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SUBJECTS FIRST! THE ROLE OF WORD ORDER AND PROSODIC PROMINENCE AS DISAMBIGUATING CUES IN ITALIAN.

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Abstract

In Italian, dislocation in the left periphery generates non-canonical word orders that might result in ambiguous strings. In particular, object focus fronting with an overt lexical subject generates the string DP DP V that is compatible both with a SOV and with a OSV interpretation. Prosody and discourse provide cues that disambiguate the sentence and in this study we looked at children sensitivity to this type of information. Anticipating the results, we found a strong preference in children for a SOV interpretation, indicating that children's preferred parsing strategy is the one that interprets the first DP as the sentential subjects. We also found that children by the age of 5 are already sensitive to the distinctive prosodic contour that mark the focused object and that they can use this information to correctly disambiguate the sentences.

1. Introduction

The articulated layer of functional projections that characterize the Italian Left-Periphery (Rizzi 1997, 2004) permits to signal several discourse-related properties through modifications in the canonical word order. In this way, Italian speakers can communicate the way they package the information using both a phonological and a syntactic marking. In particular, constituents that serve as Topic or Focus can be dislocated and fronted into dedicated left-peripheral positions. The representation in (1), based on Rizzi (2004), illustrates the array of syntactic position available in the Italian Left-Pheriphery:

(1) Force Top* Int Top* Focus Mod* Top* Fin IP (Rizzi 2004)
che$_{+fin}$ *di*$_{-fin}$
Positions target by A' moveemnt

Arguably, this articulated stack of syntactc positions has to respect general principles of language architercture (e.g. the unicity of the focus position) but several of its properties, caracterizing the Italian left-pheriphery, must be learned. Considering Topics alone, Italian allows their recursion and the presence of post-focal low Topics. Other language show instead a different parameterisation. If we consider languages with overt morpholgy marking Topics and Focus, we observe that while some of them, as Gungbe, have no topic recursion (Aboh 2004), while others, as Abiji, do not allow post-focal topics (Rizzi & Bcci 2017). From this it follows that the correct order of functional projections has to be learned by joung speakers and this can be achieved only if sentences with more than one left-disclocated element are correctly parsed by young children. This is the most direct evidence needed to hypotesyze the relative ordering of projections. To date, however, there is no suystematic study investigating how children process sentences with more than one left-dislocated element. We will concentrate here on the specific case given by by constructions in which the object is contrastively/correctively focalized and it is moved from its canonical clause-internal position to a dedicated Focus position. Non-canonical word orders, such as OSV and SOV (with the subject also moved to a left-peripheral topic position) can then be obtained, but only to the extent that discourse-pragmatic and prosodic conditions are also satisfied. Given that in these types of constructions various syntactic, pragmatic and prosodic factors come into play, it is a significant question for acquisition studies to ask when and how these factors develop in children's grammar and interact with each other. A case that I consider particularly instructive is given by sentences like (2), in which a non-canonical sequence with two DPs precedes the verbal cluster:

(2) la tigre la zebra ha battuto
the tiger the zebra has defeated
a. "the tiger defeated the zebra" SOV
b. "the zebra defeated the tiger" OSV

The string in (2) is in principle compatible with the two different interpretations in (2a) and (2b), depending on the theta-role assigned to the two DPs.A crucial point, however, is that this particular word order is felicitous only when the appropriate prosodic and discursive requirements are met and both prosody and discourse-pragmatics provide the necessary interpretive cues to decide between (2a) and (2b). When the object is correctively focalized, the string in (2) is felicitous given an appropriate context and a correct prosodic realization . Consider (2) in a corrective context:

(3a) Speaker A: la tigre ha battuto il coccodrillo
Speaker B: No! la tigre LA ZEBRA ha battuto (SOV only)

(3b) Speaker A: la tigre ha battuto il coccodrillo
Speaker B: No! LA ZEBRA la tigre ha battuto (OSV only)

