**Born in the USA: A Comparison of Modals and Nominal Quantifiers in Child Language**

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**Abstract**

One of the challenges confronted by language learners is to master the interpretation of sentences with multiple logical operators (e.g., nominal quantifiers, modals, negation), where different interpretations depend on different scope assignments. Five year-old children have been found to access some readings of potentially ambiguous sentences much less than adults do. Recently, Gualmini, Hulsey, Hacquard, and Fox (2008) have shown that, by careful contextual manipulation, it is possible to evoke some of the putatively unavailable interpretations from young children. The focus of this work was on sentences involving nominal quantifiers and negation. The present study extends the investigation, by comparing children’s interpretations of negative sentences with nominal quantifiers to ones with modal expressions. The results reveal that, in the case of sentences with modal expressions, the kinds of contextual manipulations introduced by Gualmini et al. do not suffice to explain children’s initial scope interpretations. In response to the recalcitrant data, we propose a new three-stage model of the acquisition of scope relations. Most importantly, at the initial stage child grammars make available only one interpretation of negative sentences with modal expressions. We call this stage Unique Scope Assignment (USA).

1. Introduction

Investigations of how adult language users interpret potentially ambiguous sentences provide a unique window into the inner workings of the human sentence processing mechanism, i.e. the parser. Whenever more than one structural analysis is available for the same string of words, the parser’s decision about the preferred interpretation sheds light on its internal operating principles. Similarly, investigations of the resolution of ambiguities by children are revealing about how the internal operating principles of the parser are acquired. In addition, investigations of young children’s interpretations of ambiguous sentences can be revealing about the ways in which the parser may be influenced by considerations of language learnability.
Our focus in this paper is on ambiguities that are (at least potentially) generated in sentences that contain multiple logical operators. Such ambiguities have been extensively investigated in the semantic literature (see a.o. May 1985, Beghelli & Stowell 1997, Szabolcsi 1997). More recently, they have attracted interest in the field of child language acquisition. To illustrate one of the relevant phenomena, consider sentence (1), which is taken from Musolino (1998). The example contains both negation and a universal nominal quantifier in subject position.

(1) Every horse didn’t jump over the fence.
   a. Every horse was such that it didn’t jump over the fence
   b. Not every horse jumped over the fence

For adult speakers, depending on the context and on intonation, sentence (1) can be assigned either the meaning indicated in (1a) or the meaning in (1b). It is easy to verify that these two readings are associated with different truth-conditions. For example, if not every of the horses jumped over the fence, but some did, then (1a) is false, whereas (1b) is true.

In evaluating sentence (1), adults tend to accept it both in contexts that verify meaning (1a) and in contexts that verify (1b). If child grammar is the same as that of adults, then, children too would be expected to accept sentence (1) in both circumstances. Previous studies, however, have suggested that this may not be the case. In particular, Musolino (1998) reported that five year-old children tended to reject sentences like (1) in one of the contexts in which adults accept them. This suggests that children may only assign a subset of the adult interpretations to ambiguous sentences like (1). More specifically, the Musolino study found that children consistently rejected sentences like (1) as an accurate description of experimental vignettes that only verified the reading in (1b), whereas adults consistently accepted the same sentences in these experimental contexts. Musolino (1998) interpreted the results as supporting the view that children’s grammar initially excludes – or strongly disfavours – the semantic interpretation in (1b). Following the initial study by Musolino, similar results were obtained by other researchers, revealing asymmetries in the interpretations assigned to ambiguous sentences by children and adults (Musolino et al 2000, Krämer 2000).

The observed differences between children and adults suggest that children access only a restricted set of the interpretations that adults assign to ambiguous sentences. In addition, some experimental findings led to the conclusion that the differences between children and adults extend to sentences that are unambiguous for adults. There have been at least two such cases. One involved negative sentences with an existential nominal quantifier, such as (2), which contains negation and the quantifier some.

(2) No horse is such that it didn’t jump over the fence.
The detective didn’t find some guys.

a. *It is not the case that the detective found some guys
b. There are some guys that the detective didn’t find

In principle, there are two possible scope assignments for (2), as indicated in (2a) and (2b). For adult English-speakers, however, interpretation (2b) is acceptable, but (2a) is excluded. In contrast to adults, the findings reported in Musolino (1998) suggested that English-speaking children initially access only the interpretation represented in (2a), the one that is excluded for adults.

