Does "Case" Matter in the Acquisition of Relative Clauses in Romanian?

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1. Introduction

Relative clauses are an instantiation of filler-gap dependencies[1], in which a constituent (the 'filler') is moved to a higher position from the canonical thematic position (the 'gap', represented as ___) where it was merged in the structure.

1) Show me the cat that ___ chases the mouse.
2) Show me the cat that the dog chases ___.

Although both sentences in (1) and (2) contain a displaced element (e.g. the cat), the two structures differ as to the position of the gap inside the relative clause. In subject relative clauses such as (1), the position which the filler moves from is the syntactic subject of the relative clause (e.g. 'the cat chases the mouse'). By contrast, in object relative clauses like (2), the filler is moved from the direct object position of the verb in the relative clause (e.g. 'the dog chases the cat').

For children to produce and interpret relative clauses like those exemplified in (1) and (2) above, they must have both knowledge of movement operations and sufficient processing resources to compute the relevant syntactic dependencies. Research in various languages has shown that children have difficulties comprehending object relative clauses, but the cause of the difficulties is debated (Sheldon 1974, Tavakolian 1981, Hamburger and Crain 1982, for English; Adani et al. 2010, Arosio et al. 2010, for Italian; Guasti et al. 2008, for Greek; Arnon 2009, Friedmann et al. 2009, for Hebrew; Diessel and Tomasello 2005, for German). One plausible account is that object relatives are initially analyzed as subject relatives and later require a revision, which is problematic for children (Trueswell et al. 1999). This initial misanalysis occurs in many languages because the relative pronoun is ambiguous between subject relative and object relative.

The present study investigates to what extent case disambiguation at the onset of the relative clause can prevent initial misanalyses and assist children's comprehension by using a comparison between subject and object relative clauses in Romanian. Romanian provides an ideal testing ground because relative pronouns show overt case-marking in the Accusative and the Dative. In principle, this should offer a cue in identifying the structure of the relative clause and in correctly assigning the filler to the gap contained in the relative clause.

The structure of the paper is as follows: In section 2 I will present an overview of the processing of relative clauses by adults and the early acquisition of such structures. Section 3

[1] Typical examples of filler-gap dependencies are *wh*-questions, relative clauses, and topicalization.

describes the experiment carried out with Romanian children aged 4 to 6 and presents the results obtained which reveal that the presence of case-marking on the relative pronoun does not help children to disambiguate between different types of relatives. Finally, in section 4, I discuss the implication of the results for identifying the source of difficulties in the acquisition of object relative clauses and I will show that these difficulties can be accounted for in terms of intervention, following recent proposals by Friedmann & Rizzi (2009). Section 5 concludes the paper.

2. Relative Clauses: Adult Processing and Child Acquisition

Previous research on adult sentence processing shows that object relative clauses are more difficult to process than subject relative clauses. This has been found for English (King & Just 1991, Traxler et al 2002), for French (Frauenfelder, Segui & Mehler 1980), Dutch (Frazier 1987, Frazier & Flores D'Arcais 1989) and German (Schriefers, Friederici & Kühn 1995). This difference in difficulty has been attributed to the way in which the processing of filler-gap dependencies unfolds in adults. Syntax-based accounts argue that adults deal with such dependencies by using an active filling strategy (Frazier & Flores D'Arcais 1989).

The Active Filler Strategy states that the parser will link the filler to the earliest possible gap. In relative clauses, for example, when the parser encounters a relative pronoun following a noun, it will postulate a gap in the embedded subject position as in (1), which is the earliest possible position where an argument could occur. Whereas this process of active dependency formation converges on the correct syntactic analysis for subject relative clauses, it is problematic for object relative clauses, because they are initially analyzed as subject relatives. The object relative clause interpretation is obtained through reanalysis of the parsed structure into a relative clause with the gap in the embedded object position. On this account, the subject-object processing asymmetry in relative clauses arises from syntactic misanalysis and revision which make object relative clauses computationally more costly. Evidence for a general tendency in readers to initially interpret the filler as the embedded subject of the relative clause comes from a slowdown in reading times when the first possible gap encountered by the parser is already filled (Traxler et al. 2002).

