# THE COMPREHENSION OF SUBJECT AND DIRECT OBJECT WH-QUESTIONS IN CHILD ROMANIAN

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## 1. INTRODUCTION

This paper focuses on the comprehension of *who*- and *which*-questions by typically developing monolingual Romanian-speaking children with the goal to examine (i) whether the subject/object asymmetry found in other languages is also present in Romanian, (ii) whether case-marking modulates comprehension of wh-questions, as well as determine (iii) the relevance of the NP feature for the computation of locality effects in children.

The syntactic complexity of wh-questions makes them a useful test ground for the development of grammatical knowledge in children: in order to correctly interpret the subject and object wh-dependencies seen in (1) and (2), the child must *a.* have knowledge of movement operations, *b.* establish the corresponding syntactic dependency between the wh-elements and the verb, and also *c.* retain information about the moved elements until they encounter the original position from where movement took place and where the moved elements are assigned an interpretation. This position is marked as an underline below:

(1) * *Which cat* ____ bit the dog?
(2) * *Which cat* did the dog bite ____?

Although both subject (1) and object (2) dependencies are instances of Abar (A') – movement (i.e. movement of an element to a non-argumental position at the left periphery of the clause), the two configurations differ in their surface form. The distance between the moved elements and the position where they are interpreted in the sentence is greater for object extraction than for subject extraction. Moreover, in object dependencies, an embedded subject (e.g. *the dog*) appears between the A'-element and its place of extraction.

Cross-linguistic studies of the comprehension of wh-questions have revealed a twofold asymmetry: subject questions are easier for children to comprehend than object questions and object *who*-questions yield better accuracy than object *which*-questions[1] - according to Ervin-Tripp (1970); Tyack and Ingram (1977); De Vincenzi, Arduino, Ciccarelli and Job (1999); Avrutin (2000); Philip, Coopmans, van Atteveldt, and van der Meer (2001); Friedmann, Belletti and Rizzi (2009). Friedmann et al. (2009) propose that the source of children's difficulties lies in the *intervention* of the subject in the interpretive chain formed by the A'-object (*which cat*) with its canonical position in the structure (i.e. object of the verb *bite*). These intervention effects are traced back to the general locality principle of Relativized Minimality (RM), formally capturing intervention, which exerts pervasive effects in adult grammar and imposes constraints on the syntactic relations that can hold between a displaced element and its original position in the sentence. According to RM, a local relation between X and Y cannot hold if there is an intervener, Z, which is of the same structural type as X and which can be a potential candidate for the same relation:

[1] Pesetsky (1987) introduces the notion of "Discourse-linked" (D-linked) to refer to wh-phrases like *which cat* as these elements prompt an answer chosen from a set of referents already present in the discourse, whereas *wh*-phrases like *who* do not.

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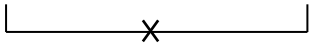
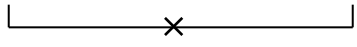
(3) X **Z** Y



The gist of this approach is that children encounter difficulties with movement structures in which one element containing a lexical restriction (i.e. a [+NP] feature) intervenes in the movement of another [+NP] element. In other words, children only struggle with those structures in which (i) the A'-chain linking the object to its base-generated position crosses an intervening subject and (ii) the intervening element shares a partial featural specification with the A'-moved object. This results in an intervention configuration in *which*-object questions, as well as in headed object relative clauses, since the subject DP represents a potential competitor in establishing the correct grammatical dependency between the A'-moved constituent and its original position, as shown in (4):

**X** **Z** **Y**
+NP +NP +NP
(4) [$DP_{Object}$ [$DP_{Subject}$ [ V <$DP_{Object}$> ]]]



Children are not able to properly compute the featural inclusion configuration between the two elements X (the A'-object) and Z (the subject intervener). The dependency between X and Y is thus blocked, which results in comprehension and production difficulties. Children's improved performance with object *who*-questions and object free relative clauses validates this account since it shows that children can easily establish a dependency between the A'-moved object and its argumental position once the moved element and the intervening subject do not share the feature [+NP].

Such an account raises the question of what features are taken into consideration for the computation of similarity between the moved DP and the intervening subject and what structural properties can modulate the comprehension of A'-constructions in child language. Recent studies revealed that a mismatch in features such as gender and number facilitate children's comprehension of headed object relative clauses and *which*-questions, but the effects seem to be linked to the status of a particular morphosyntactic feature as attractor for movement in a given language. Thus, a mismatch in gender was shown to modulate comprehension of headed object relative clauses in Hebrew, but not in Italian – according to Belletti, Friedmann, Brunato and Rizzi (2012), whereas a mismatch in number improves comprehension of object relative clauses in Italian (as Adani, van der Lely, Forgiarini and Guasti (2010) claim), as well as of object *which*-questions and object relative clauses in English - as stated by Contemori and Marinis (2013 a, b). Language-specific structural properties have also been shown to affect processing of wh-questions: for example, the various strategies for the formation of matrix questions present in French (which allows both ex-situ and in-situ wh-elements) positively impacts children's comprehension of object wh-questions, as Benţea and Durrleman (2013, 2014) claim.

An important observation of the intervention account is that the features that enter the computation of locality are the features that function as attractors for movement. This should explain the cross-linguistic difference in the effect of gender on the comprehension of relative clauses in Hebrew and Italian: while gender belongs to the set of Phi features attracting a DP to a subject position in Hebrew, this is not the case for Italian. If only features participating in the triggering of movement are taken into account in the calculation of RM, then one should determine whether the [NP] feature does indeed act as a trigger for movement. Independent evidence in favour of considering lexical restriction as an attractor in different constructions comes from Northeastern Italian Dialects. For example in Bellunese, studied by Munaro (1999), cited in Poletto and Pollock (2000), bare *wh*-words and lexically restricted *wh*-elements target different positions in the left periphery of the clause; the first occur in a

sentence-final position, while the latter move to a sentence-initial position in the clause[2]:

(5) a. Ha-tu magnà *che*?
have-you eaten what ?
'What did you eat ?'
b. * *Che* ha-tu magnà?
what have-you eaten ?
c. *Che* vestito à-la comprà?
what dress has-she bought
'Which dress did she buy?'
d. * Ha-la comprà *che vestito*?
has-she bought what dress ?

The difference in syntactic behavior between lexically-restricted and bare *wh*-phrases points to the presence of different attractors for the movement of the two types of *wh*-elements (see also section 3 below, examples (19) and (20), for more evidence from Romanian supporting this view). Since the presence of a [+NP] feature affects the landing site of wh-movement, it follows that [+NP] should also be considered as a feature determining movement, possibly encoded on a complex Probe formed of a [+Q] (i.e. interrogative) and [+NP] feature and which attracts the wh-constituent to a position different than the Specifier Focus position associated with movement of bare wh-elements - see Soare and Laenzlinger (2005), Soare (2009) who put forth the idea that lexically-restricted wh-phrases target the Specifier position of a Topic+Wh head.

