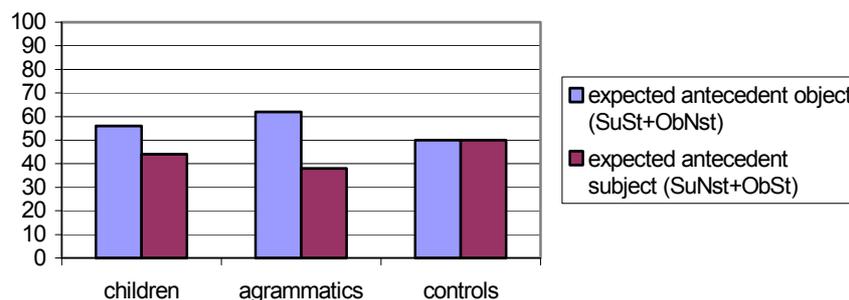


Figure 1: types of incorrect responses as percentage of total of incorrect responses⁸

Figure 1 clearly shows that children and agrammatics' errors tend to be subject-directed rather than object-directed. Similar results have been found for Dutch children and Dutch and Russian agrammatics (Ruigendijk et al. 2002; Zuckerman, Vasić, Ruigendijk and Avrutin 2002; Avrutin, personal communication).

We propose that these results show the effect of a discourse principle that we will call the **Topic Prominence Principle** (TPP). This principle states that sentence topics are privileged antecedents for pronouns. Since the sentence topic is normally the subject of the sentence, the TPP will have the effect of making the subject the

⁷ A similar tendency was found by Maratsos (1973) in the stressed conditions; children performed less targetlike on stressed subject than on stressed object pronouns.

⁸ The control data represented in this figure are from the agrammatism study.

most prominent antecedent of the pronoun (Li and Thompson 1975; Prince 1992). In coordinate structures such as (6) the TPP is overridden by parallelism (and contrastive stress interpretation, which makes use of the parallelism construal). However, the TPP surfaces again when for some reason parallelism cannot be computed. This is the case for young children and agrammatics.⁹

We have argued that parallelism makes use of syntactic notions such as subject and object. This means that in order to apply parallelism the syntactic configuration of the first conjunct has to be kept in working memory for some time. Syntactic configurations deteriorate more rapidly in children and agrammatics than in non-brain damaged adults, due to children and agrammatics' more limited processing resources. As a result, children and agrammatics will often, but not always, fail to apply parallelism, and resort to the TPP in order to identify the antecedent of the pronoun. Unlike parallelism, the TPP does not make use of syntactic notions such as *subject* and *object*, but only of the discourse notion *topic*. This means that syntactic structure need not be kept in working memory; the TPP can be applied as long as the information structure or discourse representation of the first conjunct is maintained. Children and agrammatics' relatively good performance on SuNst and their poor performance on ObNst follow from the interaction of the TPP and parallelism.

Let us start with SuNst. We have argued that children and agrammatics know parallelism, but have difficulties with the application of this knowledge. Consequently, they will sometimes succeed in applying this principle, but will often fail to do so. Suppose they manage to apply parallelism successfully. In that case they will correctly identify the first conjunct's subject as the antecedent of the null subject. Suppose they fail in their attempt to apply parallelism. In that case they will resort to the TPP. However, the TPP also leads them to identify the null subject with the subject of the first conjunct. This means that for SuNst both parallelism and the TPP lead children to correctly choose the subject of the first conjunct as the antecedent of the null subject, which explains children and agrammatics' relatively good performance on SuNst. Let us now turn to ObNst. In the case of the ObNst condition, parallelism and the TPP do not converge on the same antecedent. When children and agrammatics manage to apply parallelism, they will choose the object of the first conjunct as the antecedent of the clitic pronoun. But when they fail to apply parallelism, the TPP will lead them to choose the subject of the first conjunct

⁹ When non-brain damaged adults make errors they tend to show the same pattern as children and agrammatics, showing more subject directed errors than object directed errors. This tendency was observed in the Dutch and the Russian controls (Ruigendijk et al. 2002; Zuckerman, Vasić, Ruigendijk and Avrutin 2002; Avrutin, personal communication), but, as Figure 1 shows, not in the Spanish controls, probably because of a ceiling effect. The similar distribution of the errors in non-brain damaged controls shows that the TPP is also active in non-brain damaged adult, and surfaces whenever for some reason application of parallelism (or interpretation of contrastive stress) fails. It also supports the processing account defended in this paper, since it shows that even non-brain damaged adults show, qualitatively, though not quantitatively, similar performance as children and agrammatics if for some reason computation of parallelism and/or contrastive stress fails.