However, several studies have shown that filler-gap dependencies involving object extraction are not all equally difficult to process and that the ease of performing reanalysis can be determined by the various disambiguating cues which could help readers identify the canonical position from where the filler was displaced in the sentence. According to Fodor and Inoue's (2000) Diagnosis model, reanalysis can be easily accomplished if the information given at the disambiguating point clearly shows how to revise the structure. In their view, a cue acts as a "positive symptom" if it not only informs the parser that something went wrong in the first analysis, but it will also directly inform it on how to rebuild the structure. Meng and Bader (2000), for example, have looked at German wh-sentences with subject–object ambiguities and shown that, in a speeded grammaticality judgment task with adults, examples disambiguated through case are more readily accepted as grammatical than those in which

disambiguation was realized through number agreement. For ungrammatical sentences, case mismatch errors yielded a higher rate of false positive grammaticality judgments than number mismatch errors. In Fodor and Inoue's Diagnosis Model of garden-path processing, the efficient case disambiguation in German follows from the fact that reanalysis triggered by case, contrary to that triggered by agreement, provides the parser with a clearer sign about how to build the correct structure. Therefore, in the processing of object relative clauses, the parser's facility and rapidity in revising the initial analysis depend on how informative the disambiguating cues are.

Whereas adults are capable of revising initial parsing commitments, children have great reanalysis difficulties. Trueswell et al. (1999) have shown that 5-year-olds have problems dealing with local syntactic ambiguities and revising the initial interpretation. This implies that the asymmetry found in language acquisition between comprehension of subject and object relative clauses might stem from children's limited ability to perform reanalysis and abandon the preferred subject interpretation in favor of an object relative clause interpretation.

However, within an analysis along the lines of Fodor and Inoue's Diagnosis model, it is expected that different disambiguating cues can be more or less effective for the process of reanalysis and, hence, have an effect on children's acquisition of the various types of object relative clauses. Several studies have looked at the impact of disambiguating cues on modulating the subject-object asymmetry in the comprehension of relative clauses in children (Adani et al. 2010, Arosio et al. 2010, Guasti et al. 2008).

Guasti, Stavrakaki, and Arosio (2008) investigated the comprehension of subject and object relatives in Italian and Greek children aged 4;5 to 5;9 in order to evaluate the disambiguating effect of number agreement on the verb, of the syntactic position of the embedded subject, and of overt case-marking on the noun phrase (NP) on the reanalysis process. The effect of case-marking was only tested with Greek children since Italian does not have the option of overtly marking the NPs for case. The experimental findings of Guasti et al.'s study show that Italian and Greek children comprehend subject relatives better than object relatives when disambiguation is realized through number agreement on the verb and syntactic position of the embedded subject (i.e. when the subject of the relative clause appeared in a post-verbal position). Their results also show that Greek children's comprehension of object relative clauses with a post-verbal subject significantly improve when the embedded subject is unambiguously marked for nominative. Case-marking on the NP in Greek, contrary to number agreement, facilitates the revision process and allows children to override the initial subject relative analysis.

Recently, Friedmann, Belletti, and Rizzi (2009) have also shown that not all object dependencies are difficult for children. Friedmann et al. tested Hebrew speaking children aged 3;7 to 5;0 on the comprehension of subject and object *who* and *which* questions, as well as headed subject and object relative clauses, with and without resumptive pronouns, free subject and object relatives, and object relatives with an arbitrary *pro* subject. Their results show that children performed poorly with object relatives with or without a resumptive pronoun, and

with object *which*-questions, but that children's performance improved significantly for free object relatives, object relatives with an impersonal *pro* subject, and object *who*-questions.

The authors take the structural similarity between the moved element and the intervening subject, namely the fact that they both contain a lexical NP, to be the source of the children's problems in the comprehension of headed object relatives and of *which*-object questions. Friedmann et al. propose an account in terms of intervention effects, reminiscent of the locality principle of Relativized Minimality[2] (Rizzi 1990, 2004) which they consider to be operative in a stricter manner in children. When the head of the relative clause and the intervening subject share some morphosyntactic features (when they both carry the feature [+NP], i.e. they both contain a *lexical restriction*), the formation of the dependency between the filler and the gap is problematic for children and they cannot properly comprehend this type of structures. Such an approach brings into question of the nature of the precise featural properties that trigger the intervention effects.