Wh-questions in Romanian are particularly relevant in this context as object questions are disambiguated from subject questions through the presence of the accusative marker *pe*. Thus, the form of the interrogative pronoun overtly signals whether the structure should receive a subject or an object interpretation. Interestingly, recent studies on the comprehension of headed relative clauses in Romanian bring evidence in favor of a subject-object asymmetry in the processing of these structures, despite the presence of the disambiguating case-marking preposition *pe* – according to Bențea (2012; Sevcenco and Avram (2012); Sevcenco, Avram and Stoicescu (2012). A comparison between wh-questions and relative clauses can thus be informative of the role that *pe* plays in the processing of A'-dependencies in Romanian and whether the two A'-dependencies share the same level of complexity.

Furthermore, Romanian also has the option of forming *which*-questions without an overt NP. Although such *which*-questions do not carry an expressed NP, they still have lexical specificity, which limits the set of possible referents for the wh-expression to those existing in the discourse context. This offers a good testing ground in determining whether children's grammar is sensitive to the presence of a lexical restriction or NP feature on both the moved element and the intervener, even when the lexical NP is not overtly expressed in the wh-expression.

The paper is organized as follows: section 2 gives a brief overview of the syntax of wh-questions in Romanian. Section 3 presents the experimental study and the results obtained, which are discussed in section 4.

[2] As Poletto and Pollock (2000) point out, the sentence-final position of the bare wh-word in (5a) should not be associated with an IP internal object position. One piece of evidence comes from the fact that questions like (5a) show obligatory subject verb inversion, which is totally banned in wh in-situ in French, for example. For more arguments in favour of an overt movement analysis of all wh-questions in Bellunese, and for a more detailed analysis of structures like in (5a) in terms of Remnant Movement, I refer the reader to Poletto and Pollock (2000), sections 1 and 6.

## 2. PROPERTIES OF ROMANIAN WH-QUESTIONS

The study presented in section 3 explores Romanian children's sensitivity to morphosyntactic information in the interpretation of bare and lexically-restricted wh-questions and investigates to what extent children's selective difficulties with movement dependencies can be modulated by language-specific properties. To this effect, the study exploits two properties of wh-questions, namely presence of case-marking on the wh-object and the possibility of having or not an overt lexical restriction (i.e. an overt NP element) in *which*-questions in Romanian. Both these properties are illustrated in more detail in the remainder of this section.

Subject and object wh-questions in Romanian referring to [+animate] entities can be introduced by two wh-elements: *cine* ('who') for non lexically-restricted wh-questions (examples (6) and (7)) and *care* ('which') for lexically-restricted questions, as in (8) and (9)[3]. The noun phrase in parentheses in these latter examples illustrates the option of having *care*-questions without an overtly-expressed lexical NP.

(6) * Cine l-a intervievat pe student?
who $him_i$.ACC-has interviewed pe.ACC $student_i$
'Who interviewed the student?'

(7) * Pe cine a intervievat profesorul?
pe.ACC who has interviewed professor.the.M.SG
'Who did the professor interview?'

(8) * Care (profesor) l-a intervievat pe student?
which professor $him_i$.ACC-has interviewed pe.ACC $student_i$
'Which professor interviewed the student?'

(9) * Pe care (student) l-a intervievat profesorul?
pe.ACC which $student_i$ $him_i$.ACC-has interviewed professor.the.M.SG
'Which student did the professor interview?'

Note that in subject wh-questions illustrated in (6) and (8) above, the direct object *pe profesor* is doubled by a co-indexed clitic pronoun *l* ('him'). This is an instantiation of the 'clitic doubling' phenomenon present in languages like Romanian and Spanish, whereby an accusative or dative clitic pronoun appears together with a co-referential full lexical noun phrase. Clitic doubling in Romanian requires the direct object to be additionally marked by means of *pe*, a marker similar to the Spanish *a*, as evidenced by the ungrammaticality of (10):

(10) * Studentul $l_i$-a impresionat $profesor_i$ cu răspunsul său.
$student.the.M.SG_j$ $him_i$.ACC-has impressed $professor_i$ with answer $his_j$.
'The student impressed the professor with his answer.'

When the direct object is a definite noun phrase, it appears without *pe* and without clitic doubling:

[3] Wh-questions can also be introduced by the interrogative pronoun *ce* ('what'), whose syntactic behavior patterns with that of *cine* ('who') - see Dobrovie-Sorin (1994) for a more detailed discussion:

(i) Ce (carte) ai citit de curând?
what book have.2.sg read of recent
'What book have you read recently?'

(ii) Ce (autor) a scris 'Robinson Crusoe'?
what author has written 'Robinson Crusoe'
'What author wrote 'Robinson Crusoe?'

(11) * Studentul$_i$ (*l-)a impresionat (*pe) profesorul cu răspunsul său$_i$.
student.the.M.SG$_i$ has impressed professor with answer his$_i$.
'The student impressed the professor with his answer.

The obligatory or optional distribution of *pe*-marking with the direct object in Romanian is generally assumed to be triggered by conditions such as animacy, specificity, and definiteness: *pe*-marking is obligatory with personal pronouns (referring to both animate and inanimate entities), animate proper names, and (modified) definite human postverbal noun phrases; it is optional with animate unmodified definite and indefinite nouns; and it is ungrammatical with inanimate noun phrases, as claimed by Dobrovie-Sorin (1994), Pană-Dindelegan (1997), Cornilescu (2001), von Heusinger & Onea (2008), Chiriacescu & von Heusinger (2010); Ciovârnache & Avram (2012), von Heusinger & Chiriacescu (2013), Tigău (2014), a.o..

This brings us to the contrast between direct object questions in (7) and (9) with respect to the distribution of clitic pronouns: these are illicit in non-lexically-restricted interrogatives, but are obligatory with lexically-restricted wh-phrases, as shown by the examples in (12) and (13) which contrast with those in (7) and (9):

(12) * Pe cine$_i$ l$_i$-a intervievat profesorul?
pe.ACC who$_i$ him$_i$-has interviewed professor.the.M.SG

(13) * Pe care (student) a intervievat profesorul?
pe.ACC which student has interviewed professor.the.M.SG

Given the parallelism between *care +NP* and *care –NP* structures with respect to the obligatory presence of a clitic pronoun corresponding to the moved argument, it follows that these two elements also share the same structural properties and that *care –NP* is only an apparent case of bare wh-element. That the obligatory clitic appearing with *care* constructions is not a resumptive pronoun is indicated by the fact both *cine* and *care* structures are sensitive to islands, according to Dobrovie-Sorin (1994):

(14) * Pe cine cunoşti profesorul care a intervievat _?
pe.ACC who know.2.SG professor.the.M.SG which has interviewed
'Who do you know the professor that interviewed?'

(15) * Pe care student$_i$ cunoşti profesorul care l$_i$-a
pe.ACC which student$_i$ know.2.SG professor.the.M.SG which him$_i$-has
intervievat _?
interviewed
'Which student do you know the professor that interviewed?'

