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Agreement in the production of Italian subject and object wh-questions

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1. Introduction

A marked crosslinguistic preference for subject over object wh-questions emerges in a variety of populations. Adults read and process faster subject than object questions (e.g., De Vincenzi, 1991; Fiebach, Schlesewsky & Friederici, 2002; Frazier & Flores D'Arcais, 1989; Penolazzi, De Vincenzi, Angrilli & Job, 2005; Schlesewsky, Fanselow, Kliegl & Krems ,2000; see also Stowe, 1986 for contrasting findings). Similarly, adult agrammatic patients find subject questions easier to handle than object questions (Dickey, Choy, Thompson, 2007; Garaffa and Grillo, 2008; Neuhaus and Penke, 2008; Salis and Edwards, 2008). Children, generally, produce and comprehend subject questions earlier and better than object questions and for children affected by specific language impairments (SLI) object questions are more challenging than subject questions. Subject questions are more frequently produced than object questions in English (Stromswold 1995). In elicited production studies, children are more accurate on subject than on object questions from an early age (Ervin-Tripp, 1970). O'Grady (2005), citing Yoshinaga (1996), reports that English learners have no problem in producing subject *who* -questions by age 2 (100%) while they have many difficulties with object *who*-questions (8% of correct responses). It is only at age 4 that the production of object questions almost equals that of subject questions with respectively 80% and 89% of correct questions produced. Van der Lely and Battell (2003), by comparing the production of WH-questions in typically developing (TD) children and in children with SLI, also report a subject over object preference for *who* questions in 6 year old TD English-speaking children. These findings are extended to Greek by Stavrakaki (2006), who reports a very mild advantage in subject questions over object questions (subject *who* =100%; object *who* =92%; subject *which*=93%; object *which*=81%) by 4;1 years old Greek speaking children. Beyond production, also the comprehension of wh-questions is problematic and, in this case, the difficulty is modulated by the type of WH-element (Ervin Tripp, 1970; Tyack & Ingram, 1977). Avrutin (2000) found that 3;5 to 5;2 year old English-speaking children (mean age 4;3) comprehend object *which*-questions less well than subject *which*-questions (48% correct versus 86% correct responses), while such an asymmetry was not attested for *who*-questions (80% correct responses in both cases) (this last finding is also replicated by Hirsch and Hartman, 2006). More recently, similar results were found by Friedmann, Belletti & Rizzi (2009) with Hebrew-speaking children aged 3;7-4;10 years (mean age 4;3). These children scored significantly lower in the comprehension of object *which*-questions, 58%, than in that of

subject *which*-questions 78%, but they were equally good in the comprehension of subject and object *who*-questions (around 80% correct responses). Finally, carrying out a comprehension experiment on WH-questions in Italian learners, De Vincenzi, Arduino, Ciccarelli & Job (1999) found out that while at age 3-4 children do not show any significant asymmetry in the comprehension of subject versus object questions (scoring respectively 64% and 53%), by age 4 they experience difficulties with object questions, while rapidly improving in subject questions, an asymmetry lasting until age 10. In contrast to previous studies on comprehension, this asymmetry was evident both in *who*- and in *which*-questions, but in the last case it was more marked, at least until age 7. Another notable aspect of De Vincenzi et al. is that the asymmetry detected in the Italian learners lasted longer than in the English or Greek ones, given that an adult-like performance was reached at about 10-11 years. In sum, although, across languages, an asymmetry between subject and object questions is evident both in production and in comprehension, there are intriguing divergences: some studies find this asymmetry both in *who*- and in *which*-questions; others only in *which*-questions. But notice that, while both *who* and *which*-questions were investigated in comprehension, generally only *who*-questions were examined in production. In addition, the developmental pattern seems to differ across languages: in some languages the asymmetry is evident for a shorter time than in others.[1] In this paper, we investigate the production of WH-questions in early learners of Italian, comparing it to the production of adults, by employing an elicited production experiment. Our study will complement the comprehension study carried out by De Vincenzi et al. and from these two angles we will try to better characterize the nature of the subject/object asymmetry. By focusing on this issue, we attempt to gain insight into the way the acquisition process unfolds and which processes are readily available during acquisition and relatively efficient in the adult system. Putting it in a crosslinguistic perspective, we will argue that the specific processes involved in the formation of WH-questions across languages are to be held responsible for the different developmental patterns.

First, we discuss questions in Italian (§ 2); then, we present some accounts of the subject/object asymmetry (§ 3). We finally describe our experiment (§ 4), analyze the results and discuss them (§5).

2. Italian WH-questions

Italian WH-questions are peculiar in that subject and object questions display the same order of elements: WH V NP, an order often found in languages with VS order, such as Arabic languages, Irish, Malagashy. It is only through agreement on the verb that the sentence is disambiguated: a subject question (1), if the verb agrees with the copy of the WH-operator, an object question (2), if it agrees with the postverbal NP subject.

(1) Chi colpisce i bambini?
Who hit-3SG the children?
Who hits the children?

[1] We do not claim that the asymmetry completely disappears, but it is likely that it is manifested in other ways, i.e., in terms of the reaction times in adults (see De Vincenzi, 1991).

(2) Chi colpiscono i bambini?
Who hit-3PL the children?
Who do the children hit?

It follows that a WH-question displaying a singular overt NP (as in (3)) is potentially ambiguous between a subject or an object interpretation since the singular verb agreeseither with the WH-operator or with the overt singular NP.

(3) Chi colpisce il bambino?
Who hit-SG the child?

The surface word order WH V NP displayed by both subject and object questions is made possible by the fact that subjects can occur in a postverbal position. This latter may, however, also be found sitting in the left periphery of the question as in (4), where we have an object question with a topicalized subject in front of the WH-element. Obviously, being Italian a null subject language, the subject can remain phonologically null, as in (5), if the context makes this option pragmatically felicitous (i.e., if it is clear who the referent is; this is always the case for the 1st and the 2nd person, but not for the 3rd person).

(4) I bambini, chi colpiscono?
The children, who hit-PL?
The children, who do (they) hit?

(5) Chi colpiscono?
Who hit-PL?
Who do (they) hit?