3. The study

1. Research questions

Determining which information children draw upon when interpreting relative clauses is an important step in identifying how processing of this type of dependencies unfolds in children and in accounting for the delayed acquisition of certain types of object dependencies. If the acquisition of relative clauses is modulated by various cues, we want to examine to what extent the case information on the relative pronoun facilitates parsing of object relatives in children by looking at Romanian, a language in which the case-marking system helps to disambiguate between subject and object relative clauses.

Romanian presents a useful test case since it provides several cues for disambiguating between subject (3) and object relative clauses (4-5). The relative pronoun care ("who/ which") used to introduce both types of relative clauses is preceded by the Accusative case-marking preposition *pe* in direct object relatives (4) and is morphologically marked for Dative, bearing the same phi-features as the head of the relative, in indirect object relatives[3] (5):

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[2] Relativized Minimality states that a syntactic relation is restricted to the closest element bearing that relation and, therefore, it cannot hold between two elements X and Y if Z is structurally similar to X and Z intervenes between X and Y:

i. …X … Z …Y…

[3]A mismatch in *phi*-features between the relative pronoun and the head of the relative would give rise to ungrammaticality effects, illustrated below:

i. *Câinele căreia băiatul îi aruncă un os. (gender mismatch)
Dog.the which.F.SG boy.the him.DAT throw.3.SG a bone.
'The dog to whom the boy throws a bone.'

ii. *Câinele *cărora* băiatul îi aruncă un os. *(number mismatch)*
Dog.the which.M.PL boy.the him.DAT throw.3.SG a bone.
'The dog to whom the boy throws a bone.'

3) Arată-mi câinele **care** fugăreşte pisica.
Show-me dog.the **which** chase.3.SG cat.the.
'Show me the dog that chases the cat.'

4) Arată-mi pisica **pe care** câinele *o* fugăreşte.
Show-me cat.the **ACC which** dog.the *her.ACC* chase.3.SG.
'Show me the cat that the dog chases.'

5) Arată-mi câinele **căruia** băiatul *îi* aruncă un os.
Show-me dog.the **which.M.SG.DAT** boy.the *him.DAT* throw.3.SG a bone.
'Show me the dog to which the boy throws a bone.'

Omitting the ACC case-marker is a common option in colloquial Romanian, as illustrated in (6).

6) Arată-mi pisica **care** câinele *o* fugăreşte.
Show-me cat.the **which** dog.the *her.ACC* chase.3.SG.
'Show me the cat that the dog chases.'

In addition to case information on the relative pronoun, object relative clauses in Romanian are also characterized by the obligatory presence of resumptive clitics (in italics in the examples above). Their presence provides further indication as to the position of the gap inside the relative clause.

Thus, in Romanian, object relative clauses are disambiguated with respect to subject relatives through (i) the form of the relative pronoun, which is marked for case, indicating the syntactic role played by the relative head inside the relative clause and (ii) the presence of the resumptive clitic at the relativization gap. Investigating what role these cues play in the parser's task of identifying the gap location and in reanalysis is the goal of this study.

More specifically, the present study tries to answer three questions:

I. Does an early case disambiguation in Romanian preempt misanalyses?

II. If reanalysis is applied, does the case cue in Romanian inform the parser on how to repair the structure?

III. Can the crucial complexity factor in child object relative clausess be identified in an intervention effect of a Relativized Minimality type ?

2. Predictions

The predictions for the experiment can be summarized as follows: if case disambiguation at the onset of the relative clause prevents initial misanalyses, a similar performance should be observed for both subject and object relative clauses. In addition, if case marking on the relative pronoun correctly informs the parser on how to revise the

structure, children should perform better for object relatives with case marking than without case marking.

By contrast, if difficulties in comprehension are due to the featural similarity between the target (X) and the intervener (Z), children should perform better with subject relatives than with object relatives, irrespective of case-marking on the relative pronoun, since both the head noun and the subject of the relative clause are specified for the same features, which creates a maximal intervention configuration.

In order to test these predictions, an experiment was run which manipulated case-marking on the relative pronoun in Romanian object relative clauses.

3. Participants

A total of twenty-four monolingual Romanian children were included in the experiment. The children belonged to three age groups: 10 four-year-old children with a mean age of 4;7 (range 4;0 to 4;11), 10 five-year-old children with a mean age of 5;4 (range 5;0 to 5;6), and 4 six-year-old children with a mean age of 6;6 (range 6;2 to 6;10). All the children were recruited in two kindergartens in the town of Bistriţa, Romania.