Dobrovie-Sorin (1990, 1994) links the obligatory absence of clitics in *cine* structures and their obligatory presence in *care* structures to the different quantification features associated with the two types of wh-elements[4]. *Cine* acts as a syntactic quantifier binding a variable in an A-position. Assuming the definition of variables in (16):

(16) * α is a variable if and only if α is an empty category that (a) occupies an A-position, (b) is bound by a quantifier, and (c) is Case-marked, as claimed by Dobrovie-Sorin (1994:201),

[4] *Cine* and *care* structures are also distinguished through the presence or absence of weak crossover effects and their ability to license parasitic gaps; see Dobrovie-Sorin (1994): chapter 6 for a more detailed discussion of properties of the various types of Romanian wh-structures.

the ban on clitics from *cine* quantifier-variables configurations follows from the fact that the clitic absorbs the Case which would normally be assigned to the empty category in the direct object position. *Care* configurations, on the other hand, require the obligatory use of a clitic pronoun because *care* does not bear quantification features and, therefore, cannot bind a syntactic variable. Contrary to *cine*, *care* wh-elements are, according to Dobrovie-Sorin, 'restricted quantifiers' whose domain of quantification is restricted by the lexical NP following them[5].

Further evidence in favor of a distinction between *cine* and *care* wh-phrases comes from the ordering of these elements at the left-periphery of the clause. Romanian, like Slavic languages, allows multiple wh-elements to be fronted to a clause-initial position:

(17) * Cine pe cine a intervievat?
who pe.ACC who has interviewed
'Who interviewed whom?'

(18) * Pe cine cine a intervievat?

Laezlinger and Soare (2005) and Soare (2009) convincingly argue that, while there is a strict ordering among bare wh-elements, D-linked or lexically-restricted wh-expressions always appear clause-initially, preceding bare phrases. From an interpretive standpoint, they are associated with the notion of 'givenness' and have been analysed as topics - see Comorovski (1996), Alboiu (2002):

(19) * Care (profesor) pe cine a intervievat?
which professor pe.ACC who has interviewed
'Which professor interviewed whom?'

(20) * Pe care (student$_i$) cine l$_i$-a intervievat?
pe.ACC which student$_i$ who him$_i$-has interviewed
'Who interviewed which student?'

The lexically-restricted element can also be separated from other bare *wh*-phrases by fronting it to the left periphery of a matrix clause with bare elements appearing in a lower position (21a). This option is ruled out for bare *wh*-words (21b).

(21) a. *Pe care (student)* vrei să știi *cine când* l-a intervievat?
pe.ACC which student$_i$ want.2.SG SUBJ know.2.SG who when him$_i$-has interviewed
'Which student do you want to know who interviewed when?'
b. *Pe cine* vrei să știi *cine când* a intervievat?
pe.ACC who want.2.SG SUBJ know.2.SG who when has interviewed
'Whom do you want to know who interviewed when?'

By adopting a split-CP analysis (Rizzi, 1997) and a cartographic approach to syntactic structures (Belletti, 2004, Cinque, 2006, Rizzi, 2004), Laezlinger and Soare (2005) and Soare (2009) show that *care* wh-phrases in Romanian get attracted to a higher position than the

[5] While the logical form of the question in (6) is something like *For which x, x is a human, the professor interviewed x*, the logical form of a question like in (8) is *For which $x_i$, x is a student, the professor interviewed him$_i$.*

position occupied by bare elements at the left periphery[6]. Given the topic flavour of lexically-restricted or D-linked wh-constituents, the authors suggest that these phrases target the specifier position of a Topic+Wh head above the Specifier Focus position which is the landing site of bare wh-phrases. These observations related to the position of *which*-elements in the Romanian left-periphery bring further support to the view that there must be different attractors for lexically restricted and bare *wh*-elements, as the presence of a lexical restriction on the *wh*-phrase determines different landing sites for movement.

To resume, this section has shown that *cine* ('who') and *care* ('which') interrogative elements in Romanian behave differently, both at a syntactic and at an interpretive level. Knowing how such differences influence the acquisition pattern of wh-questions in Romanian can prove very insightful for the study of children's syntactic development.

## 3. EXPERIMENTAL STUDY ON THE COMPREHENSION OF WH-QUESTIONS IN CHILD ROMANIAN

The goals of the study were three-fold:
(1) determine whether the comprehension of wh-questions in Romanian displays the same subject-object asymmetry reported for other languages;
(2) examine the role that the case-marking cue plays on the comprehension of object wh-dependencies and whether children are able to draw upon this language-specific property and
(3) assess the nature and impact of the NP feature on children's comprehension of Abar-dependencies.

To my knowledge, this is among the first investigations into Romanian children's comprehension of *who*- and *which*-questions and thus aims at filling this gap in the acquisition literature.

### 3.1. Participants

Fifty typically developing monolingual Romanian-speaking children aged 3;8 to 7;2 were recruited at a pre-school and a school in Bistrița, Romania. Data from 6 children were excluded based on three criteria: they did not complete the whole experiment (n=2); they were not paying attention during the task (n=3); they provided wrong answers to five or more fillers (n=1). The study reports the results of the remaining 44 participants divided across two age groups, as illustrated in Table 1. In addition, 6 adult native speakers of Romanian were included as a control group.

| Age group | No. of participants | Age range | Mean Age (S.D.) |
|---|---|---|---|
| **4 y.o** | 21 | 3;8 – 5;2 | 4;4 (0.60) |
| **6 y.o.** | 23 | 5;8 – 7;2 | 6;5 (0.62) |
| **Adults** | 6 | 18;0 - 40 | 31 (6.73) |

Table (1). Participant data per age group (number per group, age range, mean age and standard deviation)

### 3.2. Materials and procedure

[6] Within a cartographic approach to left periphery of CP – according to Rizzi (1997, 2004), the traditional representation of the C system as a single head and projection is replaced with a view in which the complementizer system is defined by a universal hierarchy of functional positions. The heads delimiting this system are Force (declarative, interrogative, etc.) and Fin (Finiteness):

(i) Force … Top* … Foc … Top* … Fin IP – according to Rizzi (1997, 2004)

3.2.1. *Materials*

The experiment investigated the comprehension of subject and object questions introduced by various types of wh-elements. 18 sets of 6 sentences like those exemplified in (22) were constructed. As we can see, condition (a) was a subject question with a bare wh-word *cine* 'who'; condition (b) was an object bare question introduced by *cine* 'who' preceded by the case-marker *pe*; in condition (c) we have a subject *which +NP* question where the wh-phrase *care* 'which' is followed by a lexical noun (i.e. *girafă* 'giraffe'), while in condition (d) we have an object *which +NP* question, hence the presence of *pe* at the onset of the wh-expression; (e) and (f) illustrate the *which –NP* conditions, so subject and object questions also introduced by the wh-element *care* 'which', but without a lexical noun.