Placed in a Corrective-Focus context (Bocci, Bianchi & Cruschina (2015) the sentence is now disambiguated: the object receives a distinctive L+H* intonation and it expresses a correction that individuates one of the alternatives in the focus set given by all the animals that have been beaten by the tiger. Corrective focus has the following properties:

(4) Properties of Corrective-Focus Constructions
(a) CF is employed to correct part of a previous statement
(b) CF can trigger A'-movement to the sentence left-periphery
(c) CF constituent is marked by a distinctive L+H* pitch accent

The properties in (4) then correspond to different types of information that adults and children could exploit to disambiguate strings like (1). This study tries to assess if children can use the distinctive prosodic contour to decide what DP is the focused object in structures like (1) and if they are able to move it across the subject.

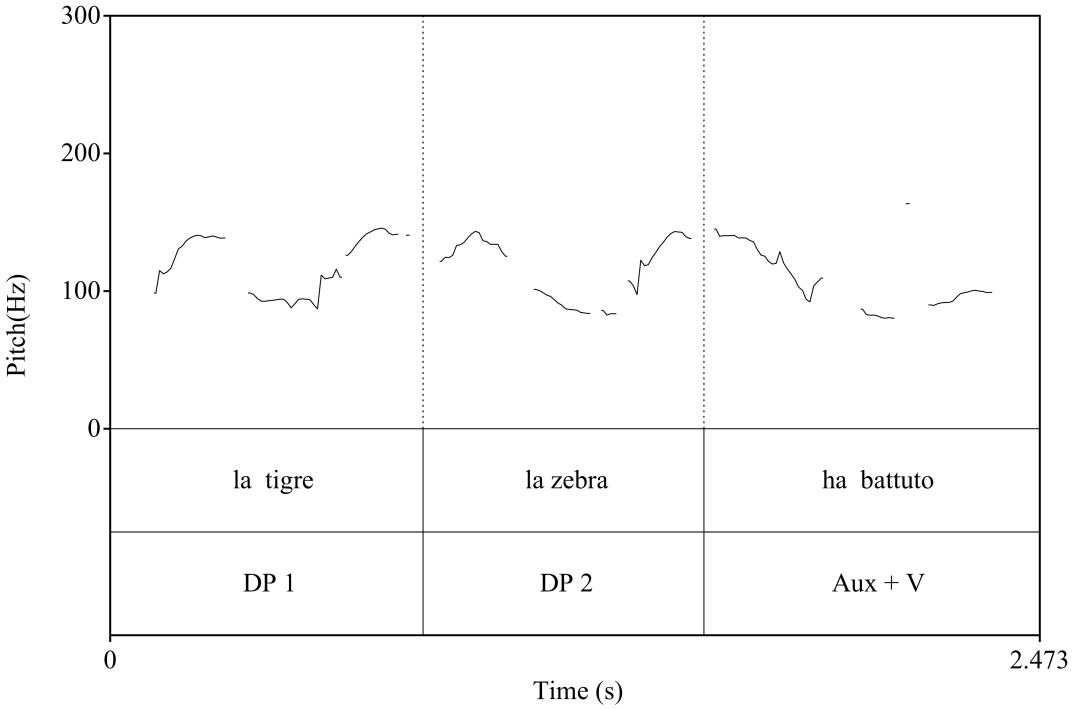
2. The experiment: prosody and word order in interpreting object-fronting

Strings of the form DP DP V have been tested using contexts in which either the first or the second DP could count as the correctively focused object. As shown in (2), repeated in (5) below, this string is potentially ambiguous between the SOV and OSV reading:

(5) [la tigre^{DP1}] [la zebra ^{DP2}] ha battuto (either SOV or OSV)
the tiger the zebra has defeated

In order to assess what drives children's correct individuation of the fronted object, we manipulated two factors: the prosody and the position of the fronted object. The first manipulation was relative to the pitch contour assigned to the fronted object. This was a between subjects manipulation and participants were divided into two groups: the first group heard the sentences with both DPs receiving a flat topic-like intonation. This contour is shown in figure 1. As the figure shows, the intonation of the two DPs is very similar and no prosodic information can be used to identify which one is the focused left-dislocated object.