4. Experimental task

Materials: Thirty-two experimental sentences were divided into four conditions: (a) Subject relatives (SR), (b) Direct object relatives with overt case-marking (DORpe), (c) Direct object relatives without case-marking (DOR), and (d) Indirect object relatives (IOR). Examples of sentences in the different experimental conditions are provided below:

7) Arată-mi elefantul ***care*** stropeşte crocodilul. (SR)
Show-me elephant.the which splashes crocodile.the
'Show me the elephant which splashes the crocodile.'

8) Arată-mi elefantul ***pe care*** crocodilul **îl** stropeşte. (DORpe)
Show-me elephant.the ACC which crocodile.the him.ACC splashes
'Show me the elephant which the crocodile splashes.'

9) Arată-mi elefantul ***care*** crocodilul **îl** stropeşte. (DOR)
Show-me elephant.the which crocodile.thee him.ACC splashes
'Show me the elephant which the crocodile splashes.'

10) Arată-mi vulpea ***căreia*** gâsca **îi** cântă un cântec. (IOR)
Show-me fox.the which.DAT.F.SG goose.the her.DAT sings a song.
'Show me the fox to which the goose is singing a song.'

All nouns were singular and each pair of nouns associated with an action had the same gender. Only the case information on the relative pronoun was manipulated. The sentences were semantically reversible and object relative clauses contained preverbal subjects only.

Two lists were created based on two different randomized orders of the items and the children were randomly assigned to one of the two lists.

Procedure: Relative clause comprehension was tested through a character-selection task. The children were presented with powerpoint animations involving two pairs of animals (e.g. two different dogs and two different horses) performing the same action but with reversed roles. Each action, as well as the Agent-Patient relation, was clearly illustrated in the animations. All the scenarios started with a presentation of the characters involved in the action. At the end of each animation, the child had to identify a character in one of the two scenarios appearing on the screen when the experimenter requested it by using an instruction that contained a relative clause of the type given in (7) to (10) above. The left-right position on the screen of the target character was counterbalanced across conditions.

5. Results

The results obtained (Figure 1) show that Romanian children perform almost at ceiling for subject relative clauses, whereas their comprehension scores on both direct object relatives (with or without case-marking) and indirect object relatives are very low.