Based on children’s behavioural responses to sentences with nominal quantifiers, as in (1) and (2), Musolino (1998) and Musolino et al. (2000) observed that children initially assign an isomorphic mapping between surface syntax and semantic interpretation, disallowing inverse-scope readings. A second discrepancy between child and adult behaviour defied the observation of isomorphism, however. The findings were first reported by Moscati (2008). In this case, the potential ambiguity involved negative sentences with modals expressing possibility, as in the Italian example in (3).

(3) Il contadino può non dare le carote all’elefante.
   the farmer MOD not give the carrots to-the elephant
   a. *It is impossible that the farmer gives carrots to the elephant
   b. It is possible that the farmer doesn’t give carrots to the elephant

For adult Italian-speakers grammar, sentence (3) is unambiguous. The only licit interpretation is (3b). The absence of ambiguity follows from the fact that the interpretation of negative sentences with existential modals is dictated by surface word order of Italian. That is, there are no ‘inverse scope’ reading. Consequently, the modal potere takes wide scope (possible > neg) when it precedes negation, as indicated in (3b), and the reading (3a) is excluded. Similarly, negation obligatorily takes wide scope (neg > possible) when it precedes a modal, as in (4) (see also Gualmini & Moscati 2009).

(4) Il contadino non può dare le carote all’elefante.
   the farmer not MOD give the carrots to-the elephant
   a. It is impossible that the farmer gives carrots to the elephant
   b. *It is possible that the farmer doesn’t give carrots to the elephant

The Moscati study revealed that Italian-speaking children consistently rejected the unique adult reading of (3), i.e., (3b). In contrast to adults, children assigned the ‘inverse scope’ reading (3a), which is totally

The absence of a unified account of children’s interpretation of potentially ambiguous sentences invited a reconsideration of a different proposal. This proposal was advanced in Crain et al (1994) and Crain & Thornton (1998) (see also Moscati 2013; Moscati & Crain in press). On this account, learnability constraints dictate children’s initial scope preferences for interpreting ambiguous sentences. The proposal was that children always start with the logically strongest interpretation of ambiguous sentences, i.e., the subset reading (see Berwick 1985). This learnability-based account encompasses children’s interpretations of all of the examples we have considered so far: (1), (2) and (3). In all three cases, children’s initial interpretation corresponds to the strong reading, regardless of surface word order.

These two proposals, while very different, share in common the idea that children initially only have a single reading for the sentences in (1-3) and that this reading is not necessarily one that is attested in the local language. Child and adult grammars differ, therefore, in ways that cannot be explained by experience-based accounts of language development which rely on general learning mechanisms and frequency in the input as the basis of children’s behaviour. In any case, there would seem to be circumstantial evidence for postulating a stage of language acquisition, roughly between the ages of about 3- to 5-years-old, at which only one scope assignment is possible for children. We call this stage Unique Scope Assignment (USA).

The USA has its detractors. In particular, Gualmini and his colleagues conducted a series of experiments demonstrating the availability of readings that, they contend, were artificially suppressed in previous studies of children’s ambiguity resolution. The research strategy they advise emphasizes the crucial role played by pragmatic factors in evoking interpretations of logically ambiguous sentences that had been, arguably, obscured in earlier research (Gualmini et al 2008; see also Gualmini 2004). Careful manipulation of contextual features were shown to assist children in accessing the putative unavailable readings of sentences like (1), bringing the range of interpretations assigned by children on a par with those of adults. Such results called into question the need to postulate a stage of Unique Scope Assignment (USA), at least in the cases investigated by Gualmini et al (2008). Instead, the new findings invited the conclusion that multiple readings of ambiguous sentences are available to children as soon as they can be tested.

In this paper we ask whether the kinds of pragmatic factors discussed in Gualmini et al (2008) can be generalized to account for those instances where children have been observed to lack interpretations that are highly salient, in fact unambiguously so, for adults. If the research
strategy employed by Gualmini et al is up to the task, then we should find that, provided appropriate contextual support, children are able to access the readings of sentences that have eluded them in previous studies. This should include the surface scope reading of negative sentences with existential modals in Italian, such as example (3).