4. An elicited production experiment

One group of 35 children aged from 3;11 to 5;11 (M=4;10, SD=0;6) and one group of adult controls (N=20) participated in the experiment. Five more children were discarded because they did not complete the experiment or did not understand the task. Children were tested in school and parent consent forms were previously collected.

First, children were familiarized with a male puppet to which they had to ask questions. Then, they were tested individually in a quiet room and were invited to ask questions to the puppet. The questions produced by the child were transcribed by the experimenter on a score sheet and were tape recorded for further check. Adults were tested with the same procedure except that they were expected to ask questions to an imaginary person. The experiment was presented using a portable computer and stimuli were displayed through a powerpoint presentation. The technique used is an adaptation of that used by Yoshinaga (1996) and reported in O'Grady (2005). Subjects were shown a picture displaying some character(s) doing or participating as patients in an action. The agent or the patient was hidden depending on whether a subject or an object question was aimed. As the picture was shown, a pre-recorded voice delivered through loudspeakers connected to the portable computer described what was happening. For example, the voice said: "*Someone is chasing the elephants*

(pointing to the character hidden under an ellipsis). The puppet knows who. Ask him who". The action or its results was clearly depicted on the picture. After hearing the voice, the child was expected to ask the puppet a question, that in this case was: "*Who is chasing the elephants?*". The puppet, manipulated by the experimenter, had to guess who was hidden, and the mysterious character then appeared from underneath the ellipsis. The child would finally judge the correctness of the puppet's guess. We elicited subject and object questions introduced by who or by which NP. In the latter case, in order to make the context felicitous for the use of a which-question, we had to use two pictures. In the first picture, the relevant characters were presented and then a picture for eliciting the questions was shown. Before starting the experimental session, children were exposed to 2 practice trials eliciting questions introduced by what. During the practise children received feedback to make sure they understood that a question was expected from them. We manipulated two factors, each one comprising two levels: question type (Subject, Object); WH-element (*who, which NP*). There were 6 trials for each condition, for a total of 24 questions. Eighteen different transitive verbs, all reversible, were used (*bite, chase, caress, catch, dip, dirty, dream, follow, frighten, greet, hit, leak, pull, push, run after, tie, wash, wake up*) with different nouns. The verbs *dip*, *pull*, *run after*, *tie*, *wash* were used twice, but with different nouns. Some of the pictures were taken from De Vincenzi (1996) and adapted to the task. We may notice that *who*–subject questions always feature a singular verb, while *who*-object questions invariably employ a plural verb. This was inevitable given the grammar of Italian WH-questions (see above), if one wants to elicit unambiguous questions. We counterbalanced for this bias in *which*-questions, where we had 3 subject questions with singular verbs (*which cook is greeting the football players?*) and 3 with plural verbs (*which children are pulling the fairy?*) as well as 3 object questions with singular verbs (*which horses is the lion chasing?*) and 3 with plural ones (*which child are the smurfs dreaming of?*). From the first list of stimuli a second list was created by using pictures with the same characters and actions, but reversing the direction of the actions. For example in one list we used the picture displaying a hidden animal chasing the elephants and we elicited a subject question (*who is chasing the elephants?*). In the other list the corresponding picture displayed two elephants chasing some other character in order to elicit an object question (*who are the elephants chasing?*). In this way, all children viewed the same actions and characters, with only the direction of the action changing. The presentation order was randomised and the same order set was used for each participant. Children and adults were randomly assigned to one of the two lists. All stimuli were pre-recorded by a native speaker of Italian.

5. Results

Children and adults' responses were first scored for correctness and correct responses were then categorized into different types. Responses were considered correct when they matched the target question. Responses substituting *which NP* with *who* were scored as *who* questions, responses substituting *which NP* with *which* (corresponding to English *which one*) were score as *which*-questions and responses substituting *who* with *what* were scored as *who*-questions (in these questions *what* stands for an animate entity being questioned; this change occurred only in object questions). Errors included subject questions produced

when an object question was targeted or viceversa, production of the WH element alone (i.e., *who*?), transformation of the WH-question into a yes/no question, irrelevant responses.

To analyze our data we used a repeated measures logistic regression analysis, as the dependent variable (Response) is categorical (and not continuous as required by the ANOVA). In the logit model, the dependent variable is rescaled "in terms of a logit (or log odd) response-strength measure" (Dixon, 2008:1), i.e., the logarithm of the ratio between the event probability (e.g., producing a correct response) and the non-event probability (producing an incorrect response).

As the response accuracy between the two lists did not differ ($\chi^2(1)=2.60$, $p=0.10$),- we collapsed the data together for all further analyses. First, we contrasted all correct responses (656 for children and 434 for adults) versus all incorrect ones (183 for children and 46 for adults). This analysis revealed that adults were generally more accurate than children in producing all questions, except for subject which-questions (where no difference was observed between children and adults), that the rate of correct subject questions was higher than that of correct object questions but only for *who*-questions (no difference being observed for *which*-questions), that *who*-questions were easier to produce than *which*-questions for adults, but this held only for subject questions in children. These findings are supported by the statistical analysis calculating the change of probability of producing an error rather than a correct question, for each factor (Sentence and Type of WH-element) and for each age group. A main effect of age ($\chi^2(1)= 13.60$, $p=0.0002$), of sentence ($\chi^2(1)= 7.80$, $p=0.005$) and of type of WH-element ($\chi^2(1)=11.79$, $p=0.0006$) was found. In addition, two interactions were found: one between sentence and type of WH-element ($\chi^2(1)=5.05$, $p=0.02$) and another one between age and type of WH-element ($\chi^2(1)=9.05$, $p=0.002$). As for the first interaction (Sentence by Type of WH-element), *who*-questions systematically elicited higher correct responses (Subject=92%, Object=79%) than *which*-questions (Subject=81%, Object=77%). Concerning the second interaction (Age by Type of WH-element), we observe that *who*-questions systematically elicit higher correct responses (children=79%, adults=96%) than *which*-questions (children=76%, adults=84%). Thus, the two interactions do not affect the interpretation of the three main effects (age, sentence and type of WH-element). To unpack these interactions we carried out separate analyses. We found a main effect of age for subject *who* -questions ($\chi^2(1)=11.35$, $p=0.008$), for object *who*-questions ($\chi^2(1)=16.72$, $p<0.0001$) and for object *which* -questions ($\chi^2(1)=4.05$, $p=0.04$), but not for subject *which*-questions ($\chi^2(1)=0.34$, n.s.). Thus, the main effect of age is due to *who*-questions (subject and object) and to object *which*-questions. Then, for children, we found a main effect of type of WH-element for subject questions ($\chi^2(1)=5.23$, $p=0.02$), but not for object questions ($\chi^2(1)=0.27$, n.s). For adults, we found a main effect of type of WH-element both for subject ($\chi^2(1)=6.05$, $p=0.01$) and object questions ($\chi^2(1)=5.81$, $p=0.01$). Thus, the main effect of type of WH-element is due to subject questions for children and to both subject and object questions for adults. Finally, we found a main effect of sentence for *who*-questions in children ($\chi^2(1)=19.62$, $p<0.0001$) and in adults ($\chi^2(1)=4.16$, $p=0.04$). Thus, the effect of sentence is due to *who*-questions. Table 1 summarizes the main results.