Figure 1. Pitch contour for DP 1 and DP 2 in the no prosody condition.



The second group of participants heard instead sentences in which the focused object received prosodic prominence. Therefore, depending on which one of the two DPs served as the focused object, participants heard two different pitch contours. They are illustrated in figures 2 and 3, corresponding to (3a) and (3b) in the same context. The different pitches can then be used by participants assigned to this group to disambiguate between the SOV (Figure 2) and the OSV interpretation (Figure 3).

Figure 2. Pitch contour in the SOV condition.

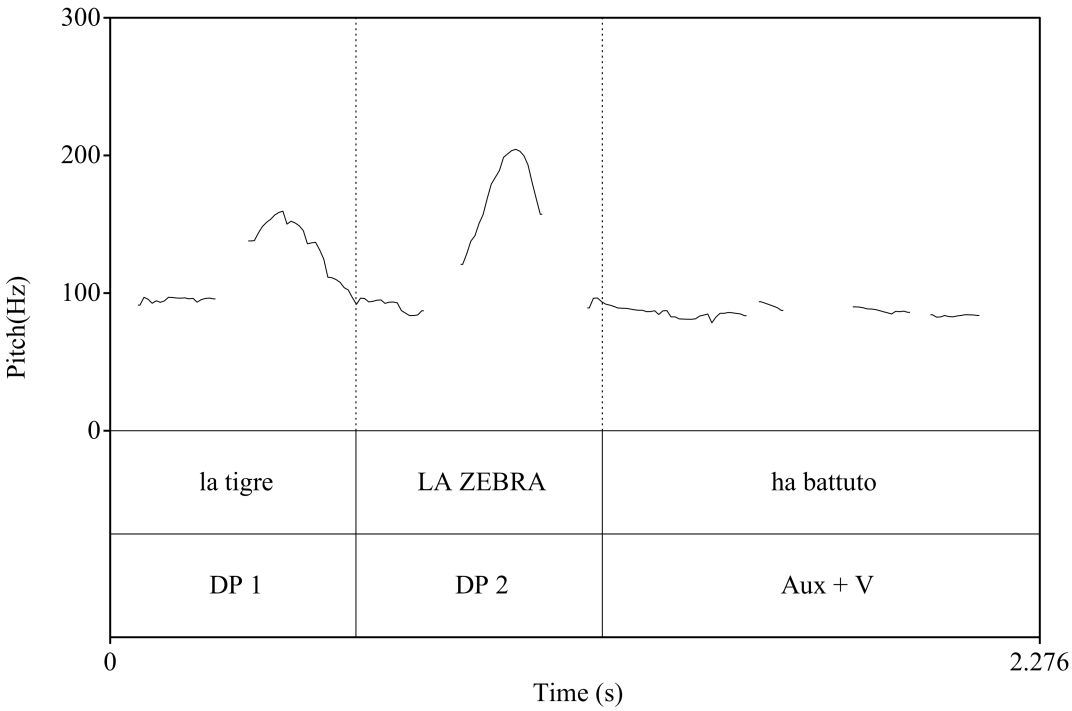
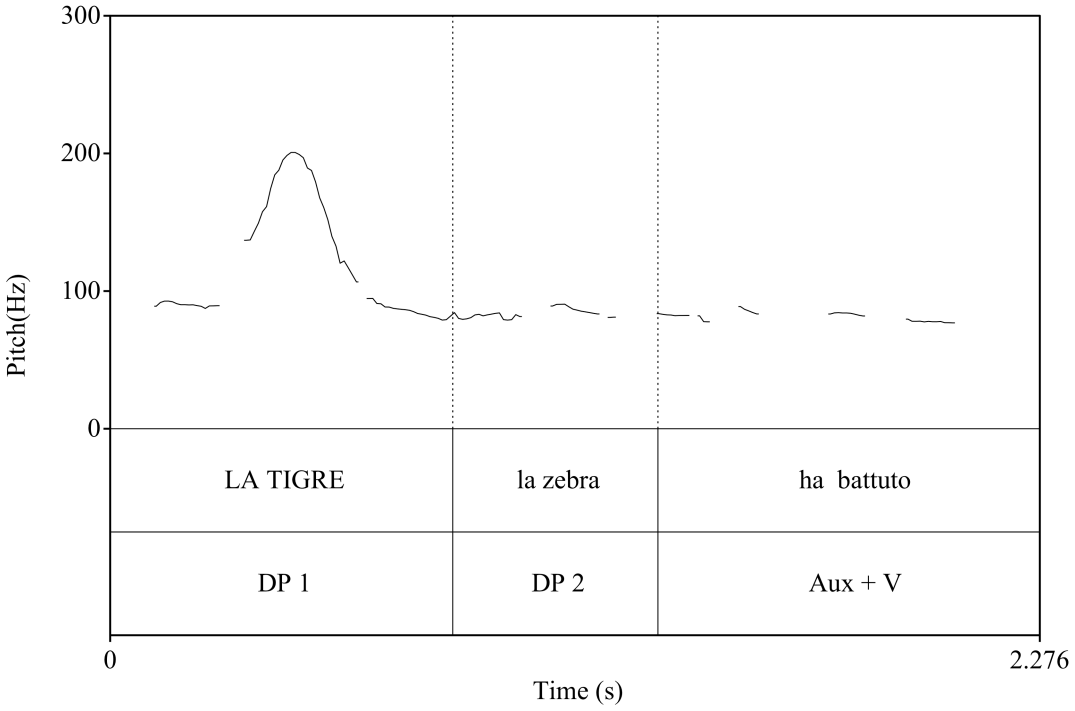