Here is the structure of the paper. The next section introduces the proposal by Gualmini et al. (2008) in more detail, and spells out the predictions of the account for both modals and nominal quantifiers. Section 3 reports the findings of an experimental study designed to test these predictions using negative sentences with modal expressions, with Italian-speaking children. Anticipating the results, children’s interpretations of sentences with modal expressions resist being assimilated within the Gualmini et al account based on children’s interpretation of nominal quantifiers. In Section 4 we articulate a developmental model incorporating a stage of Unique Scope Assignment.

2. Questions under discussion: Gualmini et al. 2008

After the appearance of results indicating children’s apparent absence of certain adult interpretations, as summarized above, a series of studies reversed the conclusions of earlier research. These studies showed children’s sensitivity to contextual factors when interpreting ambiguous sentences, resulting in adult-like performance by children in accessing many of the interpretations that had eluded them in previous research. According to the authors of many of these studies (e.g., Gualmini 2004, Musolino & Lidz 2006, Gualmini et al. 2008), the source of children’s non-adult behaviour in previous research resided in their greater sensitivity to certain discourse-pragmatic factors, as compared to adults. Gualmini and his colleagues focused on one contextual factor in particular, namely the question that was under consideration in the experimental contexts children were responding to.

Essentially, Gualmini et al. drew our attention to the fact that sentences can profitably be analysed as responses to an explicit or implicit question about events that have unfolded (or are going to unfold) in the conversational context. They refer to this feature of the context, the Question Under Discussion (QUD) (Roberts, 2004 among others). Gualmini et al. argue that the QUD plays a crucial role in promoting and demoting various readings of ambiguous sentences. They captured this intuition in the following principle:

(5) **Question Answer Requirement (QAR)**
The selected interpretation of an ambiguous sentence is required to be a good answer to the Question Under Discussion (QUD).
Let us spell out some of the assumptions that underlie the QAR. Frist, the QAR is based on a particular analysis of the meaning of questions, and what counts as a good answer to a question. Following Hamblin (1973) and much subsequent work, the meaning of a Yes-No question such as (6a) is taken to be the set that contains (the meanings of) its positive and negative answers, as in (6b). A good answer is any sentence that entails either the proposition corresponding to the positive member of the set, or the one corresponding to its negative member. So, good answers include the sentence \textit{John is over there drinking champagne} (which entails that John came) as well as the sentence \textit{He is in Florida} (which entails that John did not come).

(6)  
\begin{enumerate}  
\item a. Did John come? 
\item b. [] Did John come? [] = {}[] [] John came [] [], ¬[] John came [] 
\end{enumerate}

With these basics in hand, we can return to how the QAR is invoked to explain children’s non-adult behaviour in previous research. The proposal is that the readings that proved problematic for children were ones that were not good answers to the Question Under Discussion (QUD) in the story-contexts presented to children in previous research. To illustrate, consider the sentence in (7) (repeated from (2) above). Recall that children proved unable to access the reading indicated in (7b) in Musolino’s (1998) study. Instead, children appeared to assign a non-adult interpretation to (7), corresponding to (7a).

(7)  
\begin{enumerate}  
\item a. *It is not the case that the detective found some guys. (¬∃)  
\item b. There are some guys that the detective didn’t find. (∃¬)  
\end{enumerate}

Gualmini et al. argue that, in the experimental context in that study, the salient (albeit implicit) QUD was whether or not the detective found some of the guys. That is, the QUD was (8). The meaning of this question has been rendered in (8b), and schematically in (8c).