Main effects	Due to	Findings
Age	Subject *who* -questions Object *who*-/ *which*-questions	Adults better than children
Sentence	*who* -questions (children and adults)	Subject vs. object asymmetry only in *who* –questions
Type of WH	Subject-questions (children) Subject and object-questions (adults)	*who*- better than *which*-questions

Table 1. Results from the analysis correct/incorrect

Correct questions displayed different kinds of structures, especially in children's production. The different structures produced reveal which strategies speakers use when they have to produce a question. Table 2 reports the possible strategies and exemplifies them for subject and object questions.

Strategy/Structure	Subject questions	Object question
NP-final: WHVNP	Chi lava gli orsi? *Who washes the bears?*	Chi lavano gli orsi? *Who wash-3PL the bears?* *Who are the bears washing?*
NP-topicalization: NPWHV	Gli orsi, chi (li) lava? *The bears, who washes (them)?*	Gli orsi, chi lavano? *The bears, who (they) wash-3PL?* *The bears, who do they wash?*
Cleft	Chi è che lava gli orsi? *Who is it that washes the bears?*	Chi è che lavano gli orsi? *Who is it that wash-PL the bears?* *Who is it that the bears are washing?*
Argument drop	Chi (li) lava? *Who washes (them)?*	Chi lavano? *Who(they) wash-3PL?* *Who do they wash?*
Passivization	Da chi sono lavati gli orsi? *By whom are washed the bears?* *By whom are the bears washed?*	Chi è lavato dagli orsi? *Who is washed by the bears?*

Table 2. Type of correct questions produced.

Figure 1 reports the percentages of use of these different structures employed by children and by adults, as a function of the type of question and of WH-element.

These percentages are calculated by considering only correct questions.

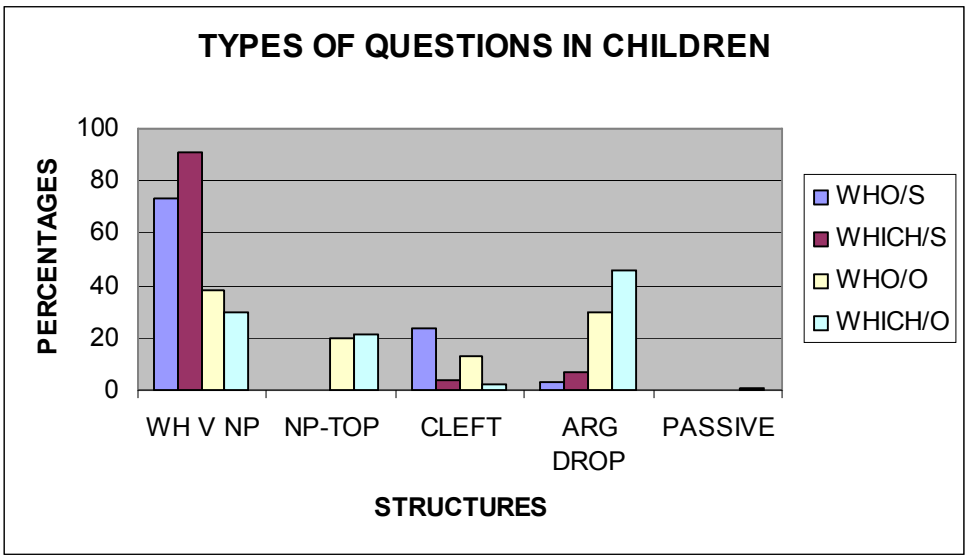


Figure 1a. Structures produced by children as a function of type of questions and of wh-element

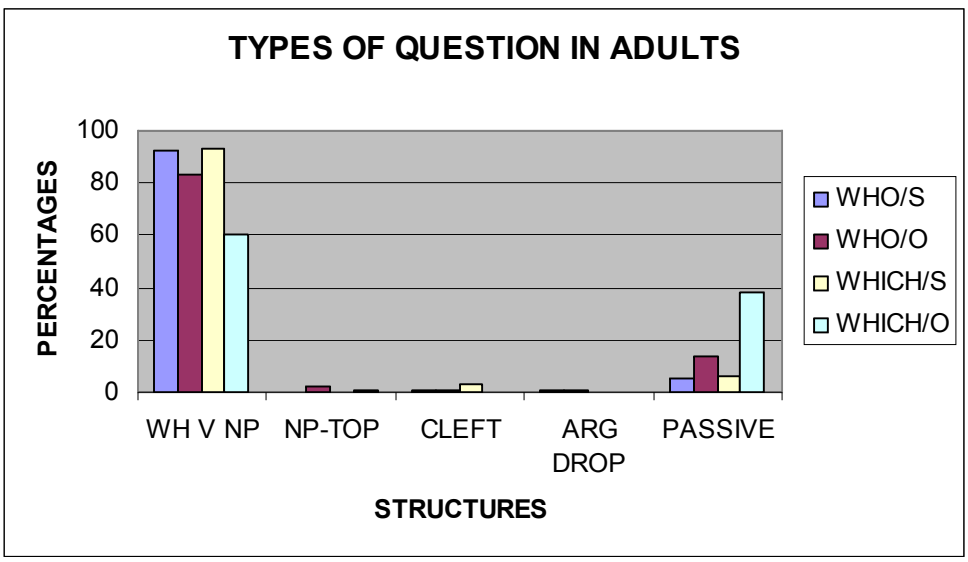


Figure 1b. Structures produced by children as a function of type of questions and of wh-element