Figure 3. Pitch contour in the OSV condition



The second experimental manipulation was in the word order. Assuming that a high topic position above Focus is also available and that it can host a topical subject, the focalized object can either precede or follow the subject. In order to assess whether word-order also plays a role in driving children's interpretation, we vary the position of the object. All participants heard sentences in which half of the times the object was in sentence initial position and the other half it followed the subject. In sum, our experimental design was a 2 X 2, given by the combination of Prosody (+ focus, - focus) and Word Order (SOV, OSV). The four experimental conditions are reported in table 1.

Table 1. Exprerimental conditions

Conditions	Focus Prosody	WO	Test sentences
1	+	SOV	La tigre$_{sing}$LA ZEBRA$_{sing}$ ha$_{sing}$ battuto
2	+	OSV	LA TIGRE$_{sing}$ la zebra$_{sing}$ ha$_{sing}$ battuto
3	-	SOV	la tigre$_{sing}$ la zebra$_{sing}$ ha$_{sing}$ battuto
4	-	OSV	la zebra$_{sing}$ la tigre$_{sing}$ ha$_{sing}$ battuto

To test the target sentences, the experimental procedure simulated natural exchange between two characters. They appeared on screen immediately after the presentation of a short story and one of them corrected what the other just said using a focus-fronting structure of the kind reported in table 1.

The experimental sentences were introduced by narrating to children brief stories that make true and felicitous either the OSV or the SOV interpretation. In order to make the corrective-focus interpretation appropriate, we provided a short exchange between Alien and Pinocchio: Alien is an extra-terrestrial who has just landed on earth and who knows nothing about our planet. For this reason, Alien asks for Pinocchio's help, whose task is to correct him whenever he says something incorrect. However, the experimenter also warned the participants that Pinocchio is not fully reliable and that his corrections are sometimes wrong. Thus, participants' task was to signal if Pinocchio's corrections were right or wrong. To illustrate the procedure, consider the following scenario that was narrated with the aid of a series of pictures appearing on the computer screen.

(6) Experimenter: *in this story the zebra sees some balls and she thinks that it will be fun to have a competition. So she challenges a tiger and a giraffe, saying that the winner is the one who will push more balls. The zebra goes first and she pushes two balls. The giraffe comes next and she pushes three balls. The tiger comes last and she manages to push only a single ball.*

At this point, the result is the following:
(7) Giraffe > Zebra > Tiger.