(8)  
\begin{enumerate}  
\item a.  
\begin{enumerate}  
\item The detective found some guys [] , 
\item ¬[] The detective found some guys []  
\end{enumerate}  
\item b. {}∃,¬∃  
\end{enumerate}

Assuming that, for children, the QUD was (8), then how should they be expected to interpret the answer in (7)? The Question Answer Requirement predicts that only the reading (7a) would be accessible. This is because (7a), but not (7b), is a good answer to (8). That is, the meaning
in (7a), *It's not the case that the detective found some guys*, its one of the two possible answers to the question in (8): \( \neg \text{[| The detective found some guys |]} \). This answer is one of the members of the set in (8b/c).\(^1\)

The claim is that children did not access certain interpretations because they were not good answers to the salient QUD. This immediately predicts that these readings will become available to children if the relevant QUD is made salient. For instance, the QAR predicts that children will be able to access the adult interpretation of (7), i.e., (7b), in circumstances in which the QUD is (9). In this case, both reading (7a) and (7b) are good answers to (9), as they both entail \( \neg \forall = \neg \text{[|The detective found every guy |]} \).

(9) Did the detective find every guy?
   (1) \{ \text{[| The detective found every guy |]},
       \( \neg \text{[| The detective found every guy |]} \) \}
   b. \{\forall, \neg \forall\}

Indeed, a series of experiments reported in Gualmini et al. (2008) showed that children access the reading in (7b) when (9) was the salient QUD. Other findings also confirm the QAR, at least for sentences involving negation and nominal quantifiers.\(^2\)

What about adults? Why do adults have more ready access to readings that do not satisfy the QAR? Gualmini and his colleagues proposed that two factors are at play in the interpretation of ambiguous sentences, both for children and adults. One is the Question Under discussion (QUD), and the other is the Principle of Charity. The Principle of Charity entreats language users to favour interpretations of ambiguous sentences that make them true in the conversational context (Grice 1975). Adults lean more heavily than children do on the Principle of Charity. If the QUD is not answered in the conversational context, the Principle of Charity encourages adults to accommodate a different QUD. In contrast to adults, children adhere to the Principle of Charity only if the QUD is answered, according to the account. In short, the QAR was invoked to devise a two-stage model of development: at the first stage, the QUD outranks the Principle of Charity; at the second stage, the ranking is reversed.

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\(^1\) The reading (7b), instead, does not entail either the negative or the positive member in (8b/c) \( \exists \neg \Rightarrow \neg \exists, \exists \neg \Rightarrow \exists \).

\(^2\) Gualmini et al. did not explicitly manipulate the QUD. They did so indirectly by changing the story context. The intended effect is nonetheless that illustrated by the questions in (8) versus (9).
Stage 1: QUD  > Charity
Stage 2: Charity > QUD

Although the two-stage QAR model of acquisition was originally developed to account for the interpretations of negative sentences with nominal quantifiers by children and adults, it is clear that the account is intended to generalize to other combinations of logical operators. More generally, the account predicts that manipulations of the QUD should suffice to evoke less accessible readings of ambiguous sentences, regardless of the logical operators they contain. To investigate this prediction, we turn now to a study by Moscati (2011), which looked at negative sentences with modals. This study is topical, because the findings represent an apparent challenge to the QAR model.

2.1 A potential challenge to the QAR model

To assess the QAR model, Moscati (2011) investigated Italian-speaking children’s interpretation of negative sentences with modal expressions. The stimulus sentences included examples such as (11) (previously example (3)). Recall that children were reported to initially access only a non-adult-interpretation of (11), represented in (11a). Children failed to access the unique interpretation available to adults, indicated in (11b).

(11) Il contadino può non dare le carote all’elefante.
    the farmer MOD not give the carrots to-the elephant
    a. *It is impossible that the farmer gives carrots to the elephant ¬◊
    b. It is possible that the farmer doesn’t give carrots to the elephant ◊¬

According to the QAR, children should be able to access the reading in (11b) if they are provided with the appropriate QUD. To test this, Moscati introduced an explicit QUD on each test trial, manipulating whether (11b) was or was not a good answer to the QUD in the experimental context.

Here is the experimental design in slightly more detail. First, only the reading associated with (11b) was a true description of the events that had unfolded on each experimental trial. Therefore, children’s acceptances of the target sentences were taken as evidence that they assigned the adult interpretation, such as (11b), whereas their rejections were taken as evidence that they had assigned a non-adult reading, such as (11a).