These strategies/structures were generally or, in most cases, exclusively employed to produce object questions, except for the first one. They can be classified into two main categories: those in which the subject occupies a postverbal position (WH V NP and clefts) and those in which it occupies a preverbal position (NP-topicalization, null arguments and passivization). Let us examine each strategy in detail. NP-final is a strategy which results in the order WH V NP, with NP being the postverbal subject or the object. This is the common order in Italian WH-questions, but if one employs reversible verbs such order is potentially ambiguous (see (3)). This structure is more commonly used by adults than by children. Its use was more frequent in subject than in object questions, in both adults and children and for both types of WH-element.

NP-topicalization results in a structure in which the subject or the object is preposed to a preverbal dislocated position. When the preposed NP is an object (in subject questions), a resumptive clitic must be used within the question. In fact, this structure was never used to form subject questions. Children often produced object questions with the NP subject preposed or topicalized to a left peripheral position, before the WH-element and they did so equally often for both *who*- and *which*- questions. Adults also used NP-topicalization and did so only in object questions, but their frequency is very low (between 1% and 2% of the target structures).

The third structure is the cleft, a structure commonly used in the spoken variety of our subjects (but that sounds somehow substandard). Both adults and children produced subject and object cleft questions, but adults did so much less frequently than children. This happened more frequently in the case of *who*-questions than in the case of *which*-questions.

Argument drop yielded object questions with a phonologically null subject, an option that is legitimate in Italian and that, given the experimental context, was appropriate as the subject was mentioned in the lead in (The *bears are washing someone. Ask the puppet who*). For the same reason, omission of the lexical object NP is an option, but in this case the question should include a clitic pronoun (*Chi lo lava?* Lit. Who him washes? Who washes him?). Interestingly, the option of expressing the object through a clitic pronoun in subject questions is rare. Thus, generally only the subject was dropped (in object questions) and this option was only exercised by children.

Finally, passivization consists in the transformation of an active into a passive question. We considered it as a strategy whereby the subject is preverbal in that, being the grammatical subject (or the underlying internal argument) a WH-element, it moves to a preverbal position. In the case of subject questions, applying passivization gives rise to a subject question introduced by the by-phrase. In both cases, the thematic roles are assigned correctly. Passivization was mostly used when the target was an object question and when the operator was *which NP* rather than *who*.In addition, this strategy was exclusively used by adults.

6. Discussion

As in other studies we found a subject/object asymmetry in the production of questions. In the literature, such subject/object asymmetry in WH-questions hasbeen explained as an effect of the length between the WH-element and its copy, an intuition, known as the Minimal Chain Principle (MCP)[2] (De Vincenzi, 1991; see also the Active filler Hypothesis, Frazier and Flores D'Arcais, 1989) which states that the preference for subject over object questions derives from a shorter chain in the former case than in the latter and this results in a reduction of the parser's memory load. While this account fares well with the main finding presented in section 1 and our results, it fails to explain why object questions are particularly delayed in Italian and an adult-like performance is reached much later than it is in English or in Greek.

[2] *Minimal Chain Principle (MCP)*: Avoid postulating unnecessary chain members at Surface-structure, but do not delay required chain members. (De Vincenzi, 1991)

Recently, a different approach has been proposed by Friedemann et al. based on the acquisition of Hebrew WH-questions. Emphasizing on the similarity between the configuration created by object extraction in Hebrew WH-questions in (6) and the one created by extraction of an adjunct out of an indirect question in (7), Friedemann, et al. have proposed an account of the subject/object asymmetry in terms of intervention. These authors point out that (6) and (7) share the same abstract configuration in (8), where the dependencies between X and Y (Y being the original position marked by the underline) cannot be created when a candidate for the same local relation intervenes between them, yielding a well-known relativized minimality violation (Rizzi, 1990).

(6) **et** **eize kelev** **ha-xatul** noshex ----?
ACC which dog the-cat bites?

(7) **How** do you wonder **Who** behaved ---?

(8) X Z Y

In (7) *who*, the intervener, blocks the local relation between *how* and its copy in the embedded clause and gives rise to an ungrammatical sentence. In (6), the sentence is not ungrammatical, but its comprehension is ruled by the same principle in (8): essentially the intervention of a DP (the cat) impacts on the possibility of establishing a connection between *which dog* and its copy and this is particularly taxing for children, causing their poor comprehension of questions such as (6). Following Rizzi (2004), Friedemann et al. assume that relativized minimality is expressed in terms of features belonging to different classes, as shown in (9) (see also Starke, 2001).

(9) Argumental (A): person, number, gender, case…
Quantificational (Q): WH-, Neg, measure, focus . . .
Modifiers (M): evaluative, epistemic, Neg, frequentative, measure, manner

A Z, in (8), with features belonging to the same class as X and Y intervenes and blocks the relation between the two. This is the case in (7), where *who* and *how* have the same feature +Q. The same holds in (6), as what matters is not merely the presence of an intervener, but the fact that the intervener and the WH-expression share a subset of the features. In (6), the relevant feature is +NP, i.e. lexically restricted. The wh-expression (+Q, +NP) and the subject (NP) share the +NP feature and this makes the dependency between *which NP* and its copy in the merged position difficult to be instantiated. These authors also show that in Hebrew at age 4 no subject/object asymmetry is found in *who*-question as the WH-element (+Q) and the intervener, the subject (+NP), do not share any feature. This account does not anticipate any difficulty in *who*-questions, which are indeed found in Italian, both in production and comprehension, and also in English. Thus, this account does not explain the crosslinguistic differences that seem to emerge in the course of the acquisition of wh-questions.