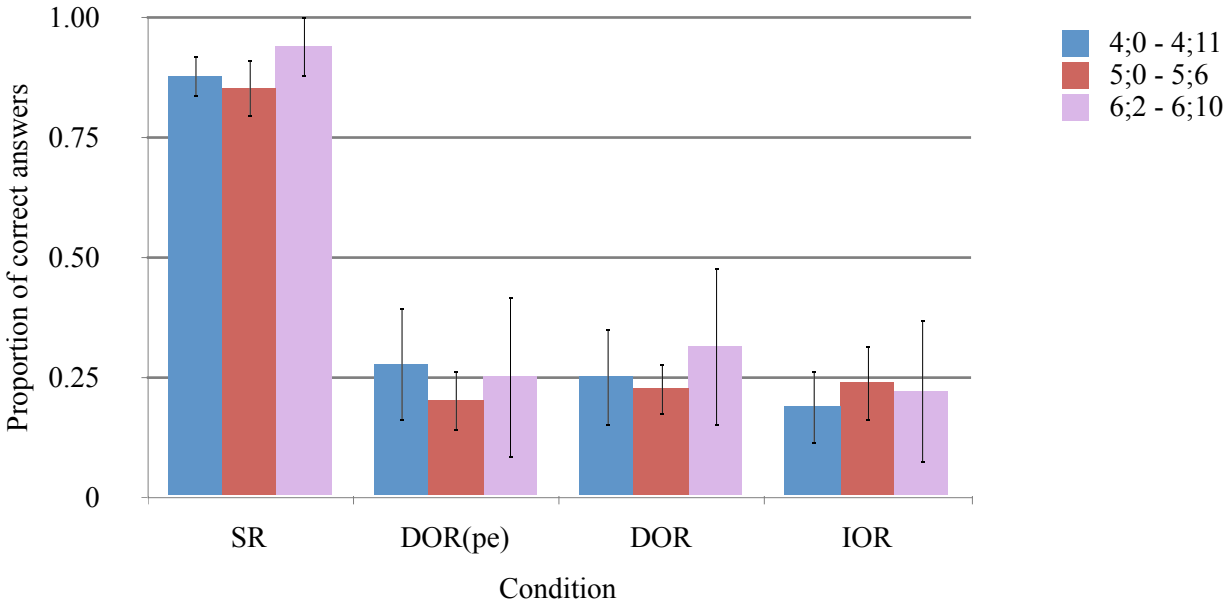

Figure 1. Mean correct responses per Sentence Type and Age Group

The participants' answers were analyzed using a Generalized Linear Mixed Model (GLMM) assuming a binomial family distribution and adopting as fixed factors the type of structure (subject vs. object relative) and case-marking (overt vs. null), whereas items and subjects were treated as random factors. The GLMM analysis yielded a significant effect of the Structure type ($p<.001$) on the comprehension of relative clauses, while no significant effect was found for case-marking ($p=.442$). All age groups show asymmetries in the

comprehension of subject and object relatives and no significant effect of age ($p > .05$) was found.

As for the errors children make, these are divided into two major types: *Agent errors,* when children point to the embedded subject and not to the head of the relative, and *Reversed roles*, when children assign the wrong thematic role to the relative head (i.e. they interpret it as the Agent and assign a subject interpretation to the object relative). Figure 2 illustrates the distribution of the errors across the object relative clause conditions.

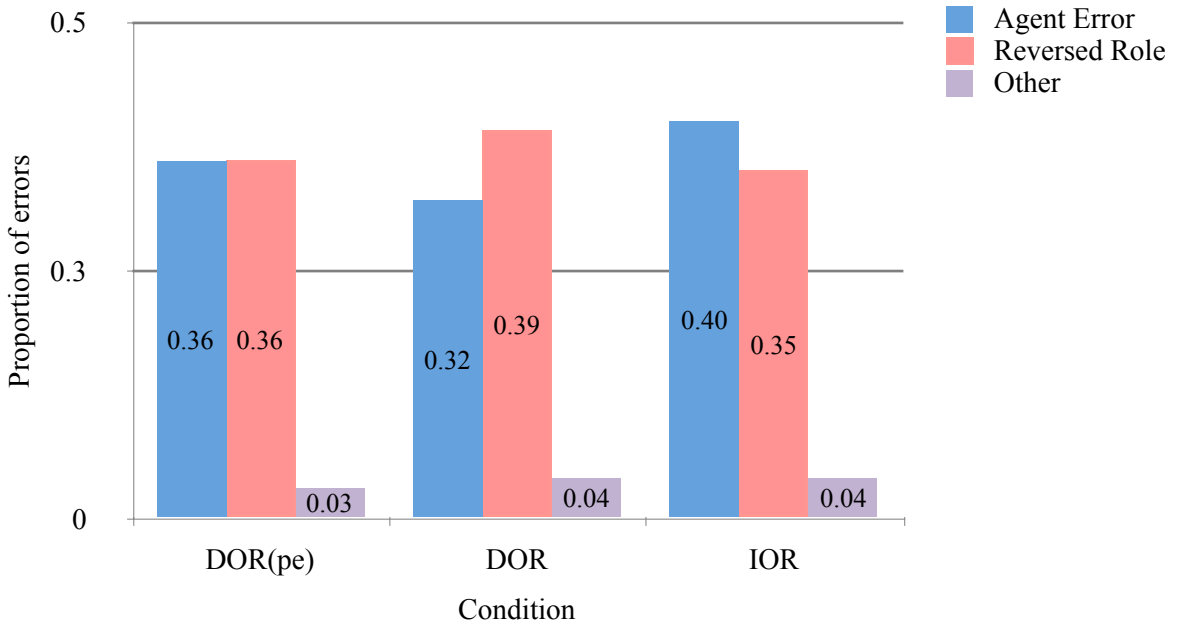

Figure 2. Types of errors in object relative clauses

4. Discussion

The goals of this study were to investigate whether children are sensitive to case-marking on the relative pronoun in object relative clauses and whether case information and other disambiguating cues (i.e. resumptive clitics) modulate the comprehension of relative clauses in Romanian by informing the parser about the correct analysis. The results confirm previous findings that subject relative are easier to comprehend and process than object relatives.

As shown by the statistical analyses reported in the Results section and as summarized in Figure 1, case marking on the relative pronoun does not preempt misanalyses and does not help Romanian children disambiguate between different types of object relatives, despite appearing at the very beginning of the relative clause. Moreover, the resumptive clitics at the relativization gap, which should represent extra disambiguating cues with respect to subject relative clauses, do not seem to play a role in improving Romanian children's comprehension of object relatives.

