

The Role of Number and Gender Features in the Comprehension of Italian Clitic Left Dislocations

Claudia Manetti, Vincenzo Moscati, Luigi Rizzi, and Adriana Belletti

1. Introduction

The present study addresses the issue of the acquisition of A'-dependencies involving Topic positions in the cartography of the left periphery (Rizzi 1997). We focus on intervention configurations of the type identified by the locality principle Relativized Minimality expressed in featural terms as in (1):

(1) In a configuration like:

X Z Y

The dependency between X (target) and Y (origin) cannot be established if Z (intervener) structurally intervenes, and Z and X are positions sharing relevant features (Rizzi 1990, 2004, Starke 2001; Chomsky 2001 for the principle expressed in terms of Minimal search).

We report a study investigating the comprehension of Italian Clitic Left Dislocations (CLLD) by children aged 5 to 6. The study consists of two experiments which test comprehension of transitive sentences with CLLD of the form “DP₁ DP₂ CL V”; the first experiment tested ambiguous sentences as in (2), in which the two DPs match in gender and number and the object clitic can ambiguously refer to either one of the two DPs interpreted as the direct object, hence both Subject Object V and Object Subject V interpretations of the string are possible; the second experiment tested the comprehension of unambiguous CLLDs of the same form, but in which the two DPs mismatch either in number (3a) or in gender (3b), so that reference of the object clitic is unambiguous.

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- (2) Il gatto il cane lo morde
 The cat_{MASC-SING} the dog_{MASC-SING} him_{CL} bites
 ‘The cat the dog bites him.’
- (3) a. I gatti il cane lo mordono
 The cats_{MASC-PL} the dog_{MASC-SING} him_{CL} bite
 ‘The cats the dog bite him.’
 b. La bambina il principe lo fotografa
 The girl_{FEM-SING} the prince_{MASC-SING} him_{CL} photographs
 ‘The girl the prince photographs him.’

By manipulating the featural mismatch we aimed at investigating intervention effects of the type familiar from previous studies on relative clauses (Friedmann et al. 2009) and *wh*-questions (Guasti et al. 2012); specifically, we aimed at testing whether different morphosyntactic features play a (different) role in the comprehension of CLLD-structures similar to the one emerged in previous studies on different A' dependencies such as relative clauses. More specific considerations on the choice of number and gender as the relevant features to be tested are given in 1.2.

1.1. Why comparing number and gender

The two features number and gender have been shown to have a different status in helping young children analyze otherwise problematic structures (Friedmann et al. 2009; Adani et al. 2010; Belletti et al. 2012). As for Italian, Adani et al. (2010) have shown that number mismatch between the (lexically restricted) relative head and the intervening lexical subject significantly improves children's comprehension of object relatives, whereas a mismatch in gender does not. Belletti et al. (2012) have confirmed that gender mismatch with the intervening subject does not enhance children's comprehension of object relatives in Italian, in sharp contrast with Hebrew in children of the same age, thus showing that the very same feature can have a different status in modulating locality in different languages. Under the featural approach to RM illustrated above (Starke 2001, Rizzi 2004), Friedmann et al. (2009) have proposed that only features triggering syntactic movement are relevant for the principle and are consequently able to modulate intervention locality. In Hebrew, gender is part of the set of Phi features expressed in the finite verbal morphology, so that it presumably contributes, as the other members of the Phi set, to triggering syntactic movement of the subject:

- (4) a. Yoni shar
 Yoni sing_{SSING-MASC}
 ‘Yoni sings.’
 b. Miri share
 Miri sing_{SSING-FEM}
 ‘Miri sings.’

Number (but not gender) is a feature triggering syntactic movement in Italian, as witnessed by S-V number agreement:

- (5) a. Il bambino mangia_{SING}
 ‘The kid eats.’
 b. I bambini mangiano_{PL}
 ‘The kids eat.’

Thus, it is a relevant research question to ask whether the same selective role is played by the two features in a different A'-dependency than relative clauses, such as CLLD.

2. The study

In experiment 1, we first examined whether Italian-speaking children and adults would show any preference in the interpretation of ambiguous CLLDs structures of the form DP₁ DP₂ CL V, when the two DPs match in gender and number: this structure is compatible with two possible interpretations: (1) Sub-Obj-CL-Verb or 2) Obj-Sub-CL-Verb.