To overcome these weaknesses, we need to recognize that the subject/object asymmetry is modulated by the specific processes that are employed in a given language to form questions. Toward this end, we offer a new proposal that

builds on research by Guasti & Rizzi (2002) and by Franck, Lassi, Frauenfelder, & Rizzi (2006). In this proposal, a central role is attributed to the subject-verb agreement relation, as it is agreement with the verb that tells one whether a subject or an object question will ensue in Italian (see examples 3 and 4).

Let us then turn to experimental work on the production of subject-verb agreement by adults showing that attraction errors occur more frequently in VS than in SV configurations. Let us illustrate this finding. With the term *attraction* we refer to a phenomenon whereby speakers produce sentences like in (10), where the verb erroneously agrees with the more local noun *neighbours* (a modifier of the subject), rather than with its subject *son*. Essentially, attraction errors originate when some NP intervenes between the subject and the inflected verb.

(10) *The son of the neighbours always come back late

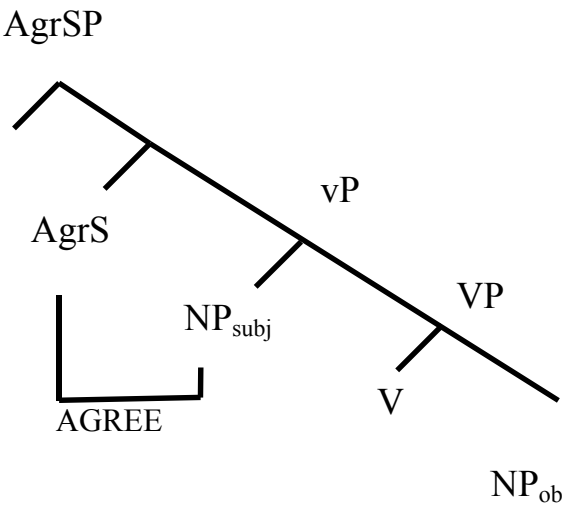
Through a series of experiments, Franck et al. have shown that attraction errors come about at different rates depending on the structural configuration (e.g., linear precedence, c-command) entertained by the elements involved. In particular, in one experiment they tested French object cleft sentences such as in (11) with the embedded subject in the preverbal or in the postverbal position. In both kinds of configurations, attraction errors were found, i.e., in both cases, participants produced the verb *seduce* with a singular rather than a plural inflection and thus agreeing with the object, the singular noun *the adolescent*, rather than with its plural subject*, the boxers*. Interestingly, the rate was significantly higher in the VS configuration in (11b) totalling to 29% than in the SV configuration in (11a) totalling to 15%.

(11) a. C'est l'adolescent que les boxeurs seduisent
It is the adolescent that the boxers seduce

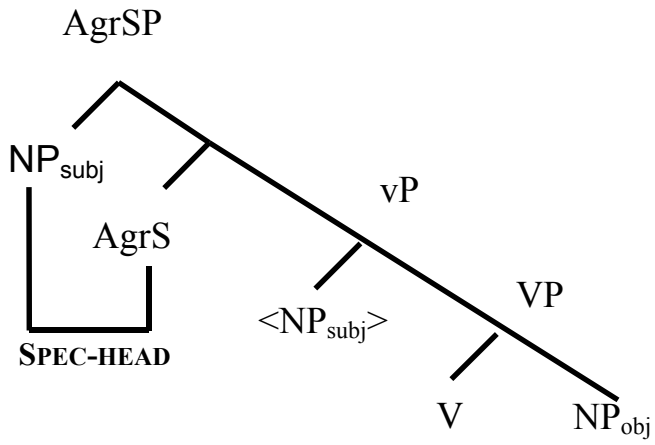
b. C'est l'adolescent que seduisent les boxeurs
It is the adolescent that seduce the boxers

In order to explain this asymmetry, Franck et al. proposed that agreement consists of two subprocesses: AGREE and Spec-HEAD agreement. AGREE is the operation whereby the subject initially merged as the specifier of the lexical verb in the vP (see Koopman and Sportiche, 1991) and endowed with person and number features values the feature of the inflectional node AgrS above it, i.e., it copies its features onto the AgrS node under c-command and in a local configuration, as displayed in the lower portion of (12a). Spec-Head agreement is the additional operation that originates when the subject moves out of vP (and leaves a copy there) to Spec AgrS and enters in a local Spec-head relation with the AgrS head, where the verb may have previously moved to receive its morphological specification, as displayed in the upper part of (12b). Broadly speaking, in sentences with the SV order agreement is obtained by AGREE, MOVE, and Spec Head while in VS sentences it results solely from AGREE.

(12a)

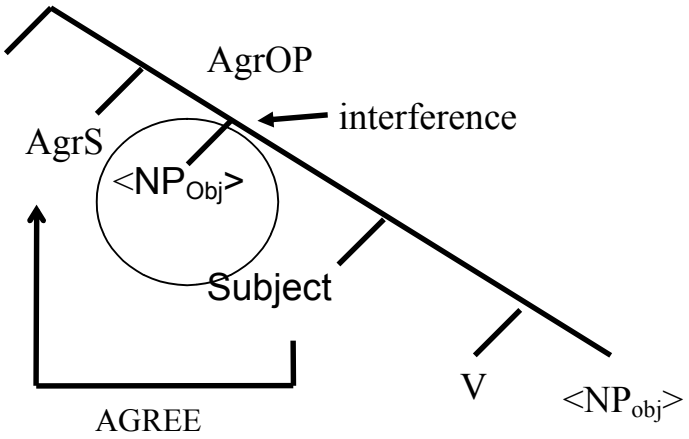


(12b)



This two step conception of morphological agreement is the key to understand the different rate of attraction errors occurring during spontaneous speech production as a function of the configuration between the subject and the inflected verb. It is assumed that object movement to the left periphery, as in cleft sentences and in similar constructions, is stepwise and involves a preliminary movement to an intermediate projection, AgrOP (Kayne, 1989; Chomsky, 1995) immediately dominating the vP, plus a final movement to the left periphery, as in (13). Hence, when AgrS, the probe, looks for a goal in its c-commanding domain, it first finds the object (or the object copy) in Spec AgrOP. Thus, the object interferes on the AGREE relation between the thematic subject in Spec vP and AgrS and induces attraction errors, whereby the object, rather than the subject, may sometimes value AgrS and induce attraction errors.