(22) a. *Subject **who** question*
***Cine*** a gâdilat țestoasa?
who has tickled turtle.the.F.SG
'Who tickled the turtle?'

b. *Object **who** question*
***Pe cine*** a gâdilat țestoasa?
pe.ACC who has tickled turtle.the.F.SG
'Who did the turtle tickle?'

c. *Subject **which +NP** question*
***Care girafă*** a gâdilat țestoasa?
which giraffe has tickled turtle.the.F.SG
'Which giraffe tickled the turtle?'

d. *Object **which +NP** question*
***Pe care girafă*** a gâdilat-o țestoasa?
pe.ACC which giraffe has tickled-her.ACC turtle.the.F.SG
'Which giraffe did the turtle tickle?'

e. *Subject **which –NP** question*
***Care*** a gâdilat țestoasa?
which has tickled turtle.the.F.SG
'Which one tickled the turtle?'

f. *Object **which –NP** question*
***Pe care*** a gâdilat-o țestoasa?
pe.ACC which has tickled-her.ACC turtle.the.F.SG
'Which one did the turtle tickle?'

The study thus used a 2 X 3 design with type of structure (*subject* vs *object*) and type of wh-element (*who* vs *which +NP* vs *which –NP*) as within-participant factors. The *which +NP* and *which –NP* notation distinguishes between *which*-questions with and without an overt full lexical noun. In using this notation, I adopt the terminology of previous studies - Friedmann et al. (2009), Belletti et al. (2012) - where the +NP feature characterized cases involving the presence of a lexical noun and, accordingly, I initially classify wh-questions headed only by *care* and *pe care* as –NP.

Children saw each item twice: for example, they would see the item given in (22) once in the (a) condition, so paired with a *subject **who** question* and once in the (d) condition, therefore paired with an *object **which +NP** question*. The 6 sentences of each set were divided into three lists such that each list included 6 items for each of the 6 conditions. Items were presented in a randomized order within each list and were mixed with 18 fillers. Additionally, there were 2 practice trials at the beginning of each list. Consequently, each list included 2 practice trials, 36 target sentences and 18 fillers, summing up to a total of 56 trials per list.

All target sentences contained the transitive verbs and nouns that matched in gender and number. The characters were always either two animals or two humans. A postverbal subject was used in all object questions, which is the default option in Romanian. In addition, the object noun phrase in subject questions, although it was an animate definite NP, was not preceded by *pe* and was not doubled by a clitic prounoun, which is also possible in Romanian as shown in example (6) above. This allowed to neutralize word order as a disambiguating cue and to zoom in only on the effect of the case-marking preposition *pe* when present on the wh-word. As such:

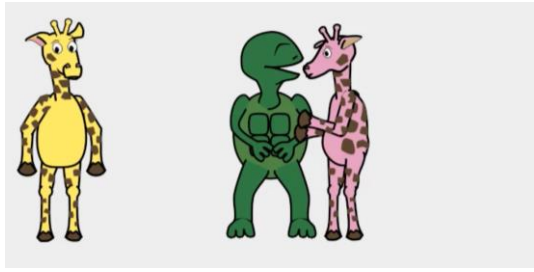
(1) *pe* is the only element that signals an object interpretation vs. a subject interpretation for *who* questions in (22a-b);
(2) subject and object *which +NP* and *which –NP* questions in (22c-d) and (22e-f) are disambiguated through the use of *pe* and the clitic pronoun, which can appear either post-verbally (in the case of the feminine clitic) or pre-verbally (in the case of the masculine clitic);
(3) object *who* and object *which –NP* questions are only distinguished, at a surface level, by means of the clitic pronoun in the latter structures.

The task used was a character-selection task adapted from Friedmann et al's (2009) study on wh-questions in Hebrew. The visual stimuli were cartoon movies realized with an animation software. This type of visual stimuli differs from that employed in previous studies which assessed comprehension or production of wh-questions through the use of static pictures. Each cartoon displayed three characters (e.g. two giraffes and a turtle) involved in the same action and was accompanied by a pre-recorded description of the scenes. A sample description and an example of test question are illustrated in (23). Figure (1) shows the sequence of events in the visual display.

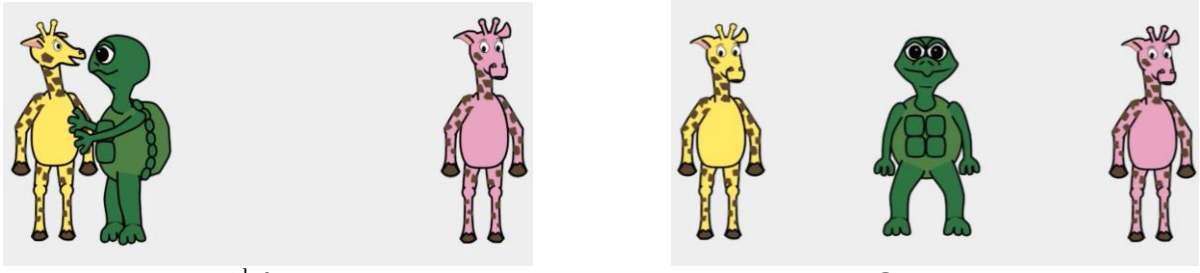
(23) * *Lead-in*: Uite două girafe și o țestoasă!
'Look! There are two giraffes and a turtle.'
*1st action*: Să vedem ce se întâmplă! O girafă gâdilă țestoasa.
'Let's see what happens next! A giraffe is tickling the turtle.'
*2nd action*: Acum uite! Țestoasa gâdilă o altă girafă.
'Now look! The turtle is tickling another giraffe.'
*Question*: Care girafă a gâdilat țestoasa?
'Which giraffe tickled the turtle?'

In order to create a pragmatically felicitous context for the use of *which –NP* questions exemplified in (22e-f) above, the target question was always preceded by an introductory question (e.g. *Did you see the giraffes?*).

Lead-in



1st Action



2nd Action Question

Figure (1). An example of animation sequence used to assess comprehension of wh-questions

The target questions were associated with a static display presenting the characters in their original position. After each question, the child had to point to the correct character or reply by describing the colour of the character (e.g. 'the pink giraffe'). Given that the correct answers always consisted of pointing to one of the characters on the sides (left or right), the position of the target character as well as the direction of the action were counterbalanced. In addition, the answers to filler sentences targeted the middle character, so as to remove a potential bias of pointing only to the characters on the sides. The animations associated with the fillers had the same design as that of the other experimental items (e.g. two girls and a boy; one girl dances together with the boy, then the boy dances with the other girl) and were paired with sentences such as 'Show me who the girls are dancing with'. The adult participants saw the same experimental stimuli.

3.2.2. *Procedure*

The experiment was set up as a quiz game in which the children interacted with a puppet, the reindeer Rudolf. Children were told that they would watch cartoon stories together with Rudolf, who will then ask a question after each story. Every experimental session started with two practice trials to ensure that the children understood the task and then continued with a presentation of the target and filler sentences, which all followed the same format as the one described in (23) above. The cartoons and the recorded description of the stories were presented on a laptop using digital media player software. At the end of each story, when the characters appeared again on the screen in their initial position, the experimenter paused the cartoon, asked a question through the puppet and noted down each answer on the answer sheet. The questions were produced with a neutral prosody so as not to influence in any respect children's interpretation. After each child saw half of the total sentences, the experimenter paused the presentation of the cartoons. This allowed children to have a small break in which they could interact with the puppet, making sure that they stay attentive throughout the duration of the whole task. Children were also told that they could stop the experiment and have a break at any time. After each answer, the child received a short positive feedback to motivate them to pay attention, as well as a small reward from the puppet at the end of the task. Each experimental session lasted approximately 35 minutes.