To be sure that participants correctly understand the story, the experimenter asked who was the winner, who was the second and who was the last one. At this point, Alien appeared on screen and gave his version of what happened. Immediately after, Pinocchio popped out on screen and corrected Alien. In the OSV condition, he uttered the sentence with the first DP being the corrective-focalized object; in the SOV condition Pinocchio corrected Alien but this time the corrective-focalized object was the second DP:

Condition 1: O^{foc} S V
(7) a. Alien. La zebra ha battuto la giraffa
b. Pinocchio. No! LA TIGRE$_{sing}$ la zebra ha$_{sing}$ battuto
(OSV, TRUE, CORRECTIVE PROSODY)
Condition 2: S O^{foc} V
(8) a. Alien. La zebra ha battuto la giraffa
b. Pinocchio. No! la zebra$_{sing}$ LA TIGRE$_{sing}$ ha$_{sing}$ battuto
(SOV, TRUE, CORRECTIVE PROSODY)

We expect that if both the OSV and SOV word order are accessible, children's acceptance rate should not vary between condition 1 and 2. The testing scenario for Condition 3 and 4 was the same, with the sole difference that the same intonation was assigned to both DPs.

Condition 3: OSV
(9) a. Alien. La giraffa ha battuto la tigre
b. Pinocchio. No! la zebra$_{sing}$ la giraffa$_{sing}$ ha battuto
(OSV, TRUE, PROSODIC VIOL.)
Condition 4: SOV
(10) a. Alien. La giraffa ha battuto la tigre
b. Pinocchio. No! la giraffa$_{sing}$ la zebra$_{sing}$ ha battuto
(SOV, TRUE, PROSODIC VIOL.)

To control for children's correcting understanding of the task, 4 simple SVO sentences were also added. In addition, there were also 16 fillers, similar to the test sentences but with a number mismatch between DP1 and DP2 that disambiguate the sentence.

Method & Materials
All the stories were presented on a computer screen showing a series of pictures that accompanied the narration. Before the beginning the task, participants heard a short introduction that provided a plausible frame for the exchange between Alien and Pinocchio. In the introduction, participants were familiarized with the procedure by a preliminary naming task. Alien saw an animal and then he incorrectly named it. For example, he saw a hippopotamus and said "*this is a giraffe*". At this point, Pinocchio appeared on the screen and tried to correct Alien, naming the animal either correctly "*No! This is a hippo*" or incorrectly "*No! This is a zebra*". Six familiarization trials of this sort preceded the experimental trials.

In the experimental session, in the first two stories Pinocchio always used a SVO sentence to correct Alien. These two sentences served as a warm-up and were inserted to be sure that children correctly understood the task. Successively, participants heard 20 stories. 4 stories were used for the SVO controls and 16 for SOV or OSV sentences, of which 8 matched the picture (true) and 8 did not match the picture (false). Prosody was manipulated between subjects, so that each subject saw 4 SOV and 4 OSV true sentences, with or without focus prosody. The experimental conditions were the same reported in Table 1.

Participants
33 adults (Age > 22) and 41 children (mean = 5;7, SD = 2,9 months) recruited at the Kindergarten Mameli in Florence. From the children's group we excluded 7 children: four decided to interrupt the task right after the preliminary naming task and three paid little attention to the task giving random answers to both the warm-up items and to the SVO sentences. The 33 adult controls were assigned either to the [+prosody group] (N=16) or to the [-prosody group] (N=17), while 34 children were equally split (N=17) between the [+prosody group] or to the [-prosody group]. Mean age was the same in both children group (mean 5;6).

Results

In figure 4 we report subject's proportion of correct acceptances of true sentences for the SVO controls. The figure shows that participants in both groups had no trouble in accepting the SVO sentence when they were true in the context and rejecting them when they were false. We take this as indicating that whenever the sentence's theta-structure is clear, as in canonical SVO sentences, children had no trouble in understanding the experimental task. Figure 4 also shows the absence of any positive bias: the proportion of correct acceptances is comparable to the one of correct rejections.