(13)

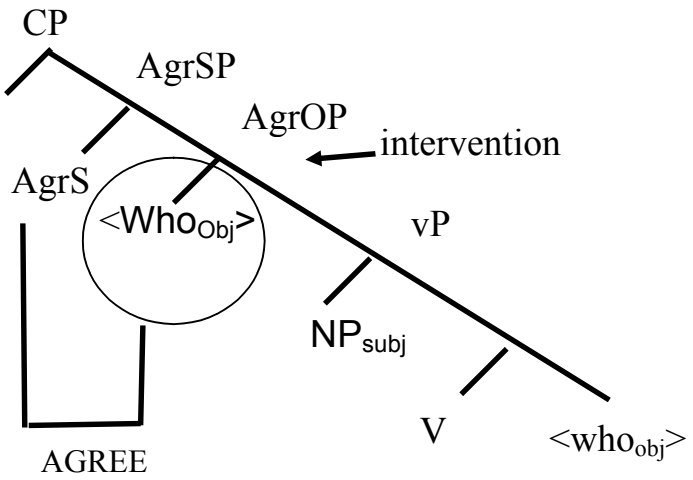


In object clefts with postverbal subjects (OVS clefts henceforth), nothing else happens. In cleft sentences with preverbal subjects (OSV clefts henceforth), instead, the subject moves out of vP to Spec AgrSP and agreement is further checked in the Spec-head configuration. This further step makes the agreement relation stronger and purges (most of) the attraction errors originated during the AGREE operation, by verifying the match in agreement feature between the subject in Spec AgrS and AgrS itself.[3] Thus, although the object (or the object copy) intervenes in both OVS and OSV clefts on the AGREE relation, the different rate of attraction errors in the two constructions depends on the fact that agreement is checked only once in the former case and twice in the latter, with the second step essentially correcting the effects of the interference on the former relation.

Extending this account to our data, we claim that the locus of the difficulties that children (and adults) experience in the production of WH-questions is the interference of the object copy on the AGREE relation between the postverbal subject in Spec VP and AgrS. Furthermore, we argue that the different strategies adopted to form object questions represent various attempts to correct the attraction errors originated during the AGREE relation. Let us explicit this proposal further. When children (and adults) have to produce an object question, they plan a hierarchical structure such as the one in (14) (similar to the one reported in (13) for object clefts).

[3] By adopting the two step computation of agreement, we maintain Spec head in our system in contrast to recent version of minimalism (Chomsky, 2004).

(14)



In the structure in (14), AgrS, the probe, looks for a goal, the thematic subject in Spec vP. However, it first finds the WH-object that, on its way to Spec CP, moves through Spec AgrOP. Thus, in this position, the object (or its copy) interferes on the AGREE relationship between the thematic subject in Spec vP and AgrS. Usually, through AGREE, the person and number features of the subject are copied into AgrS, an operation that may fail when the object copy intervenes and transfers its own features into AgrS, giving rise to an attraction error. When this happens, the verb ends up agreeing with the copy of the logical object, which is then coindexed with the fronted WH-element and the question turns out to be a subject rather than an object question. This is precisely one of the errors that participants in our experiment made when an object question was targeted. Alternatively, due to the interfering object, participants may get stuck and be unable to produce a relevant response. In that case, they may not answer at all or they may repeat the sentence heard during the lead in. Franck et al. showed that attraction errors in object cleft sentences are reduced when the subject is preverbal, essentially because the Spec Head relationship established through movement of the subject to the preverbal position (and of the verb to AgrS) purges the errors ensuing through the previously established operation AGREE. In Italian WH-questions, Spec AgrSP is banned to lexical subjects, i.e., the question in (15) is out in Italian (see Rizzi, 1996 for an explanation).

(15) *Chi i cavalli mordono?
Who the horses bite?

However, Spec AgrS is not banned to phonologically null subjects. We argue that questions featuring null subjects or NP-topicalization represent various types of attempts to correct the attraction errors created during the AGREE relation that make the agreement relation stronger. Let us consider first the null subject question illustrated in (16).

(16) Chi [$_{AgrSP}$ pro mordono] ?
Who pro bite-PL?
Who do they bite?

Null subjects, although generated in Spec vP, have to move to Spec AgrSP in order to be licensed (evidence for the claim that null subjects are located in Spec AgrSP comes from Cardinaletti,1997). In that position, the null subject enters in a Spec-Head relation with AgrS and checks agreement for a second time, thus allowing the correction of attraction errors created during AGREE. Questions with NP-topicalization, exemplified in (17), are like those with null subjects and, in addition, they include a lexical NP dislocated in the left periphery (see also Cardinaletti, 2007).

(17) I cavalli, chi [pro mordono]?
The horses, who pro bite?
The horses, who do they bite?

The lexical subject in this structure is left dislocated and placed in the left periphery via movement. In other words, we are treating (17) on a par with the more familiar case of left dislocation of the object in (18) (Cinque, 1977, 1990):

(18) I libri, chi li ha letti?
The book, who them has read?
The book, who has read them?

While the dislocated object is resumed by a clitic in (18), there is no clitic resuming the dislocated subject in (17), as Italian does not have subject clitics. However, in (17), the dislocated subject is resumed by a null pronominal subject in Spec AgrSP. More specifically, inspired by Cecchetto's analysis (2000) (see also Belletti, 2008), we assume that the structure of (17) includes a big DP1, which contains the DP2 *i cavalli* in its Spec and a *pro* in its head. This *big DP1* is originated in the thematic subject position and is the goal of AGREE. Being headed by a null subject, the *big DP1* moves to the Spec of AgrSP and checks agreement for the second time. Then, the double DP2 *i cavalli* is moved to the left peripheral position that, following Rizzi (1997), we assume to be the Spec of a Topic Phrase (TP) leaving a copy in the Spec position of the *big DP1,* as illustrated in (17). Attraction errors arise during AGREE between AgrS and the thematic subject in the vP, the *big DP1,* due to the intervention of the object copy. As before, these errors are corrected, thank to the second step of agreement checking occurring when the *big DP1* headed by *pro* moves to Spec AgrSP. Thus, object questions with null subjects or with NP-topicalization are the expression of the same strategy: agreement is checked for a second time through *pro* in order to remove the attraction errors generated during AGREE.