The procedure used with the adult participants was similar, the only differences being that there was no puppet interacting with them during the task and there was no intermediate break. The experiment with the adults took approximately 15 minutes.

**3.3. Predictions**

Several predictions hold for the study. First, if children are able to use the mismatch in case features between the A'-object and the intervening subject to assign the correct interpretation to object wh-questions introduced by *pe*, then the presence of this case-marking preposition should improve comprehension of object questions (so examples like (22b), (22d) and (22e))

as compared to subject questions (illustrated in (22a), (22c) and (22f). The reason is that the presence of *pe* at the very onset of the question should prompt an object interpretation and should help with theta-role assignment. As such, we should find no difference in the comprehension of subject and object who questions (22a,b). In the case of *which*-questions (22c-f), the subject-object asymmetry should disappear if having a wh-object case-marked for Accusative and appearing in a sentence-initial position is an informative enough cue that can override any intervention effects triggered by a lexically-restricted +NP subject. On the other hand, if the difference in case-marking between the wh-object and the subject cannot override intervention effects found in object *which*-questions (so examples like (22d) and (22f)), then we should still find a subject-object asymmetry with this type of questions, but this asymmetry should be reduced when compared to other languages that do not have this type of marking, like for example Italian and English. According to the same rationale, we also expect the presence of *pe* in both object *who* (22b) and object *which* ((22d) and (22f)) interrogatives to reduce the difference between questions with (*which*) or without (*who*) a lexically restricted +NP feature attested in languages which do not have this additional cue.

Second, as shown in section 2, the syntactic behaviour of *care* 'which –NP' patterns with that of *which*-expressions with an overtly expressed noun and is distinct from that of bare wh-phrase like *who*. In addition, as far as their meaning is concerned, both types of *which*-expressions presuppose the availability of a given set of referents in the discourse context. Contrary to *cine* 'who' interrogatives (22a,b), questions like (22d) to (22f) cannot be asked out-of-the-blue since *which (giraffe)* implies a choice from "a set of individuals previously introduced into the discourse, or ... part of the 'common ground' shared by speaker and hearer" (Pesetsky 2000:16). Despite the similarity in surface form between *cine* 'who' and *care* 'which –NP', only the first wh-element can be truly considered as –NP, whereas the latter only apparently lacks a lexical restriction. The apparently bare *care* is in fact analogous to the English *which one*. It could thus be assigned the form [$_{WH}$ [$_{NP}$ [$_{N}$ e]]], along the lines of Dobrovie-Sorin (1994), where the N has been deleted, contrary to *care NP* cases (e.g. *care* 'which one' vs. *care girafă* 'which giraffe'), where an NP is present. As such, the instances of *care* 'which' not followed by an overt full lexical noun still contain a [+NP] specification.

This observation has important consequences for an account of children's comprehension difficulties with object A'-dependencies in terms of intervention effects determined by a similar featural specification on the A'-moved element and the intervening subject. If the child's grammar system only paid attention to the surface form of the lexical elements and if this were enough to overcome comprehension difficulties, then performance for bare *who*-questions (22a,b) should be on a par with performance for *which*-questions that do not have a full nominal element (22e,f). Moreover, children should comprehend such *which –NP* questions better than *which +NP* ones (given in (22c,d) above). On the other hand, the data from Bellunese and Romanian related to the behaviour of wh-elements with or without a lexical restriction clearly show that the NP feature can be considered as an attractor for movement of *which*-elements to a higher position than that of bare wh-phrases. The NP feature thus forms part of the array of morphosyntactic features that impact the landing site of wh-movement and, as such, should enter into the computation of intervention. Consequently, if NP enters the computation of locality, then the child's grammar system should be sensitive to this feature although it is not overtly expressed through the presence of a noun from the contentive lexicon.

### 3.4. Results

Response accuracy was the dependent variable in the experiment: an answer was coded as correct when the child pointed to or described the corresponding character targeted by the wh-question. The bars in each figure represent the standard error to the mean. To recall, the label *Subject 'who'* and *Object 'who'* represents the conditions in which we tested bare wh-question introduced in Romanian by the wh-element *cine*, so examples like (22a) and (22b)

above; *Subject 'which +NP'* (22c) and *Object 'which +NP'* (22d) are the equivalent of wh-questions with a full lexical noun (e.g. *which giraffe*); the notation *Subject 'which –NP'* (22e) and *Object 'which –NP'* (22f) refers to *which*-questions without an overtly expressed lexical restriction. Both *which +NP* and *which –NP* dependencies are introduced in Romanian by the wh-phrase *care.*

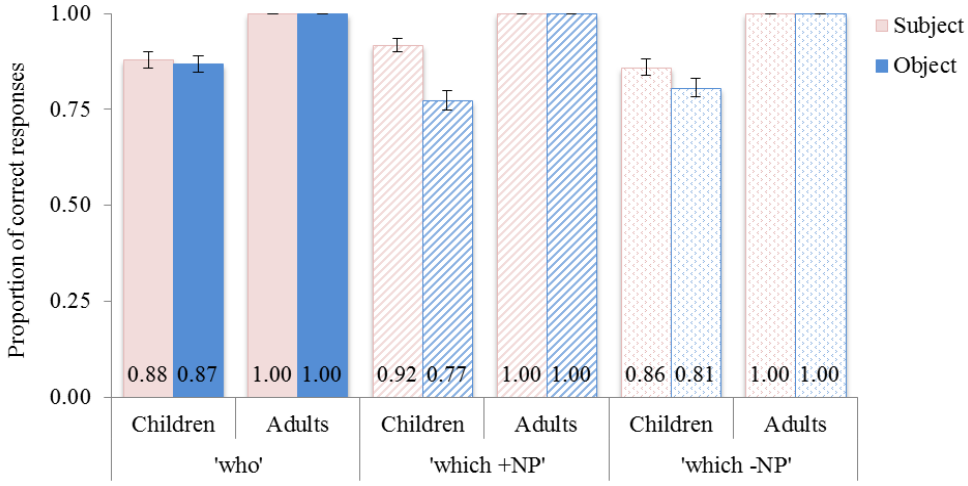



Figure 2. Proportion of correct answers for children (age range 3;8 – 7;2) and adults by condition

The overall results indicate that, although children comprehend subject and object questions very well, as evidenced by their high accuracy scores, they are less accurate than the adult participants on all six conditions. There is no difference in children's performance with subject and object *who* questions (0.88 vs. 0.87 proportion of correct responses). Comprehension scores for subject and object *which –NP* questions are almost on a par (0.86 vs 0.81 proportion of correct responses). The subject-object asymmetry manifests itself in a more pronounced way in *which +NP* questions, because children comprehend subject *which +NP* questions better than object *which +NP* questions, suggesting that this latter structure poses the most problems for comprehension. The overall results also reveal an asymmetry within the three types of object questions tested in the experiment: children comprehend object *who*-questions better than both object *which +NP* and *which –NP* questions, these yielding similar accuracy scores.