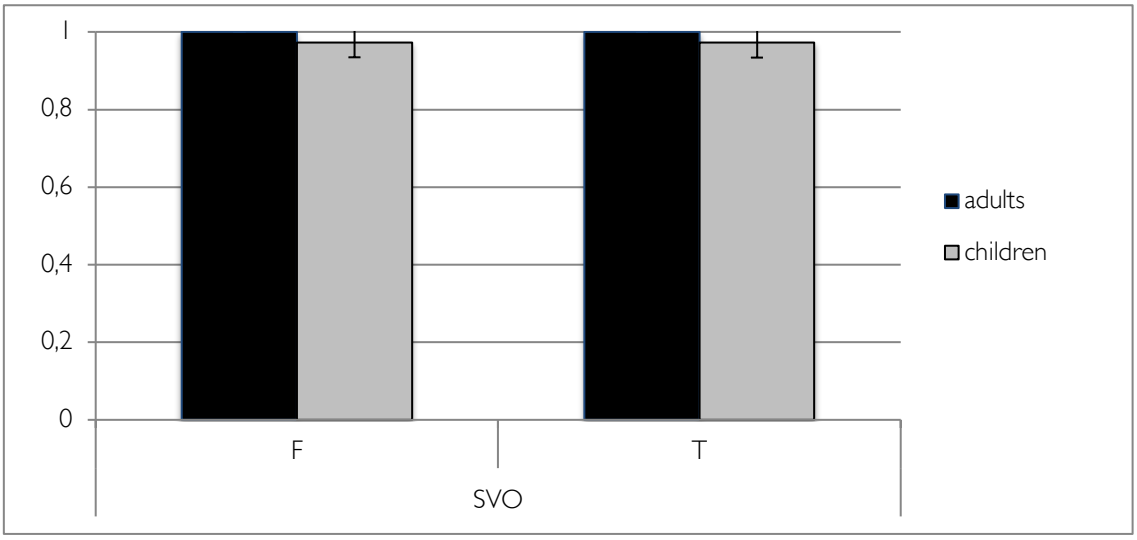


Fig. 4 Proportion of correct acceptances for true SVO sentences. Error bars = 2.S.E.

We turn now to the target sentences, presenting the results separately for adults and children. Figure 5 shows that adults were much more likely to accept true sentences in the SOV condition[1]. In this condition they were at ceiling and no effect of the prosodic manipulation is visible. In the OSV condition, instead, adults had a tendency to reject sentences that were actually true, showing that this interpretation is less accessible to them. In the OSV condition an effect of the prosodic manipulation become visible: while participants in the group with no focus prosody accepted the OSV interpretation only in 20% of cases, in prosody group the acceptance rate jumped to 56%.

[1] Our dependent variable was the correct acceptance of true sentences. We did not considered rejections. The reason is that whenever the sentence was false under a certain interpretation, we cannot say whether the rejection has to be classified as a correct answers or if the sentence was rejected because participants did not find it fully grammatical.