Even though adults performed better than children and produced more target questions, they too were more accurate in producing subject than object questions. The most parsimonious account of this asymmetry is that adults too experience the same problems that children do, but to a lesser extent and that the difference is quantitative. This is plausible given that various studies, included the one by Franck et al. discussed above, have shown that adults are prone to attraction errors in various contexts. Thus, adults sometimes failed to produce object questions, because of the interference of the object (copy) on the AGREE relation. Like children, adults too attempted to remove the problems caused by the interference of the object copy, but they did so through a different strategy

than those employed by children. They turned an object into a subject question through passivization as shown in (19).

(19) Chi è rincorso dai cavalli?
Who is chased by the horses?

Passive is a radical way of getting rid of the interference effect on the AGREE relation, under any theory of passive (Jaeggli, 1986; Baker et al., 1989), as the object becomes the subject. We conjecture that passivization was not used by our children, as it is known that young children (4-5 years) have troubles with passive (Borer & Wexler, 1992). We expect that older children, who have passed the period in which passive is problematic, will use passive in the production of object questions. Indirect confirmation for this conjecture comes from the production of object relative clauses in Italian, whose structure shares similarities with object WH-questions. Indeed, Belletti (2008) found that passivization is used by 6 year olds Italian speaking children when an object relative clause is targeted.

At first sight, our results stand in contrast with the wisdom from the literature showing that children have no particular problems in forming WH-questions. Guasti (1996) showed that 4-5 year old Italian speaking children did not experience any problem in the formation of subject and object WH-questions. Interestingly, in this last study, the object WH-questions elicited featured non-reversible verbs with the two arguments differing in terms of animacy and the object being introduced by *che cosa* (what), as in (20). In the hierarchical structure of the question in (20), reported in (21), the object copy intervenes on the AGREE relation between AgrS and the thematic subject, but apparently it does not disrupt the production of the target questions, as this kind of questions are routinely produced by children.

(20) Cosa compera il bambino?
What buys the child?
What does the child buy?

(21) [CP Cosa$_i$ [AgrSP compera [AgrOP <cosa>$_i$ [vP il bambino?]
What buys <what> the child

To explain this fact, we have to notice that, in a number of languages, agreement relations between the verb and its subject are modulated by animacy (e.g., in Georgian). Thus, it is plausible to assume that animacy is a grammatical feature specified on AgrS on a par with number and person. This implies that when looking for a goal with matching features in (28) AgrS first finds the object copy in Spec AgrOP. Although the object copy intervenes on the AGREE relation, it does not carry the animacy feature and thus it does not qualify as an eligible goal and does not count as a potential intervener. This means that an intervention effect arises when the intervener and the goal share the same animacy features.

In summary, we argued for an account of the subject/object asymmetry in the production of WH-questions that capitalizes on the role of agreement relationships. Object questions are more difficult to produce because in the hierarchical structure planned during production, the object copy interferes on

the AGREE relation between the probe, AgrS, and the goal, the subject in the thematic position and this interference may induce attraction errors that result in the production of subject rather than object questions or may block the production of object questions altogether. The interference effect is observed both in children and in adults, but to a different extent and is resolved in different ways.

6.2. Questions formation in other early languages

In this section, we shall evaluate our approach against the results found for other early languages. In Greek the order of words in subject and object questions is the same, as in Italian, as shown in (22) (Example from Stavrakaki, 2006).

(22) a. Pios kinigise ton elefanta? (Subject Who-question)
Who-nom-chased-3s-the-elephant-acc
Who chased the elephant?
b. Pion kinigise o elefantas? (Object Who-question)
Who-acc-chased-3s-the-elephant-nom
Who did the elephant chase?

Yet, Greek speaking children produce more correct object questions than Italian speaking children and at a younger age (4 years). We conjecture that these remarkable differences between Italian and Greek stem from the fact that in Greek the WH-expressions and the NPs are morphologically case marked, as the glosses above show. When looking for a goal, AgrS does not see the object copy as a possible candidate for the AGREE relation, when this has accusative case marked, as in Greek. Therefore, attraction errors are rare and, in our terms, errors in the production of object questions arise less frequently in Greek than in Italian.

We move now to languages in which both steps of the agreement process take place. In this case, the subject/object asymmetry should be evident for a shorter period than in languages in which only AGREE can occur and this seems to be the case. In the production of English *who*-questions, a subject/object asymmetry is found from 2 to 3 years, but not at age 4 (data from Yoshinaga). In English sentences, an independent principle requires the subject to occur in the preverbal position and this means that it can check agreement through Spec Head. This is so also in object questions. Therefore, the attraction errors, ensuing from the first step of the agreement process (AGREE), can be corrected during the second step. Given this scenario, we conjecture that in English and in Italian difficulties in forming object questions arise from the interference of the object copy during AGREE. Up to the age of 4, the interference is so disruptive that no additional Spec Head checking occurs and children transform almost all target object questions into subject questions. At age 3 and then 4, fewer attraction errors should occur during AGREE, as the child system develops and is less prone to interference; thus, both in Italian and English the rate of object questions should increase, just as a consequence of less interference during AGREE. In addition, in English, the additional Spec Head checking should become more effective and it should contribute to the removal of the attraction errors ensuing during AGREE. Thus, at the age of 3, we would expect an improvement both in Italian and in English, but this improvement should be more consistent in English than in Italian. We do not know what happens at 3

years in Italian, but certainly an improvement is observed in English. Finally, at the age of 4, a further improvement is observed in English and should be observed in Italian as well, but in this last case, we still expect problems, as solely AGREE can occur. And this is exactly what seems to happen. Thus, in English the effect of AGREE are removed more rapidly, as a consequence of the presence of an independent principle (subject in Spec AgrSP) that forces the second step of the agreement process to occur.