Note finally that the TPP has also been made visible in non-brain damaged adults by using on-line tasks, such as in Carminati's (2002) self-paced reading experiment, in which she tested Italian adults on their interpretation of null-subjects.

as the antecedent of the clitic pronoun. This means that with ObNst parallelism and the TPP lead to the identification of different antecedents for the pronoun, which explains children and agrammatics' lower performance on this condition.

As we have argued before, contrastive stress signals a shift in the reference of the pronoun with respect to the antecedent selected by parallelism. Keeping the parallelism construal is difficult by itself (see above), but performing the required reference shift often, but not always, exceeds children and agrammatics' processing capacity. We propose that children and agrammatics' interpretation of contrastive stress can proceed in several ways. The first possibility is that children succeed in maintaining the parallelism construal long enough and also succeed in performing the reference shift. In that case children will correctly choose the subject of the first conjunct as the antecedent in the ObSt condition and the object in the SuSt condition. Suppose children fail in their attempt to apply parallelism. Then contrastive stress cannot be interpreted, since it requires a parallelism construal. The child or agrammatic will resort to the TPP and select the subject of the first conjunct as the antecedent of the pronoun. Alternatively, the child or agrammatic may succeed in maintaining the parallelism construal but fail to realize the reference shift associated with stress. There are two ways in which this can take place. One way is that the child or agrammatic avoids computing contrastive stress and sticks to the parallelism construal, if it is still present, assigning subject reference to the pronoun in the SuSt condition and object reference in the ObSt condition. Alternatively, children and agrammatics may try to interpret contrastive stress, but fail in their attempt to compute the reference shift. In that case the computation breaks down, and children and agrammatics resorts to the TPP, selecting the subject of the first conjunct as the antecedent for both SuSt and ObSt. Summarizing, the computation of contrastive stress will lead to different outcomes, depending on the child or agrammatic's success at carrying out the different steps that this operation involves. At group level this will often lead to a roughly 50% performance on both stressed conditions, although at the individual level other patterns may be expected, such as the pattern shown by our agrammatic patient.¹⁰

This account of children and agrammatics' difficulties with the application of parallelism fits a more general view on language acquisition and Broca aphasia proposed by Avrutin (1999; to appear). According to this view children have adultlike syntactic competence from a very early age. This competence is preserved in Broca aphasia. What is lost in agrammatics (as a result of brain damage) and needs to develop in children is the ability to *use* syntax to structure information. When children and agrammatics are unable to use syntax for information structuring,

¹⁰ Apparently the agrammatic sometimes stucked to parallelism instead of trying to compute the reference shift, and sometimes applied the TPP, either as a result of his failure to maintain a parallelism construal, or as a result of his failed attempt to compute the reference shift. This leads to a very poor performance on the SuSt condition (application of parallelism and the TPP lead to incorrect subject reference), but also a better, but far from targetlike, performance on ObSt (application of parallelism leads to incorrect object reference, the TPP leads to correct subject reference). Note that the Dutch agrammatics studied by Ruigendijk et. al (2002) and the Russian agrammatic patients studied by Avrutin (personal communication) showed a group pattern that was similar to that of the Spanish children, showing a roughly 50% targetlike performance on both stressed conditions.

they will resort to extra-syntactic means for structuring information. In this particular study, this is reflected in children and agrammatics' resort to the TPP when they fail to apply parallelism (which requires syntactic structure to be present).

9. Conclusion

In this study we showed that Spanish children exhibited difficulties with the application of two principles that regulate the interpretation of pronouns in coordinate structures: parallelism (object refers to object, subject to subject) and stress induced reference shift (choose the antecedent not selected by parallelism). We have argued that children know parallelism, but that the rapid deterioration of the syntactic representation that this principle draws on, leads children to resort to the Topic Prominence Principle, a principle that draws on a discourse/information structure representation. The results also showed that children exhibited more difficulties with the interpretation of contrastive stress than with the application of parallelism. We argued that this is the result of the additional complication implied by the application of the reference shift operation, which requires the presence of the parallelism construal, complicated in itself. This view on children's errors, which is supported by results from other languages and from (adult) agrammatism, supports Avrutin's (1999) claim that children and agrammatics have full syntactic competence, but have problems with the use of syntax to structure information, resorting to extra-syntactic means of information structuring instead.

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