The results reveal a fully significant effect of the structure type factor on the comprehension of relative clauses and a clear asymmetry between subject relatives and object relatives (both direct and indirect) in early Romanian. Despite appearing very early in the relative clause, case-marking on the relative pronoun does not help Romanian children to disambiguate between different types of relatives and does not seem to provide an informative enough cue for the parser to be able to revise the initial interpretation.

This is contrary to what has been found for Greek (Guasti et al. 2008), where overt morphological case-marking on the subject NP considerably improved the accuracy scores on the comprehension of object relatives with a post-verbal subject. Reanalysis is successfully carried out in Greek, allowing children to build a new representation for the sentence. This is not the case for Romanian children, at least at the ages tested in the present study. Therefore, the first two predictions of the present study are not borne out. Case-marking does not block initial misanalysis and does not point the parser towards the correct solution.

This is also illustrated by the types of errors children make when presented with direct and indirect object relative clauses. The Reversed Role errors reflect that children, like adults, first assign a subject interpretation to the object relative construction and analyze the first NP as the agent of the action. Therefore, children cannot reanalyze the structure in a correct way and case is not an informative enough cue to guide them towards the correct solution.

The Agent Errors indicate that children correctly assigned theta roles. However, they fail to integrate the thematic interpretation into the whole sentence as a relative clause. This type of error suggests that children have difficulties in forming a dependency between the filler (the head of the relative) and the gap (the argument position from which the filler was displaced and which is the object position). The dependency is disrupted by the interference of a structurally similar element, which is computationally costly for children. The Agent error has been previously accounted for in the literature on the acquisition of relative clauses as children's difficulty in identifying the modifier nature of the restrictive relative clause. That is, children fail to realize that the relative clause modifies the head noun and they interpret the phrase as a coordinated structure (*Show me the elephant. The crocodile is wetting*). However, this brings us back to the Conjoined Clause analysis that was proposed by Tavakolian (1981) and which has been rejected on the grounds that it fails to account for the continuity between child and adult grammar since it postulates that children assign a different structure to relative clauses than adults do.

Children's difficulties seem to stem mainly from the structural configuration of object relative clauses which prevents children from correctly mapping between arguments and surface syntactic position. Following the line of reasoning put forth by Friedmann et al (2009), I would like to suggest that children's difficulties arise when a lexically restricted NP crosses over another lexically restricted NP, due to a stricter version of Relativized Minimality which is at play in child grammar with respect to adult grammar. For example, a headed object relative has the following configuration (where [+R] is the relative feature and [+NP] is the lexical restriction:

11) … the elephant that the crocodile splashes <the elephant>

+R, +NP	+NP	+R, +NP
X	Z	Y

The feature at stake is the [+NP] feature on both the subject (the intervener) and the relative head (the target) and the set of features of the intervener is included in the set of features of the target. According to this account, intervention effects arise in children when a potential candidate Z intervenes in the local relation between the displaced position (X) and the gap (Y). Such configurations are not problematic for adult grammars, but pose difficulties for child grammars which appear to require that the moved element and the intervener be featurally disjoint.

Crucially, Romanian children do not seem to draw on the case-marking cue in interpreting object relative clause. Since case-marking in Romanian is realised on the relative pronoun, it follows that the featural specification of the NP is not rich enough to create disjointness between the target and the intervener in child grammar. The featural specification of the intervener is thus properly included in the featural specification of the moved element. This inclusion configuration is problematic for children and is associated with higher computational demands.

5. Conclusions

To summarize, the present study has shown that case-marking on the relative pronoun in Romanian, a language-specific mode of disambiguation, does not seem to modulated comprehension of object relative clauses in Romanian children. The results show no improvement across the three types of object relative clauses, thus arguing against a facilitating effect of case-marking on the relative pronoun. Romanian children cannot override their preferred analysis and, thus, revise the incorrect grammatical function assigned to head of the object relative clause. The subject-object asymmetry found in the comprehension of relative clauses in Romanian seems to stem from the structural configuration of object relative clauses, which give rise to intervention effects in child grammar, effects that can be traced back to the grammatical principle of Relativized Minimality formally capturing intervention.

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