6.4. Avoidance strategies in languages

Our proposal capitalizes on the role of AGREE in formation of object wh-questions and on the exploitation of various avoidance strategies that get around the interference of the object copy originating during AGREE by performing the second step of the agreement process. Avoidance strategies are not uncommon in languages. In Maroccan Arabic a question like in (23a) is ambiguous between a subject and an object question (like Italian (3) above), but the first reading is by far preferred. To form object questions a cleft structure with a resumptive pronoun is used, as in (23b) (thank to Jamal Ouhalla for bringing my attention to these facts):

(23) a. shkun shaf Omar?
who saw Omar?
Who saw Omar? (subject reading the default reading)
Who did Omar see? (object reading possible, but much less accessible)
b. shkun (huwwa) lli shaf-u Omar?
who (is) that saw-him Omar
Who was it that Omar saw?

In our framework, the object reading in (23a) is highly dispreferred, because the object copy intervenes on AGREE relation and no Spec Head checking occurs, as in Maroccan Arabic the subject must stay in the postverbal position in questions. Under the assumption that the presence of a resumptive pronoun is a sign that no movement occurs, then *who* in (23b) does not come from the embedded clause, but is likely to be connected to the resumptive pronoun through a chain. No element intervenes on this chain and thus no interference effect is observed.[4] In (23b) the resumptive accusative pronoun intervenes between AgrS and the postverbal subject *Omar*, but being case marked it does not qualify as an intervener on the AGREE relation, as the object copy does not in Greek.

Another language in which an avoidance strategy is used to form object questions is Malagasy. In theory neutral terms, we can say that the grammatical function of the wh-extracted element is encoded in the morphology on the verb. The example in (24a) illustrates a question on the subject with the verb bearing

[4] In Maroccan Arabic object *which*-questions feature the presence of a resumptive pronoun, as in (i) (an option that is not available for *who*-questions, as in (ii)). The cleft cannot be used to express which-questions, a restriction present in Italian as well.
i) shmen rajl shaf-u Omar?
which man saw-him Omar
Which man did Omar see?
ii) *shkun shaf-u Omar
who saw-him Omar
Who did Omar see?

the actor morphology and on (24b) a question on the object with the verb displaying the Theme morphology.

(24) a. Iza no mamono ny akoho amin'ny antsy?
Who Foc AT.kill det chicken with-Det knife?
'Who is killing the chickens with the knife?'
b. Inona no vonoin' ny mpamboly amin'ny antsy?
What Foc TT.kill Det farmer with-Der knife?
'What is being killed by the farmer with the knife?'

On one analysis (e.g., Keenan, 1976; Paul, 2002) only subjects can be wh-extracted. To extract an object, as in (24b) first this must be promoted to the subject function through a sort of passive and then it can be wh-extracted. Thus, the TT morphology is the passive voice and the question is a passive question on the surface subject (but see Pearson, 2005 for an alternative analysis). Under this view, passivization is a radical way to avoid the interference of the object on the AGREE relation, similar to the one adopted by Italian speaking adults. While in Italian passivization is not obligatory in Malagasy it is, because an independent constraint requires only subject to be wh-extracted.

The facts reviewed here show that the behaviour of children in the formation of object questions is not unique and it is the manifestation of a broader phenomenon present in languages, especially those with a VS order (such as Maroccan Arabic and Malagasy). What these languages have in common is the use of strategies to enhance the AGREE relation, some way or another. This means that the source of what children do while they attempt to produce object questions has its root in the architecture of language; locality seems to be a key property of language and interference by some element on a local relation is disruptive. Different degrees of disruption can be observed across languages and in early systems going from the impossibility to form object questions to the possibility to do so through various strategies. This raises the question of why there are such different degrees. In this paper, a partial answer is offered through the behaviour of children acquiring different languages. Essentially, the idea is that there is some independent property in the language that is responsible for repairing the results of the interference on AGREE. In English and Hebrew such property is the requirement that subject be in Spec AgrS to force the occurrence of both steps of the agreement process, also in questions. Other languages may have other properties that may be more or less effective than the one operative in English and Hebrew and may, thus, determine different courses of acquisition.

7. Conclusions

In this study, we investigated the production of Italian wh-questions. While we found a subject/object asymmetry as in other studies, we were able to gather different kinds of information that have shed light on the crosslinguistic differences in the acquisition of wh-questions and on the differences between comprehension and production. Starting from this last point, our study shows that limiting the investigation to a single modality may offer an incomplete picture. While Italian speaking children are at chance in the comprehension of object questions at the age of 4-5, their production is far ahead. This asymmetry

is spurious. In production, children invoke different avoidance strategies that can simply not be invoked during comprehension, where only one structure was tested and where only one structure at a time can be tested.

Our study, as other similar ones, established that object questions elicit more errors; but it also showed that the shape of object questions is more varied than that of subject questions, although a common feature characterizes this variation: the attempt to have the subject in a preverbal position. We accounted for these facts by assuming a two steps theory of agreement: agreement results from AGREE and an optional Spec Head process. Based on this, we proposed that difficulties with the formation of object questions arise from an interference of the object copy on the AGREE relation between AgrS and the thematic subject in SpecvP. The avoidance strategies (questions with null subject or NP-topicalization) represent attempts to accomplish both steps of the agreement process: AGREE and Spec Head. Putting our approach in a crosslinguistic perspective, we have seen that in languages in which agreement results solely from AGREE the production of object questions is problematic for a longer period than in language in which also Spec Head must occur for independent reasons (modulo the presence of morphological case): Hence Italian-speaking children still display a subject/object asymmetry where such an asymmetry is overcome in English and Hebrew (at least for *who*-questions), where the additional Spec Head step must occur. This conclusion is in line with a generalization based on child language and on comparative data proposed by Guasti and Rizzi (2002) according to which morphological agreement is more stable when it is realized in a spec head configuration (SV) than when it results from a VS configuration (involving AGREE only).

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