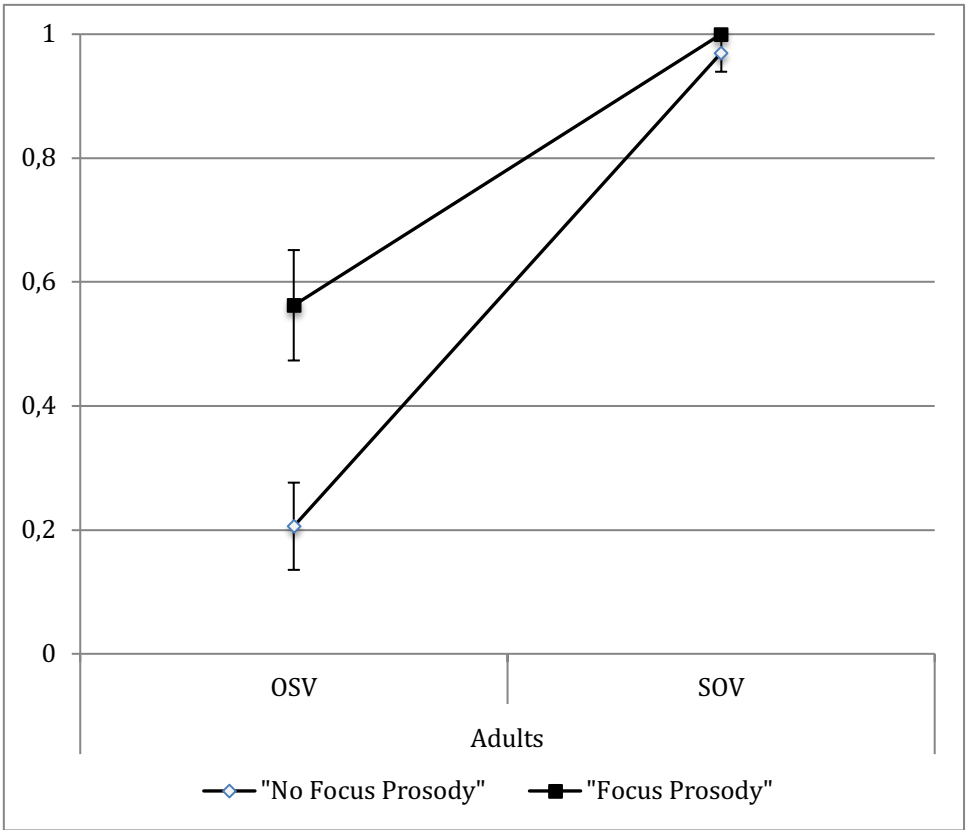


Figure 5. Proportion of correct acceptances for true OSV and SOV sentences in the adult groups with or without focus prosody. Error bars = 2.S.E.

For what concerns the effect of Word Order, children's results are not dissimilar from the adult ones. The pattern is reported in Figure 6. As the figure shows, children had less trouble in the SOV than in the OSV conditions. However they were not at ceiling like adults in the SOV condition. For what concerns the manipulation of Prosody, it didn't seem to help children in the OSV condition and its effect was also limited in the SOV condition.