The novel experimental manipulation in the study, however, involved the QUD. There were two conditions. In Condition 1, the reading that made the sentence true, e.g. (11b), was not a good answer to the QUD. According to the QAR, children should not access this reading in this condition, and should reject the test sentences. Condition 1 is illustrated in (12). Notice that interpretation (11b), *It’s possible that the farmer doesn’t
give the carrots to the elephant (◊¬), does not answer (12) – it does not entail either the positive or the negative member of the meaning of (12).

(12) Può il contadino dare le carote all’elefante?
Can the farmer give the carrots to the elephant
a. {◊, ¬◊}

In the second condition, the same interpretation (11b) did answer the QUD. Example (13) illustrates Condition 2.

(13) Deve il contadino dare le carote all’elefante?
Must the farmer give the carrots to the elephant
a. {☐, ¬☐}

The critical observation is that question (13) is answered by sentence (11), on interpretation (11b). This is because It’s possible that the farmer doesn’t give the carrots to the Elephant (◊¬) entails the negative member of the meaning of question (13): it entails It is not necessary that the farmer gives carrots to the elephant (¬☐). According to the QAR, therefore, children should access this interpretation, and should accept the test sentence (11).

In sum, everything but the QUD was held constant across trials. According to the QAR, children should reject the target sentences in Condition 1, where the only true reading of the test sentences is not felicitous (i.e. does not answer the QUD), and they should accept the target sentences in Condition 2, where there is a reading that is both felicitous and true in the context. Despite these manipulations of the QUD, Moscati (2011) found no evidence of an effect of the QUD across the two conditions - children consistently rejected the target sentences in both Condition 1 and in Condition 2.

The results reported in Moscati (2011) represent a challenge for the QAR approach. However, there were noteworthy limitations to the study which blunt the force of any conclusions that can be drawn. First, there were no suitable controls to ensure that children were paying attention to the QUD. If children were ignoring the QUD, this alone could explain why Moscati found no effect across conditions. Second, the study did not include nominal quantifiers, precluding a direct comparison between children’s responses to modals and to nominal quantifiers. We are left with only indirect comparisons, based on different experimental materials and different tasks. The goal of the present study was to overcome these possible limitations of the Moscati study, in order to see whether children’s interpretations of negative sentences with modals constitute a serious challenge to the QAR account.
3. Experiment

A Truth Value Judgement Task (TVTJ) was conducted to investigate whether adherence to the QAR grants children access to the problematic readings for both negative sentences with nominal quantifiers and for ones with modals (Crain & Thornton 1998). Target sentences of both kinds were tested in parallel using the same group of children. Therefore, the experimental design was 2 x 2, with group (adults vs. children) and operator type (quantifiers vs. modals) as factors.

In the quantifier condition, the test sentences produced by the puppet were analogous to those of Musolino (1998) and Gualmini et al (2008). The sentences contained negation and an existential quantifier in object position, and these sentences were true descriptions of the experimental contexts on only one of their interpretations. Moreover, the sentences were always good answers to an explicit QUD. Here is a typical trial.

(14) Quantifier Story
Jack and Fred are going to take photos of animals in the jungle. There are two crocodiles and two elephants hanging around. Jack and Fred decide to try to take photos of them. Fred tries first, however he doesn’t manage to take photos any of them. Then it is Jack’s turn. He manages to take photos of the elephants, but not of the crocodiles.

The outcome of this story was that Jack didn’t take photos of all the animals, just some of them (the elephants). At this point, the experimenter asked the puppet the question in (15) and the puppet answered as in (16):

(15) QUD: Il fotografo ha fotografato tutti gli animali? {∀, ¬∀}
‘Did the photographer shoot all of the animals?’

(16) Il fotografo non ha fotografato qualche animale.
   a. There are some photos that the photographer didn’t shoot
      (∃¬) True
   b. The photographer didn’t shoot any photos
      (¬∃) False

It is easy to verify that both interpretations of (16) answer the QUD, because both entail the negative member of the question meaning. Moreover, (16) is true in the context in (14) if it is interpreted as in (16a).
The modal condition was completely parallel. The target sentences were analogous to those of Moscati (2011), with negation and a possibility modal. Here is a typical trial.