Secondly, experiment 2 explored the comprehension of unambiguous CLLDs, with a mismatch in either gender or number between the two sentence-initial DPs, and we tested the role of features mismatch in modulating comprehension.

2.1. Experiment 1

2.1.1. Participants

A group of monolingual Italian-speaking children (N=24; aged from 5;0 to 6;2; MA 5;7; SD= 4 in months) took part in the study; they were recruited in three kindergartens in the area of Florence. A group of Italian-speaking adults (N=17, aged from 21 to 50) also participated.

2.1.2. Method and Materials

The experiment consisted of a preference task (picture-sentence matching task)¹, in which we measured the interpretation of ambiguous CLLDs, with both DPs matching in number and gender (ex. 6): participants were asked to match an ambiguous clitic left dislocation to one of two images depicting actional verbs and pairs of either human or animal characters. The two pictures represented the same action but with reversed thematic roles, as shown in Figure 1. This sentence is compatible with two possible interpretations: Subject-Object-clitic-Verb (SOclV) (7a) corresponding to the top picture; or Object-Subject-clitic-Verb (7b) corresponding to the bottom picture.

¹ The pictures were adapted from Belletti, Friedmann, Brunato & Rizzi (2012).

- (6) Il gatto il cane lo morde
 The cat the dog him_{CL} bites
 ‘The cat the dog bites him.’
- (7) a. *SOclV* interpretation:
 The cat_{SUB} the dog_{OBJ} him_{CL} bites (cat biting dog)
- b. *OSclV* interpretation:
 The cat_{OBJ} the dog_{SUB} him_{CL} bites (dog biting cat)

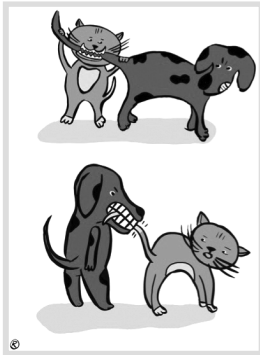


Figure 1

The pictures depicted eight actional verbs (*mordere* ‘bite’, *spingere* ‘push’, *disegnare* ‘draw’, *inseguire* ‘chase’, *bagnare* ‘wet’, *pettinare* ‘comb’, *coprire* ‘cover’, *fotografare* ‘photograph’) and the referents were all animate (either humans or animals), in the masculine and singular form. Both characters were introduced in the discourse (see 8) before each experimental sentence.

We created four main lists in which the introduction of the characters (before the stimuli) and the order of the characters (the two DPs) in the sentence were counterbalanced. The position of the first DP of the CLLD was evenly distributed on the screen within each list, so that when the first DP corresponded to the agent, it evenly appeared on each of the four positions of the screen. The direction of the action (left vs. right) was also balanced within each list (half pairings of pictures presented left-to-right action, the other half presented right-to-left action; in figure 1, the action goes from left to right).

Each list included 16 experimental items and 16 fillers. Fillers consisted of 16 base form verbs (infinitive verb; e.g. *lavare* ‘wash’): the infinitive form of the verb was chosen in order to avoid any other word order in the test (e.g. SVO, SV), which could influence the interpretations of the word order of the ambiguous CLLDs. Experimental items and fillers were presented in pseudo-randomized lists with a maximum of two CLLDs presented sequentially. Five practice trials preceded the test and included three infinitive verb trials and two CLLDs.

We report an experimental trial in (8): the experimenter introduces the two characters, then a recorded voice produces the CLLD, which the participants

could match to one of the two pictures. The sentence could be listened twice in case the participant requested it.

- (8) a. Experimenter: Here there are two animals: the dog and the cat. Now show me in which picture...
 b. Experimental sentence: Il gatto il cane lo morde
 The cat the dog him_{CL} bites

2.1.3. Results

We coded adults and children's responses on the basis of SOclV vs. OSclV interpretations of CLLDs. Overall, adults and children admitted both interpretations (56% SOclV; 44% OSclV). Group-level analysis shows a difference between adults and children: children preferred SOclV (63%) over OSclV (37%); whereas adults admitted both interpretations on a par (SOclV 46% vs OSclV 54%).

Table 1: SO vs. OS preference by group

	SOclV	OSclV
Adults	124 46%	148 54%
Children	239 63%	138 37%
Total	363	286
Mean	56%	44%

We ran a mixed logit model (see Jaeger 2008) to measure whether the interpretations of CLLDs differed across groups (children vs adults): *subject* and *item* were included as random effects, *group* as fixed effect. Extralinguistic factors regarding the position of the characters on the picture and the direction of the action were also considered in the model, but they did not play any significant role in predicting children and adults' sentence-picture matching.