Let us now look in more detail at the results obtained for each age group tested, summarized in Figure 3:

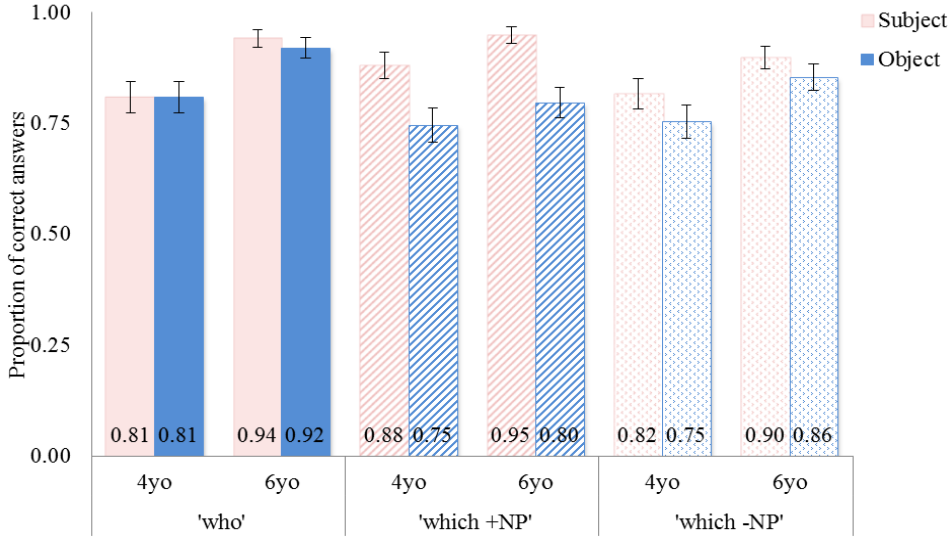



Figure 3. Proportion of correct answers for children by type of structure, wh-phrase and age group (4- and 6-year-olds)

A closer look at children's comprehension scores within the two age groups tested reveals that the 6-year-old group gives overall more accurate responses than the 4-year-old group. However, the same performance patterns can be observed within the groups for each of the experimental conditions. More specifically, both groups show equally good performance for subject and object *who*-questions. The 4-year-olds perform on a par for object *which +NP* and *which –NP* questions (0.75 proportion of correct responses), whereas they are more accurate with both subject *which +NP* and *which –NP* conditions. The comprehension scores for the 6-year-old group reveal similar performance for all three types of subject wh-questions. In contrast, when it comes to object questions, children comprehend *who*-questions better than both *which –NP* and *which +NP*. Like for the 4-year-old children, the accuracy scores of the 6 year-olds show that they struggle most with object *which +NP* questions and this leads to a sharper subject-object contrast in the comprehension of *which +NP* questions as compared to the other two types of wh-elements.

3.4.1. *Statistical analyses*

Given that the response variable was categorical (i.e. choice of correct character among three competitors), the data was analysed with a mixed logit model (according to Baayen, Davidson, & Bates (2008) and Jaeger (2008)), using the *lme4* package for Linear Mixed Effects (as Bates, Maechler, Bolker and Walker claim (2014)) in *R*. Type of structure (i.e. Structure Type), type of wh-element (i.e. Wh-word Type) and age group were used as fixed predictors for the model. The fixed predictors were coded using treatment contrast, the default contrast coding scheme in R. Treatment contrast compares each level of the categorical variable to a fixed reference level. In this case, the reference level was the response accuracy mean for Object *Which –NP* and the means for each of the other levels of the variables Structure Type, Wh-word Type and Age Group were compared to the reference level. The maximal random effect structure justified by the data included a random intercept and a random slope for Structure Type for participants and only a random intercept for items. Table 2 and Table 3 summarize the fixed effects and the random participant and item effects obtained:

| **Predictors** | **Coefficient** | ***SE*** | **Wald *Z*** | ***p*** |
|---|---|---|---|---|
| (Intercept) | 1.37 | 0.31 | 4.46 | <.001*** |
| Structure Type = *Subject* | 0.79 | 0.39 | 2.02 | <.05* |

| | | | | |
|---|---|---|---|---|
| Wh-word Type = *which +NP* | -0.27 | 0.23 | -1.17 | =.24 |
| Wh-word Type = *who* | 0.54 | 0.26 | 2.07 | <.05* |
| Age Group = *6 y.o.* | 0.84 | 0.35 | 2.43 | <.05* |
| Interaction = *Subject & which +NP* | 0.99 | 0.39 | 2.53 | <.05* |
| Interaction = *Subject & who* | -0.29 | 0.39 | -0.73 | =.46 |

Table 2. Generalized linear mixed effects model of correct responses for subject and object wh-questions for all age groups (*final model: Response Accuracy ~ Structure Type + Wh-word Type + Age Group + Structure Type * Wh-word Type + (1 + Structure Type | Participant) + (1 | Item); N = 1584, AIC = 1186.4, BIC = 1245.4, log-likelihood = -582.20,* $\chi^2 = 5.27$)

| **Random effects** | $s^2$ | **Correlation with random effect for Intercept** |
|---|---|---|
| Participant Intercept | 1.31 | |
| Structure Type = *Subject* | 3.17 | -0.54 |
| Item Intercept | 0.08 | |

Table 3. Summary of random effects and correlation in the mixed logit model

Several main effects and one interaction appear as significant. The results show that children overall comprehend subject wh-questions better than object questions ($\beta = 0.79$, $SE = 0.39$, $z = 2.02$, $p < .05$). Children also perform better with object *who* questions than with object *which –NP* questions ($\beta = 0.54$, $SE = 0.26$, $z = 2.07$, $p < .05$). Although the negative coefficient for Wh-word type *which +NP* indicates that the presence of a wh-element followed by a lexical noun hinders comprehension, the difference in children's comprehension of object *which +NP* and object *which –NP* questions is not significant ($\beta = 0.20$, $SE = 0.23$, $z = 0.85$, $p < .05$). We can also observe that the 6-year-old group gives significantly more accurate responses ($\beta = 0.84$, $SE = 0.35$, $z = 2.43$, $p < .05$), illustrating that comprehension of wh-dependencies improves with age. The interaction between Structure Type: *Subject* and Wh-word Type: *Which +NP* was also significant (Figure 4):

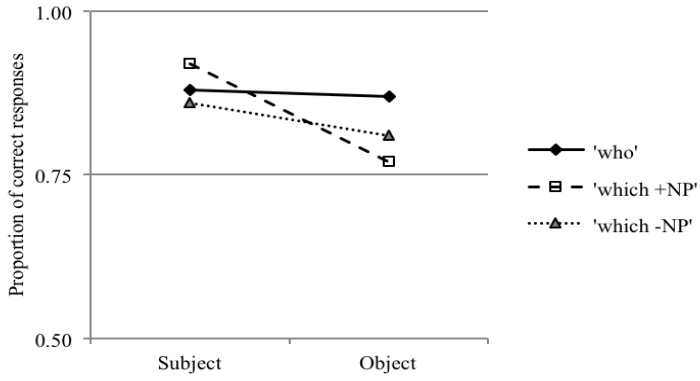



Figure 4. Proportion of correct responses for subject and object wh-questions by type of wh-word for all the children tested (age range 3;8 – 7;2)

The interaction shows that comprehension significantly improves in the presence of a subject question introduced by a *which +NP* phrase ($\beta = 0.99$, $SE = 0.39$, $z = 2.53$, $p < .05$) as compared to object questions. Once again, we see from the interaction plot that the absence of a lexical noun from the *which*-phrase in object questions does not improve children's performance, for which performance is very close to that for object *which +NP* questions.