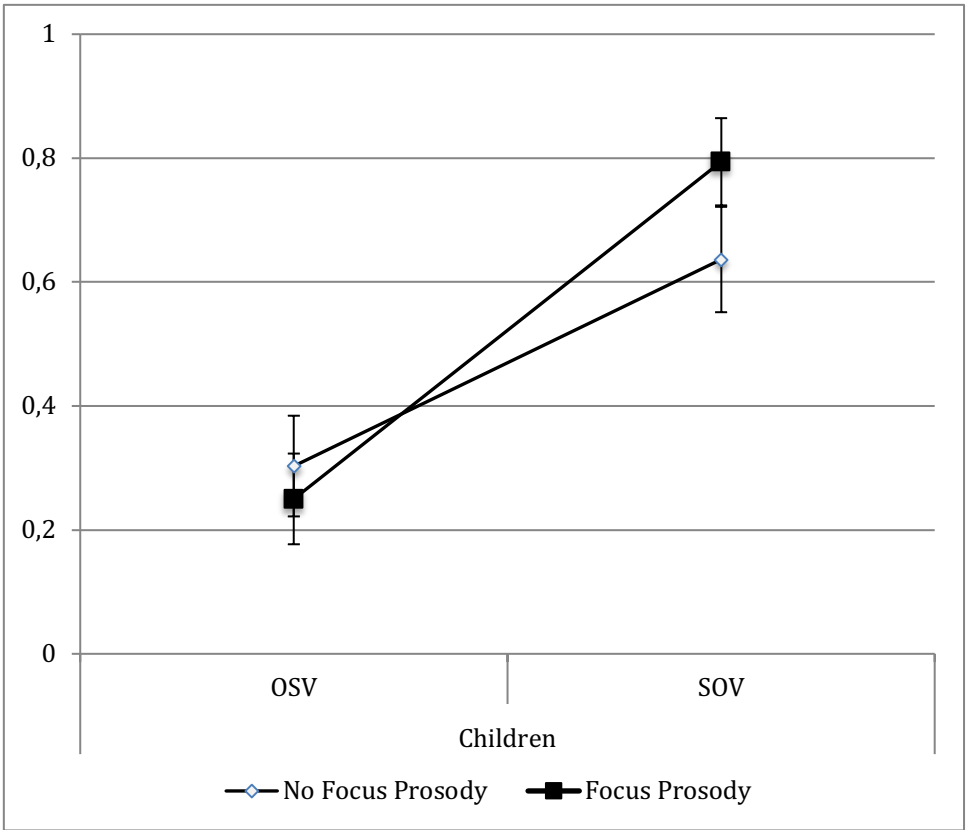


Figure 6. Proportion of correct acceptances for true OSV and SOV sentences in the child groups with or without focus prosody. Error bars = 2.S.E.

In order to verify the effect of Word Order and Prosody on the proportion of correct acceprtaces, we analysed the results in R fitting the data into two Generalized Mixed Effect Models, one for adults one for children. We used Prosody and Word Order as fixed effects and Subject and Item as random effects. The results are reported in Table 2, for adults, and in Table 3 for children. The analyses revealed a main effect of Word Order in both groups ($p < 0.01$), showing that the proportion of correct answers was higher in the SOV condition, reaching statistical significance. In addition, a main effect of Prosody was also significant in the Adult group, but not in the Child Group.

Table 2. Adults. Fixed effect of Prosody and Word Order from logistic regression of probability of correct answers.

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.4408	0.5900	-2.442	0.01 *
Prosody	1.7111	0.5834	2.933	0.00 **
Word Order	5.0288	1.2603	3.990	0.00 **
Prosody*WO	16.3260	295.6034	0.055	0.95

Formula in R: correct ~ prosody * WO + (1 | item) + (1 | subject). AIC 97.6, BIC 114.8, logLik -42.8, deviance 85.6. Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 3. Children. Fixed effect of Prosody and Word Order from logistic regression of probability of correct answers.

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.3780	0.8717	-1.581	0.11
Prosody	-0.4648	0.9187	-0.506	0.61
Word Order	2.2499	1.0803	2.083	0.03*
Prosody*WO	1.7417	1.1131	1.565	0.11

Formula in R: correct ~ prosody * WO + (1 | item) + (1 | subject). AIC 158.2, BIC 175.6, logLik -73.1, deviance 146.2
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Discussion

The results of our experiment suggest that for non-canonical sentences in which both S and O precede the verb, both children and adults favour the SOV interpretation. This novel result is open to different interpretations. A first possibility is that there is a subject-first parsing preference, in accordance with some previous results on children (Sauermann, Höhle, Chen & Järvikivi 2011; Müller, Höhle, Schmitz and Weissenborn 2006) and adults (Schlesewsky, Fanselow, Kliegl, Krems 2000, De Vincenzi 1991). Although the experimental findings reported here support an account along these lines, a word of caution is needed. In the experiment we tested sentences in which the subject was always given information i.e. Topical while the object was always associated with new information. Therefore we cannot exclude that the preference for interpreting the first constituent as the sentential subject cannot be reframed in terms of a Topic–first preference. This alternative topic-first hypothesis also finds support in previous literature (a.o. Narasimhan & C. Dimroth 2008) and a way to distinguish between these two competing hypothesis would be to run a follow-up experiment in which subjects do not serve as topics.

Turning to focus prosody, the experiment confirmed the role of intonation only in adults, while in children it was only descriptively observable a mild ameliorating effect in the SOV condition. One important open question is why children show no visible improvement associated with the correct prosody in the OSV condition. We got no explanation for this yet, but the reason for this has to be found in whatever factor disfavours the O_{Foc} S_{Top} V interpretation in adults too: it is plausible that the same factor can almost completely block this interpretation in children, regardless of its intonation.

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