The model, reported in table 2, revealed a significant main effect of group: children and adults significantly differed in the selection of SOclV vs. OSclV interpretations ($p = .035$).

Table 2: Mixed logit model analysis on (SO vs OS) preference

	Estimate	Std. Error	z value	Pr(> z)
Intercept	-0.2521	0.3316	-0.760	0.447
Group (children vs adults)	0.9070	0.4306	2.106	0.0352*

glmer (SO ~ group + (1|SUB) + (1|ITEM), data=dataset, family = binomial)

The main finding of Experiment 1 is that in DP₁ DP₂ cl V both interpretations SOV and OSV are accessible to both adults and children. As for children, this result may suggest that they are already target consistent on this structure, since their results appear to be adult-like (apart from the slight preference for SOV), with both interpretations accessible. Alternatively, the apparent target consistency could be illusory here: it could be that children cannot in fact compute the structure and assign an interpretation at chance (the slight SOV preference could be due to a parsing strategy: first DP = subject). In order to disentangle the two possibilities we conducted a second experiment in which we investigated the comprehension of unambiguous CLLDs.

2.2. Experiment 2

In order to test the question of children's sensitivity to intervention in these structures and their ability to compute them, we tested the comprehension of CLLDs by manipulating two types of *featural* mismatches (Gender vs Number) and word order (SOclV vs OScIV). The rationale for the choice of these two features is based on the previous evidence quoted in 1.2, according to which a number mismatch allows the child to overcome the difficulty with the intervention configuration, whereas a gender mismatch does not in a language like Italian (Friedmann et al. 2009; Adani et al. 2010; Belletti et al. 2012).

2.2.1. Participants

Another group of 28 children (aged from 5;2 to 6;2, MA 5;7 months, SD=3 in months) from the province of Florence, and 12 adults (aged from 20 to 25) took part in the experiment.

2.2.2. Method and Materials

We adapted the materials and the task (picture-sentence matching task) of Experiment 1 to the mismatch conditions of Experiment 2. In the CLLDs, we manipulated the mismatch between the DPs (number vs. gender) and the order of the two DPs (SOclV vs. OScIV) in a within-subjects manipulation (see 9,10). Notice that, differently from experiment 1, each sentence is not ambiguous and correctly describes only one of the two pictures, hence in this experiment we measured the accuracy of the matching, not the preferential interpretation of an ambiguous sentence. Below we report an example for each condition.

Number Mismatch Conditions (Fig. 2):

- (9) a. SOclV: I cani il gatto lo mordono
 The dogs_{MASC-PL} the cat_{MASC-SING} him_{CL} bite
- b. OScIV: Il gatto i cani lo mordono
 The cat_{MASC-SING} the dogs_{MASC-PL} him_{CL} bite

Gender Mismatch Conditions (Fig.3):

- (10) a. SOclV: La bambina il principe lo fotografa
 The girl_{FEM-SING} the prince_{MASC-SING} him_{CL} photographs
 b. OSclV: Il principe la bambina lo fotografa
 The prince_{MASC-SING} the girl_{FEM-SING} him_{CL} photographs

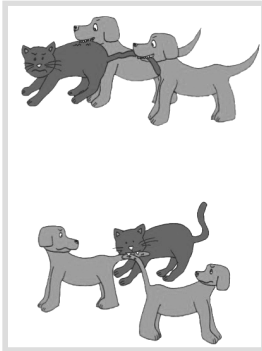


Figure 2



Figure 3

The test, as already specified for experiment 1 (see 2.1.2), included 16 experimental trials (four in each condition) depicting actional verbs and pairs of either human or animal characters, 16 fillers and 5 practice trials. The characters were introduced before the stimuli, as shown in (11):

- (11) a. Experimenter: Here there are two characters: the prince and the girl. Now show me in which picture...
 b. Experimental sentence: La bambina il principe lo fotografa
 The girl the prince him_{CL} photographs

2.2.3. Results

We coded the responses on the basis of the accuracy of the sentence-picture matching (target vs. non-target). Adults showed ceiling performance in all conditions (100%); in contrast children's target comprehension of CLLDs reached 70%. As for the manipulation of word order and featural mismatch, we report the performance for children only, since adults were at ceiling across conditions.