(17) Modal story
The Indian and Smurfette want to visit Papa Smurf at his home far away. A motorbike is available to them. However, only the Indian is tall enough to ride it. The Indian is considering using it, but in the meanwhile a pilot comes by and he offers the Indian his car. Now the Indian has two choices: the bike and the car.

At the end of the story, the Indian was free to choose between the car and the bike. In other words, the Indian can take the bike but he doesn’t have to. At this point, the experimenter asked the puppet the question in (18) and the puppet replied with (19):

(18) QUD: L’indiano deve guidare la moto? {☐, ¬☐}
\textquoteleft Must the Indian drive the bike?’

(19) L’indiano può non guidare la moto
\begin{enumerate}
\item The Indian might not drive the bike \((\Diamond\neg)\quad \text{True}\)
\item *The Indian cannot drive the bike \((\neg\Diamond)\quad \text{False}\)
\end{enumerate}

Again, both of the interpretations of (19) were good answers to the QUD, as both entail the negative member in (18). Moreover, the target sentence was true under the interpretation in (19a). We have seen that, in both conditions, the true readings (16a) and (19a) are good answers to the explicit QUD. The QAR account therefore predicts that children should accept both (16) and (19) to the same extent.

Method
Subjects were presented with 3 sentences per condition, for a total of 6 stories. These were introduced in random order, and were acted out with props and toys. At the end of each story, the outcome was made explicit by the arrangement of the characters. Following each story, children heard two questions. One question was similar to those in (15) and (18), and the child’s task was to judge whether or not the puppet’s answer accurately described what had happened in the story. The other was a \textit{wh}-control question, to assess whether children were paying attention to the experimenter’s QUDs. For example, on the trial corresponding to the story in (14), the experimenter posed the question (Q) in (20), and children were asked to evaluate the puppet’s fragment answer (A).
(20) *Wh*-control
   Q. *Who didn’t shoot any animal?*
   A. *Fred*

Notice that children cannot successfully judge the accuracy of the puppet’s answer in (20) unless they relate it to the *wh*-question (and arguably reconstruct a full-representation on the basis of the antecedent, along the lines of (21); see Merchant 2001 among others).

(21) *Fred <didn’t shoot any animal>*

Another four trials were interspersed among the target stories, to control for children’s interpretation of positive sentences without negation, and to balance the number of true and false sentences. There were two positive controls for each operator type, and these were false descriptions of the corresponding scenarios. On the control trials, the target sentences were introduced by a Yes/No question and combined with an additional *wh*-question/fragment exchange. On both the experimental trials and on the control trials the fragment answers were associated with a truth-value opposite to that of the target sentences. In total, each subject was presented with a total of 10 stories.

*Participants*
There were 16 monolingual Italian-speaking children (mean 5;6, range 4;10-5;8), and 10 adults were tested as controls.

*Results*
Figure 1 summarizes the proportion of correct answers for the fragment answers and the proportion of correct rejections to the positive controls.

Fig. 1. Proportion of correct TVJs to the controls.
As Figure 1 illustrates, children performance was similar to that of adults. Children correctly rejected the positive control statements at a rate above 80% correct for both modals and nominal quantifiers. Children also experienced little difficulty accepting and rejecting the puppet’s fragment answers. Their proportion of correct answers remained at above 80%. These findings establish that children were paying attention to the questions posed by the puppet and judged the puppet’s fragments as they pertained to the QUD.

We turn next to data from the two experimental conditions, which are summarized separately in Figures 2 and 3.
As Figure 2 shows, children accepted the test sentences with existential quantifiers 90% of the time. This was only slightly lower than the adult rate of 96%. Figure 3 shows that, by contrast, children’s acceptance rate for negative sentences with modals dropped to 43%, whereas adults uniformly accepted these sentences.

Data were analysed in R using linear-mixed-effects-models, with Group and Operator-Type as predictors, and Subjects and Items as random effects (see Baayen 2008). The analysis revealed a main effect of Group and Operator-Type, with the interaction approaching statistical significance. Results of the analysis are summarized in Table 1.