Children's comprehension of both *which +NP* and *which –NP* object questions is less accurate than their comprehension of object *who*-questions.

## 4. GENERAL DISCUSSION

The motivation for this study was to determine how language-specific properties such as case marking affect children's processing of wh-questions in Romanian, as well as understand the impact that the NP feature has on the comprehension of A'-dependencies. The adult data show no asymmetries in comprehension, as adults perform at ceiling for all the experimental conditions. In the remainder of the section, I will focus on the child data by discussing first the role of case marking and then the effect of the NP feature on children's comprehension of wh-questions.

### 4.1. The role of case marking

One of the findings of this study concerns the role of the preposition *pe* in children's parsing of wh-questions. As illustrated in section 3, the use of *pe* in the experimental material should straightforwardly disambiguate between a subject and an object interpretation, irrespective of the type of wh-word, and should help identifying the thematic role of the wh-argument in relation with the verb. Except for the presence of a clitic pronoun in object *which* questions, subject and object questions had the same word order – namely *WH Verb NP* – as a post-verbal subject was used in all three types of questions. Verbal agreement also provided the same cues in all of the object questions (the verb was always singular and could agree in person and number with both the subject and the object). As such, *pe* at the very onset of the wh-question gave the most salient cue with respect to the syntactic position that the wh-constituent occupies in relation with the verb.

The general picture that emerges from the experimental findings reveals a subject-object asymmetry in the comprehension of *which*-questions: this asymmetry is more pronounced in the case of *which +NP* and is present, but less salient, with *which –NP* questions. The subject-object contrast is absent from *who* questions, due to the fact that children comprehend both subject and object *who* questions very well. Moreover, children have more problems arriving at the correct interpretation for *which*-questions as compared to object *who*-questions. The results therefore suggest that the case marking on the wh-pronoun in Romanian does not eliminate the difference in the comprehension of subject and object *which*-questions or the asymmetry between *who* and *which*-interrogatives. This is consistent with the results of a number of studies on a variety of languages (according to De Vincenzi et al. (1999); Avrutin (2000); Friedmann et al. (2009), Benţea and Durrleman (2013), (2014), etc.) illustrating that children struggle more with object *which*-questions. The data also fall in line with several findings for the comprehension of relative clauses in Romanian (as claimed by Benţea (2012); Sevcenco and Avram (2012)) showing that case marking on the relative pronoun does not facilitate processing of object relative clauses.

However, despite the subject-object difference surfacing in the comprehension of *which*-questions in Romanian, this asymmetry is greatly reduced with respect to earlier studies with other languages. Romanian children comprehend object *which +NP* questions 77% of the time, compared with earlier findings of 58% for Hebrew (as Friedmann et al. claim (2009)), 50% for Italian (according to De Vicenzi et al. (1999)) and around 40% for French with children of the same age range (as claimed by Benţea and Durrleman (2013), (2014)). These results also contrast with those reported for the comprehension of relative clauses in Romanian, for which accuracy scores seem to be as low as 25% in the case of object relatives and as high as 95% with subject relatives.

Two explanations come to mind to account for such differences. One very plausible possibility would be to relate the improvement found with object wh-questions to task-specific effects. Contrary to other studies, the present study assessed comprehension of wh-

questions using animations and not static pictures. An important feature of this type of experimental material was that each target sentence was preceded by a pre-recorded preamble where all the characters were named and each action was clearly described and illustrated. This allowed the child to visualize the whole experimental setting while reducing the lexical access load. Another important characteristic of the pictorial stimuli was the use of only one display with three characters instead of two pairs of images with the same characters performing the same action with reversed roles (see also Arnon (2005) and Adani (2011) for a criticism of this latter type of stimuli). However, this cannot fully account for the data as both De Vincenzi et al. (1999) and Friedmann et al. (2009) used images depicting three characters (e.g. two dogs and a cat; one dog bites the cat and the cat bites another dog) and still found a subject-object asymmetry in the comprehension of *which*-questions.

Rather, this improvement with respect to other cross-linguistic findings seems more likely due to properties of wh-questions in Romanian which facilitate comprehension of object questions to a greater extent. More specifically, this facilitation might stem from the simultaneous presence of *pe* and of a post-verbal subject. Note that these two properties distinguish Romanian wh-questions from both Hebrew and Italian wh-questions. In Hebrew, the wh-object is also preceded by an accusative marker – *et* – similar to *pe* in Romanian[7], but in all the questions included in Friedmann et al.'s (2009) study the subject always appeared in a pre-verbal position[8]. In Italian, on the other, the subject appears in a post-verbal position in object wh-questions and there is no case marking on the wh-phrase. This leads to the same surface order in both subject and object questions in Italian, rendering the *WH Verb NP* order ambiguous between a subject and object interpretation. Therefore, agreement with the verb is crucial for disambiguating the structure. However, as De Vincenzi et al. (1999) showed, the correct interpretation of object wh-questions with a post-verbal subject in Italian is greatly delayed when compared to the comprehension of subject wh-questions. De Vincenzi et al's results are corroborated by findings from an elicited production of wh-questions in Italian (claimed by Guasti, Branchini and Arosio (2012)) which revealed that adults are more likely to produce questions with the *WH Verb NP* order than children. That Romanian-speaking children perform better with object *which*-questions than their Hebrew- and Italian-speaking peers could therefore be explained through the additive effect of the case marker *pe* and the post-verbal subject. Sevcenco and Avram (2012) already show that a post-verbal subject facilitates comprehension of headed object relatives in Romanian. This, coupled with the presence of *pe* at the very onset of the wh-question which signals that the phrase should receive an object interpretation, seems to boost children's comprehension of object wh-questions.

The facilitation effect, however, is not strong enough to completely override children's difficulties with object questions in which both the A'-moved element and the intervening subject share a [+NP] specification – that is, they both contain a lexical restriction. Children's performance with object *who*-questions lends further support to this hypothesis, as it shows that these questions are not taxing for comprehension. Children comprehend object *who*-dependencies better than object *which*-dependencies, although *pe* is present in both types of structures and should equally facilitate comprehension.