Table 3 shows the comprehension for featural mismatch by word order conditions.

Table 3: Accuracy in children's responses

	Gender Mismatch		Number Mismatch		Total
	SOclV	OSclV	SOclV	OSclV	
Target	63 56%	55 49%	101 90%	92 86%	311 70%
Non-target	49 44%	57 51%	11 10%	15 14%	132 30%

In a mixed logit model (Jaeger 2008) we controlled for the effect of mismatch and word order manipulations onto children's target comprehension of CLLDs. In the model, we included Mismatch (gender vs. number) and Word Order (SOclV vs. OSclV) as fixed effects, and we controlled for the interaction effect as well. As random effects, we entered subjects and items. Below we report the model that improved the fit relative to the simpler model.

The analysis only reveals a significant main effect of featural mismatch: overall number mismatch yielded better comprehension compared to gender mismatch (Number 88% vs. Gender 53%; $p < .0001$). As for the manipulation of word order, the comprehension of SOclV appears slightly better than OSclV in both mismatch conditions (Number: SO 90% vs. OS 86%; Gender: SO 56% vs. 49%), but the analysis showed no significant effect of word order manipulation; no interaction was found as significant. Table 4 reports the summary of the statistical model.

Table 4: Mixed logit model analysis on children's accuracy

	Estimate	Std. Error	z value	Pr(> z)
Intercept	0.0924	0.1792	0.516	0.606
Mismatch (number vs gender)	2.01	0.3012	6.673	< .0001***

glmer (Accuracy ~ Mismatch + (1|SUB) + (1|ITEM), data=dataset, family = binomial)

3. General discussion

In Experiment 1, given a DP DP cl V string, both interpretations SOclV and OSclV appear to be accessible to both children and adults in the selection of the preferred picture. We raised the question of whether children were already target consistent in the interpretation of such structures, or whether they could not analyze the structure grammatically, and selected one interpretation in an extragrammatical way (with the preference for the SO interpretation possibly related to a "subject first" parsing strategy). In order to disentangle these two interpretations of the first experiment, we designed experiment 2 in which, due to a featural mismatch in number or gender between the two DPs, each structure has only one interpretation, with the DP agreeing with the clitic in number or gender invariably interpreted as the object. In Experiment 2, while adults were at ceiling, always selecting the right picture, children correctly interpreted the

sentences with number mismatch, but were at chance in the sentences with gender mismatch.

Focusing for a moment on the sharp discrepancy between adult and children performance in cases in which the DP DP cl V structure is disambiguated by gender mismatch, we interpreted it as showing that the parallelism observed in the first experiment between children and adults is in fact illusory: when structures are disambiguated by gender, children are unable to analyze DP DP cl V structures grammatically, and interpret them at chance.

This results is not surprising under the featural RM approach assumed here. In the gender mismatch condition of Experiment 2 the constitution of features relevant for RM is the same in the two DPs: in cases like “la bambina il principe lo fotografa” both topic positions in the left periphery are +Top, +N, hence they instantiate a situation of featural identity between target and intervener, a configuration which is excluded under featural RM (the gender mismatch not being taken into account in the computation of RM configurations for the reasons mentioned above, discussed in Belletti, Friedmann, Brunato, Rizzi 2012).

Note, however, that a new question is raised by this interpretation of children’s behavior: how can adults overcome the featural RM violation arising in this case, as is indicated by their ability to correctly interpret all the sentences of Experiment 2? The question in fact falls under the broader question of why multiple topics are possible in a language like Italian: in such cases, the movement of one topic inevitably crosses another topic; so, why don’t RM effects arise?