Table 1. Best-fitting logistic regression of probability of correct answers for Group and Operator-Type.

|                          | Est. | Std. Err | z val. | Pr(>|z|) |
|--------------------------|------|----------|--------|---------|
| (Intercept)              | -0.43| 0.53     | -0.81  | 0.41    |
| Child. vs Adults         | 4.70 | 1.50     | 3.12   | 0.001 **|
| Modal vs Quant.          | 3.57 | 0.77     | 4.59   | 4.32e-06 ***|
| Child/Mod vs Adults/Q    | -3.57| 1.95     | -1.82  | 0.067 . |

Formula in R: lmer(correct_answer ~ Group*Operator + (1|subject) + (1|item), family = binomial), AIC 109, BIC 127.1, LogLik -48.52, deviance 97.03. Signif. codes: ‘****’ = p<.001; ‘***’ = p<.01; ‘.’ =p<0.1.

Discussion
The present experiment manipulated QUDs for two types of logical operators, modals and nominal quantifiers. One of the main findings was a replication of that of Gualmini et al (2008). Both studies found that children are able to access the true reading of negative sentences with nominal quantifiers when this reading answered the explicit QUD in the context. However, the present study also replicated the finding reported in Moscati (2011). In both studies, children were unable to access the true reading of negative sentences with modals, even when this reading felicitously answered the explicit QUD in the context.

The present study was designed to overcome the possible limitations of the Moscati study, in two ways. One feature of the present study was to investigate negative sentences with modals and ones with nominal quantifiers using the same child participants. Children’s responses to sentences with numeral quantifiers were consistent with the QAR, but their responses to sentences with modals were not. In view of the effect of QUD in guiding children’s responses to sentences with nominal quantifiers, there is no reason to believe that children were selectively ignoring the QUD in modal sentences. Moreover, the fact that children correctly responded to the control sentences demonstrates that they
attended to the Question under Discussion. If children were not ignoring the QUD, however, the present results effectively challenge the QAR proposal advanced in Gualmini et al. (2008). In the remainder of the paper, then, we briefly sketch a modification of the two-stage model of acquisition that underlies the QAR account. According to the present proposal, there is an initial stage at which only one scopal interpretation is available in child grammar (the USA).

4. A new three-stage model

As we saw, the QAR is a two-stage model of acquisition. At the first stage, the QUD is more highly ranked than the Principle of Charity. At this stage, children are expected to reject ambiguous sentences if no reading is both true and felicitous in the context (where ‘felicitous’ means a good answer to the salient QUD). This holds even if a sentence has a reading that is true, but not felicitous, in the context. At the second stage, older children/adults rank the Principle of Charity more highly than discourse congruence. At this stage, if an ambiguous sentence has a reading that is true in the context, people will accept it, even if this requires accommodating a new QUD. The model is represented in (21).

\[(21)\] QAR: A two-stage model  
Stage 1: QUD > Charity  
Stage 2: Charity > QUD

It is clear that the model in (21) cannot account for the asymmetry we observed in children’s responses to negative sentences with modals as compared to ones with numeral quantifiers. We therefore propose a modification of the two-stage model, which includes an initial stage at which children have access to only one interpretation of potential scope ambiguities.

\[(22)\] A three-stage model  
Stage 1: Unique Scope Assignment (USA)  
Stage 2: QUD < Charity  
Stage 3: Charity > QUD

On this model, children may move from the first stage to the second stage at different rates, depending on the operator involved. For instance, if one particular operator is acquired later than another in child grammar, we expect the transition from the first stage to the second to be later for this operator. It has been suggested in the literature that modals are acquired later than nominal quantifiers (Noveck 2001, among others). We propose, then, that this is why the Unique Scope Assignment stage is still
observable in 5-year-old children when they are responding to negative sentences with modals, but not to ones with nominal quantifiers.

In sum, while pragmatics plays a crucial role in the interpretation of ambiguous sentences by both children and adults, the findings of the present experiment support the existence of a stage in language development in which children access only a subset of the interpretations available to adults for ambiguous sentences. Even more surprisingly, perhaps, children are sometimes unable access the unique adult interpretation of (potentially) ambiguous sentences. The interpretation that children initially assign to such sentences can even be one that is not available to adult speakers of the local language. We shall remain neutral for the time being on how children’s initial assignments should be accounted for, but for one proposal see Moscati and Crain (in press).

References