These findings are in line with the predictions of an intervention account of the RM type (according to Friedmann et al. (2009)): children only struggle with those structures in which the A'-chain linking the object to its base-generated position crosses an intervening subject and the intervening element shares a partial featural specification with the A'-moved object, thus leading to an inclusion configuration between the features of the object and the

[7] Different constraints govern the distribution of *et* and *pe:* while *et* in Hebrew is used with both animate and inanimate definite objects (according to Danon (2001)), the use of *pe* in Romanian is determined by conditions such as animacy, specificity and definiteness.

[8] Post-verbal subjects in Hebrew are only possible with unaccusative and passive verbs (see Botwinik (2011)).

intervener. The specific structures that pose problems for children involve a particular featural set-relation represented in (24a) and they contrast with the featural specification of the wh-phrase and the intervening element found in object *who*-questions (24b). [+Q] is the scope-discourse or 'criterial' feature attracting the target to the corresponding A'-position:

(24) a. +Q+NP +NP
Pe care girafă a gâdilat-o țestoasa?
pe.ACC which giraffe has tickled-her turtle.the

b. +Q +NP
Pe cine a gâdilat țestoasa?
pe.ACC who has tickled turtle.the

Example (24a) illustrates that the element heading the A'-chain contains a [+NP] feature also present on the intervening subject. The computation of this inclusion relation, where the features on the embedded subject are included in the set of features present on the moved *wh*-element, is more problematic for children than the computation of a disjunction relation (24b). As a consequence, the intervening subject competes with moved A'-object and hinders the realization of the correct dependency between the moved element and its base-position as it becomes a potential candidate for this relation. In contrast *who*-questions, in which the fronted element is [–NP], do not give rise to such intervention effects. This illustrates the impact of the featural specification of the elements forming the A'-chain and further raises the question of the role that the overt presence of a [+NP] element plays in the processing of wh-dependencies, which I will turn to in the remainder of the discussion.

**4.4 The role of the [+NP] feature**

The aim of comparing *cine* 'who', *care NP* 'which +NP' and *care* 'which –NP' questions was to uncover the effect that the NP feature has on children's comprehension of wh-questions. Following previous proposals in the literature (according to Friedmann et al. (2009), Belletti et al. (2012)), I classified *which*-questions introduced by *care* 'which' and not containing an overt lexical noun as –NP. Such a comparison is particularly relevant given the findings for *who*-questions, which are [–NP] and which pose no difficulties for comprehension.

However, as discussed in section 3.3, there is only an apparent similarity between *cine* 'who' and *care* 'which' not containing a full lexical NP. The latter element patterns with *care NP* 'which NP' expressions both at a syntactic and at an interpretive level. This has been taken as evidence to show that *care* 'which' elements without a noun from the contentive lexicon still contain a [+NP] specification and have the form [$_{WH}$ [$_{NP}$ [$_{N}$ e]]]. To recall, we predicted that if the child grammar system is only sensitive to the absence of a lexical noun, then performance for object *who* and object *which –NP* questions should be on a par. On the other hand, if the [+NP] feature acts as an attractor for movement and is taken into consideration for the computation of Relativized Minimality, the children's comprehension of object wh-dependencies should be affected by the presence of a +NP feature on both the moved element and the intervener, even when the lexical NP is not overtly expressed in the wh-expression. As a consequence, object questions introduced only by a *which*-element and without a lexical NP (so object *which –NP* questions) should still give rise to intervention effects and children should perform similarly for object *which +NP* and object *which –NP* questions.

The results of the present study follow from the predictions of a RM-based approach to the acquisition of A'-dependencies: children perform better with object *who* than with object *which +NP* and object *which –NP* questions. Moreover, there is no significant difference in children's comprehension of object *which*-dependencies, irrespective of the presence or absence of a noun from the contentive lexicon. Configurations like (25) in which the features

on the moved object include the [+NP] specification also present on the intervening subject are harder for children to parse than configurations like (22b), repeated here as (26), where a disjunction relation holds between the featural sets of the two elements.

(25) * Pe care (+Q+NP) a gâdilat-o (+NP) țestoasa?
pe.ACC which has tickled-her turtle.the

(26) * Pe cine (+Q) a gâdilat (+NP) țestoasa?
pe.ACC who has tickled turtle.the

Object *which*-questions introduced in Romanian by *care* but lacking an overt lexical noun (25) instantiate the same inclusion configuration present in *which NP* questions (24a): the morphosyntactic feature set of the moved A'-object properly includes the set of features characterizing the subject intervener, which in turn blocks the realization of the chain relation between the A'-object and its base position.

These findings also have implications for the characterization of the features that can impact the computation of intervention. In discussing the different effect of the gender feature in Hebrew and Italian, Belletti et al. (2012) put forth the idea that features not functioning as attractors "in the inflectional head of the clause are disregarded in the computation of the set theoretic relation relevant for Relativized Minimality." (2012: 1064). In other words, only the features that are overtly manifested on the verbal inflection have the potential to modulate comprehension. However, the results obtained in this study for the comprehension of *which – NP* questions indicate that features which do not have an overt manifestation in the clausal inflectional head are nonetheless taken into consideration in the calculation of intervention effects. If we assume featural RM to be the formal intervention principle, then such effects receive a straightforward explanation. Under the standard assumptions of RM, intervention effects are induced by attracting features that belong to the same featural class (i.e. Argumental, Quantificational, Modifier, Topic) and such features are not typically expressed in the verbal morphology. It is precisely the capacity to trigger movement that makes a feature visible for the computation of intervention. The morphological expression of a feature on the inflectional head might be a sufficient criterion for this feature to be taken into account by RM, but it is not a necessary one.

## 5. CONCLUSIONS

The present study aimed at investigating whether a subject-object asymmetry also surfaces in the comprehension of *who* and *which*-questions in Romanian and whether the [+NP] feature impacts the processing of wh-dependencies even in the absence of an overt lexical restriction or lexical noun on the moved wh-object. Whereas no difference in comprehension emerges from the adult data, children's results reveal two asymmetries: (i) a subject-object asymmetry in the comprehension of *which*-questions, but no difference in the comprehension of subject and object *who*-questions; (ii) an asymmetry in performance with object *who*-dependencies and object *which*-dependencies, independent of the presence of a full lexical noun after the wh-phrase. Following Friedmann et al. (2009), I propose to account for these asymmetries in terms of intervention effects generated by the inclusion relation that holds between the featural sets characterizing the intervening subject and the moved wh-object. The critical property is the presence of a [+NP] on both elements: a [+NP] subject hinders the establishment of the correct syntactic and interpretive relation between a displaced object, also bearing a [+NP] feature, and the verb. That this account is on the right track is further supported by the results for the comprehension of *which*-questions that do not contain an

overtly expressed noun and which still trigger intervention and lead to comprehension difficulties. The data also suggest that, like the adult system, the child system takes into consideration for the computation of locality those features that act as attractors or movement even in the absence of an overt manifestation of these features on the clausal inflectional head.

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