A comprehensive discussion of this issue goes beyond the limits of this paper; so let us consider two speculative hypotheses in turn. A first possible line of interpretation could be the following. Benincà & Poletto (2004), Frascarelli & Hinterhoelzl (2007), Bianchi & Frascarelli (2010) have argued that higher topics have distinct interpretive properties than lower topics, so that, in case of multiple topics we would have distinct features, say Top1, Top2 characterizing the different topic positions. An adult representation would then be like the following:

- | | | | |
|------|--------------------------------------|--|---|
| (12) | La bambina,
The girl
+Top1, +N | il principe
the prince
+Top2, +N | _____ lo fotografa _____
(she) photographs him |
|------|--------------------------------------|--|---|

Inasmuch as Top1 and Top2 are distinct features, this configuration would be one of intersection. As the computation of intersection, however, is accessible to both adults and children (as proposed in Belletti et al. 2012), this hypothesis would capture the fact that adults correctly interpret the structure, but it would raise the question of why children should be in trouble here. What is the relevant developmental factor? One possible line of argument would be that children in the relevant age range have not yet mastered the distinction between Top1 and Top2: if the distinction is not accessible initially, and a single undifferentiated Top feature is assumed, then (12) becomes a case of identity, a configuration

violating RM; only when the distinction between Top1 and Top2 is mastered is identity turned into intersection, an acceptable configuration of intervention.

A second possible hypothesis for capturing the discrepancy between adults and children on cases of gender mismatch could capitalize more directly on the featural differences assumed by Frascarelli & Hinterhoelzl (2007), Bianchi & Frascarelli (2010) between the various topic positions. According to these references, higher topics can shift topicality to a different referent in discourse, whereas lower topics do not have this shifting power, and just reiterate a familiar entity (for the sake of simplicity, we omit the discussion of other types of topics assumed in these references). Assuming that the feature composition of a lower topic (+Top) is properly included in the richer feature composition of a higher one (+Top, +Shift), since both topic DPs are lexically restricted and hence also share the relevant +N feature, overall the set theoretic relation between higher and lower topic DPs amounts to one of inclusion:

- (13) La bambina, il principe ___ lo fotografa ___
 The girl the prince (she) photographs him
 +Top, +Shift, +N +Top, +N

According to Friedmann, Belletti & Rizzi's 2009 proposal on the status of featural RM in development, the set theoretic relation of inclusion is known to be accessible to adults but not to young children. This would explain the difference between adults and children in the CLLD cases, with the relation between the feature composition of the two DPs not being one of identity, but rather one of inclusion.

A priori, this second hypothesis has the advantage over the first that it traces back the difference between adults and children to a developmental property already identified elsewhere: young children are in trouble with the inclusion configuration in the computation of RM, a configuration which becomes accessible to computation later in life. A more detailed comparison between the two hypotheses would require a more refined investigation of children's sensitivity to the fine featural constitution of different kinds of topics. We cannot pursue this issue further here, so we leave it open, pending further work.

Consider now the case in which the two topics mismatch in number, a feature which, contrary to gender, is taken into account in the computation of RM in Italian (Belletti, Friedmann, Brunato & Rizzi 2012). Here (whatever hypothesis turns out to be correct about the finer analysis of different topic positions) the set-theoretic relation between target and intervener is one of intersection, due to the number mismatch:

- (14) I cani il gatto ___ lo mordono ___
 The dogs.sub the cat.obj him.CL bite
 +Top+N, +Pl +Top+N, +Sing

In Belletti, Friedmann, Brunato & Rizzi (2012) it is proposed that young children can compute intersection relations in intervention environments. The good performance found in children with this kind of sentences in experiment 2

is thus predicted, as well as the sharp contrast observed in children between number and gender mismatch.

Let us also notice that in children, a numerical advantage emerged in the SO condition over OS, but the difference is not significant, neither in gender nor in number mismatch conditions. This raises the question of why the slight preference for SO emerged in the Experiment 1 does not reach significance in Experiment 2. If the preference observed in Experiment 1 is attributed to the operation of a parsing strategy (e.g. “first DP = S”) in children, the question as to why the same strategy would not apply in all cases remains; a question that we leave open as our results do not allow us to draw any firm conclusion on the issue.

In conclusion, the main result of our study concerns the sharp contrast between the two feature mismatch conditions investigated, gender and number, in the interpretation of DP₁ DP₂ cl V configurations in children. The different role of the gender and of the number features with respect to intervention-locality relates to their different morphosyntactic status in Italian: in this language, number is an attractor for movement, being part of the Phi set morphologically expressed on the verb and attracting the subject out of vP to the subject position in the high IP structure as presented in 2.1; in contrast, gender does not have such a role of attractor in Italian. Therefore gender is not taken into account in the computation of locality. Hence, the results presented here from children’s comprehension of CLLD structures confirm those on the dissociation between the two features in Italian, already emerged in studies on the acquisition of object relatives (Adani et al. 2010; Belletti et al. 2012).

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